INRMP

2020-2025

Fort Carson and the Piñon Canyon Maneuver Site

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Enable the Mission by Sustaining Natural Resources

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN 2020-2025

Fort Carson and the Piñon Canyon Maneuver Site

APPROVAL

This Integrated Natural Resources Management Plan was developed in accordance with Army Regulation (AR) 200-1, Environmental Protection and Enhancement, paragraph 4-3d(1)(a), and meets requirements of the Sikes Act (16 USC 670a. *et seq.*) as amended.

Submitted By:

HAL K. ALGUIRE
Director
Public Works
Fort Carson, Colorado

2 Sept 2020
Date

JAMES R. RICE
Director
Plans, Training, Mobilization, and Security
Fort Carson, Colorado

3 Sep 2020
Date

Approving Official:

NATHAN R. SPRINGER
COL, AR
Garrison Commander
Fort Carson, Colorado

9 September 2020
Date

Concurring Officials:

LIISA SCHMOELE
Assistant Field Supervisor, Colorado Field Office
USFWS Ecological Services
Denver, Colorado

08/20/2020
Date

BRETT ACKERMAN
Southeast Region Manager
Colorado Division of Parks and Wildlife
Denver, Colorado

7/22/2020
Date

EXECUTIVE SUMMARY

This Integrated Natural Resources Management Plan (INRMP) links and integrates conservation management actions with Army military mission activities in order to maintain high-quality lands for military training, biodiversity, and recreation.

This INRMP is the guiding conservation and natural resources document for Fort Carson and the Piñon Canyon Maneuver Site (PCMS), Colorado. Fort Carson is an Army installation. The PCMS is an Army training site under the administration of Fort Carson. In view of its size and geographic separation from Fort Carson, the PCMS is an important component of Fort Carson's conservation and natural resources management program. In this INRMP, for ease of reference, both Fort Carson and the PCMS will be referred to as installations. This INRMP provides useful information for all organizations and individuals involved with or interested in the management or use of natural resources and lands on Fort Carson and the PCMS. This includes active duty units, reserve components, directorates, private groups, members of the public, and local, state, and federal agencies.

All plans, goals and objectives regarding natural resources programs on Fort Carson and the PCMS, including those stated in this INRMP, are subject to the statutory mandate that they be "[c]onsistent with the use of military installations … to ensure the preparedness of the Armed Forces." 16 USC 670a. (a)(3)(A). As stated in Department of Defense Instruction (DoDI) 4715.03, *Natural Resources Conservation Program*, paragraph 4a, "The principal purpose of DoD lands, waters, airspace, and coastal resources is to support mission-related activities." Thus, implementation of this plan is designed to:

- Achieve 100 percent compliance with environmental laws and regulations;
- Use an ecosystem-based approach to natural resources management, managing for values such as biodiversity, recreation, water quality, native species, and aesthetics;
- Practice adaptive management, improving our approaches and techniques using the best available science;
- Foster a sense of environmental stewardship among soldiers, employees, and neighbors who use or have an interest in natural resources on Fort Carson and PCMS;
- Improve communication, coordination, and participation among interested parties and partners in the region; and
- In conjunction with the Integrated Training Area Management (ITAM) program, facilitate sustainable training by promoting education and by managing the natural resources to meet the needs of the trainers and the missionscape.

This INRMP layout follows the U.S. Army Installation Management Command (IMCOM) format. Each chapter is briefly discussed below.

- Chapter 1 - **Overview:** Includes the purpose, scope, and goals and objectives of the INRMP, and explains responsibilities, authority, management strategy, and plan integration.

- Chapter 2 - **Current Conditions and Use:** This chapter gives a general description of where the installations are, the surrounding regional land uses, past and current military mission land use, operations and activities that may affect the natural environment, constraints to training due to natural resources-related issues, and a general description of the physical and biotic environments, wetland habitats, and flora and fauna of each installation.

- Chapter 3 - **Environmental Management Strategy and Mission Sustainability:** This chapter addresses the integration of the military mission and sustainable land use through consultation and partnership with other federal and state agencies

- Chapter 4 - **Program Elements**: Each natural resources-related program is addressed in this chapter, including the program goals, objectives and elements. This includes all of the programs managed by the Directorate of Public Works (DPW) Environmental Division – Conservation Branch, as well as some programs managed outside of the DPW, such as natural resources law enforcement and Integrated Training Area Management (ITAM).

- Chapter 5 - **Implementation**: This chapter briefly discusses how this INRMP will be implemented. The chapter includes discussion of funding, cooperative agreements, and methods to ensure that discretionary activity results in no net loss of military training capability of the installations. All actions described herein are subject to availability of funds and the priorities described herein.

- **Appendices:** There are ten appendices. Included are acronyms used in the document, species management plans for federally petitioned species, information on how to access other natural resource management plans, the Environmental Assessment for this INRMP, vertebrate and plant species lists, migratory bird management information, recurring INRMP activities, ITAM / Land Rehabilitation and Maintenance (LRAM) Best Management Practices (BMPs), and LRAM Project List for FYs 2019 and 2020. The last three appendices will change from year to year to reflect DPW, Directorate of Emergency Services (DES), and ITAM annual work plans.

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Fort Carson and the Piñon Canyon Maneuver Site

TABLE OF CONTENTS

EXECUTIVE SUMMARY 3
TABLE OF CONTENTS 5
1. OVERVIEW 9
1.a. Purpose 9
1.b. Scope 9
1.c. Goals 9
1.d. Responsibilities 10
1.e. Authority 16
1.f. Stewardship and compliance 17
1.g. Review and revision process 17
1.h. Management strategy 19
1.i. Other plan integration and preparing prescriptions for projects 20
2. CURRENT CONDITIONS AND USE 21
2.a. Installation Information 21
2.b. General physical environment and ecosystems 27
2.c. General biotic environment 42
3. ENVIRONMENTAL MANAGEMENT STRATEGY AND MISSION SUSTAINABILITY 43
3.a. Supporting sustainability of the military mission and the natural environment 43
3.b. Natural resources consultation requirements 45
3.c. NEPA compliance 46
3.d. Partnerships and collaborative resource planning 46
3.e. Public access and outreach 46
3.f. Encroachment management 46
3.g. State comprehensive wildlife plan 49
4. PROGRAM ELEMENTS 50
4.a. Species of conservation concern 50
4.b. Wetlands management 57
4.c. Conservation law enforcement 62

4.d. Fish and wildlife management 64
4.e. Forest management 73
4.f. Vegetation management 78
4.g. Migratory bird management 78
4.h. Invasive species management 81
4.i. Pest management 87
4.j. Land management 91
4.k. Agricultural / grazing outleasing 91
4.l. Geographic Information Systems (GIS) management 92
4.m. Outdoor recreation 92
4.n. Wildlife Aircraft Strike Hazard (WASH) 95
4.o. Wildland fire management 97
4.p. Training of personnel 103
4.q. Coastal / marine management 104
4.r. Floodplains management 104
4.s. Mineral resources 104
4.t. Urban forest management 105
4.u. Water rights management 107
4.v. Cultural resources 111
4.w. Integrated Training Area Management (ITAM) 111
4.x. Bald and golden eagle management 124
5. IMPLEMENTATION 127
5.a. Process of preparing management prescriptions 127
5.b. No net loss 127
5.c. Cooperative agreements 127
5.d. Funding process 127
5.e. Staffing 129
LITERATURE CITED 130
APPENDIX 1: Acronyms 134
APPENDIX 2: Species Management Plans 137
Annex A: Colorado Checkered Whiptail Management Plan 137
Annex B: Little Brown Bat Management Plan 141
Annex C: Monarch Butterfly Management Plan 146
Annex D: Plains Spotted Skunk Management Plan 151
Annex E: Tri-colored Bat Management Plan 154
APPENDIX 3: Other Management Plans 156
APPENDIX 4: Environmental Assessment 157

APPENDIX 5: Vertebrate Species Lists 217
Fort Carson Vertebrates 219
Piñon Canyon Maneuver Site Vertebrates 229
APPENDIX 6: Plant Species Lists 237
Plant List for Fort Carson 237
Plant List for the Piñon Canyon Maneuver Site 255
APPENDIX 7: Migratory Bird Management 268
APPENDIX 8: INRMP Recurring Activities 276
APPENDIX 9: ITAM / LRAM Best Management Practices 302
APPENDIX 10: LRAM Project List for FYs 2019 and 2020 337

List of Tables

Table 1-1: INRMP Metrics 18
Table 5-1. DPW Environmental Division/Conservation Branch staffing 129

List of Figures

Figure 2-1. Location of Fort Carson and Piñon Canyon Maneuver Site (PCMS) 21
Figure 2-2. Average monthly temperature data for Fort Carson from 2004 to 2014 28
Figure 2-3. Average monthly precipitation totals for Fort Carson from 2004 to 2014 28
Figure 2-4. Average monthly temperature data for the PCMS from 2004 and 2014 30
Figure 2-5. Average monthly precipitation totals for the PCMS from 2004 to 2014 30
Figure 2-6. Central Shortgrass Prairie ecoregion map 31
Figure 2-7. Surface waters and elevations on Fort Carson 32
Figure 2-8. Surface waters and elevations and Piñon Canyon Maneuver Site 33
Figure 2-9. General vegetation classes for Fort Carson 37
Figure 2-10. General vegetation classes for Piñon Canyon Maneuver Site 38
Figure 2-11. Plant communities of Fort Carson 39
Figure 2-12. Plant communities of Piñon Canyon Maneuver Site 40
Figure 2-13. Areas of Colorado in the NRCS Loamy Foothills Ecological Site Desciption 41
Figure 2-14. Areas of Colorado in the NRCS Loamy Plains Ecological Site Desciption 41
Figure 3-1. Fort Carson ACUB map as of October 2019 48
Figure 4-1. Mean fire expectancy for Fort Carson 98
Figure 4-2. Mean fire expectancy for PCMS 99

This page intentionally left blank.

1. OVERVIEW

1.a. Purpose

This Integrated Natural Resources Management Plan (INRMP) links and integrates conservation management actions with Army military mission activities in order to maintain high-quality lands for training, biodiversity, and recreation.

1.b. Scope

The INRMP is the guiding natural resources document for Fort Carson and the Piñon Canyon Maneuver Site (PCMS), Colorado. The INRMP provides useful information for all organizations and individuals involved with or interested in the management or use of natural resources and lands on these installations. This includes active duty units, reserve components, directorates, private groups, individuals, and state and federal agencies.

1.c. Goals

Fort Carson intends to follow the major land management program goals stated in AR 200-1:

1. Integrate natural resources stewardship and compliance responsibilities with operational requirements to help achieve sustainable ranges, training areas, and other land assets.

2. Develop, initiate, and maintain programs for the conservation, utilization, and rehabilitation of natural resources on Army lands.

Further, Fort Carson intends, to the extent appropriate and applicable, to provide for no net loss in the capability of the installation lands to support the military mission, and to identify and address threats to mission land use, as well as, give high priority to management objectives that protect mission capabilities of installation lands.

All goals and objectives of the natural resources programs on Fort Carson and the PCMS have been developed in recognition of the fact that the military missions of the Army are the primary purposes for the existence of these installations. Specifically, we plan to:

- Conserve the environment for the purpose of supporting the military mission;

- Strive to achieve no net loss of capability of installation lands to support the military mission;

- Eliminate or minimize both permanent and temporary land restrictions on military training;

- To the greatest extent possible, shape the landscape to meet the training needs of the military;

- Achieve 100 percent compliance with environmental laws and regulations;

- Use an ecosystem-based approach to natural resource management, managing for values such as biodiversity, recreation, water quality, native species, and aesthetics;

- Practice adaptive management, improving our approaches and techniques using the best available science, and sound Best Management Practices (BMPs);

- Foster a sense of environmental stewardship among soldiers, employees, and neighbors who use or have in interest in natural resources on Fort Carson and PCMS;

- Improve communication, coordination, and participation among interested parties and partners in the region; and,

- In conjunction with ITAM, facilitate sustainable training by promoting education and by managing the natural resources to meet the needs of the trainers and the missionscape.

1.d. Responsibilities

There are numerous people and organizations involved in natural resources management on Fort Carson and the PCMS. Below is a list of the different stakeholders along with a brief description of their responsibilities.

1.d. (1) Installation stakeholders

Garrison Commander
The Garrison Commander, Fort Carson, is responsible for his or her staff's actions to implement this INRMP. The Garrison Commander also makes final decisions concerning suspension of recreational privileges on Fort Carson and the PCMS. The Garrison Commander is responsible for providing training facilities such as maneuver training areas and ranges.

Directorate of Public Works (DPW)
The DPW is responsible for maintaining compliance with environmental laws and regulations, and managing the natural resources on Fort Carson and the PCMS. The DPW Operations and Maintenance Division conducts downrange road repair, as well as, building and grounds maintenance for requests that fall within the Base Ops Contract in the cantonment. Work requests and service orders that do not fall within the Base Ops Contract are processed through the Business Operations and Integration Division (BOID) and the Annual Work Plan (AWP). BOID manages and initiates the NEPA process when a work request or service order is generated, by which proposed construction, maintenance, and other future actions are identified and vetted across organizational lines where subject matter experts have the opportunity to review and provide comments and concerns to ensure timely and synchronized execution of Public Works projects. Specifically, the Conservation Branch within the Environmental Division:

- Develops and implements programs to ensure the inventory, delineation, classification, and management of wetlands, threatened and endangered species, sensitive and critical habitats, and other natural resource areas;

- Recruits and trains qualified natural resources personnel;

- Implements the INRMP on behalf of the Garrison Commander;

- Contributes to and reviews all environmental documents, such as NEPA environmental analysis documents (Categorical Exclusions, EAs, EISs, and various management plans) and construction designs and proposals to ensure adequate protection of natural resources;

- Coordinates with internal and external organizations on issues related to conservation and natural resources management for Fort Carson and the PCMS.

Directorate of Plans, Training, Mobilization and Security (DPTMS)
The DPTMS provides training area and range access to accomplish provisions of this INRMP, assists in enforcing range regulations, repairs training damage through the ITAM Program, and is directly responsible for evaluating how this INRMP impacts training. DPTMS and DPW work together to identify range reclamation needs in relation to military operations and overall conservation of ecosystems, watersheds, and wildlife habitat. DPTMS communicates the location of limited-use areas to all involved organizations, so that military training does not damage land reclamation efforts or sensitive areas. DPTMS personnel provide information on hunting seasons and "sensitive use" areas to preclude game violations and deterioration of land from recreational use. DPTMS personnel prepare the Range Complex Master Plan (RCMP), regarding operation of existing ranges and planning for future range needs. The RCMP also includes analyses of natural resource management as it relates to live fire ranges. For more information on the RCMP, please see Section 3.a. (3) of this INRMP.

G3
The G3 is responsible for planning military training and operations, and provides military training requirements for Fort Carson and PCMS ranges. The G3 coordinates with Fort Carson staff elements, as required, to ensure proper consideration of training requirements in all aspects of planning and execution of programs associated with natural resources management. The G3 is a staff element of the mission headquarters, under the direction of the Senior Commander and his command group.

Directorate of Emergency Services (DES)
The Fort Carson Conservation Law Enforcement Program, within the DES, is responsible for actively enforcing local, state, and federal environmental and natural and cultural resources laws and regulations. The Fire Department within DES is the primary proponent of the wildland fire program. However, the DPW Wildland Fire Team is the primary proponent of prescribed burns for ecosystem purposes.

Public Affairs Office
The Public Affairs Office is responsible for promoting activities on Fort Carson and the PCMS to the public and providing professional public affairs advice and support to installation leaders and activities. The Public Affairs Office assists in distributing information related to the natural resources programs.

Staff Judge Advocate
The Staff Judge Advocate provides legal advice, counsel, and services to command, staff, and subordinate elements of Fort Carson. Specific Staff Judge Advocate responsibilities with regard to integrated natural resources management include:

- Conducting legal research and preparing legal opinions pertaining to interpretation and application of laws, regulations, statutes, and other directives;
- Coordinating with the Department of Justice, Environmental Law Division of the Office of The Judge Advocate General, and other governmental agencies on matters pertaining to litigation for the federal government;
- Advising DPW on compliance with environmental laws; and,
- Advising the G3 and DPTMS on laws and regulations that affect training land use, management, and compliance.

1.d. (2) External stakeholders and interested parties

U.S. Army Forces Command

The 4th Infantry Division is within the U.S. Army Forces Command (FORSCOM), located at Fort Bragg, North Carolina. FORSCOM has a requirement under AR 200-1 to review and concur with the INRMP. Among other things, FORSCOM recommends funding priorities for range construction, ITAM projects, and Army Compatible Use Buffer (ACUB) projects.

Installation Management Command, Readiness Directorate (IMCOM RD)

Located at Fort Bragg, North Carolina, is responsible for providing command and technical guidance to the Fort Carson natural resources program by:

- Assisting with program implementation and conducting staff visits to Fort Carson;
- Ensuring that effective natural resources stewardship is an identifiable and accountable function of management;
- Providing budget and funding oversight, and project review and validation;
- Facilitating communication between installations and higher headquarters; and,
- Reviewing this INRMP.

IMCOM RD will conduct an onsite evaluation of the Fort Carson natural resources program at least once every three years.

U.S. Army Environmental Command (USAEC)

USAEC, located in San Antonio, Texas, provides oversight, centralized management, and execution of Army environmental programs and projects. USAEC works with installations to develop, implement, and maintain programs for the conservation, utilization, and rehabilitation of natural resources on 13.6 million acres, spread across 152 installations, with 12,563 operational ranges, 1.1 million acres of forest and 1.3 million acres of wetlands. This includes responsibility for protecting 184 endangered species on 79 installations, as well as 68 candidate species on 44 installations identified by the U.S. Fish and Wildlife Service, which could impact Army missions.

USAEC helps quantify environmental encroachment vulnerabilities and assesses the use of external buffer zones to enhance testing and training capabilities, protecting more than 200,000 acres from incompatible development at 28 installations through ACUB program partnerships. USAEC also helps centrally manage the Conservation Reimbursable Forestry, Agricultural/Grazing Outlease, and Fish and Wildlife Conservation programs, which provide ecosystem-level management that supports and enhances the land's ability to support each installation's respective military missionscape. Finally, the Integrated Pest Management Program helps sustain infrastructure used for training, working, and living by providing professional guidance to reduce or eliminate impacts from all plant, insect, fungus and vertebrate pests on Soldiers and their families.

U.S. Army Corps of Engineers (USACE)

USACE Engineer Research and Development Center laboratories provide research, technical, administrative, and logistical support to Fort Carson. The USACE Regional Civil Works Office in Pueblo, Colorado has the primary responsibility for administering Section 404 permits.

The Engineer Research and Development Center has provided support to Fort Carson on diverse projects including erosion control, soil interpretation, and maneuver impacts to soils. USACE Omaha

District primarily has oversight for military construction on Fort Carson. Pre-construction activities include NEPA reviews and Low Impact Development (LID).

Regional Military Installations

Fort Carson's natural resources issues are similar to those of other military installations in the area, including the Air Force Academy, Cheyenne Mountain Air Force Station, Pueblo Chemical Depot, Peterson Air Force Base, Schriever Air Force Base, Buckley Air Force Base, and Francis E. Warren Air Force Base (in Wyoming). These installations participate in the Front Range Ecoregional Partnership (FREP) when available.

U.S. Fish and Wildlife Service (USFWS)

The USFWS is the primary federal agency with which Fort Carson cooperates on natural resources management. Cooperative efforts with the USFWS have included conservation assistance under the Sikes Act, 16 USC 670a, federal-listed species management, migratory bird and eagle protection and management, recreation, fishing, wildlife law enforcement, issuance of eagle take permits, and wetland inventories. The USFWS is responsible for enforcement and compliance with the Endangered Species Act (ESA) and Migratory Bird Treaty Act (MBTA; 16 USC 703-712), as well as other federal wildlife acts, laws and regulations. In accordance with 16 USC 670a, DoDI 4715.03, and AR 200-1, this INRMP is developed and implemented in cooperation with the USFWS; the USFWS is a signatory to it.

Natural Resources Conservation Service (NRCS)

The NRCS has cooperated with Fort Carson on erosion control projects, soil surveys, ecological site surveys, plant materials studies, and rehabilitation efforts on disturbed lands. Numerous acres of bank sloping and rangeland seeding have also been accomplished with the technical support of the NRCS. The NRCS has worked as part of a multi-agency team to alleviate a regional sediment pollution problem.

U.S. Forest Service (USFS)

The USFS manages lands adjacent to the PCMS (Comanche National Grasslands) and close to Fort Carson (Pike National Forest). Fort Carson and the USFS have mutual aid agreements for the suppression of wildfires.

U.S. Environmental Protection Agency (EPA)

The EPA is involved in various federal programs related to natural resources management, particularly in the wetlands permitting process, delegated nationally to the USACE, and in the regulation of stormwater on federal facilities in Colorado.

U.S. Geological Survey (USGS)

The USGS is the principal federal agency with which Fort Carson cooperates on the management of watersheds and water resources on Fort Carson and the PCMS. With the support of the USGS, hydrological monitoring studies have been implemented to provide data for the proper management of water resources and watersheds on Fort Carson and the PCMS. The USGS is part of a multi-agency team that is working with Fort Carson to alleviate a regional sediment pollution problem. The USGS also supports the water rights program by collecting water diversion and use data, and provides these data to the Colorado Water Commissioner. The USGS Biological Resources Division has conducted research on Fort Carson and the PCMS. Activities have included Fort Carson providing data on mountain plover and raptor use of prairie dog colonies to the Division to support regional studies.

U.S. Bureau of Land Management (BLM)

The BLM has assisted wildlife biologists on Fort Carson in researching the distribution and habitat of the Mexican spotted owl (MSO). The BLM manages land containing several sensitive plant species that also occur on Fort Carson and PCMS.

U.S. Animal and Plant Health Inspection Service (APHIS)
The Wildlife Services division of APHIS assists with lethal control of prairie dogs at Fort Carson, particularly on and around Butts Army Airfield (BAAF). APHIS is also the primary agency that is contacted to mitigate MBTA conflicts, including nest and bird removal. They are also involved in noxious weed control programs.

Colorado Parks and Wildlife (CPW)
The CPW is responsible for management of fish and wildlife within the state, including those on federal lands. Specific cooperation with the CPW involves law enforcement, hunting and fishing license/permit sales, special seasons and bag limits, check station operation, issuance of special collection permits, and compliance issues concerning state laws and regulations, which extend to state-listed species which are threatened, endangered, or species of concern. In addition to law enforcement duties, CPW and Fort Carson biologists cooperate on wildlife surveys on the installation, including surveys for bats and small fish. In accordance with 16 USC 670a, DoDI 4715.03, and AR 200-1, this INRMP is developed and implemented in cooperation with the CPW; the CPW is a signatory to it.

Colorado State Forest Service (CSFS)
The CSFS sells tree seedlings to Fort Carson, provides technical support to the tree planting program, assists with forest insect pest control, and has assisted in the establishment and maintenance of the windbreak around the PCMS cantonment area.

Colorado Division of Water Resources (DWR)
DWR, which also known as the Office of the State Engineer, administers water rights, issues well permits, and is the state office responsible for dam construction and safety.

Other Colorado Agencies
Colorado State Parks and the State Land Board owns and manages land containing several sensitive plant species that also occur on Fort Carson and the PCMS. Exploring partnerships for coordinated management with state parks may help prevent rare species from declining and prevent the need for listing. The Colorado Department of Agriculture assists with studying the biological control of weeds on Fort Carson. The Colorado Division of Minerals and Geology provides general direction, guidance, and coordination concerning all reclamation projects, specifically the Stone City clay mine operation. The Colorado Department of Public Health and Environment (CDPHE) is delegated by the EPA to administer Clean Water Act, Section 303(d) impaired waters. CDPHE also monitors the recreational fishery on Fort Carson for mercury contamination.

Native American Tribes
The United States has a unique legal relationship with Native American tribal governments as set forth in the Constitution of the United States, treaties, statutes, executive orders, and court decisions. In accordance with the Constitution of the United States, Article 1, Section 8, tribal governments are recognized as sovereign, dependent domestic nations. AR 200-1, DoDI 4710.02*: DoD Interactions with Federally-recognized Tribes*, Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments,* and 65 FR 67249 require regular and meaningful consultation and collaboration with tribal governments. Currently, 22 tribes have indicated that they have tribal and/or cultural interest in Fort Carson and PCMS, and were consulted in the development of the INRMP. Consulted Native American tribal governments include:

- Apache Tribe of Oklahoma
- Arapaho Tribe of the Wind River Reservation, Wyoming
- Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Montana

- Cheyenne and Arapaho Tribes, Oklahoma
- Cheyenne River Sioux Tribe of the Cheyenne River Reservation, South Dakota
- Comanche Nation, Oklahoma
- Crow Creek Sioux Tribe of the Crow Creek Reservation, South Dakota
- Eastern Shoshone Tribe of the Wind River Reservation, Wyoming
- Flandreau Santee Sioux Tribe of South Dakota
- Jicarilla Apache Nation, New Mexico
- Kiowa Indian Tribe of Oklahoma
- Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana.
- Oglala Sioux Tribe
- Pawnee Nation of Oklahoma
- Rosebud Sioux Tribe of the Rosebud Indian Reservation, South Dakota
- Sisseton-Wahpeton Oyate of the Lake Traverse Reservation, South Dakota
- Southern Ute Indian Tribe of the Southern Ute Reservation, Colorado
- Spirit Lake Tribe, North Dakota
- Standing Rock Sioux Tribe of North & South Dakota
- Ute Indian Tribe of the Uintah & Ouray Reservation, Utah
- Ute Mountain Ute Tribe
- Yankton Sioux Tribe of South Dakota

In accordance with EO 13007 and DODI 4715.03, Enclosure 3(7)(b)(3), tribes have the right to access sites and resources that are of religious importance, or are important to the continuance of their culture.

Universities and Colleges

Institutions of higher education partner with natural resources staff at Fort Carson and the PCMS on diverse projects. The following are examples of such partnerships:

- Colorado State University and Texas A&M University have supported research for biological control and alternative control of noxious weeds, range management/monitoring, forest inventories, and wildlife management/monitoring and surveys.

- Colorado State University and Utah State University cooperated on a demographic study of Colorado checkered whiptails on Fort Carson.

- The University of Colorado at Colorado Springs has collared mule deer to assess the effects of military training on deer fawning success and resource utilization. They have also studied genetic diversity in mule deer and the codons associated with Chronic Wasting Disease prevalence.

- The Massachusetts Institute of Technology and Oxford University have assisted Fort Carson to better understand gullying processes.

- The University of Wyoming and the University of California – Riverside conducted selenium assessments on Fort Carson.

- The University of Wisconsin at Madison, Virginia Polytechnic University, Colorado State University, Utah State University, Oregon State University, University of Wyoming, University of Northern Colorado, University of Southern Colorado, University of Colorado at Colorado Springs, University of Denver, Pikes Peak Community College, University of Vermont, and Colorado College have supported natural resources management and research initiatives related to wildlife, watershed, and range conservation at Fort Carson and the PCMS.

Municipalities and Counties

Communities adjacent or in proximity to Fort Carson and the PCMS are positively affected by natural resources management on the installations. Fort Carson and the PCMS provide opportunities for general public hunting, fishing, and other recreation, after deconfliction with military training schedules. Fort Carson has agreements with the Colorado Springs Fire Department and El Paso County to provide mutual aid for the suppression of wildland fires on Fort Carson and the surrounding area. Fort Carson cooperates with the Fountain Creek Watershed Management Working Group of the Pikes Peak Area Council of Governments, as well as, other cooperative ventures that are established to deal with regional natural resources issues. The Upper Arkansas Weed Management Cooperative, an organization of eight southern Colorado counties, was formed to expedite and coordinate weed management efforts among agencies in the Upper Arkansas River drainage. Fort Carson coordinates with weed managers from El Paso, Pueblo, Fremont, and Las Animas Counties.

1.e. Authority

The Sikes Act requires a natural resources management plan to be written for every DoD installation having significant natural resources. The plans are developed cooperatively with the Installation, the United States Fish and Wildlife Service (USFWS), and the respective state wildlife agency (the CPW in Colorado). The law does not enlarge or diminish the existing responsibility of the USFWS or CPW, but the management plan provides for a coordinated approach to conservation, sustainable multi-purpose use, and public access. The Act requires that the management plans be “consistent with the use of the military installation to ensure the preparedness of the Armed Forces.” Since 2002, the installation’s natural resources management has been conducted cooperatively with the CPW and the USFWS by actions agreed upon and prescribed in an INRMP. This statutory requirement has been implemented at the DoD level in DoDI 4715.03 and at the Army level in AR 200-1.

DoDI 4715.03, Section 4, states that it is DoD policy that the principal purpose of DoD lands, waters, airspace, and coastal resources is to support mission-related activities. All DoD natural resources conservation program activities shall work to guarantee the DoD continued access to its land, air, and water resources for realistic military training and testing, as well as to sustain the long-term ecological integrity of the resource base. This is accomplished through management practices that facilitate long-term comprehensive range sustainability while demonstrating stewardship of natural resources by protecting and enhancing those resources for support of the military mission, and maintenance of ecosystem integrity to the greatest extent feasible.

The Integrated Natural Resources Management Plan (INRMP) Implementation Manual (DoDM 4715.03) states, in part, that INRMPs shall be prepared to assist installation commanders in their efforts to conserve and rehabilitate natural resources consistent with the use of military installations to ensure the preparedness of the Armed Forces. INRMPs are intended principally to help installation commanders manage natural resources more effectively to ensure that installation lands remain available and in good condition to support the installation’s military mission.

Under the statute, each installation INRMP must, when appropriate and applicable, provide for:

- Fish and wildlife management, land management, forest management, and fish and wildlife-oriented recreation;
- Fish and wildlife habitat enhancement or modifications;
- Wetland protection, enhancement, and restoration where necessary for support of fish or wildlife;

- Integration of, and consistency among, the various activities conducted under the INRMP;
- Establishment of specific natural resources management objectives and timeframes for proposed action;
- Enforcement of applicable natural resources laws (including regulations);
- No net loss in the capability of military installation lands to support the military mission of the installation;
- Public access to Army lands and waters when such access is compatible with military mission activities, safety, security, fiscal considerations, and ecosystem sustainability; and,
- Such other activities as the Secretary of the military department considers appropriate.

The Sikes Act also requires or provides for:

- Regular review by the signers of this INRMP of its operation and effects, not less often than every five years;
- Provisions for establishing special hunting and fishing permits and collecting and spending the fees for the protection, conservation, and management of fish and wildlife, including habitat improvement and related activities in accordance with this INRMP;
- The management and conservation of natural resources under DoD control, including planning, implementation, oversight, and enforcement functions, are inherent governmental functions; and shall not be contracted (via such mechanisms as Office of Management and Budget Circular A-76 or any similar circulars); and,
- Giving priority to state and federal agencies having responsibility for conservation or management of fish or wildlife for contracts involving implementation of this INRMP.

1.f. Stewardship and compliance

The Army's *Army Environment, Safety, & Occupational Health Strategy 2025*, published in 2017, establishes a long-range vision for the Army to meet its mission today and into the future. Sustainability is placed at the core of the *Strategy* and moves the focus beyond simple compliance with environmental regulations towards a focus on environmental stewardship. The *Strategy* applies a community, regional, and ecosystem approach to managing natural resources. The programs and actions in this INRMP not only achieve compliance with laws and regulations but also outline a program that will sustain ecosystems on Fort Carson and the PCMS through active management and stewardship.

1.g. Review and revision process

Fort Carson, USFWS, and the CPW will meet annually to review the accomplishments and planned natural resources projects. The Sikes Act requires the INRMP to be "reviewed as to operation and effect by the parties thereto on a regular basis, but not less often than every 5 years." Based on such review, a revision may be necessary, but the timeframe for publication of such revision is not mandated by statute. While the revision process proceeds, the current INRMP remains in effect for Fort Carson and the PCMS, and the responsibility and authority of the USFWS and the CPW toward

applicable natural resource laws and regulations also remains in full effect. Also, if all three parties agree that this INRMP is effective and needs no significant changes, then it can be extended from year to year by signatures of all three parties. The annual review will discuss, at a minimum, the metrics specified in Department of Defense Instruction (DoDI) 4715.03 for assessing annually how well the INRMP applies conservation efforts in order to ensure no net loss of military training capability of the installation. The following table lists the seven focus areas, each having several questions to answer, specified in DoDI 4715.03. Since the questions and focus areas, in most cases, do not lend themselves to precise quantitative answers, the responses will be in the form of green/amber/red. The blank forms will be filled out each year in the annual review meeting among the signers. For each line item, the answer for that year will be circled. Then the color with the highest number of circles will be an indicator of the implementation status of the INRMP for that year.

Table 1-1: INRMP Metrics

INRMP Metrics				
Focus Area Questions		**Green**	**Amber**	**Red**
a. INRMP project implementation				
	1. Are INRMP projects, including follow-up inventory and monitoring, properly identified, developed and submitted for funding?	yes	partly	no
	2. Has project funding been received, obligated, and expended?	yes	partly	no
	3. Have projects been completed and do they meet expected objectives?	yes	partly	no
b. Listed species and critical habitat				
	1. Are conservation efforts effective?	yes	partly	no
	2. Does the INRMP provide conservation benefits necessary to preclude critical habitat designation?	yes	n/a	no
	3. Are SAR identified and are steps being undertaken to preclude listing?	yes	partly	no
c. Partnerships' effectiveness				
	1. Has the INRMP review team (DoD, USFWS, and CPW) been effective in ensuring the INRMP's implementation?	yes	partly	no
	2. Are other partnerships needed to meet the INRMP goals?	yes	--	no
	3. Have other partnerships been effectively used to meet INRMP goals?	yes	partly	no

Focus Area Questions (cont.)		Green	Amber	Red
d. Fish and wildlife management and public use				
	1. Are recreational opportunities such as hunting, fishing, and wildlife viewing available to post residents and employees?	yes	partly	no
	2. Are recreational opportunities such as hunting, fishing, and wildlife viewing available to the public?	yes	partly	no
e. Team adequacy				
	1. Is the installation's natural resources team adequately resourced and trained to fully implement the INRMP?	yes	partly	no
f. Ecosystem integrity				
	1. What percent of the installation's native ecological systems are currently intact?	100-65%	64-33%	32-0%
	2. What percent of the installation's various habitats are susceptible to change or damage from different stressors?	100-65%	64-33%	32-0%
	3. Have any net acres of wetlands been lost?	no	n/a	yes
g. INRMP impact on the installation mission				
	1. To what degree (high/medium/low) is the INRMP and its associated actions supporting the installation's ability to sustain the current and potential future military mission?	high	medium	low
	2. Have any net acres of training land been lost permanently due to natural resource issues?	no	n/a	yes
Overall Rating		**Green**	**Amber**	**Red**

1.h. Management strategy

The programs and projects outlined in this INRMP are designed to maintain ecosystems and their components, as well as, facilitate sustainable military training on Fort Carson and the PCMS. By focusing on the ecosystem level, we strive to maximize biodiversity, improve wildlife habitat, minimize invasive species, reduce accelerated erosion, maintain aesthetic landscapes for recreation, and improve ecosystem services (e.g. nutrient cycling). Good natural resources management creates healthy and resilient landscapes, which are consistent with the mandate of the Sikes Act and maintains or increases their availability for military training. Management decisions are made on the best available science and attempt, as practical, to mimic the natural historical disturbance regimes for the ecoregion. BMPs are usually selected from a list of well-established techniques, but on occasion, new techniques will be tried. By mimicking the natural disturbance processes (e.g. fire) that shaped the evolutionary history of the landscape, we are able to design cost-effective and appropriate management programs.

As a major landholder in Colorado, Fort Carson actively participates in regional conservation initiatives. By engaging with other stakeholders and interested parties in the region, Fort Carson

works cooperatively towards ecosystem-level conservation goals. With this approach, the Army contributes to regional efforts to ensure that species of concern do not require more intensive or less compatible conservation efforts in the future. The natural resources management programs and this INRMP are adaptive. Fort Carson will continually improve and evaluate goals, objectives, and management strategies as information improves and techniques are proven in the field.

This INRMP, especially the recurring activities project list in Appendix 8, will be reviewed annually by the signatories to evaluate effectiveness and to look for improvement opportunities. Those annual reviews will satisfy the natural resources management objectives of the Environmental Management System (EMS).

1.i. Other plan integration and preparing prescriptions for projects

This INRMP serves as a foundation to the natural resources management goals on Fort Carson and the PCMS. All installation projects will be reviewed to ensure that they are consistent with this INRMP and with other natural resources plans referenced within.

2. CURRENT CONDITIONS AND USE

2.a. Installation Information

2.a. (1) General Description

Fort Carson

Fort Carson is located in the east-central portion of Colorado, south of Colorado Springs, at the base of the Rocky Mountain Front Range. It occupies portions of three counties (El Paso, Pueblo, and Fremont) and lies between two major north-south highways: Interstate 25 to the east and Colorado 115 to the west. The City of Pueblo lies approximately 35 miles south of the main post area, and Denver lies about 65 miles to the north (Figure 2-1). Fort Carson encompasses 137,404 acres.

PCMS

The PCMS is located in Las Animas County in southeastern Colorado east of Highway 350, extending to the Purgatoire River and north from Van Bremer Arroyo to the Otero County line. Nearby cities include Trinidad, approximately 30 miles to the southwest, and La Junta, approximately 50 miles to the northeast (Figure 2-1). The PCMS encompasses 235,896 acres.

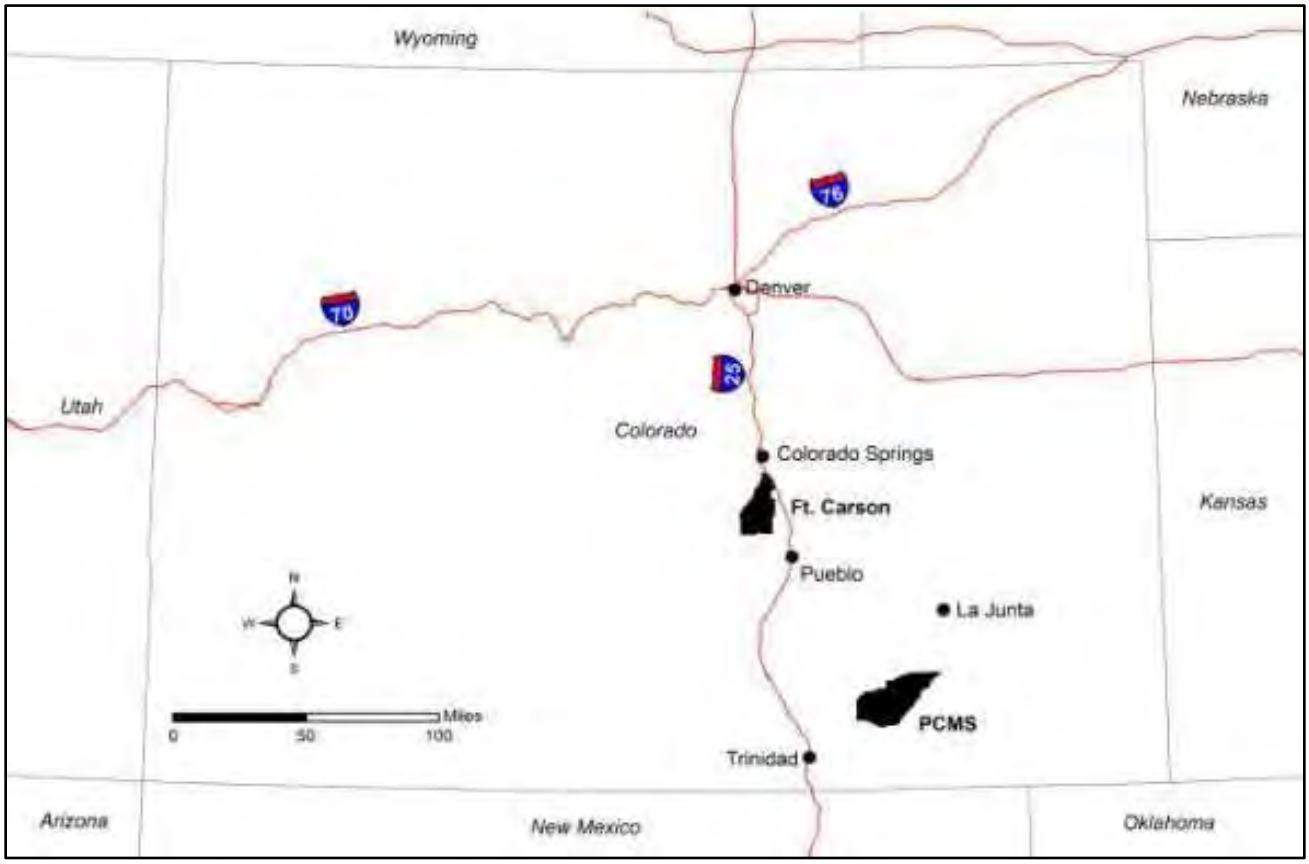


Figure 2-1. Location of Fort Carson and Piñon Canyon Maneuver Site (PCMS).

2.a. (2) Regional land use

Fort Carson

Land use adjacent to Fort Carson consists primarily of low-density residential housing with the exception of areas adjacent to the main post area, which are high-density residential housing. Development in the vicinity of Fort Carson is concentrated to the north (Colorado Springs) and east (Security-Widefield-Fountain) of the installation. Portions of the towns of Fountain, Widefield, and Security, located within one mile of the installation boundary, consist largely of dispersed residential areas. Areas bordering eastern, southeastern, southern, and southwestern boundaries of Fort Carson contain ranches, farms, and a few residences. Conservation easements exist along the southern and eastern boundaries through the ACUB program partnerships. Development is limited along the central western boundary and is increasing along the northwestern border.

PCMS

Areas bordering the PCMS contain ranches, farms, and a few private residences, as well as the Comanche National Grasslands managed by the USFS on the northern and eastern borders. Development is not occurring to any significant degree on any boundaries. Many tracts of private land along the northern border of PCMS have changed ownership from large ranches, controlled by only a few owners, to numerous smaller parcels (generally ~40 acres) that are individually owned.

2.a. (3) Historic land use

Fort Carson

A general historic regional setting and detailed history of Fort Carson are found in *Fort Carson: A tradition of victory* (1972). Many Native American tribes used the land upon which Fort Carson is located over the past 12,000 years (e.g. Ute Mountain Ute, Southern Ute, Comanche, Kiowa, Cheyenne, Arapaho, Oglala Sioux, Jicarilla Apache, Pawnee). By 1869, most Native Americans had been forced from the area following years of fighting. In 1873, the first stage road to cross the future Fort Carson was built between Denver and Cañon City. At least one railroad was constructed across the future fort site in the early 1930s. The site was owned by ranchers and used extensively for cattle grazing.

By 1940, prominent local citizens were lobbying the War Department for an Army installation. The site for Camp Carson was selected on January 6, 1942. By November 4, 1942, construction was completed. Military training began in mid-summer 1942, with 104,165 Soldiers trained at Camp Carson during World War II. Camp Carson was officially designated Fort Carson on August 27, 1954. In 1962, the Army's first mechanized infantry division (the 5th ID) was activated here. Air operations, which began in 1949 on a dirt strip on the edge of post, became a modern airfield in 1966 when Butts Field was completed. Between 1965 and 1966, 78,741 acres were added to accommodate requirements for mechanized training. By the end of 1967, activities at Fort Carson were the highest since World War II as a result of Vietnam requirements. The 4th Infantry Division arrived in 1970. Fort Carson was home to the 4th ID until 1995, when the Division, except for one brigade, was relocated to Fort Hood, Texas. In 1992, the 10th Special Forces Group (Airborne) arrived at Fort Carson. The 3rd Armored Cavalry Regiment (ACR) was relocated to Fort Carson from Fort Bliss, Texas, in 1995. In 1999, the 7th Infantry Division Headquarters was formed at Fort Carson, primarily providing command and control of three separate Reserve Component infantry brigades. They were based here for several years. In 2006, the 3rd ACR was relocated to Fort Hood, Texas, while at the same time a brigade combat team formed at Fort Carson. In 2008, an infantry brigade was transferred from Korea to Fort Carson. They later became the 4th Brigade Combat Team of the 4th ID. The Headquarters, 4th ID, returned to Fort Carson in 2009, along with a heavy brigade combat team. As of 2020, Fort Carson is home to the 4th ID consisting of one Armored Brigade, two Stryker Brigades, and one Combat Aviation Brigade, the 10th Special Forces Group, the 43rd Sustainment Brigade, and a number of smaller support elements.

PCMS

In the mid-1970s, the Army began searching for additional land on which to conduct military maneuvers. The additional land was necessary for brigade-sized units of the 4th Infantry Division (Mechanized) and associated reserve units. An Environmental Impact Statement (EIS) was prepared in 1980 to evaluate potential environmental impacts from the proposed acquisition of training land. After the EIS process was completed, 245,000 acres were purchased by September 17, 1983. Subsequently, several thousand acres, not suitable for military training due to terrain or to being landlocked (no access), were turned over to the U.S. Forest Service, Comanche National Grasslands. That transfer left the PCMS with approximately 236,000 acres. Prior to acquisition, the PCMS had supported large grazing operations and low human densities since it was first settled in the late 1870s. Military training began in August 1985. No troop units are permanently stationed at the PCMS. There are a limited number of small arms ranges and specialty ranges such as the live-fire convoy range, but the PCMS's primary purpose is still light and heavy maneuver training. There is a small permanent group of Department of the Army civilian employees at the PCMS, which is augmented during brigade size training exercises.

2.a. (4) Military mission

Fort Carson is one of the Army's Premier Power Projection Platforms. As such, it has a high priority role in deploying and mobilizing units during wartime. Fort Carson military units must be prepared to quickly deploy while other units move to Fort Carson and the PCMS for mobilization training and continued deployment. Fort Carson is home to the 4th Infantry Division (Mechanized), 43rd Sustainment Brigade, 10th Special Forces Group (Airborne), 71st Ordnance Group, and numerous smaller support units. The Army recently stationed a combat aviation brigade, or CAB, at Fort Carson. Fiscal year 2020 will bring a conversion of a Light Infantry Brigade to a Mechanized Stryker Brigade.

Fort Carson and the PCMS also support the Colorado National Guard, Army Reserve units, U.S. Army Space and Missile Command, and other military units. The mission of Fort Carson is to train, house, mobilize, deploy, and sustain combat-ready, multi-component integrated forces. Fort Carson and the PCMS provide facilities and service to U.S. Armed Forces that require land and airspace to practice combat skills and operations on a year-round basis. To accomplish this mission, realistic and quality training opportunities are necessary. The mosaic of natural communities and the varied topography found on Fort Carson and the PCMS, as well as, climate extremes ranging from hot summers to cold winters, provides U.S. Armed Forces with a variety of training scenarios.

Fort Carson is used for live-fire gunnery and is best suited for squad to battalion-sized maneuvers and land training of both reserve and active components. However, brigade-size exercises are sometimes conducted at Fort Carson. Training is nearly continuous year-round.

The PCMS is best used for battalion and brigade-sized maneuvers, land training, small arms live-fire ranges, and force-on-force exercises, usually by mechanized infantry (covered in the PCMS EIS, 2015). From 1985 to 2002, there were typically one to three brigade-sized rotations per year (three to five weeks each) with up to ten additional battalion or smaller-sized exercises per year. With the conversion of a Light Infantry Brigade to a Mechanized Stryker Brigade, heavy maneuver training events of both light and heavy vehicles will likely occur more regularly than in the past, resulting in a predicted 12.5% increase in Maneuver Impact Miles (MIM), split between Fort Carson and the PCMS. The effects of this increased training on natural resources are covered in the Environmental Assessment (EA) for the Conversion of 4ID Infantry BCT to Stryker BCT (IBCT to SBCT EA 2019).

2.a. (5) Military operations and activities

Current and/or potential military mission impacts on the environment
The following impacts on natural resources have been noted.

- Maneuver
  Maneuver has perhaps the greatest potential to affect land condition on both Fort Carson and the PCMS. Tactical maneuvers reduce vegetative ground cover and may increase bare ground area. As a result, the potential for soil erosion increases due to the loss of vegetation and to soil compaction. Erosion can eventually affect water quality through accelerated sedimentation and alteration of the soil horizons, making subsurface minerals and elements available. Dismounted training seldom affects large acreages, but it can have long-term impacts on regularly used trails. Mounted training is difficult to quantify in terms of its effects on the land. General types of vehicles (tracked or wheeled), vehicle weight and its distribution on the land (i.e., tracked vehicles better distribute weight), and conditions under which a vehicle operates (e.g. wet weather increases the potential for damage) are important. A conversion of a Light Infantry Brigade to a Mechanized Stryker Brigade is scheduled to occur in fiscal year 2020. This conversion will affect the maneuver impacts on the training areas due to the heavier wheeled vehicles being used. Mounted maneuver can produce objectionable noise, particularly when heavy vehicles move close to boundaries at night. Both mounted and dismounted maneuver have potential to impact soils, vegetation, wildlife, and cultural resources through ground disturbance. Mounted maneuver operations have the potential to create pollution from spills of petroleum, oils, or lubricants. Normal vegetation monitoring by ITAM's Range and Training Land Assessment (RTLA) program, in conjunction with as-needed surveys of wildlife, cultural resources, and soils resources, provides the data needed to plan for the re-seeding work and erosion control projects needed to maintain both installations in a usable condition for military training for the period covered by this INRMP and beyond.

Small arms range

- Use of firing ranges
  Live fire can use ammunition having projectiles that are not explosive (e.g. most rifle/pistol, machine gun, inert tank, and inert artillery rounds) in which case the impact portion of the range is not "dudded" with unexploded munitions. These impact areas can be used for other purposes when not in use for firing. Other weapons use ammunition having projectiles that are explosive and can create a "dud" (unexploded round). Access is restricted in these impact areas unless cleared of unexploded munitions. Most long-range weapon systems (e.g., artillery, tanks, Multiple Launch Rocket Systems) use the same impact area for explosive and inert rounds. Thus, these areas are generally not available for maneuver training or other uses.

  Fort Carson has ranges and impact areas sufficient to allow firing of almost all weapons in the Army inventory, to include many types of explosive projectiles. However, at PCMS the only weapons that can be fired with live ammunition are .50 caliber machine gun and smaller (no exploding projectiles), and simulated munitions. Aviation firing is now permitted at PCMS. Additionally, there are seven demolition sites (or pits) at PCMS where C4 can now be utilized.

  Surface danger zones and impact areas (large caliber, small caliber, and airburst weapons) occupy a considerable amount of land at Fort Carson. Thus, they reduce options to conduct other types of training. Also, to minimize space used and for safety reasons, live firing must be conducted relatively close to boundaries, which increases off-post noise impacts. Types

of munitions (e.g. high explosive duds virtually exclude other uses) also affect training options within impact areas and within the surface danger zones. Range locations and configurations can also reduce options for training. Range size, location, and configuration are often determined by training requirements and safety factors with few options in regards to siting. For example, the Live-Fire Maneuver Range at the PCMS affects maneuver training opportunities in a large portion of the PCMS when the range is operational.

Live firing certain munitions (e.g. incendiary, high explosive, and tracer rounds) requires careful range management, since they can cause wildland fires with the potential to extend beyond the impact areas. Construction and upgrades of ranges often involves temporary soil disturbance, thus potentially impacting wildlife and vegetation. Ground disturbance and direct destruction from ordnance impact can also impact wildlife resources. There are a very few ranges where shotguns can be fired. The Army only authorizes #9 Shot and 00 Buckshot. Ranges where civilian shooting occurs, such as the Olympic Range and the public Cheyenne Mountain Shooting Complex, shoot #2-9 with #7-9 being most common. There is limited potential for migration or leaching of lead off firing ranges. Many research programs and site characterizations have occurred on Army ranges since the 1990s in order to understand the fate and transport of lead associated with small arms ranges and to manage that lead, keeping it on the small arms ranges and not migrating away from those ranges.

- Use of Smoke
  Military training exercises can involve using obscurants like smoke that are artificially generated in order to evade the enemy's ability to observe friendly activities. Fog oil and/or synthetic graphite use in generating smoke by mechanical means have the potential to create pollution from spills of fog oil or petroleum, oils, or lubricants used by vehicles during exercises. Of greatest concern are events where visible smoke or obscurants cross or have a reasonable probability of crossing the installation property boundary. Precautionary measures that commanders must follow are in place to mitigate such risks.

- Bivouac
  Bivouac sites (temporary encampments) can create damage, particularly if the activity is repeated in the same area, or the unit remains in the same bivouac area for an extended period of time. Often, the first steps in land degradation from bivouac activities are soil compaction and the loss of ground cover, which can be followed by localized erosion and possibly increases in down-watershed stream sedimentation. Ground disturbance associated with bivouac can also impact wildlife resources and increase invasive plants.

- Engineer operations
  Engineer activities (e.g. digging fighting positions or tank ditches, obstacle removal, construction of forward operating bases [FOBs]) disturb soil, which can affect various natural resources and air quality. Demolition can cause noise and dust. Engineer operations have the potential for pollution from spills of petroleum, oils, or lubricants. Other combat engineer activities can be beneficial to natural resources. Combat engineers projects (e.g., training land rehabilitation, erosion control structure construction, and site hardening) also can protect the environment from damage in the future. Digging is prohibited in areas where certain cultural resources (historic properties, "needs data sites", burials, traditional cultural properties, and sacred sites) are known to exist.

- Aviation
  Environmental impacts of aviation activities at Fort Carson and the PCMS, which consist mainly of helicopter flights, include aircraft noise, minor disturbance to landing and drop zones, potential dust issues at some landing zones, possible disturbance to nesting birds,

and training activities of troops following air arrival. Some aviation operations have the potential to create pollution from spills of petroleum, oils, or lubricants. Live fire from helicopters can cause wildfires and wildlife risks. Compared to impacts of heavy units, however, the impacts of aviation operations are very light. Dust issues at landing zones (LZs) can be reduced by using compounds such as magnesium chloride, or various types of soil binding agents. Vegetation damage is usually minimal, since aviation support vehicles mostly travel on existing roads and two-tracks. SOPs require containment berms at forward area refueling setups, so the risk of water pollution from a spill is very low.

- Combat support and combat service support
  Support units often have similar impacts to land as described for bivouac since they use the same sites repeatedly. Support units also have potential to adversely affect land resources via petroleum product spills, improper sanitation, digging activities, and other effects of intensive use of small areas by units with a wide variety of tasks. Ground disturbance associated with many support activities can impact natural resources and air quality.

- Construction
  Impacts to the environment from construction depend largely on the location of the construction. In main post and cantonment areas, construction generally occurs on previously disturbed soil and in areas from which wildlife have either already departed or become accustomed to human activity. There is generally the possibility of temporary dust and runoff during construction periods, and new construction may diminish water quality and impact stormwater runoff. Construction in training areas generally involves a change in the land use and has the potential for greater impacts on wildlife. If the established vegetation is disturbed, there is a potential for an increase in invasive weeds if not properly revegetated. Temporary erosion may also result. In both cantonment and training areas, there is a temporary increase in noise during the construction period. Construction in training areas may also include repairs and improvements to existing ranges and training areas as part of Troop Construction Projects.

UH-60 helicopter training

- Natural Resource management impacts on the military mission
  For a discussion of the impacts of natural resource management on the military mission, please see Section 3.a. (2).

- Future military mission impacts on natural resources
  Units may change in the future, but there are no known plans to change the general types of military training activities these troops conduct at Fort Carson and the PCMS. However, the intensity may vary depending on training needs, world conditions, and budgetary constraints. Currently, the Army is in the process of increasing the dwell time (time on duty at home station rather than deployed) of all units, and expanding training to cover all of its units' potential missions, not just the limited scope required in the current theater of operations. Assuming that this process is implemented, and assuming that training is not curtailed by budgetary pressures, this may mean a gradual increase in training at both installations, which could cause greater impact on vegetation, soils, wildlife, and other natural resources. Heavy maneuver training events will likely occur more regularly than in the past, but are not expected to increase beyond historically analyzed levels in the most recent EISs for both Fort Carson and the PCMS. Also, for both installations, the ITAM Program and the DPW Conservation Branch programs are scalable; i.e., they can be expanded as the need arises, if funding and position authorizations are made available by higher headquarters.

2.a. (6) Constraints to training

There are some restrictions to training as a result of natural resources issues, such as limitations on the use of wetlands; i.e., dismounted training only and driving vehicles only on established roads and trails. There are also some naturally-occurring restrictions to training that are related to safety as well such as steep slopes that could erode if used repeatedly by vehicles. However, such steep slopes would be avoided in training because of vehicle rollover dangers. Temporary restrictions may occur because of nesting eagles, or issues with other species of conservation interest (see Section 4.a.). Other temporary constraints to training may be enacted if there is significant habitat degradation in training lands (see Section 3.a. (2) Impacts of natural resource management on the military mission, Limited-use (rest/rotation or deferment) program). Finally, temporary restrictions may be enacted to allow for recovery time needed because of natural occurrences such as heavy precipitation, but only in coordination with the senior commander on the ground. Decisions will implement the Commander's intent and reflect an informed balance of interests with consideration of reasonable alternatives and mitigation strategies.

2.a. (7) Opportunities for training

Fort Carson and the PCMS are largely available for at least some type of military training, with the exception of the main post and cantonment areas and the constraints listed above.

2.b. General physical environment and ecosystems

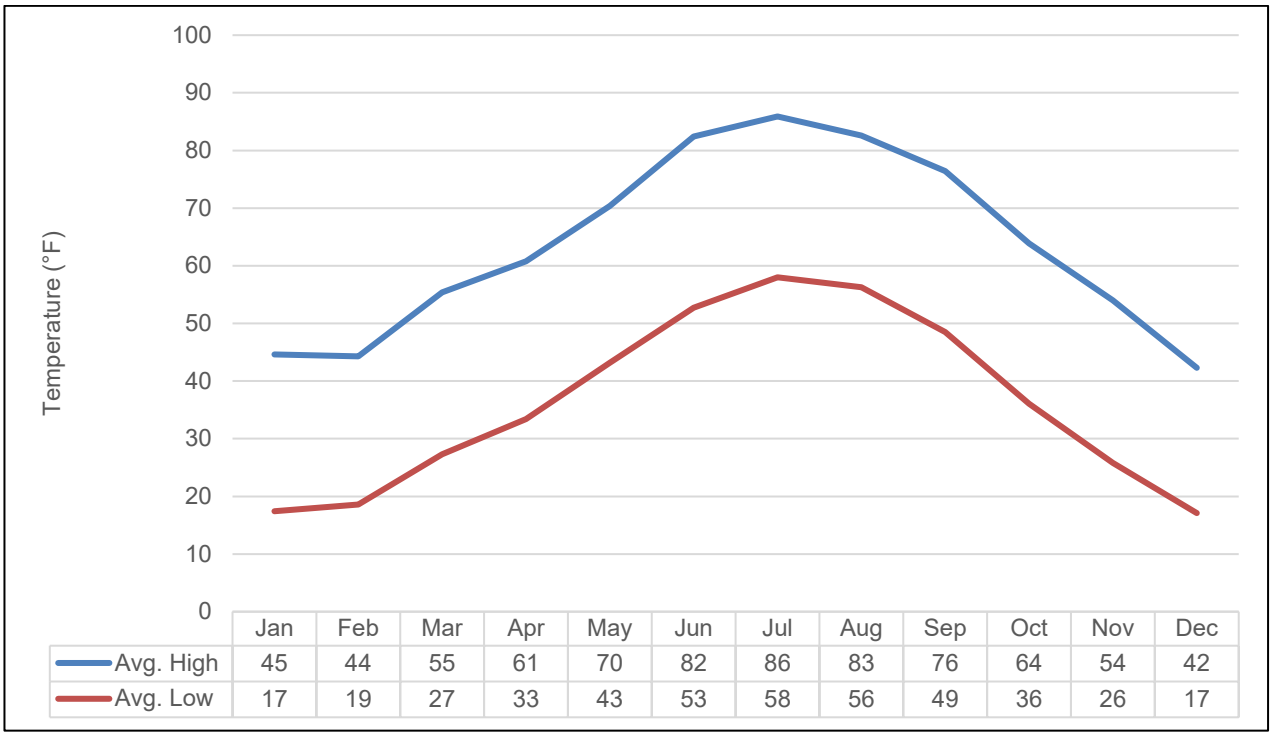
2.b. (1) Climate

Fort Carson

Fort Carson is located in a region classified as mid-latitude semi-arid, characterized by hot summers, cold winters, and relatively light rainfall. The following information is based on climate data obtained from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC) for an 11-year period between 2004 and 2014. July is typically the warmest month with an average high of 86 degrees Fahrenheit (°F) and an average low of 58°F, while December is the coldest month with an average high of 42°F and an average low of 17°F. Figure 2-2 depicts the average monthly temperature data for Fort Carson over an 11-year period from 2004 to 2014.

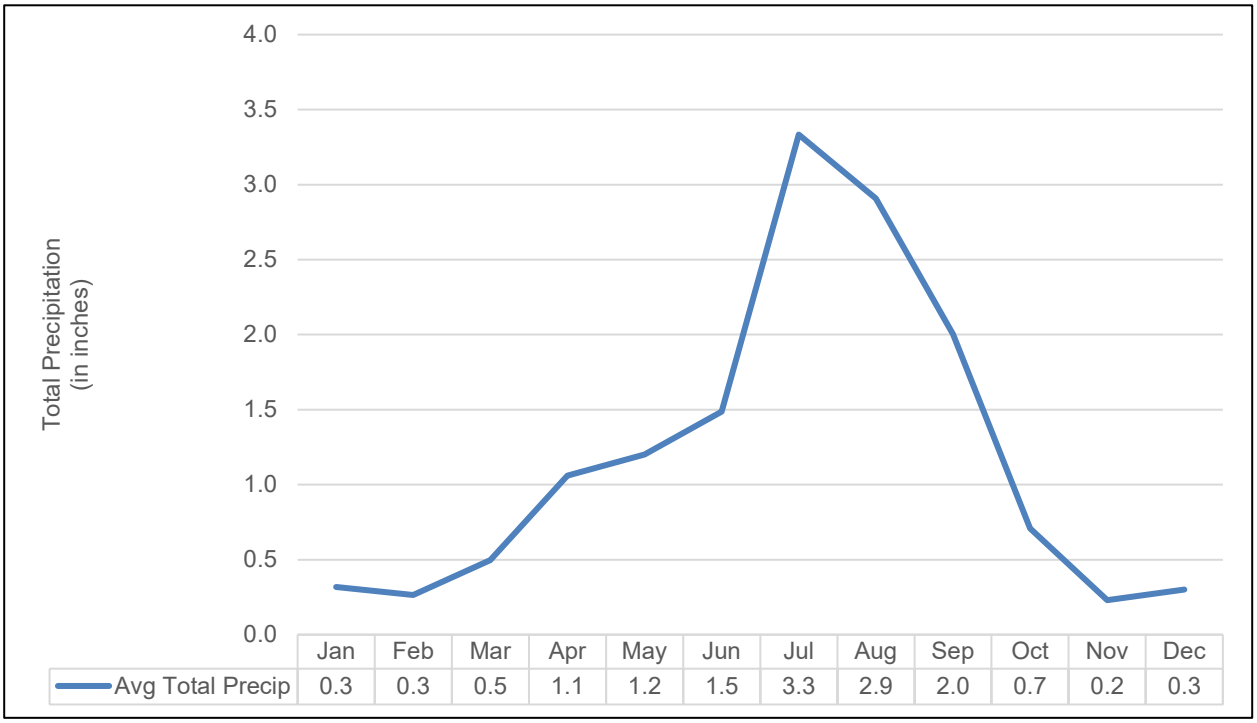
During the 5-year period from 2013-2017, the average annual precipitation measured at three USGS meteorological stations on or near Fort Carson was 20.9 inches. Precipitation occurs in the Fort Carson area as rain, snow, and intermediate forms, such as hail. The quantity of precipitation is affected significantly by the rain shadow effect of the nearby Rocky Mountains. Mean annual precipitation on Fort Carson increases toward the northwest. Figure 2-3 depicts the average monthly precipitation data for Fort Carson over an 11-year period from 2004 to 2014. Colorado Springs averages 17.5 inches of precipitation annually with about 80% falling between 1 April and 1 September in the form of thundershowers, which occur in the region about 50 days per year, generally involving heavy showers, gusty winds, frequent thunder and lightning, and occasional hail. Average annual snowfall in the region is 42.4 inches. Snow and sleet usually occur from September to May with the heaviest snowfall in March and possible trace accumulations as late as June.

There are approximately 93 days per year with a cloud cover, generally 30 percent or less. The yearly average daytime relative humidity is 39 percent and rises to 62 percent at night. Prevailing winds are normally out of the southeast. Wind speeds range from 0 to 80 mph, with typical average speeds of about 10 to 20 mph. Peaks are usually associated with thunderstorms or frontal systems. At times during summer, westerly winds shift to the southwest and bring hot dry air from deserts of the southwestern United States. These winds bring the hottest weather of the year, but the hot spells are usually of short duration.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High	45	44	55	61	70	82	86	83	76	64	54	42
Avg. Low	17	19	27	33	43	53	58	56	49	36	26	17

Figure 2-2. Average monthly temperature data for Fort Carson from 2004 to 2014. (NOAA NCDC, http://www.ncdc.noaa.gov)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg Total Precip	0.3	0.3	0.5	1.1	1.2	1.5	3.3	2.9	2.0	0.7	0.2	0.3

Figure 2-3. Average monthly precipitation totals for Fort Carson from 2004 to 2014. (NOAA NCDC, http://www.ncdc.noaa.gov)

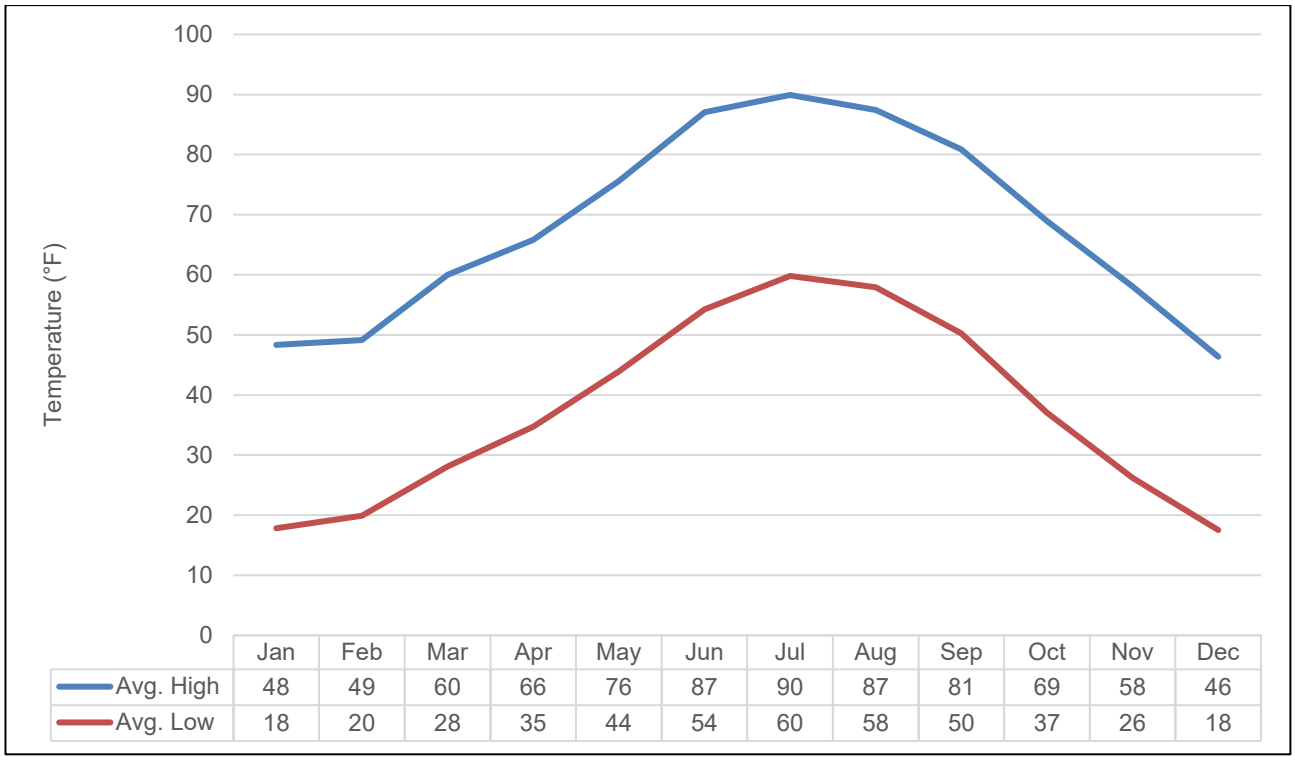
PCMS

The climate in the PCMS region is similar to Fort Carson – mid-latitude semi-arid, characterized by hot summers, cold winters, and relatively light rainfall, although the PCMS tends to have slightly warmer average temperatures and less precipitation. The following information is based on climate data obtained from the NOAA's NCDC for an 11-year period between 2004 and 2014. July is typically the warmest month with an average high of 90°F and an average low of 60°F, while December is the coldest month with an average high of 46°F and an average low of 18°F. Figure 2-4 depicts the average monthly temperature data for the PCMS over an 11-year period from 2004 to 2014.

During the 11-year period from 2004 to 2014, the PCMS area averaged 12.1 inches of annual precipitation, 81% of which fell between April and October, and fluctuated widely from year to year and across the training site. Precipitation at the PCMS primarily results from either frontal storms or convective storms. Frontal storms can occur throughout the year and have varying strength and frequency; the largest quantities of precipitation are associated with periods of moist airflow from the Gulf of Mexico. Convective storms occur frequently during July through September (Von Guerard et al. 1993; Fort Carson 2013). No data regarding snowfall amounts at the PCMS were found on the NOAA NCDC website. Figure 2-5 depicts the monthly precipitation totals averaged over an 11-year period from 2004 to 2014.

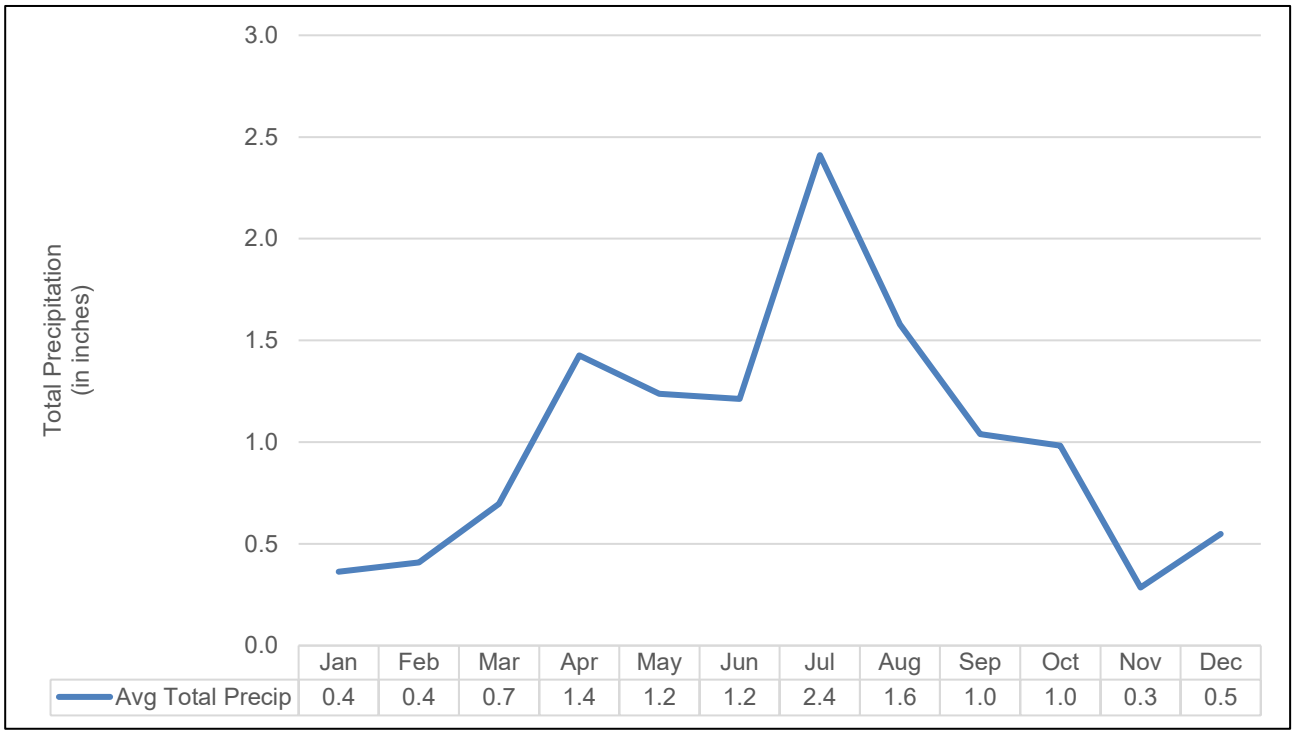
2.b. (1) Changes in Climate

The effects of the change in climate on DOD installations may have the potential to impact the military mission. Healthy ecosystems are required to successfully contribute to core training missions and ensure military readiness. Fort Carson is dedicated to managing for healthy ecosystems that support the training mission. DoD-driven direction and research that identify metric standards and thresholds that require adaptive management practices may help us in maintaining Fort Carson's training lands in a healthy state. To achieve this Fort Carson will focus its efforts on managing our ecosystems for resilience. Specifically, we will manage our piñon-juniper woodlands for resistance and persistence by reducing stand density to levels between current and pre-settlement conditions. This should improve military maneuvers, improve forest health, and optimize carbon retention while reducing fire risk. Many climate models predict larger and more frequent fires with a projected increase in temperature. Reducing stand density when combined with prescribed fire would reduce fuel loading and the potential for catastrophic (high intensity) fire. The climate models also predict more intense rain events that can lead to flood damages. Future management efforts need to assess stream stability and evolution, and improve floodplain connectivity to streams or mitigate where necessary. The Colorado Department of Agriculture is currently conducting a DoD Strategic Environmental Research and Development Program (SERDP) study on Fort Carson and PCMS to assess climate change impacts on the effectiveness of biocontrol tamarisk leaf beetles (*Diorhabda carinulata*) on tamarisk (*Tamarix* sp.), which is a widespread noxious weed that alters riparian plant communities. Climate change may extend invasive plants' growing season and presence on the land. In 2018, Fort Carson also manages for the recovery of plant communities from anthropogenic disturbance with revegetation efforts that include re-seeding. In 2008, 19,000 ponderosa pine seedlings were planted within TA 17 near Agony Hill. At the time, the only nursery stock seedlings that were available were from a seed source collected at the U.S. Air Force Academy. Agony Hill is near the lower threshold for effective precipitation requirements for ponderosa pine. Seedlings were planted on the north side of stumps or logs to provide shade when possible. Four years later (2012), 2% (n=380) of the seedlings were alive. Trees impacted by construction are replaced accordingly. Ongoing rangeland seeding efforts are conducted after large scale maneuvers. Fort Carson is also currently taking action to use, secure, and enhance its water rights for multiple use (i.e. military training, wildlife habitat).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High	48	49	60	66	76	87	90	87	81	69	58	46
Avg. Low	18	20	28	35	44	54	60	58	50	37	26	18

Figure 2-4. Average monthly temperature data for the PCMS from 2004 and 2014. (NOAA NCDC, http://www.ncdc.noaa.gov).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg Total Precip	0.4	0.4	0.7	1.4	1.2	1.2	2.4	1.6	1.0	1.0	0.3	0.5

Figure 2-5. Average monthly precipitation totals for the PCMS from 2004 to 2014. (NOAA NCDC, http://www.ncdc.noaa.gov)

2.b. (2) Ecoregion

Fort Carson and PCMS are in the Central Shortgrass Prairie (CSP) ecoregion (Figure 2-6). The CSP ecoregion encompasses approximately 56-million acres and includes parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, Texas, and Wyoming. The landscape includes plains and table lands dominated by shortgrass species such as buffalograss (*Bouteloua dactyloides*), blue grama (*Bouteloua gracilis*), and western wheatgrass (*Pascopyrum smithii*). The grasslands are dissected by streams (which are often ephemeral), canyons, buttes, and badlands. The CSP is characterized by limited precipitation, hot summers, and cold winters, with grazing, periodic fires, and drought being the primary historical natural disturbances that shaped the landscape and species present.

Figure 2-6. Central Shortgrass Prairie ecoregion map.

2.b. (3) Physiography

Fort Carson

The eastern portion of Fort Carson is in the Colorado Piedmont section of the Great Plains Province. The western portion is in foothills of the Rampart Range section of the Southern Rocky Mountains Province. Primary landforms consist of low plains, high plains, and low hills. Fountain Creek and its tributaries dominate the eastern area of the installation, which is classified as low plains. High plains, consisting of gently rolling uplands to sharp-crested hills and rocky outcrops, are in the southeastern, west-central, and western portions of the installation. The main post area is located in the high plains. Elevations range from 5,400-6,200 feet above mean sea level in the low plains and from 5,400-6,400 feet above mean sea level in the high plains. The highest point on Fort Carson is near the western boundary about two miles north of the entrance to the Turkey Creek Recreation Area, and Beaver Creek valley is the lowest. The maximum relief on Fort Carson is 1,840 feet (Figure 2-7).

PCMS

The PCMS is located within the Raton Section of the Great Plains Province. The Raton Section contains topographic features such as mesas, cuestas, dissected plateaus, deep canyons, and volcanic formations. The landscape on the PCMS is defined by four regions. Piñon pine and one-seeded juniper woodlands are found on limestone ridges in the north and northwest. The Hogback, a basalt dike, runs east and west near the southern boundary. Canyons draining into the Purgatoire River line the eastern side of PCMS. Grassy plains generally cover the area between the canyons, the Hogback, and piñon-juniper woodlands. Elevations on the PCMS range from 4,262 feet to over 5,576 feet (Figure 2-8). The highest point on PCMS is about two miles east of the Cantonment airstrip; the lowest is in the canyons at the northeast corner of the facility.

2.b. (4) Geology

There are three main fault lines in the region: Oil Creek, Ute Pass, and Rampart Range faults. The region is rated “zone one” for earthquake potential on a scale of zero to four, with a “four” having the greatest potential for earthquakes.

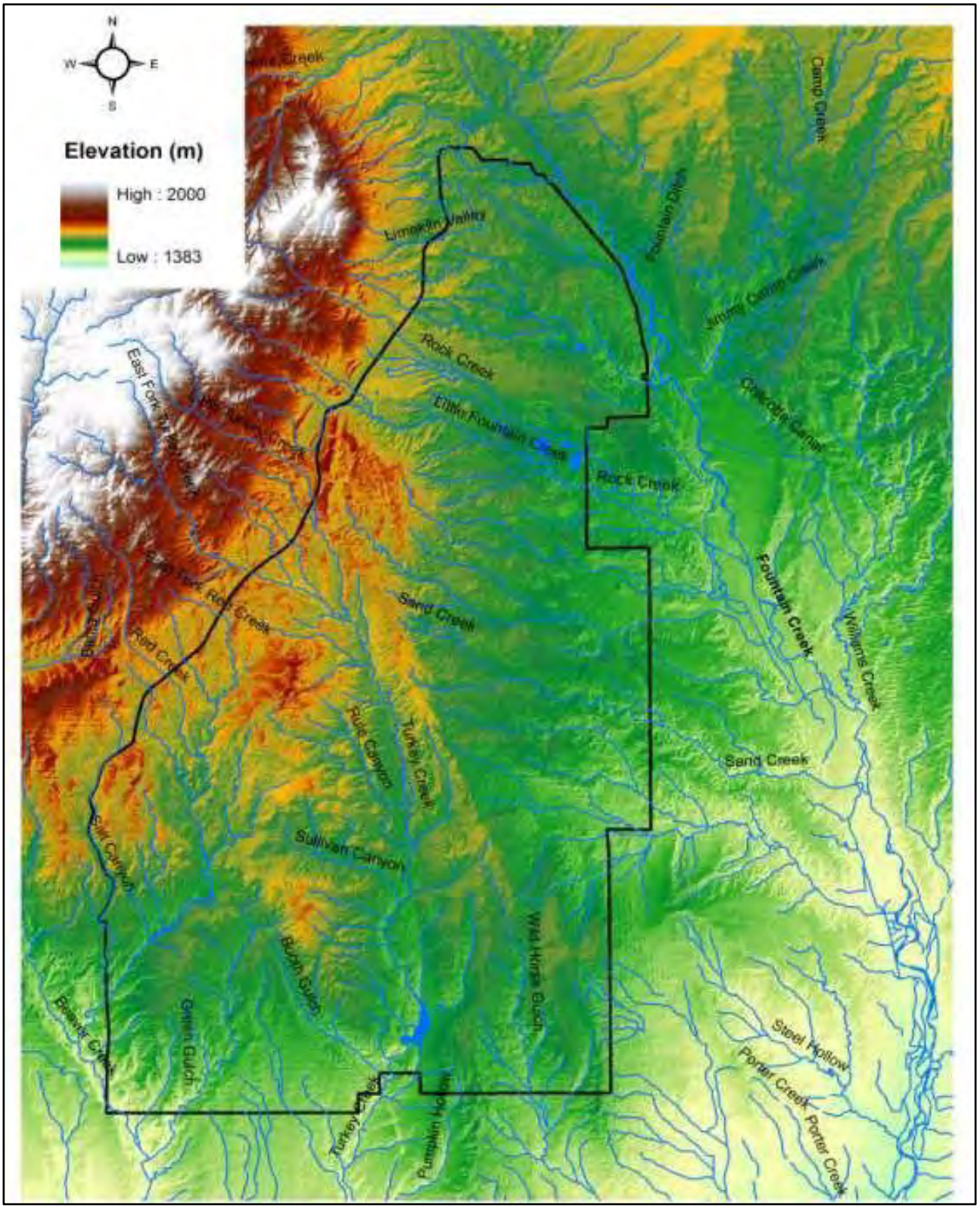


Figure 2-7. Surface waters and elevations on Fort Carson.

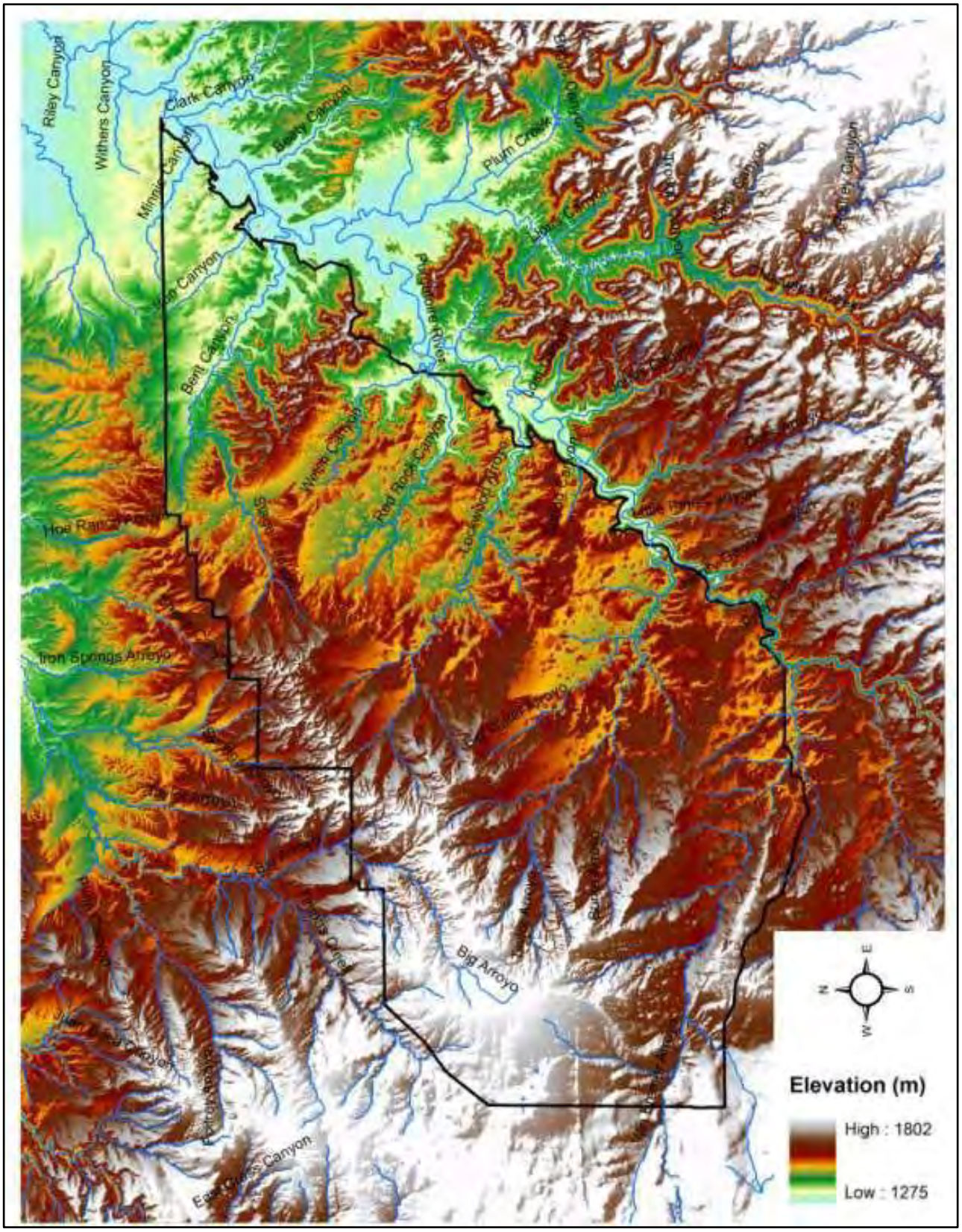


Figure 2-8. Surface waters and elevations and Piñon Canyon Maneuver Site.

Fort Carson

Geologic units on Fort Carson range in age from Quaternary (one million years before present to recent) to Pennsylvanian (200-250 million years before present). Unconsolidated sediments deposited during the Quaternary consist of fluvial and alluvial sands, silts, and gravels and wind- deposited silts and sands. Consolidated units include shale, limestone, hard sandstone, siltstone, claystone, and conglomerate sandstone and shale (Dames and Moore 1978).

PCMS

Raton Mesa and Mesa de Maya, both prominent land features in the vicinity of Trinidad, are capped with basaltic rocks (Armstrong 1972). The Spanish Peaks are likewise of volcanic origin. The geological structure of the PCMS is generally associated with the Apishapa Uplift that trends southwest to northeast across the southern area of the site. These sedimentary rocks dip generally northeastward 1-3 degrees but may dip up to 36 degrees. Small faults associated with the Uplift are found in the northern edge of the PCMS. The major smaller structure within the PCMS is the Black Hills Monocline and two associated structures, Sheep Canyon and Muddy Creek monoclines. Several smaller synclines and anticlines are also associated with these monoclines, including the Model Anticline in the western portion of the PCMS.

2.b. (5) Soils

Fort Carson

Thirty-four soil categories and 65 soil associations have been identified on Fort Carson. Predominant soil associations are the Penrose-Minnequa Complex, Penrose-Rock Complex, Schamber- Razor Complex, and Razor-Midway Complex. A high shrink-swell capacity is the result of montmorillonitic clays dominating most soil complexes. Soil erosion, primarily from water runoff, is a significant problem on the installation. Soils of greatest concern for erosion control are clays, silty clays, and clay loams. Specific information concerning soils can be obtained from the soil surveys of El Paso, Pueblo, and Fremont counties, Colorado (available through the NRCS).

PCMS

There are 31 soil associations recognized on the PCMS. Specific information concerning soils can be obtained from the Soil Survey of Las Animas County, Colorado. The western part of the PCMS is dominated by a flat to gently sloping plain. Soils in this portion are formed in wind-deposited lifts with occasional small ridges of limestone outcropping in some areas. Soils are generally silty and weakly developed and are calcareous throughout. One small area of sand dunes crosses midway through this landscape type. Range sites dominating this landscape are Loamy Plains on upland flats, Saline Overflow in depressions and along intermittent drainages, and Sandy Plains in sand dunes. This range site generally has a medium stability rating and will experience moderate soil losses by water erosion and high soil losses by wind erosion if disturbed.

2.b. (6) Water resources

Fort Carson

Fort Carson lies within the Arkansas River basin. Fountain Creek is the major surface drainage feature that receives runoff from the northeastern portion of the installation. Streams flow from the northwest to the southeast. The intermittent streams of Rock Creek and Little Fountain Creek converge and drain into Fountain Creek two to three miles east of Fort Carson. Turkey Creek, Red Creek, and Beaver Creek flow through the installation and enter the Arkansas River to the south (Figure 2-7). The combined inflow upstream from Fort Carson of Little Fountain, Little Turkey, Rock, and Turkey creeks is estimated to average 8.64 cubic feet/second. The actual inflow to Fort Carson is less than this quantity because of stream flow diversions for municipal and domestic water supplies. Pumping groundwater from alluvial aquifers upstream from Fort Carson also reduces the quantity of stream flow entering the installation. The average water flow on and near Fort Carson is about 2-5 cubic feet/second. Some streams can be expected to have no flow at some time during the year. There are

approximately 64 surface acres in 12 water bodies for fishery and wildlife resources. The closest surface waters to the main post area are man-made impoundments that are primarily used for recreational fishing, including Haynes, Townsend, Womack, and Northside reservoirs. (While "Haynes" is the name given on the state decree for the reservoir, it is widely referred to as "Haymes" Reservoir). Teller Reservoir, located in the southern portion of the installation (south of Range 143 - Multi-Purpose Range Complex), provides erosion and sediment control and flood mitigation for downstream property owners.

PCMS

The PCMS is also in the Arkansas River basin. The PCMS has fewer drainages than Fort Carson (Figure 2-8). The Big Arroyo drainage system is located in the northwest region and flows into Timpas Creek, approximately three miles northwest of the PCMS. The Purgatoire River and numerous ephemeral, intermittent, or perennial tributaries are also located within and adjacent to the PCMS. The Purgatoire River, which flows in a northeasterly direction, is a seventh-order tributary of the Arkansas River. Elevation differences in the Purgatoire River basin cause climatic variations, which, in turn, affect stream flow. During years with average and above-average snowpack, such as occurred in 1984, 30-50 percent of the annual stream flow of the Purgatoire River occurs during April and May. During the rainfall-runoff period, May through October, flashfloods occur intermittently. Releases from Trinidad Reservoir, located about 53 miles upstream from the stream flow gauging station on the Purgatoire River near Thatcher, affect stream flow on an intermittent basis (Von Guerard et al. 1987).

2.b. (7) Groundwater

Fort Carson

The availability, movement, and quality of groundwater is largely dependent on the distribution, permeability, and composition of the rock units that comprise the aquifers. Successively older sedimentary rock units uplifted with the Rocky Mountains are exposed from east to west in the installation. Groundwater at Fort Carson occurs in both alluvial and bedrock aquifers. Alluvial aquifers are formed from unconsolidated deposits of stream alluvium that are moderately permeable. However, their dependability is limited by their areal extent, thickness, and available recharge. The alluvial aquifers are capable of providing well yields from 10 to more than 100 gallons per minute.

The principal bedrock aquifer at Fort Carson is the Dakota-Purgatoire aquifer, which is comprised of massive bedded sandstones in the Dakota Sandstone and Lytle Sandstone Member of the Purgatoire Formation. This bedrock aquifer can yield 10 gallons per minute, but local fracturing can increase the permeability and yield to over 200 gallons per minute. Recharge of bedrock aquifers is from infiltration of precipitation and stream flow in areas where the aquifer is exposed at the land surface. Discharge occurs mostly from well pumping and leakage through overlying formations.

PCMS

The surface geology at the PCMS is predominantly sedimentary limestone, shale, and sandstone; basalt dikes occur along the southern boundary. The Dakota Sandstone and the Purgatoire Formation occur throughout a large part of the installation and are the principal source of groundwater in the area (Von Guerard et al. 1987). Due to the climatic water regime, groundwater has been historically the predominant source of water for the PCMS. This water supply was obtained through a series of wells or springs for the decreed usage of domestic or livestock water. Inspection of drillers' logs and onsite inspection during a well inventory indicated that most wells were completed in the Dakota-Purgatoire aquifer. From 1967 through the early 1980s, a system of pipelines that originated at more productive springs and wells was installed to improve the efficiency and areal distribution of the domestic and stock-water supply. Some of those are now used for watering wildlife. Water at the PCMS cantonment is purchased from the City of Trinidad. Primary sources of groundwater on the installation are the Dakota Sandstone Formation and the Cheyenne Sandstone Member of the Purgatoire Formation (Von Guerard et al. 1987).

Groundwater movement in the northeastern parts of the PCMS generally is toward the northeast, and groundwater movement throughout the remainder of the PCMS is toward the east and southeast. Recharge of the aquifer is primarily from precipitation and subsurface inflow from adjoining areas. Where outcrop areas are traversed by ephemeral streams, occasional flood flows provide some local recharge of very limited areal extent. Wells in the Dakota-Purgatoire aquifer have reported yields that range from less than 10 to 500 gallons/minute. Well yield in unfractured parts of the Dakota-Purgatoire, which are known to occur at the installation, are likely to be less than 300 gallons/minute (Von Guerard et al*.* 1987).

2.b. (8) Landcover

Shortgrass prairie grasslands comprise about 48% of Fort Carson and 41% of the PCMS (Figures 2-9 and 2-10). Major grasses include blue grama, western wheatgrass, galleta, sideoats grama, sand dropseeds, buffalograss, little bluestem, and needle and thread grass. Various shrubs and other plants scattered throughout the grasslands are prickly pear cactus, cholla cactus, yucca, four-winged saltbush, rabbitbrush, and skunkbush sumac.

Shrublands, which typically contain a grass understory, comprise about 15% of the vegetation of Fort Carson and 33% of the PCMS. Deciduous shrubland, whose species include Gambel oak, tamarisk, snowberry, and willow, is found along major drainages

Forest/Woodlands constitute about 37% of Fort Carson and 17% of the PCMS. Ponderosa pine, piñon pine, and one-seed juniper are the dominant species of higher elevation woodlands on rocky and steeper slopes, and cottonwood, willow, and chokecherry dominate woodlands near drainages.

The *Fort Carson, Colorado: Terrain Analysis* (Dames and Moore 1978) and *Plant Community Associations of Fort Carson, Colorado* (Polzin 2000) have additional descriptions of Fort Carson floral resources. Polzin recognized 45 vegetation communities on Fort Carson. *Plant Communities, Ecological Checklist and Species List for the U.S. Army Piñon Canyon Maneuver Site, Colorado*, (Shaw et al. 1989) recognizes 26 vegetation communities. Installation plants communities maps are presented in Figures 2-11 and 2-12.

2.b. (9) Ecological Sites

The USDA Natural Resources Conservation Service (NRCS) is currently in the process of developing Ecological Site Descriptions (ESDs) to replace the old Range Site classification system that has been used for the last 50+ years. The Range Site classifications were heavily geared toward potential vegetative productivity with grazing as the primary emphasis, rather than simply categorizing the existing vegetation. Whereas, ESDs provide a consistent framework for classifying and describing rangeland and forestland soils and vegetation; thereby delineating land units that share similar capabilities to respond to management activities or disturbance.

ESDs are reports that provide detailed information about a particular kind of land - a distinctive Ecological Site. ESDs provide land managers the information needed for evaluating the land as to suitability for various land-uses, capability to respond to different management activities or disturbance processes, and ability to sustain productivity over the long term.

ESD information is presented in four major sections: 1) Site Characteristics – physiographic, climate, soil, and water features; 2) Plant Communities – plant species, vegetation states, and ecological dynamics; 3) Site Interpretations – management alternatives for the site and its related resources; and 4) Supporting Information – relevant literature, information and data sources.

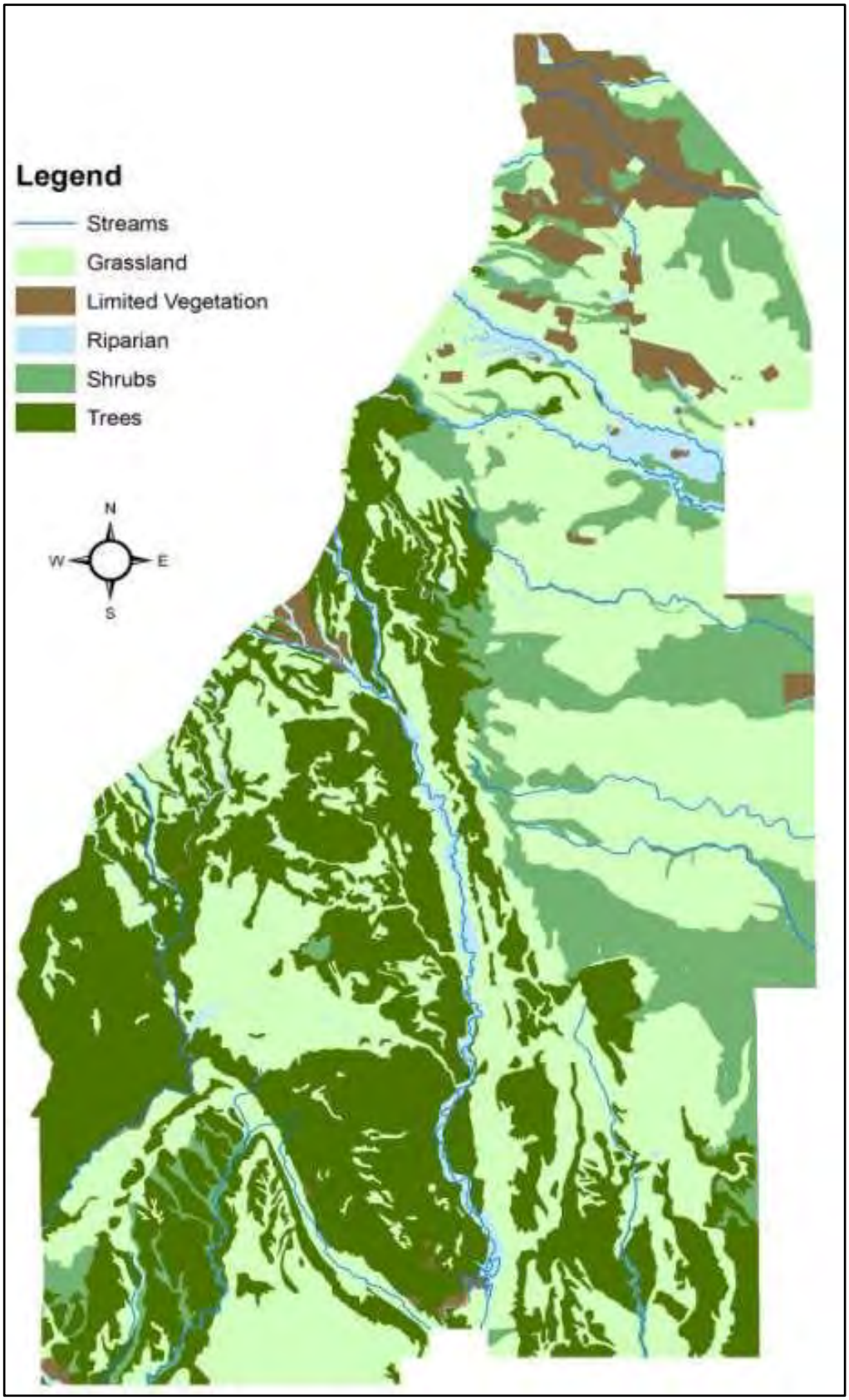


Figure 2-9. General vegetation classes for Fort Carson. Areas with limited vegetation include urban, rocky, or bare soil areas.

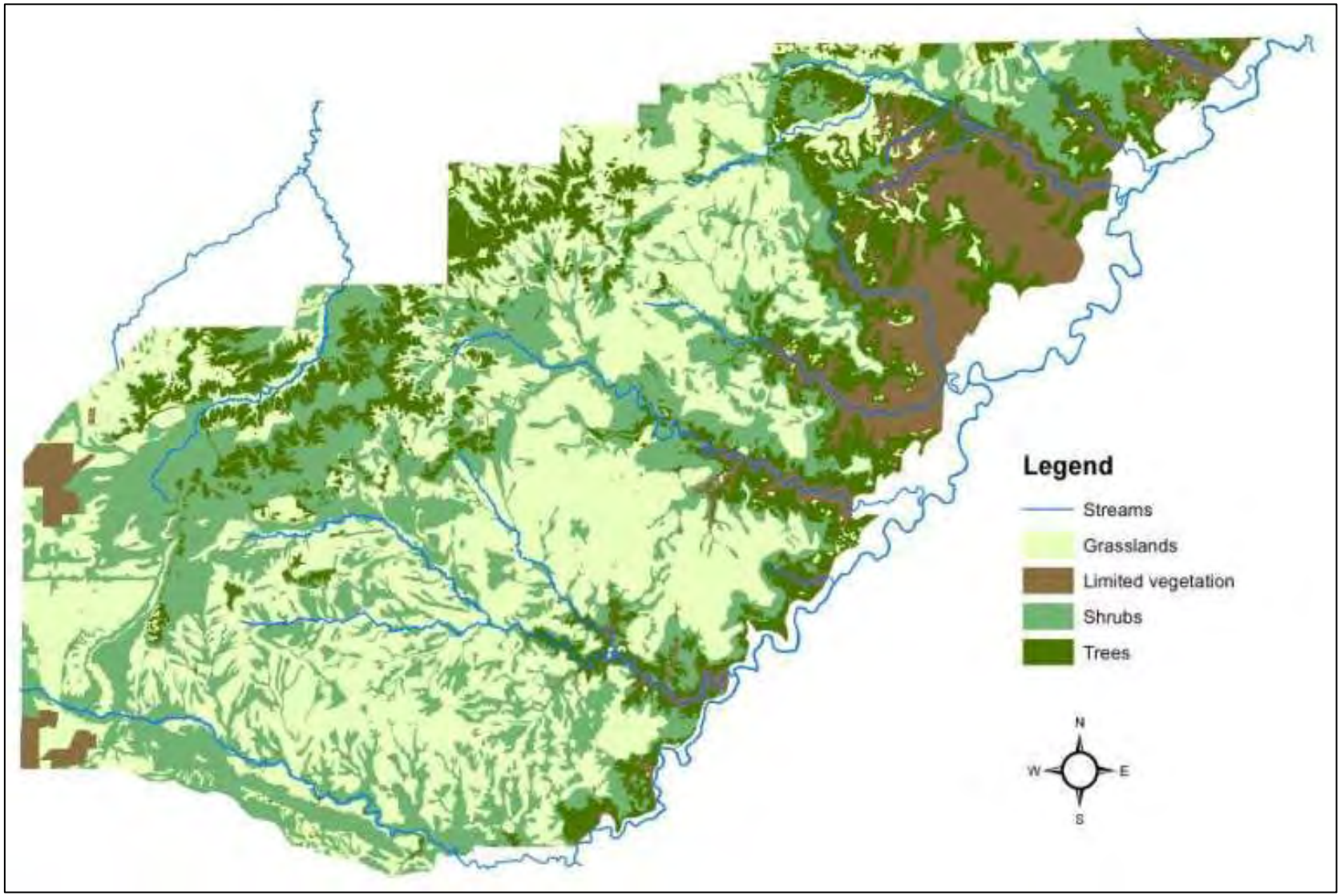


Figure 2-10. General vegetation classes for Piñon Canyon Maneuver Site.
Areas with limited vegetation include urban or rocky areas.

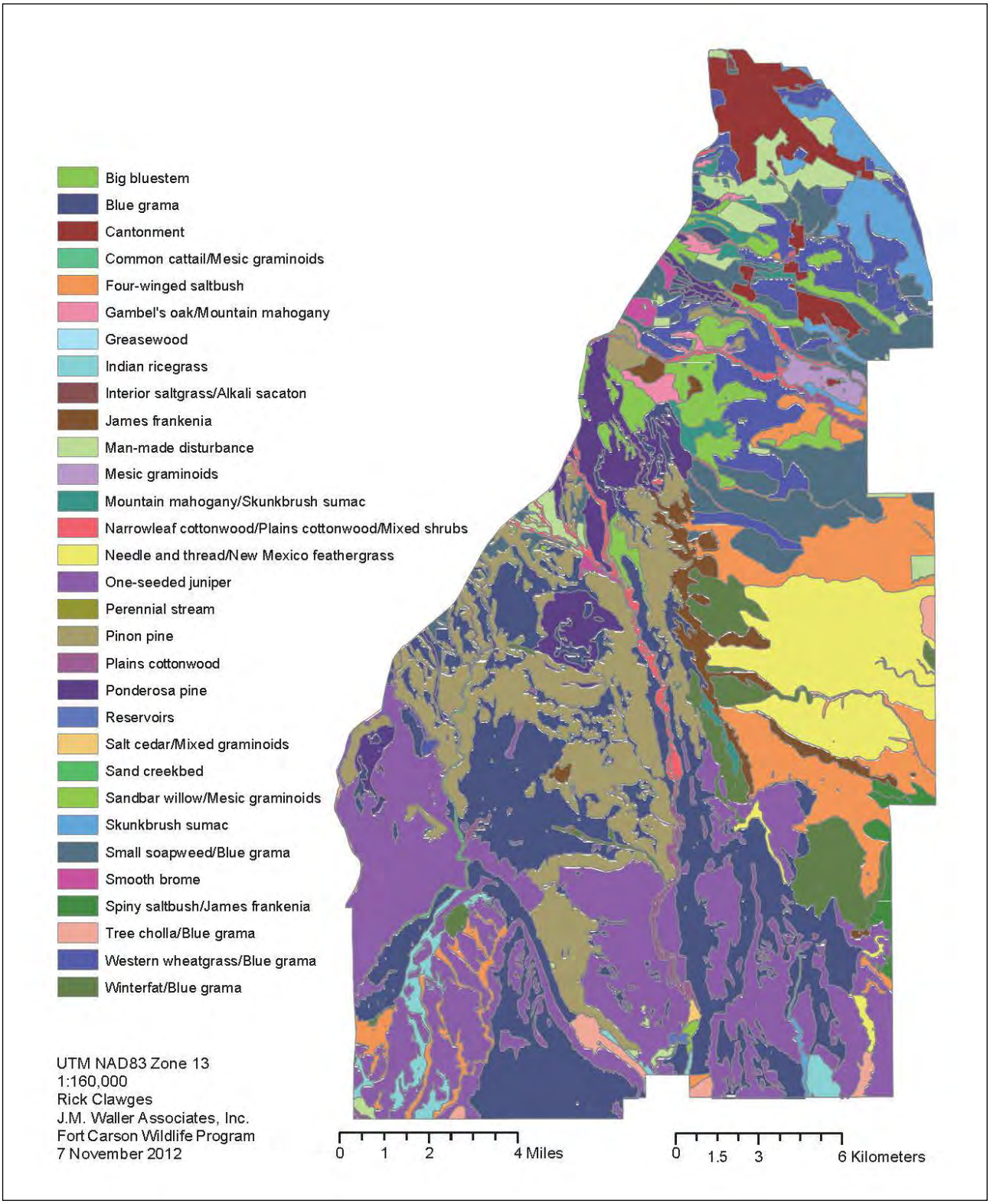


Figure 2-11. Plant communities of Fort Carson

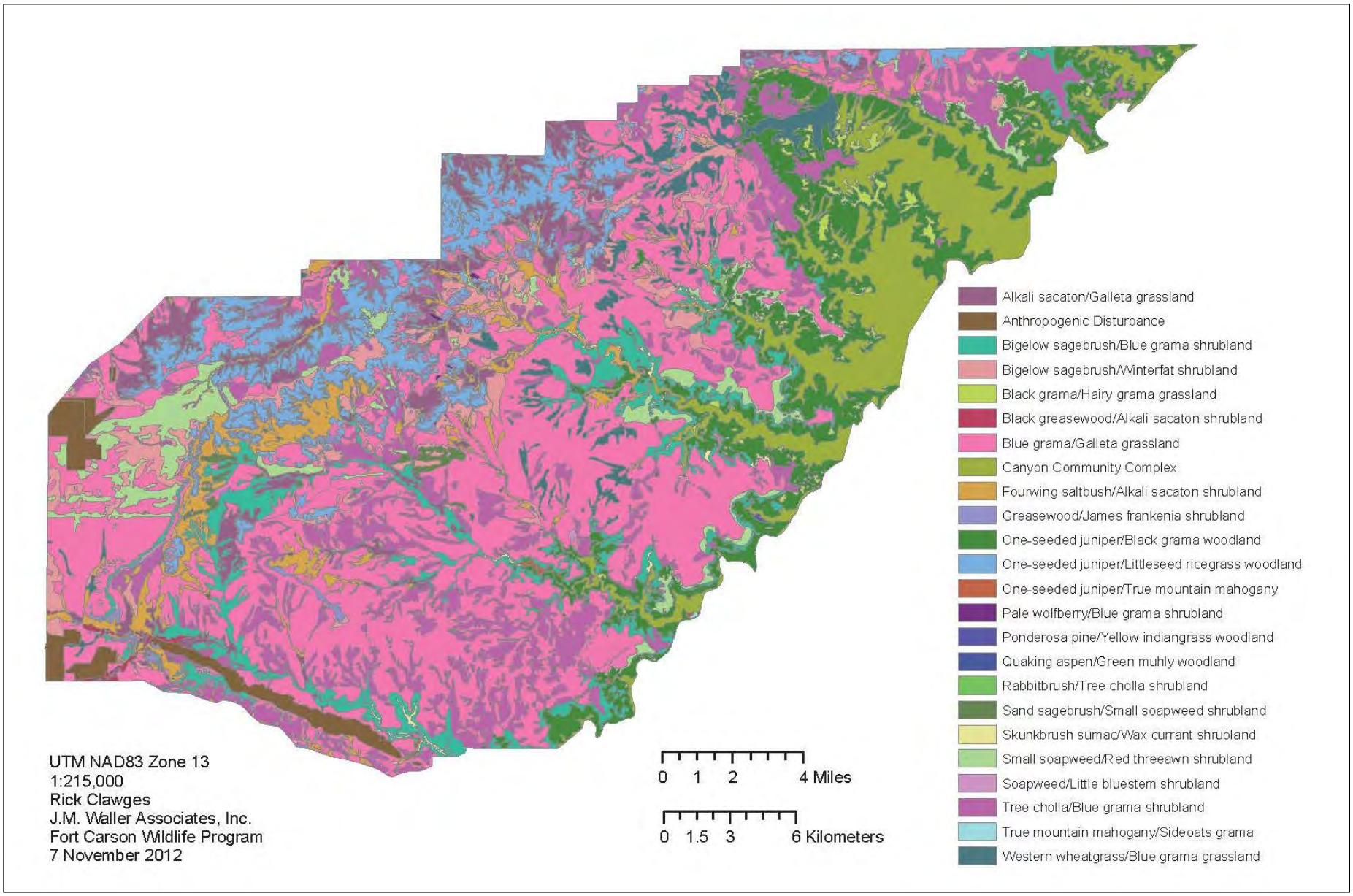


Figure 2-12. Plant Communities of Piñon Canyon Maneuver Site

As of November 2019, the NRCS only has two ESDs approved for public use that include Fort Carson and PCMS: Loamy Foothills - R049XD202CO (Fort Carson) and Loamy Plains - R069XY006CO (PCMS). Areas included in the Loamy Foothills and Loamy Plains ESDs are shown in Figures 2-13 and 2-14. Full description of the ESDs for Loamy Foothills and Loamy Plains can be found on the USDA NRCS website https://edit.jornada.nmsu.edu/catalogs/esd/049X/R049XD202CO and https://edit.jornada.nmsu.edu/catalogs/esd/069X/R069XY006CO, respectively. Other ESDs such as Gravely Plains, Shaly Hills, Sandstone Breaks, etc. are currently being developed, but are not yet approved for public use.

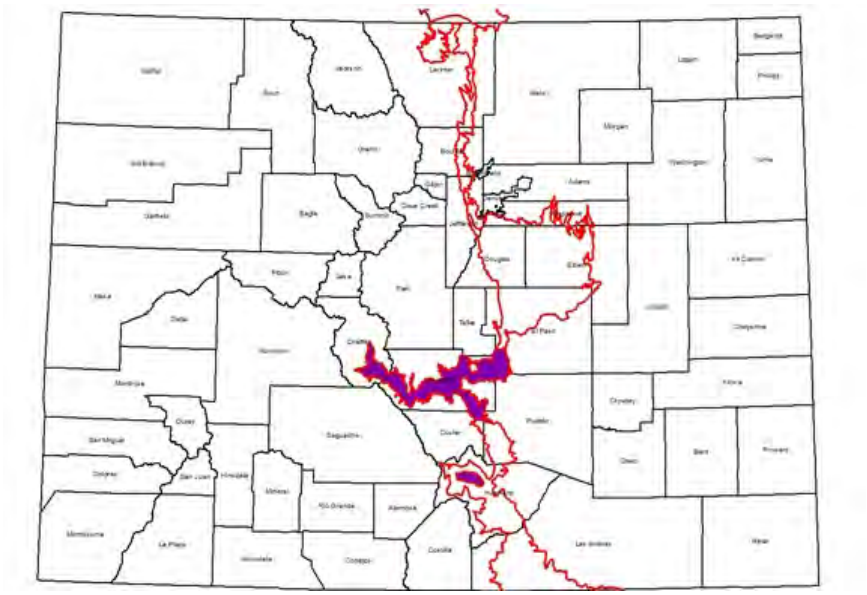


Figure 2-13. Areas of Colorado in the NRCS Loamy Foothills Ecological Site Description. (USDA NRCS Ecological Site Description System)

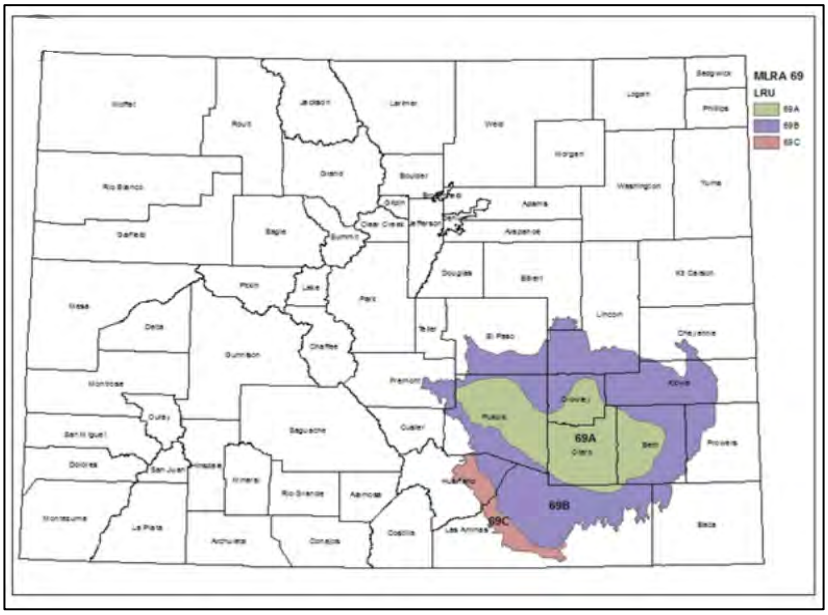


Figure 2-14. Areas of Colorado in the NRCS Loamy Plains Ecological Site Description. (USDA NRCS Ecological Site Description System)

2.c. General biotic environment

2.c. (1) Species of conservation concern

The Mexican spotted owl (MSO) and the black-footed ferret (BFF) are the only federally listed threatened or endangered (T&E) species known to occur on Fort Carson. The owl is an occasional winter resident on the south-central portion of the installation and the ferret migrated across the southern border from an introduction site on adjacent private land. The MSO is not known to nest on Fort Carson, and the black-footed ferret is only known to hunt within the prairie dog colonies on the southern border. No T&E species occur on the PCMS. See sections 4.a., 4.d., 4.g., 4.n., and 4.x. for more information on other species of conservation concern.

2.c. (2) Wetlands and deep water habitats

See section 4.b. for information on wetlands.

2.c. (3) Fauna

Information related to species and management of animals on Fort Carson and PCMS can be found in the following locations:

- 4.a. Species of conservation concern
- 4.d. Fish and wildlife management
- 4.g. Migratory bird management
- 4.i. Pest management
- 4.m. Outdoor recreation (hunting and fishing)
- 4.n. Wildlife Aircraft Strike Hazard (WASH)
- 4.x. Bald and golden eagle management
- Appendix 2. Species Management Plans for Federally Petitioned Species
- Appendix 3. Other Management Plans
- Appendix 5. Vertebrate Species Lists
- Appendix 7. Migratory Bird Management

2.c. (4) Flora

Information related to species and management of vegetation on Fort Carson and PCMS can be found in the following locations:

- 2.b. General physical environment and ecosystems (General vegetation classes)
- 4.a. Species of conservation concern
- 4.e. Forest management
- 4.h. Invasive species management
- 4.i. Pest management
- 4.t. Urban forest management
- Appendix 3. Other Management Plans: Forest Management Plan, Integrated Pest Management Plan, Urban Forest Management Plan
- Appendix 6. Plant Species List

3. ENVIRONMENTAL MANAGEMENT STRATEGY AND MISSION SUSTAINABILITY

3.a. Supporting sustainability of the military mission and the natural environment

3.a. (1) Integrating military mission and sustainable land use

This INRMP supports the Army mission by prescribing ways to conserve and enhance training lands upon which the mission is critically dependent, describing recreational opportunities associated with natural resources that are available to Fort Carson personnel as well as others, and describing impacts of the military mission upon natural resources and vice versa. For the impacts of natural resource management on the military mission, please see Section 3.a.(2) below.

In concert with this INRMP, the Training Requirements Integration (TRI) component of the ITAM Program is the integration of training requirements, range facilities, and environmental management requirements. Several program areas within DPW also help to integrate the military mission and sustainable land use. For example, the forest management program conducts thinning of piñon-juniper woodlands to improve forest ecosystem health and reduce vulnerability to wildland fire, while at the same time increase the area available for wheeled maneuver. The invasive species program seeks to control and minimize invasives in compliance with federal, state, and local laws and regulations, in order to maximize lands available for military training, and to allow native species more opportunities to establish. Coordination and communication between DPTMS and DPW also helps to integrate mission and land use requirements.

3.a. (2) Impacts of natural resource management on the military mission

Natural resource management staff personnel, both from DPW and DPTMS, strive to minimize or eliminate both permanent and temporary restrictions on military training, by means of the following activities.

Mission Safety

Some environmental restrictions and programs enhance mission safety. For example, bank sloping to reduce erosion also reduces rollover risk for maneuvering vehicles. The prescribed fire program reduces the potential effects of wildfires, which can injure troops or damage equipment and training facilities.

Training Restrictions

Restrictions on training are sometimes necessary for long-term sustainment of training land capabilities and ecosystem protection. Restrictions on troop training on Fort Carson and the PCMS are found within FC Regulation (FC Reg) 350-10 *Maneuver Damage Control Program*, FC Reg 385-63 *Firing Ammunition for Training, Target Practice, Administration and Control of Ranges and Training Areas*, FC Reg 350-1 *Mountain Post Training*, FC Reg 350-4 *Training at the PCMS*, and supplemental maps of both installations which delineate off-limits and limited-use areas and are updated periodically. Other documents, such as Fort Carson Regulation 350-1 *Mountain Post Training*, also contain some training restrictions. Training units using either Fort Carson or the PCMS must coordinate with DPTMS for site-specific restrictions needed for safety and compliance purposes (e.g. permission to dig large excavations, precluding hitting buried utilities and archeological sites). Troops are briefed regarding current training restrictions (e.g., a no-fly buffer if an eagle nest is occupied) via regularly scheduled Maneuver Damage Control classes and/or informal briefings during the scheduling process.

Limited-use (rest/rotation or deferment) program

Range Operations manages a limited-use program to accomplish specific objectives. For example, a training area that has been heavily degraded by military training may be temporarily included in the limited-use program to allow for recovery under the ITAM Program (Section 4.w). All limited-use areas are reviewed regularly to determine their recovery status and evaluate whether and when they can be returned to the training cycle. The limited-use area program is a flexible tool that can be used on both Fort Carson and the PCMS to conserve soils and restore native vegetation in specific areas, especially as troop units return from current theaters of war and training loads ramp back up to normal, peacetime levels. See Section 4.w. ITAM for more information. DPW may request that certain areas be placed in a limited-use status in order to accomplish natural resource management goals, such as rare species habitat improvement or invasive species control. DPW coordinates such requests with DPTMS and G3, and requests their concurrence. The Garrison Commander makes the decision unless he delegates that authority.

Examples of training support

The state of Colorado has been looking at establishing Total Maximum Daily Loads (TMDLs) for selenium in our drainages that are tributaries of Fountain Creek. DPW staff personnel participated in those discussions, and were able to show, based on a previous study, that selenium is both naturally occurring and very abundant in this area. Additionally, our bank sloping efforts on the eastern portions of Fort Carson had reduced the amount of sediment, and thus selenium that was entering Fountain Creek. To date, the State has not imposed a selenium TMDL, but portions of Fountain Creek are currently being monitored for selenium.

Critical habitat was proposed for the Mexican spotted owl in 2000. Fort Carson biologists developed management guidelines for protecting the owl, precluding the need to designate critical habitat on the installation. In response to USFWS concerns of the owl entering live fire areas, Fort Carson biologists conducted day and night telemetry demonstrating the species did not leave Booth Mountain and that live fire in adjacent ranges did not change the behavior of the owl. Booth Mountain is the primary location where the owls have been seen. They are only known to be present during the winter, and they are not present every year.

Military training on the southern portion of Fort Carson was threatened by the presence of several sensitive, candidate, and proposed species. The only site for nesting mountain plovers was at the base of Range 123, a live fire jet bombing range. Fort Carson biologists studied the relationship between the plover and jet fly-over, and determined the short-term behavior of the plover did not change in response to the jets.

Four species of rare endemic plants occur near the southern boundary of the installation. Fort Carson biologists, in cooperation with the Colorado Natural Heritage Program, surveyed for the species on Fort Carson, and determined these species were widely distributed on the installation and located at several locations not likely to be impacted by maneuvers. Biologists also surveyed portions of the adjacent buffer zone properties for the plant species and candidate and proposed wildlife species. By acquiring the buffer zone under the ACUB program, the Army can continue to train on our southern Training Areas, because the Walker Ranch contains habitat for those species and other sensitive species.

Bank sloping and construction of erosion control (EC) structures or elevated maneuver trails (EMT), whether done by DPTMS or by DPW, usually enhances training by allowing maneuver in directions that may have been previously unavailable due to gullies. The above examples, along with others, translate into the fact that no acres on either Fort Carson or PCMS are permanently restricted due to natural resource issues.

3.a. (3) Relationship to the Range Complex Master Plan

The Range Complex Master Plan (RCMP) covers multiple topics related to the operation of existing ranges and planning for funding and construction of needed ranges or range upgrades. It also describes the Army Compatible Use Buffer (ACUB) effort to establish a buffer zone around Fort Carson in which development incompatible with military training on Fort Carson is avoided or minimized, restrictions to training, ITAM Program, shortfalls of training land, throughput capacity, funding, and infrastructure downrange. The RCMP is coordinated with the installation Real Property Master Plan. The purpose of the RCMP is to guide the actions of DPTMS in support of the military mission on Fort Carson and the PCMS.

Within the RCMP, under the heading of *Restrictions to Training*, known friction points between environmental considerations and military training are discussed. Three programs ensure that both organizations, DPTMS and DPW, properly coordinate in order to support the military mission to the maximum extent possible. Those processes are 1) the NEPA program; 2) the Army Alternatives Analysis Study (AAS) process; and 3) the Encroachment Condition Module (ECM) process. The NEPA and AAS processes are set in motion by the project proponent submitting a Work Request (DoD Form 428) or a Military Construction Project Data form (DoD Form 1391). However, unless BOID validates the project for funding consideration, NEPA is not initiated. The ECM is a questionnaire or data call received from time to time from higher headquarters, and it is filled out jointly by DPW Environmental and ITAM/Range Control.

Preparation of the RCMP and the annual reviews is somewhat equivalent to preparation of the INRMP and its annual reviews. Both require input from the other organization, and thus function to some extent as a system of checks and balances, to help insure that Fort Carson and PCMS achieve a rational balance between the military mission, which is primary, and environmental requirements.

3.b. Natural resources consultation requirements

Federal agencies shall utilize their authorities in furtherance of the purposes of the Endangered Species Act (ESA) by carrying out programs for the conservation of endangered species and threatened species. Under Section 7 of the ESA, Fort Carson is required to 1) consult with the USFWS to ensure that any authorized action funded or carried out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat unless granted an exemption by the USFWS, and 2) consult if there is reason to believe that an endangered or threatened species may be present and likely to be affected by the action. Due to the infrequency of protected species at Fort Carson, not very many proposed projects or actions require consultation; in fact, formal consultation is rarely needed. Only those actions that may affect a listed species or a majority portion of a migratory bird population would require formal consultation. The Mexican spotted owl and the black-footed ferret are the only listed species on Fort Carson. There are no listed species on the PCMS. Fort Carson staff will obtain HQDA approval before supporting USFWS's or NOAA-Fisheries' introduction and/or reintroduction of federal and state listed, proposed, and candidate species on Army lands (AR 200-1, 13 Dec 2007).Consultation with the USFWS may be needed to deal with specific issues related to the Bald and Golden Eagle Protection Act (BGEPA) or MBTA. There is regular communication with CPW regarding game management, hunting regulations, and monitoring. Fort Carson and PCMS staff meet annually with CPW biologists to determine game populations and set license numbers and season dates. In addition, nuisance wildlife issues occasionally require consultation with CPW law enforcement personnel. Other state agencies such as the CDPHE are consulted in regard to water and air quality. Consultation with the USACE occurs on the Clean Water Act, Section 404 permitting to minimize impacts on wetlands and streams.

3.c. NEPA compliance

The purpose of NEPA review is to ensure that potential environmental consequences of proposed actions are considered before decisions to proceed with those actions are made, and that those decisions include to the extent practical, measures to avoid, minimize, or mitigate adverse environmental impacts.

DPW is responsible for ensuring that the appropriate level of NEPA analysis, including public involvement when appropriate, and subsequent documentation is completed before decisions are made to execute all applicable Fort Carson actions (e.g. significant changes in military training, introduction of new technology/equipment testing, construction projects, and real property actions).

3.d. Partnerships and collaborative resource planning

This INRMP has been prepared in cooperation with the USFWS and CPW, as mandated by AR 200-1, paragraph 4-3d(1)(a); DoDI 4715.03, Enclosure 3, and the Sikes Act. Fort Carson collaborates with other entities (see Section 1.d.) on natural resource issues. Natural resources staff collaborate with others through organized groups such as the Front Range Ecoregional Partnership (FREP), a working group of other DoD installations, as well as the Central Shortgrass Prairie Partnership, a group consisting of nonprofits, state and federal agencies, academic institutions, and private landowners focused on conservation in the shortgrass ecoregion. Cultural resources staff conduct consultation and collaboration with Native American tribal governments to provide tribes the right to access sites and resources that are of religious importance, or are important to the continuance of their culture. By working towards common conservation goals in the region, Fort Carson reduces the likelihood that restrictions implemented to protect populations and habitats of rare species will negatively impact the training mission.

3.e. Public access and outreach

3.e. (1) Public access and outdoor recreation

Hunting and fishing are allowed on Fort Carson, and hunting is allowed at the PCMS at designated times and locations. Access to training lands is under the authority of DPTMS. See Section 4.m. O*utdoor recreation* for more information.

3.e. (2) Public outreach and education

Installation personnel routinely participate in public outreach and education programs in regards to natural resource management. Examples include visiting local schools, universities, and parks for programs or leading education programs on the installations; Earth Day; public hearings; wildlife law enforcement efforts; and, ITAM's Sustainable Range Awareness (SRA).

3.f. Encroachment management

Critical habitat was proposed for the Mexican spotted owl in 2000. Fort Carson biologists developed management guidelines for protecting the owl, precluding the need to designate critical habitat on the installation. In response to USFWS concerns of the owl entering live fire areas, Fort Carson biologists conducted day and night telemetry demonstrating the species did not leave Booth Mountain and that live fire in adjacent ranges did not change the behavior of the owl. Booth Mountain is the primary location where the owls have been seen. They are only known to be present during the winter, and they are not present every year. Appendix 3 of this INRMP provides information on how a reader may review the Endangered Species Management Plan for the Mexican Spotted Owl.

The Army Compatible Use Buffer (ACUB) Program is an innovative tool to address encroachment, both physical and biological, and to achieve local, regional, and federal conservation objectives. Title 10, Section 2684a of the United States Code authorizes the DoD to enter into agreements with states, local governments, or private conservation organizations with a purpose of:

- Preserving habitat in a manner that is compatible with environmental requirements and may eliminate or relieve environmental restrictions that may otherwise restrict, impede, or otherwise interfere with military training, testing, or operations on a military installation, or

- Limiting development or use of property that would be incompatible with the training mission of the installation.

Currently, the ACUB program is funded at DoD level through the Readiness and Environmental Protection Initiative (REPI) and other available Army funds. Under that provision, Fort Carson may enter into cooperative agreements with state or local governments, nongovernmental organizations, and individuals, to provide for the maintenance and improvement of natural resources outside an installation. The purpose of such agreements must be to relieve or eliminate current or anticipated challenges that could restrict, impede, or otherwise interfere with, whether directly or indirectly, current or anticipated military activities.

The mission of the ACUB program is to establish buffer areas around Army installations to limit the effects of encroachment and maximize land inside the installation that can be used to support the installation's mission. Under the ACUB program, Fort Carson works with partners to encumber neighboring land, without acquiring ownership interests in that land. The program allows the Army to contribute funds to a partner's purchase of easements or properties from willing landowners. The partner finds potential properties, negotiates purchases of the real estate interests, and manages the subsequent interests to ensure that the purposes of the program are carried out. These partnerships limit incompatible development around Fort Carson, and some also preserve habitat. Lands covered by an ACUB are not used for military training.

Fort Carson's ACUB program has involved cooperative agreements with The Nature Conservancy (TNC) and with El Paso County. Acquisitions under both agreements have mitigated incompatible development around Fort Carson. Acquisitions under the TNC agreement have also preserved open space, protected rare plant communities, safeguarded the habitat of threatened animal species, and protected contiguous key properties within the Central Shortgrass Prairie ecoregion (Figure 2-6). The program provides for protected habitat adjacent or in close proximity to Fort Carson for sensitive species such as the mountain plover, black-tailed prairie dog, and Arkansas Valley evening primrose, thereby reducing pressure on these and other species to emigrate to training lands on Fort Carson, which would, in turn, reduce Fort Carson’s training capabilities.

Since early 2003, over 24,567 acres of permanent conservation easements along the south and southeastern Fort Carson perimeter have been acquired by TNC through Fort Carson’s ACUB program. This has created a permanent conservation buffer up to 2-1/2 miles wide for nearly 18 miles along Fort Carson’s boundary. As an ACUB partner, the El Paso County Commissioners have acquired 1,036 acres of undeveloped lots within the unincorporated El Rancho Development in El Paso County from willing sellers. These acquisitions limit incompatible residential development along the installation’s eastern boundary. Currently, there is no active purchase program by any of Fort Carson’s ACUB partners adjacent to the installation boundary.

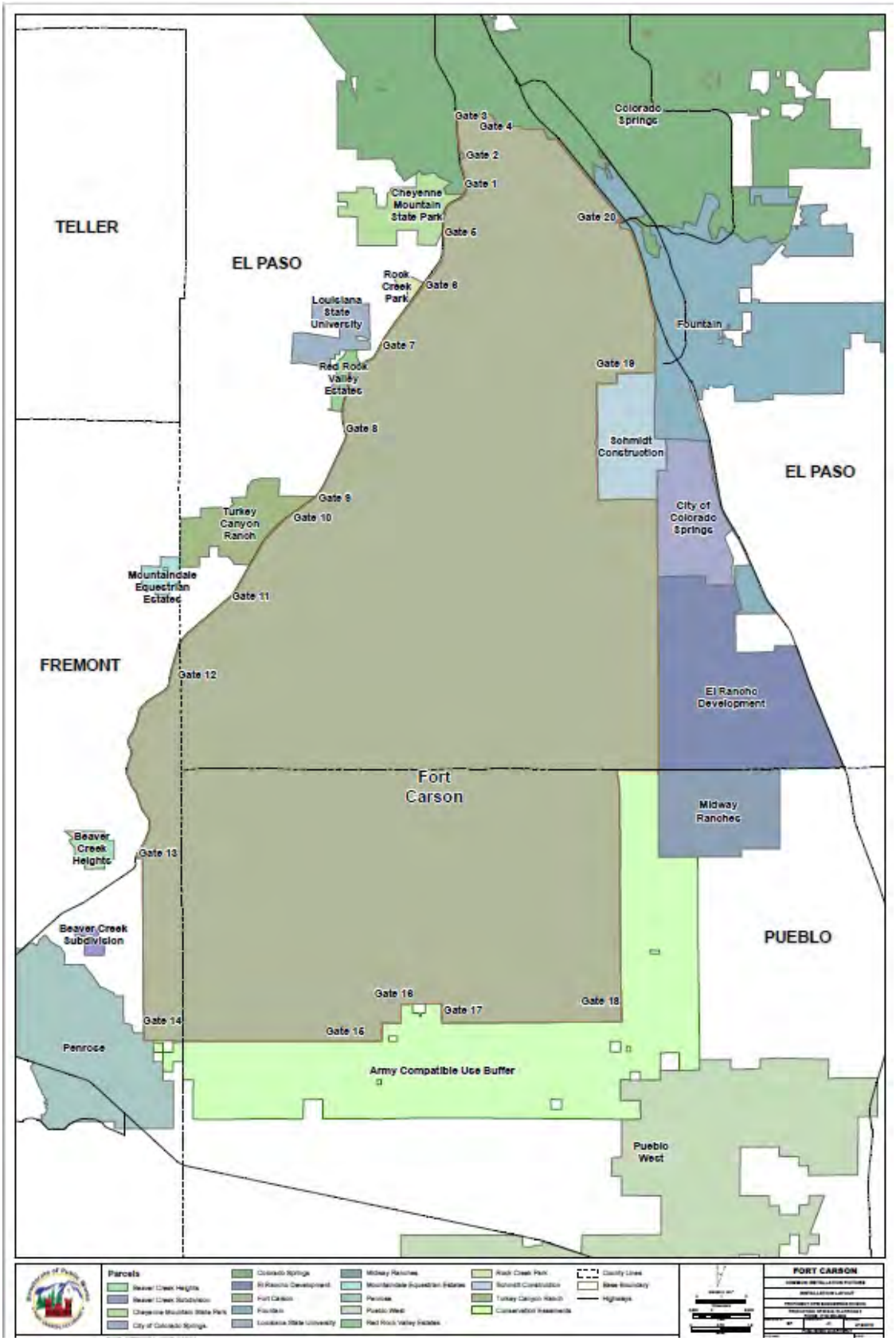


Figure 3-1. Fort Carson ACUB map as of October 2019.

3.g. State comprehensive wildlife plan

This INRMP and the natural resources programs on Fort Carson and the PCMS work in concert with the Colorado State Wildlife Action Plan (CPW 2015). As previously mentioned, promoting the conservation of rare species throughout the state reduces the likelihood that future restrictions will be placed on training lands, which could limit the ability of the Army to fulfill its mission.

4. PROGRAM ELEMENTS

4.a. Species of conservation concern

This section includes an overview of species that are rare or declining, and are a conservation concern to federal and state agencies. The goal of management for these species is to benefit the Army by reducing the likelihood that the presence of these species or their habitat could limit Soldier training. Species of conservation concern include: 1) federal listed, proposed, candidate, and petitioned species, and critical habitat, 2) Army Species at Risk, 3) state listed species, 4) USFWS Birds of Conservation Concern, 5) Colorado Natural Heritage and CPW species of special concern, and 6) CPW Species of Greatest Conservation Need. The management of migratory birds is discussed in Section 4.g, and management of bald and golden eagles in Section 4.x of this INRMP. Appendix 7 contains additional details on migratory bird management.

4.a. (1) Federal species of concern

The USFWS is responsible for administering the Endangered Species Act (ESA). Species protected under the ESA are listed as endangered or threatened. An endangered species is one that is likely to become extinct throughout all or a large portion of its range, while a threatened species is likely to become endangered in the near future. Proposed species are plants and animals for which the USFWS has written a proposed rule to list as either threatened or endangered. Proposed rules undergo a comment period before becoming final and can be withdrawn prior to a final rule to list a species. Candidate species are “plants and animals for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA but for which development of a proposed listing regulation is precluded by other higher priority listing activities.” (USFWS Fact Sheet “Candidate Species”, October 2017) A species that is “under review” has gone through a 90-day status review, during which the USFWS has found that there is substantial information that the petitioned listing may be warranted. These species then move into a 12-month review to decide if they should be listed. A petitioned species is one requested for listing as threatened or endangered by an interested person or group, but has not yet undergone a 90-day review. Critical habitat, which may or may not be included with a federal listing of a species, is protected habitat required for the recovery of a species.

- *Federal threatened and endangered species*
  The Mexican spotted owl (MSO; *Strix occidentalis lucida*) and the black-footed ferret (BFF; *Mustela nigripes*) are the only species protected by the ESA known to occur on Fort Carson. The MSO is a federally threatened species known to winter in the rugged mountainous terrain located in the south central part of Fort Carson, which includes Booth Mountain. The owl’s habitat is managed according to provisions specified in the MSO management plan (Gene Stout and Associates 2002b, revised in 2016 by the Fort Carson Wildlife Office). Protections for the owl include resource management and limiting the types of training and recreational activities that can occur in areas occupied by the owl. The BFF was reintroduced on adjacent private landowner property in October of 2013, and subsequently immigrated onto Fort Carson along the southern boundary. Fort Carson obtained a Programmatic Safe Harbor Agreement (2014), as well as the associated Biological Opinion from the USFWS to ensure no land use or training restrictions would occur as result of the ferret reintroduction efforts.

  There are no federally listed species on the PCMS.

- *Federal proposed species*
  There are no federally proposed species known to occur on Fort Carson or the PCMS. The

USFWS has proposed the listing of the eastern black rail (*Laterallus jamaicensis jamaicensis*) as threatened throughout its range (Federal Register Vol. 83, No. 195), with a final listing decision due in October of 2019, which has not been announced at the timing of this INRMP's signing. The proposed rule designates all of Colorado as within the potential range of the species. There are no records of eastern black rails on Fort Carson or PCMS, but CPW surveys have found individuals along the Arkansas River within 20 miles of Fort Carson and 50 miles of PCMS. Colorado Parks and Wildlife conducted formal surveys on Fort Carson in May and June of 2018 and did not detect any rails, but only a limited number of locations were surveyed. No formal surveys have been conducted on PCMS or anywhere on the Purgatoire River. Fort Carson wildlife staff will begin annual eastern black rail surveys on both installations in areas with suitable habitat, according to CPW protocol. If eastern black rails are found on either installation, consultation with USFWS will begin immediately.

- *Federal candidate species for listing*
  There are no federal candidate species on Fort Carson or the PCMS.

- *Species under federal review*
  Species that have been petitioned for listing and for which a 90-day substantial ruling has been published, but a 12-month finding has not yet been published, are considered under review. In May of 2019, the USFWS created a 5-Year National Listing Workplan. The workplan will allow the USFWS to meet its current and future ESA obligations. Species that have been petitioned for federal protections under the ESA are listed in this workplan. The following species in this section are those that occur or have the potential to occur on Fort Carson and/or the PCMS. If any of these species, or any additional species, become listed under the ESA, wildlife staff will immediately begin consultation with USFWS.

  - Desert massasauga (*Sistrurus catenatus edwardsii*)
    This species has been under review since 2012, and has the potential to occur on the PCMS. However, baseline reptile surveys completed in the spring and summer of 2018-2019 have not found any desert massasaugas on Fort Carson or the PCMS.

  - Little brown bat (LBB; *Myotis lucifiugus*)
    This species has been under review since 2010. Throughout the eastern portion of its range, LBB populations have been severely reduced by white-nose syndrome (WNS), with hibernacula counts declining by an average of 90%. In February 2018, the IUCN listed the LBB as globally endangered because of the threat posed by WNS. Prior to baseline bat surveys in 2019, the only LBB record on Fort Carson or the PCMS was a single individual from the 1970s. However, surveys conducted during the summer of 2019 recorded multiple individuals on both installations. Acoustic monitors recorded likely LBB calls at all Fort Carson sites, suggesting that LBBs are widespread on the installation. Lactating females were caught at two locations on Fort Carson, including the Stone City mine area. Because access to the interior of the Stone City mines is almost fully restricted, there is little risk of human disturbance of the colony or human-caused introduction of WNS. A single non-reproductive female was captured at Bernacki Ranch at the PCMS. Fort Carson wildlife staff, in cooperation with CPW, will continue monitoring the population for persistence and presence of WNS, as well as to attempt to pinpoint the location of other maternity roosts. For more information, see Appendix 2 for the Fort Carson/PCMS Little Brown Bat Management Plan.

  - Monarch butterfly (*Danaus plexippus*)
    This species has been under review since 2014, is known to occur on Fort Carson and the PCMS from incidental observations. For more information, see Appendix 2 for the Fort Carson/PCMS Monarch Butterfly Management Plan.

- Plains spotted skunk (*Spilogale putorius interrupta*)
  This species has been under review since 2012, and has the potential to occur on Fort Carson and the PCMS. One of the few documented cases of a plains spotted skunk in Colorado involved a road kill in Pueblo County. However, no surveys have been completed and the species has never been found or documented at either Fort Carson or the PCMS. For more information, see Appendix 2 for the Fort Carson/PCMS Plains Spotted Skunk Management Plan.

- Tri-colored bat (*Perimyotis subflavus*)
  This species was petitioned for listing in 2016. In December 2017, the USFWS 90-day finding determined the tri-colored bat may warrant listing and is currently on the status review workplan. As of May 2019, the workplan lists the tri-colored bat action plan as, "12-month finding on a petition to list a species" (USFWS 2019). This bat has been devastated by the invasive fungal disease known as WNS. As WNS has spread across the continent, numbers of the tri-colored bat have plummeted, along with a numbers of other bat species. Mortality rates up to 100 percent have been reported in affected hibernacula. As a result, the Center of Biological Diversity has petitioned the USFWS to list the tri-colored bat (Center for Biological Diversity 2016) as threatened or endangered under the ESA of 1973, as amended. The single documented occurrence of the tri-colored bat on Fort Carson was in an abandoned mine on the southern end of the installation on April 2, 2008. For more information, see Appendix 2 for the Fort Carson/PCMS tri-colored bat management plan.

- Western bumble bee (*Bombus occidentalis*)
  This species, which has been under review since 2016, has the potential to occur on both Fort Carson and the PCMS, as it is has been found in multiple locations along the Front Range. Baseline arthropod surveys, if funded, would help to clarify the presence and habitat associations of both the monarch butterfly and the western bumble bee.

There are currently no species on Fort Carson or PCMS that have been petitioned and are still in the 90-day review phase.

If a species known to occur on Fort Carson becomes a listed or candidate species, Conservation Branch staff will immediately begin informal consultation with the USFWS under Section 7(a)(1) of the ESA. The goal of this consultation will be to develop a mutually acceptable management plan that will be incorporated into the INRMP as part of the annual review process.

- *Critical habitat*
  In accordance with Section 4(a)(3)(B)(i) of the ESA, critical habitat is not designated on Fort Carson or the PCMS for any species.

  When designating critical habitat for a newly listed species, the USFWS can consider existing conservation and management plans when determining if an area needs the additional protection afforded by a critical habitat designation. If the INRMP includes a management plan that provides a conservation benefit to the species, a way to ensure implementation of the plan, and a way to ensure the effectiveness of the plan, the USFWS may decide that the installation does not meet the definition of critical habitat. If a species known to occur on Fort Carson becomes listed or a candidate species, the pre-listing consultation process will allow Conservation Branch staff to develop a management plan that meets these three criteria, while also meeting the Army goal of no net loss in training area. If this management plan is then approved by the USFWS and appended to the INRMP,

there is a greatly reduced chance of FC land being included in the critical habitat designation.

4.a. (2) Army species at risk (SAR)

Army SAR are species that can significantly impact the Army training mission if listed as threatened or endangered. The objective of the Army SAR initiative is to conserve species prior to listing. NatureServe, who prepared the initial DoD SAR report and has issued several subsequent updates, in their 2014 update define a SAR as:

" …native, regularly occurring species in the United States that are not federally listed under the U.S. Endangered Species Act, but are either:

- *Candidates* for listing under the U.S. Endangered Species Act, or
- *Proposed* for listing under the U.S. Endangered Species Act, or
- *Critically imperiled* (rounded global rank of G1 or T1) or *Imperiled* (rounded global rank of G2 or T2) plants and animals, according to the NatureServe conservation status rank criteria, or
- *Vulnerable birds* with a rounded global rank of G3 according to the NatureServe conservation status rank criteria or an IUCN status of critically endangered (CR), endangered (EN), vulnerable (VU), or near threatened (NT)."

According to the above definition, Fort Carson and the PCMS have the following SAR species:

- One species of reptile: Colorado checkered whiptail, COCW (*Aspidoscelis neotesselata*);
- Two species of bird: Mountain plover, MOPL (*Charadrus montanus*); and Pinyon jay, PIJA (*Gymnorhinus cyanocephalus*)
- One species of mammal: Tri-colored bat (*Perimyotis subflavus*); and,
- Five species of plants: Dwarf milkweed (*Asclepias uncialis ssp. unicalis*), golden blazingstar (*Mentzelia chrysantha*), roundleaf four o'clock (*Mirabilis rotundifolia*), Pueblo goldenweed (*Oonopsis puebloensis*), and rayless goldenweed (*Oonopsis foliosa var. monocephala*).

In November 2018, NatureServe downgraded the global ranking of COCW from G2 (imperiled) to G3 (vulnerable). However, the species still has a national and state ranking of imperiled. Because COCW only occurs in Colorado, and has large populations on both FC and PCMS, it is prudent to continue treating COCW as a species at risk. The COCW is a narrowly endemic species of southeast Colorado that was previously petitioned for federal listing. In July 2015 the USFWS determined that the petition did not present enough evidence to warrant listing (Federal Register Vol. 80, No. 126). This decision does not preclude the submission or consideration of future listing petitions. The entire known COCW range encompasses approximately 21,000 km^2 across 6 counties (Pueblo, Fremont, Otero, Las Animas, El Paso, and Teller) in southeastern Colorado, with Fort Carson and PCMS representing the approximate northern and southern boundaries of the species' range, respectively. Because a significant proportion of the entire COCW population is found on FC and the PCMS, such a future listing could have the potential to interfere with training if there is not already a management plan in place. See Appendix 2 for more detailed information on COCW distribution and management on Fort Carson and the PCMS.

The MOPL was formerly proposed for listing as federally threatened, but the proposed rule was withdrawn by the USFWS in 2011. On Fort Carson, MOPL have historically bred within prairie dog colonies near the far southern boundary, with only a handful of sightings farther north. On PCMS, they have been detected on Range 7. Fort Carson staff survey for breeding MOPL every year in concert with Burrowing Owl surveys.

Pinyon jays are ranked as vulnerable by both NatureServe and the IUCN. In Colorado, the species is considered secure, while populations in other western states are ranked as vulnerable or imperiled. Pinyon jays have been detected during general avian surveys in pinyon-juniper habitat during the breeding season, suggesting that they breed on Fort Carson, at least in some years. The species is semi-nomadic and preferentially nests in areas that had a strong pinyon pine seed crop the previous year. Incidental encounters occur year-round and are noted in the wildlife general observations database.

Three of the plant species are narrowly regional endemics restricted to shale barrens (golden blazingstar, Pueblo goldenweed, and roundleaf four o'clock). On Fort Carson, these species are primarily distributed in the southeastern and southwestern parts of the installation. Populations of roundleaf four o'clock occur in the shale barrens habitats at the PCMS. The rayless goldenweed, a Las Animas county endemic, is found in the shortgrass prairie on PCMS. Habitat of dwarf milkweed (Asclepias uncialis ssp. uncialis) is primarily grasslands, especially at the interface with pinyon-juniper woodlands. Previous SAR plant species, Arkansas River feverfew (*Parthenium tetraneuris*) and Colorado Springs evening primrose (*Oenothera harringtonii*) were downgraded from global imperilment ranking G2/T2 to G3. These two species are regional endemics with sustainable populations within their range. Each of these plant species is on the Colorado rare plants list and is fully tracked by the Colorado National Heritage Program (CNHP), but none are currently protected by state or federal regulations. However, in order to minimize the possibility that they would ever become candidate species, there is a section of FC Reg 200-6 that prohibits recreationists from collecting them. Training restrictions are not warranted at this time to protect populations of Army SAR on Fort Carson or the PCMS. Approximately 70% of the known habitat for these species has been surveyed on Fort Carson (CNHP 2007a), and 3,800 acres of PCMS were surveyed in 2007 for rare plants (CNHP 2007b). Inventory surveys for Army SAR are conducted at known and new sites annually depending upon staff availability and access to training lands.

4.a. (3) State listed species

There are three state listed species on Fort Carson: southern redbelly dace (endangered), Arkansas darter (threatened), and burrowing owl (threatened). The primary dace population occurs in Quarry Pond; smaller populations occur in the golf course and other ponds on Fort Carson. The darter occurs at several sites on Fort Carson, with the largest populations occurring in Cottonwood Springs. The population in Lytle Pond was lost when the pond dried up in 2013, but the pond remains a potential future relocation site for both dace and darters. The Fort Carson dace and darter populations have been instrumental in recovery efforts for these species in Colorado, since Fort Carson has provided dace and darters to the CPW for establishing or augmenting populations and breeding stock for state fish hatcheries. In a November 2017 meeting with DPW staff, CPW aquatic biologists cited Fort Carson's robust darter population as a contributing factor to the decision that federal listing of the species was not currently warranted. These two species of fish are not protected by the ESA, but are protected by state regulation and FC Reg 200-6 (Wildlife Management and Recreation). Fort Carson wildlife staff conduct small fish surveys annually in multiple streams and ponds across the installation, including all areas with historic records of dace or darters. The dace and darter do not occur on the PCMS.

The burrowing owl is widely distributed across Fort Carson and the PCMS but occupies only a small percentage of available habitat. The owl is generally present on both installations March-October, but has been observed in prairie dog colonies on PCMS into December. Burrowing owls are primarily restricted to prairie dog colonies during the nesting season, but may occasionally nest in other natural burrows. The owl is not protected by the ESA but is protected by the MBTA and state regulation. The burrowing owl is the only state-listed species known to occur at the PCMS. Breeding surveys are conducted annually, in conjunction with mountain plover and black-tailed prairie dog surveys.

4.a. (4) Colorado Natural Heritage Program and CPW species of State Special Concern

This group includes fish (1 species), amphibians (3 species), reptiles (2 species), birds (5 species), mammals (3 species), and vascular plants (15 species). Fort Carson biologists record and map all sightings of these species. The black-tailed prairie dog, a keystone species of conservation concern integral to the survival of other sensitive species, is monitored biennially on Fort Carson and annually on PCMS for persistence in the training environment and the presence of plague.

Species dependent on prairie dogs on Fort Carson and the PCMS include golden and bald eagles, ferruginous hawks, mountain plovers, burrowing owls, swift foxes, black-footed ferret, and numerous species of reptiles and invertebrates. Prairie dogs are the primary prey of eagles on both installations, and they modify grassland habitat making it suitable for burrowing owl and mountain plover nesting. Management of black-tailed prairie dogs at Fort Carson and PCMS is discussed in the Management Plan for the Black-tailed Prairie Dog at Fort Carson and the Piñon Canyon Maneuver Site, as noted in Appendix 3.

In addition to state species of special concern, CPW also maintains a State Wildlife Action Plan (2015) which has a broader list of Species of Greatest Conservation Need (SGCN), divided into Tier 1 and Tier 2 SGCN. Tier 1 species are “the species which are truly of highest conservation priority in the state, and to which CPW will likely focus resources over the life of this plan” and Tier 2 species “remain important in light of forestalling population trends or habitat conditions that may lead to a threatened or endangered listing status, but the urgency of such action has been judged to be less” (CPW, 2015). As of the 2015 State Wildlife Action Plan update, Fort Carson and PCMS have fourteen Tier 1 SGCN, including fish (3 species), amphibians (1 species), reptiles (1 species), birds (4 species), and mammals (5 species); and 50 Tier 2 SGCN, including amphibians (2 species), reptiles (3 species), birds (37 species), and mammals (8 species).

In 2011, Fort Carson and the CPW installed bat gates on abandoned mine entrances to protect maternal and wintering areas of bats. Baseline bat surveys are currently being conducted, and are scheduled to continue through 2020. The results of the two years of these surveys will be used to determine if Fort Carson and the PCMS have any additional bat species of special concern.

4.a. (5) Birds of Conservation Concern

Many bird species of conservation concern occur on Fort Carson and the PCMS. Included in this group are USFWS Birds of Conservation Concern (31 species), Colorado Natural Heritage watch-listed and tracked species (33 species), CPW endangered, threatened, or State Special Concern species (6 species), and CPW Species of Greatest Conservation Need (SGCN; 41 species). These species are detailed in Section 4.g. Migratory Bird Management. In addition, Fort Carson and PCMS personnel annually conduct point-count surveys in both grassland and piñon-juniper habitat and annually record observed nesting locations of burrowing owls and mountain plovers, in order to monitor nesting trends. On the PCMS, acoustic surveys for the birds are also conducted annually.

The BGEPA protects both golden and bald eagles. Both species occur on Fort Carson and the PCMS. Details regarding eagle management for both installations are found in Section 4.x. Bald and Golden Eagle Management.

Recurring actions for managing species of conservation concern

(Please note: The following proposed actions are in priority order from 1 to 17. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

1. Continue annual (PCMS) and biennial (Fort Carson) prairie dog monitoring for colony extent and plague status. Colonies were mapped on Fort Carson in 2015, 2017, and 2019; anticipated mapping in 2021, 2023, and 2025.

2. Continue annual monitoring of prairie dog colonies for the presence of burrowing owls and mountain plovers.

3. Continue evaluation, at three-year intervals, of Mexican spotted owl (MSO) roost tree buffer zones for compliance with access restrictions specified in the MSO Management Plan (2016). The most recent surveys were conducted in winter 2017 – 2018, with the next round scheduled for winter 2020 – 2021.

4. Continue to inventory Army Species At Risk (SAR) populations and evaluate persistence and relationship to training annually, as scheduled around training. Fort Carson and PCMS rare plant surveys will be scheduled to occur within the next 5 years.

5. On Fort Carson, continue Arkansas darter and southern redbelly dace population monitoring and inventory annually, as scheduled around training.

6. Conduct baseline inventory of arthropod populations, with a focus on subphylum Hexapoda. This will allow Fort Carson staff to determine the presence and distribution of sensitive arthropod species, including those that are being considered for federal listing.

7. Conduct baseline inventory of amphibian populations. This will allow Fort Carson staff to determine the presence and distribution of sensitive amphibian species. A more complete species list will also allow wildlife staff to rapidly respond to potential future ESA listings. Amphibian surveys will also allow wildlife staff to determine if invasive American bullfrogs are having a negative impact on native amphibians and determine what control measure may be necessary.

8. On Fort Carson, maintain bat gates to prevent disturbance and the spread of white-nose syndrome from anthropogenic sources, to include annual inspections and monitoring. Monitor other bat roosting sites for disturbance and presence of white-nose syndrome. Because several bat species on Fort Carson are susceptible to white-nose syndrome, proactive monitoring and management will make future restrictions less likely if any of the species are listed.

9. Continue monitoring population trends and investigating the effect of training on Colorado checkered whiptail populations as funding and staffing allow.

10. Annually survey for and maintain inventory of raptor nests. This allows wildlife staff to respond more rapidly to projects that involve removal of trees.

11. On PCMS, support nesting raptors by installing and maintaining raptor nesting platforms. Support cavity nesting birds by installing and maintaining cavity nest boxes.

12. Continue mapping distribution of species of conservation concern, annually as encountered.

13. Continue pesticide dusting and exploring other alternatives to prevent plague in prairie dog colonies important to nesting and wintering eagles, ferruginous hawks, and nesting burrowing owls.

14. On Fort Carson, continue to assist (by providing fish) the USFWS and CPW with translocating Arkansas darter and southern redbelly dace to additional sites to improve population stability. Identify potential additional sites for reintroductions on Fort Carson, pending IMCOM approval and conservation assurances from CPW and USFWS. By creating more stable populations of species at risk, the chance of federal listing (and thus the risk of future training restrictions) is reduced.

15. Sustain small mammal and bird populations in woodland areas by preferentially leaving large trees with natural and bird created cavities and crevices.

16. Create cover for sensitive species of reptiles, amphibians, and small mammals by leaving non- diseased, felled tree trunks in place during forestry operations. On Fort Carson, logs are an important component of MSO habitat and should be left in place following forestry operations in owl habitat.

17. Create slash brush piles at sites where not increasing risk of spread of wildland fire to increase habitat availability for small mammals and reptiles.

4.b. Wetlands management

Wetland management on Fort Carson and the PCMS consists of all elements related to compliance with the Clean Water Act (CWA), Section 404, as well as applicable executive orders, Army regulations, and state laws. The Fort Carson Wetlands Management Program adheres to provisions of the CWA to ensure protection from unregulated discharges of dredged or fill material that could permanently alter or destroy valuable water resources on Fort Carson and the PCMS. Executive Order 11990 Protection of Wetlands (1977) and the Clean Water Act require no net wetland losses on federal lands in the United States. The goal of the Wetlands Management Program is no net loss of wetlands on Fort Carson or the PCMS.

Fort Carson

Fort Carson and the PCMS were included in the 1992 National Wetlands Inventory (NWI), and in another NWI completed in 2004. The 2004 NWI map is available from the DPW GIS Program. The 1992 data showed 487.9 acres of wetlands on Fort Carson. There has been considerable confirmation of sites to improve the quality of the original data. The current estimate of wetlands on Fort Carson, based on the 2004 NWI, is 1,389 acres. Wetlands are a dynamic land feature and change constantly, including naturally fluctuating acreages.

Wetlands on Fort Carson are generally characterized as linear (e.g., streambeds) or small and isolated. Linear wetlands occur along intermittent and perennial stream channels and tributaries, primarily Rock, Little Fountain, Turkey, Little Turkey, Red, Sand, and Wild Horse Creeks. Isolated wetlands usually occur where an erosion control dam has been built for erosion control or for water storage; most are only 1-2 acres in size. The largest downrange wetland is on the upper reaches of Teller Reservoir, encompassing about 100 acres. There are also a number of wetland areas scattered throughout the main post area, typically in natural or stormwater runoff drainages, in the wildlife

management area, and in the Ammo Holding Area south of Butts Army Airfield. In addition to cattails, common wetland species are cottonwood and willow.

PCMS
The current estimate of wetlands on the PCMS, based on the 2004 NWI, is 361 acres compared to the 1992 NWI estimate of 4,776-acres. This significant reduction is the result of the administrative transfer of the Purgatory River section from Army management to the USFS. Most wetlands on the PCMS are associated with side canyons that are tributary to the Purgatoire River, and water developments.

4.b. (1) Wetland protection

In accordance with Executive Order 11990 and the CWA, there has been no net loss of wetlands on Fort Carson or on PCMS. This is managed under the Fort Carson Army Garrison & Piñon Canyon Maneuver Site Regional General Permit 14 (most recently issued October 2, 2019-October 2, 2025) for erosion control and other minor activities. Proposed projects or activities that may impact wetlands and the Waters of the United States (often referred to as 'jurisdictional wetlands') must be reviewed for compliance with the CWA, Section 404 (33 USC 1344). Proposed installation projects that may impact or be in proximity to wetlands or Waters of the United States must be reviewed through the DPW work request or service order process and NEPA reviews.

Per the CWA, Section 404, there are three tiers of procedures for reducing or eliminating potential net losses of wetlands. The three tiers are 1) Avoidance of impacts whenever possible; 2) minimization when impacts cannot be avoided; and 3) mitigation for impacts that cannot be minimized.

There are three types of permits that may be used based on the level and type of impact. They are the Regional General Permit (RGP) for Fort Carson and PCMS, the Nationwide Permit (NWP) and the Individual Permit. The proponent must factor into their project timeline up to 180 days, under normal circumstances, for USACE review if the latter two permits are used. Modifications during the review process, or anything that might cause the review process to be elevated, may delay the review even more. Projects requiring an EIS may take as long as three years to obtain a CWA permit.

The RGP for Fort Carson and PCMS (2014-2019) was developed by Fort Carson and the USACE for standard erosion control work. This permit includes the construction and modification of erosion control dams, check dams, diversions, etc. Specific restrictions are identified in the permit, such as acreage limits per project, time limits for completion, submission of quarterly reports, etc. Fort Carson is required to report all completed activities covered under this RGP to the USACE on a quarterly basis.

Activities not covered by the RGP may be covered by one of 52 NWPs. The project proponent, in coordination with the DPW, may identify the permit that fits the project and follow the guidelines of that permit. Based on these guidelines, the proponent may be required to submit a permit request to the USACE. Even if a proposed project or activity is covered by a NWP, in most cases the proponent must provide a pre-construction notification (PCN) to the USACE, and await their confirmation of coverage.

For activities not covered by the RGP or a Nationwide Permit, the proponent must obtain an Individual Permit.

Once the permit is obtained the proponent must follow the requirements in the permit. This includes the placement of BMPs, monitoring of project site, and regular reporting to the USACE.

If a permit is required, but not obtained, work must stop until the permit is obtained. The USACE may deem it necessary to issue a Notice of Violation to stop the work and seek restoration or mitigation of the site.

All DPW Real Property proposed projects should go through the DPW work request or service order process. Military Construction (MILCON) projects follow the MILCON process, which is outside of the work request or service order process. DPW Real Property project proponents need to remain involved throughout the process. The following is a list of the main steps a project proponent must complete:

1. Submit the project for DPW work request or service order review.

2. If project is covered by the RGP, report the completed work to the DPW Conservation Branch POC for inclusion in the quarterly report to the USACE.

3. If the project may be covered by one of the NWPs, submit a pre-construction notification to the Pueblo USACE, with a courtesy copy to the DPW Conservation Branch POC.

4. If the project is not covered by the RGP or an NWP, apply to the Pueblo USACE for an Individual Permit, with a courtesy copy to the DPW Conservation Branch POC.

5. Comply with the terms of the permit.

6. Coordinate any changes to the project with the Pueblo USACE and the DPW Conservation Branch POC.

7. Implement mitigation measures if required by the permit or NEPA.

8. Monitor the success of mitigation measures for the period of time specified in the permit or NEPA document.

9. Submit annual reports or certifications of compliance to Pueblo USACE.

4.b. (2) Water quality

Maintaining water quality on Fort Carson whether in isolated wetlands, linear wetlands, or streams includes assessments and mitigation for construction and military training activities that may cause increased sediments, selenium, other pollutants, and altered stormwater.

Protection of water quality

Under an Army-wide program, all ranges on Fort Carson and the PCMS have been qualitatively evaluated for the presence, and possible migration pathways, of lead and other munitions constituents. Several ranges at Fort Carson are also being quantitatively monitored. At all PCMS ranges, sufficient evidence was found to show no known releases or source-receptor interactions that could present an unacceptable risk to human health or the environment. All ranges will be re-evaluated periodically. Also, SOPs require that spill containment measures be put in place when temporary refueling points are set up downrange during training exercises. Drip pans are used, as needed, under every military vehicle while it is stationary.

Sediment

Erosion is a natural process in the semi-arid region of Colorado. Gullies transport sediment during flashflood events. At Fort Carson and the PCMS, DPW and DPTMS are focused on minimizing

accelerated erosion, which occurs above the natural level. Erosion can be accelerated by construction, and by training activities that damage the vegetation cover. When vegetation is removed, soil is exposed and more likely to be moved. This reduces the long-term ability of the training lands to support vegetation and the military mission. Land Rehabilitation and Maintenance (LRAM) projects which are constructed primarily under the ITAM Program (Section 4.w.) include BMPs (e.g., Elevated Maneuver Trails (EMTs), check dams, bank sloping) to repair downrange maneuver damage.

A survey of sediment loading at over 40 Fort Carson sites was conducted during 1998-2000 in cooperation with the Agricultural Research Service. In addition to the network of 40 sites, monitoring stations on an erosion control reservoir and a stream draining the western portion of Sullivan Park (Red Creek) were operated. The program with Agricultural Research Service concluded in 2002. The previously operated, continuous-record, erosion control reservoir was added to the network of three erosion-control reservoirs monitored (semi-annual or as-needed visits) by the USGS. The seasonally-operated, continuous-record, stream flow-sediment gauging station on Red Creek was converted to a seasonally-operated, peak-flow only gauging station. These sites continue to be operated by the USGS in support of limited erosion and sediment production assessment of Fort Carson.

The USGS continues to monitor a network of more than 70 erosion control reservoirs (semi-annual or as-needed site visits), a main-stem streamflow gauging station on the Purgatoire River, and five seasonal, continuous-record, streamflow-sediment gauging stations on tributaries draining more than 60 percent of the PCMS. Monitored erosion control reservoirs are used in assessing sediment and streamflow yields from small watersheds within the PCMS, and streamflow-sediment gauging stations are used to quantify streamflow and sediment outflows from the PCMS. These sites continue to be monitored and/or operated by the USGS in support of erosion and sediment production assessment of the PCMS, subject to availability of funding from the Army.

Outside of flood events and construction related sedimentation that are mitigated, the studies do not have conclusive findings on sedimentation caused by military training because the streams on Fort Carson and the PCMS are ephemeral and not constantly flowing.

Bank sloping before and after

Selenium

Fort Carson and the PCMS have some of the highest naturally occurring, documented levels of selenium in the United States. Naturally occurring selenium can create problems when land disturbances occur, such as military mechanized maneuvers and excessive erosion. Selenium that has leached into lower soil profiles over millions of years is exposed when the ground is disturbed, and plants that act as selenium receivers then invade disturbed sites. Selenium can enter directly into aquatic systems when selenium-loaded soils are exposed to water. Selenium can also be redistributed onto ground surfaces by deep-rooted, selenium receptor plants. Both aquatic and

terrestrial wildlife can be acutely and chronically affected. No government standards or regulations exist for terrestrial and non-point source selenium. Bank sloping projects on the eastern portions of Fort Carson have been shown to reduce the amount of sediment erosion, and thus the amount of selenium, that enters Fountain Creek.

Stormwater

The Fort Carson Stormwater Program focuses on protecting water quality through the implementation of the installation's Stormwater Management Plan (SWMP) to meet the requirement of the Clean Water Act. The program implements control measures and best management practices (BMPs) to maintain compliance with the installation's stormwater permits (e.g. Municipal Separate Storm Sewer System (MS4), Multisector General Permit (MSGP)), and construction activities under the Construction General Permit (CGP). The program focuses on compliance through inspection and routine analytical sampling, integration with future development and engineering design initiatives, and repairs and maintenance to address conditions which may negatively affect stormwater quality. Additionally, the program works with regional partners to protect and enhance the Fountain Creek Watershed. Construction projects disturbing over one acre of land require a National Pollutant Discharge Elimination System (NPDES) permit for point source discharge of stormwater and must operate under the EPA's Construction General Permit. Designs and projects submitted by engineering have to be reviewed at design percentage stages by natural resource subject matter experts as part of the NEPA review. More information on the Fort Carson stormwater program is available at: https://www.carson.army.mil/organizations/dpw.html

Impaired waters

Section 303(d) of the Clean Water Act (33 USC 1313(d)) requires the State of Colorado to classify waters that do not meet designated water quality standards as "impaired" water bodies. Colorado's Water Quality Control Commission within the Colorado Department of Public Health and Environment (CDPHE) is required to present this information in a list to the EPA for review and approval. This list is known as the "Section 303(d) List of Impaired Waters". Fort Carson and the PCMS do not have any waters within their boundaries that are listed as impaired on the Section 303(d) listing.

As part of this listing process, the CDPHE is required to prioritize waters/watersheds for future development of Total Maximum Daily Load (TMDL). Colorado and the Regional Water Quality Control Board have ongoing efforts to monitor and assess water quality, develop the Section 303(d) List, and develop TMDLs with associated priorities of High, Medium, or Low. The 303(d) list is regularly updated and can be downloaded through the EPA or CDPHE websites. Portions of Fountain Creek and Wild Horse Creek are listed as impaired for selenium and/or *E. coli*. Sections of the Purgatoire River have been listed as impaired for selenium. Again, neither installation has any Section 303(d) listed impaired waters within its boundaries.

In order to assist with increasing the water quality within our watersheds, Fort Carson continually works in partnership with local, state, and federal stakeholders to ensure compliance. These efforts have resulted in mitigating violations put forth against the installation for non-compliance of the impaired waters regulations. It is of note that the *Fountain Creek Watershed Environmental Protection Agency Nine-Element Plan for the Management of Escherichia Coli* (Brown and Cadwell et al. 2019) reflects increased *E. coli* loading predominantly above installation boundary lines. Efforts made by Fort Carson continue to increase water quality regionally by decreasing pollutants in stormwater runoff.

Recurring actions for wetlands management

(Please note: The following proposed actions are in priority order from 1 to 6. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

1. Ensure no-net-loss of wetland acreage on Fort Carson and the PCMS.

2. Use the NEPA process to evaluate impacts on wetlands, which could result from new construction or other activities, and assist with coordination between proponent and USACE.

3. Continue to minimize training impacts on wetlands with recommendations such as dismounted training only or driving on established crossings and roads, or avoiding steep slope traverses that affect safety and erosion.

4. Submit quarterly Regional General Permit (RGP) reports, and review/update the RGP on a 5-year basis.

5. Maintain/update database of Waters of the US delineations with the USACE.

6. Requirement for SOPs to include spill containment measures when setting up temporary refueling points and that drip pans are required under stationary vehicles.

7. Collect reservoir-area-capacity and sediment yield data from erosion control reservoirs from 68 PCMS monitoring sites every three years.

4.c. Conservation law enforcement

The Fort Carson Conservation Law Enforcement Program is responsible for actively enforcing local, state, and federal environmental, natural and cultural resource laws and regulations in accordance with DoDI 5525.17. Sikes Act, 16 USC 670e-1, states that "All Federal laws relating to the management of natural resources on Federal land may be enforced by the Secretary of Defense with respect to violations of the laws that occur on military installations within the United States." 10 USC 2671, *Military reservations and facilities: hunting, fishing, and trapping*, mandates the Secretary of Defense to require that all hunting and fishing on an installation be in accordance with the fish and game laws of the state in which it is located. This statute also says that an act or omission committed on the installation that would have been punishable under state law be subject to a like punishment.

Pursuant to the Garrison Commander's inherent responsibility to provide for the safety and security of the installation, Fort Carson Conservation Law Enforcement Officers (CLEOs) are duly commissioned law enforcement officers specially trained and delegated the authority to enforce all natural and cultural resource laws, statutes and regulations on Fort Carson and the PCMS. CLEOs are assigned to the DES. As stated earlier, this INRMP does not enlarge or diminish the existing responsibilities of the USFWS or the CPW or the DOD. Certain details of law enforcement operations may evolve over time as part of the annual review process of this INRMP, and be captured in written mutual understandings or agreements. If appropriate, any such changes would be included in future updates of this INRMP.

The Fort Carson Office of the Staff Judge Advocate and the local federal magistrate approved a *Violations and Monetary Penalties List*. Violators are cited by Fort Carson CLEOs for misdemeanor offenses through the US Courts Central Violations Bureau. This list contains citable offenses and monetary fines that mirror USFWS and CPW violation penalties. Felony violations are coordinated with the US District Court for the District of Colorado through the Staff Judge Advocate's Special Assistant to the Assistant United States Attorney.

CLEOs may also suspend for up to five years the recreational privileges of any recreationist that has committed an offense involving willful criminality or gross negligence. The Chief of Law Enforcement makes suspension recommendations, but the Garrison Commander has the ultimate appeal authority.

The goal of the Conservation Law Enforcement Program is to help ensure the safety and security of Fort Carson and the PCMS by enforcing all natural resource laws, statutes, and regulations on these installations.

Priorities

Conservation law enforcement activities are prioritized based upon the impact violations may have on state and federally mandated requirements, animal species and habitat identified as critical, and on the operations of the installation. The following list of priorities is not exhaustive, and may encompass other concerns as the mission dictates. Enforcement emphasis will change seasonally or with the deployment or redeployment of military units, and as priorities change:

Priority 1 – Endangered Species Act (ESA), Archeological Resource Protection Act (ARPA), Native American Graves Protection and Repatriation Act (NAGPRA), and Bald and Golden Eagle Protection Act (BGEPA)

Priority 2 – Migratory Bird Treaty Act (MBTA), Lacey Act (combats trafficking in illegal wildlife, fish, and plants) and Game law compliance inspections

Priority 3 – Hazardous Waste Disposal Violations, Clean Water Act, and the Clean Air Act

Operations

CLEOs support Fort Carson's mission by conducting law enforcement patrols and investigations; providing for the safety of recreationists and military users of the land; maintaining a proactive environmental and wildlife education program to deter intentional or inadvertent violations of the law; and assisting the installation's requirement to meet natural resource objectives as outlined within this Plan. The CLEOs accomplish this by:

- Investigating violations of natural and cultural resource laws, citing offenders and pursuing prosecution. Fort Carson CLEOs must inform the CPW of all violations of State wildlife statutes in a timely manner and provide the CPW the opportunity to collaboratively investigate all violations.

- Sending copies of post adjudication misdemeanor citations written on Fort Carson, regardless of jurisdiction, to the CPW for assessment of points against a violator's hunting and fishing privileges. Copies of citations written by the CPW on Fort Carson or the PCMS, regardless of jurisdiction, will be provided to the Supervisory CLEO either via e-mail or may be dropped off at the Military Police Desk at building 2700.

- Ensuring violations of the ESA, BGEPA, and ARPA are coordinated with the USFWS Office of Law Enforcement to foster an exchange of criminal information and expedite prosecutorial efforts.

- Proactively enforcing provisions of Federal laws to ensure compliance and help avoid violations by official and recreational users of military lands.

- Ensuring that important habitat, waterways, nesting sites and sensitive areas identified by the Natural Resource Manager and DPW Program Managers are routinely monitored via patrols, surveillance and the strategic placement of motion activated cameras.

- Actively patrolling ranges, particularly during hunting seasons, to prevent conflicts and ensure the safety of recreationists and military personnel training.

- Conducting federal and state license compliance inspections to ensure recreational users are properly authorized to hunt and fish on the installation and comply with all wildlife related laws and regulations. Law enforcement personnel from the CPW (in areas of concurrent and State jurisdiction) and USFWS are allowed unfettered access to the installation to the greatest extent possible, as determined by Range Control based on live-fire activities and/or secure or classified activities, to conduct license compliance inspections and patrols. Prior to conducting any other law enforcement operations or activities on the installation, coordination is required to be effected with the DES through the Supervisory CLEO.

- Advising and assisting commanders, directorates and residents to resolve problems with dangerous wildlife. Bears or lions on Fort Carson or on the PCMS that pose an immediate threat to human health and safety may be humanely euthanized. The entire carcass will be provided to the CPW for disposition. Other bears deemed simply a nuisance may be hazed from populated areas and the CPW can be notified to assist with conflict prevention and control measures. Prior to trapping, tranquilizing, and translocating any bear or lion, coordination will be effected with CPW to ensure compliance with the state's black bear and mountain lion policies, such as CPW administrative Directive W-2. Per Directive W-2, all translocated bears will be ear-tagged with yellow ear tags by CPW personnel. The phrase "do not consume if harvested before XXXX date" and a withdrawal date from the controlled sedation drug will be clearly labeled on the ear tag. All complaints of bear or lion activity will be reported to the CPW for recordkeeping and identification of areas for proactive management strategies.

- Assisting DPW with providing education classes to soldiers, commanders, recreationists, school age children, and the general public concerning natural resource laws, urban wildlife encounters, and environmental concerns.

Recurring Actions for conservation law enforcement
(Please note: The following proposed actions are in priority order from 1 to 3. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

1. Ensure military and civilian personnel and activities are in compliance with natural, cultural and environmental laws and regulations on Fort Carson and the PCMS.

2. Coordinate enforcement activities with other stakeholder agencies and organizations.

3. Assist in providing education and awareness classes to various groups that use Fort Carson and the PCMS, including online classes.

4.d. Fish and wildlife management

Fort Carson and the PCMS lands support a broad array of wildlife and ecosystems that are integral to the Army training mission and to landscape-scale natural resources management in eastern Colorado. Ensuring Army lands meet current and future training needs for realistic training through the sustainment of biological diversity of terrestrial and aquatic ecosystems is the overall goal for wildlife management on Fort Carson and the PCMS. The species included in this section are vertebrate game and nongame species with regionally or nationally secure populations that are not covered in the Species of Conservation Concern, Migratory Birds, and Eagle Protection sections.

4.d. (1) Big Game Species

The big game management goal for Fort Carson and the PCMS is species management within an ecosystem context that includes supporting regional CPW management objectives for private and public lands, sustaining current water availability, control of invasive species, and large-scale habitat improvement with prescribed fire and re-seeding.

CPW determines big game population sizes on a large scale called Data Analysis Units (DAUs). A DAU is the geographic area that represents the year-round range of a big game population and includes all of the seasonal ranges of a specific population. DAUs usually contain smaller Game Management Units (GMUs) situated geographically within the DAU. Fort Carson and the PCMS have different DAU names for the different species populations (see below), but the installations have the same GMU, regardless of species, except for bighorn sheep. Fort Carson is designated GMU 591 and the PCMS is designated GMU 142. CPW typically reports big game population size on the larger DAU, primarily on deer and elk. CPW conducts deer and elk aerial surveys annually for the DAUs, which include Fort Carson and the PCMS. Fort Carson rarely conducts aerial surveys, but does so when further data are needed to support CPW aerial survey numbers. CPW uses the aerial survey data to generate estimates of deer fawn/doe or elk calf/cow ratios and deer buck/doe or elk bull/cow ratios for DAUs. These data are then fed into a population model to help CPW determine population size for the entire DAU.

CPW GMUs are managed by seasonal hunting to attain population and sex ratio targets within the DAUs. Fort Carson's (GMU 591 and 142) harvest objectives are set annually through cooperation between Fort Carson and CPW, and CPW sets the final season dates and the numbers of licenses sold. Reducing the spread of chronic wasting disease (CWD) from Fort Carson to adjacent private and public lands is also an objective factored into population objectives. Current management practices have reduced the prevalence of CWD in deer harvested on Fort Carson, but the rate is still above the target of 4%. CWD is a transmissible neurological prion disease affecting deer, elk, and moose. The disease produces spongiform changes in the brain, abnormal behavior, progressive weight loss, and eventually death. While there is no evidence that CWD can be transmitted to humans, hunters are encouraged not to consume meat from infected animals.

Big game hunting on both installations encompasses archery, muzzleloading, and rifle seasons, which begin in late August and end in January. The major big game hunting seasons, in terms of the number of participants, are deer, elk, and pronghorn. Management of big game populations presents significant challenges related to ensuring adequate law enforcement and security, safety of training Soldiers, and mitigating hunting season conflicts with military training. Hunting season conflicts are less problematic on the PCMS than on Fort Carson due to how training is scheduled and the number of hunters.

Despite Fort Carson experiencing a considerably greater training frequency and duration than that experienced on the PCMS, Fort Carson averages approximately 50-60% more hunters and recreationists downrange throughout the year than the PCMS (based on 2016-2018 data). This is most likely due to the isolated nature of the PCMS location. Hunting and fishing regulations specific to Fort Carson and the PCMS are detailed in FC Reg 200-6.

The primary focus of big game population management on both installations is maintaining currently functional water availability (natural and artificial), re-seeding, prescribed fire, and reducing the incidence of CWD. Guzzlers have been installed to provide water for wildlife. DPW and the University

of Colorado at Colorado Springs (UCCS) investigated the use of water guzzlers by wildlife, and the results of this study concluded that ungulates and many species of birds and other wildlife use these artificial water sources. Guzzlers are maintained and filled on an annual basis or when needed. In the past, Fort Carson, CPW, and the Rocky Mountain Bighorn Sheep Society have cooperatively developed supplemental water sites for sheep at the PCMS. Recently, the maintenance of wells on the PCMS have been transferred to DPW Real Property who will be responsible for maintaining these wells and keep them functional.

- *Deer*

  CPW considers the deer on Fort Carson as part of the Rampart deer population, which includes GMUs 59, 511, 512, & 591 (Fort Carson). The Rampart DAU population objective is between 4,000 and 5,000 deer. Between 2014 and 2018, the Rampart deer population averaged 3,722 individuals (standard deviation [SD] 643.099, 95% confidence interval [CI] 563.701). Deer harvests on Fort Carson vary yearly, depending mostly on access to Fort Carson, due to large military exercises closing areas of prime deer habitat. The 2016-2018 three year average (95% CI) for harvest of mule deer and white-tail deer on Fort Carson was 56.0 (± 9.80) and 8.0 (± 3.33) individuals, respectively. Deer on the PCMS are part of the Las Animas herd population (DAU D-45), which includes eight other GMUs. The most recently published data, in 2017, reported that the post-hunt population of the Thatcher herd was 9,570 deer, with a buck/doe ratio, per 100 individuals, of 33 bucks. The 2016-2018 three year average (95% CI) for harvest of mule deer and white-tail deer on the PCMS was 41.3 (± 14.33) and 1.3 (± 1.41) individuals.

  Fort Carson, the United States Air Force Academy (USAFA), and the UCCS participated in a study to cooperatively investigate the relationship between deer movements, habitat use, and military training (Follett 2014). Forty-two female deer were fitted with satellite GPS collars. One study looked at home and core ranges of these collared deer. The results of the study concluded that female deer were non-migratory and their home ranges did not change seasonally, but core ranges and habitat selection shifted. The shift from grasslands to areas with more cover (riparian and shrubland) was probably due to predator avoidance and access to thermal cover. Fieldwork began in March 2010 and was completed in late 2012. These studies have concluded, and the literature produced documenting the results of the studies can be accessed through UCCS.

  The prevalence of CWD is a significant deer management concern on Fort Carson and regionally. The CPW recognizes Fort Carson as a “CWD hot spot" due to a high number of animals testing positive for the disease. Since 2011, testing for CWD has been mandatory for all deer harvested on Fort Carson so that biologists at Fort Carson and CPW can quantify disease prevalence at the installation. In wild deer herds, CWD prevalence is thought to have a positive relationship with deer density. Within deer herds, male deer are more likely to become infected with CWD than females (Western Association of Fish and Wildlife Agencies 2017). Reducing deer density and disproportionately harvesting bucks may be one way to reduce the prevalence of the disease on Fort Carson. CPW and Fort Carson’s objective for CWD was to decrease its prevalence in Fort Carson deer by increasing the buck deer licenses each year, which started when mandatory CWD testing began. In 2015, Fort Carson attempted to calculate the Fort Carson deer population by conducting a smaller, site-specific, aerial survey. Fort Carson estimated the deer population at 300 individuals. This is a dramatic decline from 2003 surveys that estimated the Fort Carson deer population between 950-1,250 individuals. The current objective of CPW and Fort Carson is to maintain

the Fort Carson deer population at approximately 300 individuals and to continue to decrease CWD numbers in the Fort Carson and surrounding area deer. By continuing to issue high numbers of buck licenses on Fort Carson, the objective may be achieved by continually "over-turning" the deer population, which in turn may decrease the prevalence of CWD. Studies of CWD promote this practice until more understanding of the disease and prevention is discovered (Western Association of Fish and Wildlife Agencies 2017).

Fort Carson, the USAFA, and UCCS included a genetics study that followed the satellite GPS collar study. The genetics study focused on prevalence of CWD and genetic CWD genotyping of harvested deer on Fort Carson. Samples were collected for five hunting seasons, which started at the beginning of the 2012 hunting season and ended at the end of hunting season in January 2017. Part of this study included harvested deer incisor aging, to assist in accuracy of aging in analysis. The codon of the PRNP gene for susceptibility of CWD was tested in all deer harvested, as well as the prevalence of CWD. A sample size of 226 harvested deer were used in the genetics evaluation, however the genotype for one CWD positive male, from the 2014-2015 sample, could not be determined. The male was removed from these preliminary results. Results of the 225 deer, suggested that 73.33% of deer were homozygous for susceptibility, of which 15.15% were infected with CWD. Of the sampled deer, those that were heterozygous for susceptibility equaled 26.67%, of which 3.33% were infected with CWD. None of the 225 sampled deer were homozygous resistant (i.e., no susceptibility gene). These data suggest that heterozygous deer are more resistant to CWD than homozygous deer. Further evaluation of the data is needed to determine how to apply practical practices on the ground to reduce CWD. Since mandatory CWD testing started on Fort Carson, CWD prevalence has ranged from a high of 17.2% (2012) to a low of 7.4% in 2018. So far, CWD in deer on Fort Carson has slowly decreased with time, but still remains above the objective CWD rate of 4%. In 2015, after several years of increasing the buck license numbers, Fort Carson experienced a younger age class of deer, however in recent years mature bucks are believed to be migrating onto Fort Carson despite the high buck harvest numbers. An additional objective for Fort Carson is to evaluate genetic data and monitor immigration of mature bucks onto Fort Carson that may further elucidate how to control CWD.

CWD has not been noted in deer populations at the PCMS. Testing for CWD on the PCMS occurred during the 2019 rifle season.

- *Elk*

  Elk on Fort Carson are part of the Eleven Mile population, which includes game management units 59, 511, 512, 581, & 591 (Fort Carson). CPW's population objective for the Eleven Mile elk is between 2,700 and 3,300 individuals. Between 2014 and 2018, the Eleven Mile elk population averaged 3,502 individuals (SD 303.41, 95% CI 265.95). On Fort Carson, the numbers of harvest vary yearly, depending mostly on access to Fort Carson, due to large military exercises closing areas of elk habitat during elk season. For example, in 2017, Fort Carson was closed during elk bull rifle season, which resulted in a significant decrease in harvested elk that year. Elk on the PCMS are part of the Apishipa herd population (DAU E-53), which includes four other GMUs. The most recently published data, in 2017, reported that the post-hunt population of the Apishipa herd was 940 elk, with a bull/cow ratio, per 100 individuals, of 21 bulls. The 2016-2018 three year average (95% CI) for harvested elk on Fort Carson and the PCMS was 27.0 (± 9.10) and 27.7 (± 8.73) elk, respectively. Fort Carson and CPW have maintained the numbers of hunter elk cow licenses issued for several years.

  During the 2000's, the Fort Carson elk population was larger than it is today with estimates of 800-1,000 individuals. The two largest herds, classified as the Ray Nixon herds, are found

along the installation border, and the elk move between the installation and private lands. The 2018 aerial survey resulted in 303 total elk from two groups (194 cows, 56 calves, 29 spikes, 13 two-year old bulls, and 11 adult bulls). The 2017 survey count was limited by military aerial exercises, but still resulted in 77 total elk counted (53 cows, 11 calves, six spikes, four two-year old bulls, and three adult bulls).

CWD is also known to occur in elk populations. CWD testing became mandatory for all elk harvested on Fort Carson in 2014. Since mandatory testing began, a single harvested individual elk tested positive for CWD in each of the years 2014, 2017, and 2018. There is a heightened agenda to control CWD in the state and Fort Carson's objective will be to continue to test all elk harvested on the installation. This objective will be evaluated annually to determine its continued necessity, and management of CWD and Fort Carson elk objective will regulated accordingly.

- *Pronghorn*
  CPW considers pronghorn on Fort Carson as the Fort Carson population, but less is known about the population numbers. CPW estimates this population at 280 individuals. In 2011, the pronghorn population on Fort Carson was estimated to be fewer than 125 animals. The largest herds, ranging from 20 to 40 individuals, are found along the southern border and in and along the north and east side of the Large Impact Area. Pronghorn are frequently associated with prairie dog colonies and cholla fields, and herds move frequently between Army lands and adjacent private lands. The numbers of licenses issued to hunters for Fort Carson pronghorn have been low for many years and continue to be low due to the low population size.

  Pronghorn on the PCMS are part of the Thatcher herd population (DAU A-7), which includes eight other GMUs. The most recently published data, in 2017, reported that the post-hunt population of the Thatcher herd was 9,570 pronghorn, with a buck/doe ratio, per 100 individuals, of 41 bucks. CPW harvest objectives are to maintain a steady pronghorn population at the PCMS. Pronghorn numbers are higher on the PCMS than on Fort Carson, which results in a higher number of licenses issued and higher harvest numbers. The 2016-2018 three year average (95% CI) for pronghorn harvest on Fort Carson and the PCMS was 10.3 (± 5.26) and 48.7 (± 36.03), respectively.

- *Bighorn sheep*
  The PCMS is located within Sheep Management Unit S61. Hunters with a license for this unit frequently hunt on and adjacent to the PCMS. Four licenses (all for rams, as of 2018) are issued for this unit annually. Success rate for big horn sheep on the PCMS was 96% for the period between 2011 and 2018. Sheep occasionally occur on Fort Carson, but are not hunted.

4.d. (2) Small Game Species

Turkey, dove, coyote, bobcat, and rabbit are the important small game seasons. Turkey is a popular season on Fort Carson and results in an increase of hunters, especially the spring turkey season. Coyotes are overpopulated across their range, and CPW and Fort Carson allow a year-round unlimited harvest of this species.

Mountain lion, bear, and waterfowl seasons attract fewer hunters annually. All of Fort Carson is considered mountain lion, bobcat, and bear habitat by CPW. CPW estimates that areas of Colorado,

west of interstate 25 (and most likely Fort Carson), sustain 1.0 to 5.0 mountain lions/100 km^2, depending on the quality of habitat. Fort Carson and the PCMS allow mountain lion hunting during the state's designated season, however only four mountain lions have been harvested on the PCMS in the last five years. Bobcats are harvested at an average rate of 1-3 bobcats a year on both Fort Carson and the PCMS. There is a bear season on Fort Carson, but harvests of bear are rare on the installation.

Hazard management of bear, coyote, red fox, mountain lion, prairie dog, and raccoon falls largely within the Pest Management and Conservation Law Enforcement sections of DPW and DES, respectively. The primary objectives are the control of zoonotic diseases, public safety, and prevention of property damage. Wildlife office personnel assist with management of these species, particularly at Butts Army Airfield where conflicts present hazards to aircraft and personnel. Mountain lion activity has been documented within 400 meters of the urbanized areas on Fort Carson.

4.d. (3) Nongame species

Inventory and monitoring of nongame species are conducted annually on Fort Carson and the PCMS. T & E species and species of conservation concern are the primary focus of all nongame inventory and management. Surveys for species of conservation concern, discussed in Section 4.a, are generally conducted at the community level and are therefore inclusive of species groups identified in this section, e.g. inventory of little brown bats includes all bat species.

- *Birds*
  On Fort Carson, 285 species of birds have been recorded, of which 44 are species of concern. This includes USFWS Birds of Conservation Concern, Colorado state threatened species and state species of concern, and Colorado State Wildlife Action Plan Tier 1 and Tier 2 species. On PCMS, 243 species of birds have been recorded, of which 39 are species of concern (See Appendix 5 for full listing and conservation status). Bird surveys are conducted by biologists in the field and with acoustic recording devices.

- *Mammals*
  On Fort Carson, there are 73 species of mammals, including 12 species of conservation concern (Appendix 5). Sixty-two species of mammals are known to occur on the PCMS (Appendix 5), including eight species of conservation concern.

  - Small Mammals

The status and distribution of small mammals in the major habitats on Fort Carson and the PCMS are fairly well known, but not for vegetation communities having limited distribution, particularly wetlands, ponderosa pine forests, and sites within MSO winter habitat. Numerous small mammal/rodent community level surveys were conducted in recent years. On Fort Carson, there are 25 known species of small mammals (Appendix 5). The Niobrara Chalk Barrens on Fort Carson, which supports several endemic SAR species of plants and an endemic reptile, were inventoried for small mammals in 2007 (Peyton 2008). Surveys involving DPW and UCCS were conducted in and adjacent to Butts Army Airfield in support of a wildlife

hazard inventory. Small mammal trapping in partnership with UCCS continues to contribute to knowledge about distribution and habitat use on Fort Carson. Small-medium mammal management consists of plague management through lethal and prophylactic means, i.e. insecticide dusting of prairie dog colonies to reduce the incidence of plague. Plague was recently discovered in Mexican woodrats in the Fort Carson MSO wintering areas, which could affect the winter survival of MSO; woodrats are the primary food source for the owl. On PCMS, 25 species of small mammals have been documented. Since 2015, small mammal surveys have been conducted annually in a variety of habitats, which has increased the knowledge of the status and distribution of small mammals.

- Prairie dogs

Prairie dog

Prairie dog colonies are routinely surveyed on both installations. During the surveys, overall colony health, colony size and associated species (e.g. burrowing owls, black-footed ferrets) are recorded. On PCMS, surveys started in 2008 and since 2012 have been conducted annually. As of 2019, there were 453 active acres, which is lower than the peak of 5,457 active acres in 2014 and the eight year average of 2,311 active acres. (Blake 2019). On Fort Carson, prairie dog colonies are mapped every other year. In 2019 there were approximately 3,150 active acres. This was an increase from the historic low of 2,515 acres mapped in 2017, but still well below the historic high of 6,515 acres mapped in 2009. Although Soldiers are not permitted to bivouac on prairie dog colonies, Range Control is notified when a specific colony presents a plague risk to Soldiers.

- Bats

Big brown bat

Baseline bat surveys, including both acoustic monitoring and capture surveys, were begun on Fort Carson (FC) and PCMS in October 2018 and will conclude in 2020. Prior to this baseline study, the only surveys of bats on FC included mine inspections and mist netting at a few sites. As of October 2019, these surveys have conclusively detected 11 bat species on FC and 8 on PCMS. When combined with previous detections, there have now been a total of 13 bat species detected on FC and 12 on PCMS, including six species of conservation concern. Most species records prior to 2019 were opportunistic sightings by biologists during execution of other field projects. A maternal Townsend's big-eared bat colony was discovered in 2010, one of the few colonies known in Colorado (personal communication, Kirk Navo 2011). Current management for bats on Fort Carson includes closing abandoned mines and installing bat gates. Bat gates are installed for human safety and to minimize the potential for anthropogenic spread of White Nose Syndrome (WNS). WNS is a disease devastating bat populations in the eastern U.S. that is rapidly spreading westward from northeastern states. The disease has not been detected in Colorado as of 2019, but has been found in Nebraska, Kansas, Oklahoma, and Wyoming.

- *Fish*

On Fort Carson, 24 species of fish have been recorded, including 15 native species, one state endangered species, one state threatened species, and one species of state special concern (Appendix 5). On PCMS, 12 species of fish have been recorded (Appendix 5), including 11 native species and one species of state special concern. An aquatic monitoring

program was initiated on Fort Carson in 1995, and replicated again in 2006. Since then, multiple sites of interest, including the 1995 monitoring sites, are surveyed annually in cooperation with CPW. The intensity of sampling greatly increased in 2016, leading to the discovery of two additional native fish species on Fort Carson: sand shiner (*Notropis stramineus*) and flathead chub (*Platygobio gracilis*) which is a state species of special concern. These sites are surveyed primarily for evaluating the potential effects of actions executed in and adjacent to wetlands, and to meet CPW monitoring objectives. Currently sites are selected and monitored based on known fish populations and areas where state-listed species occur. Native fish management on Fort Carson includes (1) ensuring sensitive species of native fish persist at current sites through best management practices; (2) removing non-native predator fish from natural water bodies; and, (3) working with applicable DPW employees to protect native fish populations during construction and other actions. DPW will continue to provide native fish to CPW from Fort Carson to assist with breeding programs and establishing populations at locations in eastern Colorado. Native fish trapping and monitoring requires collection permits through CPW, which include annual reporting requirements. Aquatic inventories have been conducted on the PCMS, but populations are not monitored by PCMS biological staff. At PCMS, the primary native fish management tool is enforcing the regulation prohibiting fishing.

- *Amphibians*

Couch's Spadefoot

A comprehensive inventory, i.e. Army Planning Level Survey, of amphibians has not been conducted on either installation. Most species records are opportunistic sightings reported by biologists during execution of other field projects. A partial two-year inventory for amphibians was conducted on Fort Carson in the northern third of the installation in conjunction with an inventory for the northern leopard frog. Nine amphibian species (two are non-native) are known to occur on Fort Carson, including the northern leopard frog and Couch's spadefoot which are both species of special concern. Eight species of amphibians are known to occur on the PCMS, including Couch's spadefoot. The American bullfrog is an introduced invasive species that is spreading into new areas on Fort Carson and threatening leopard frog populations, a former federal petitioned species for listing. The bullfrog is known to occur on PCMS, but the current status, and threats to the plains leopard frog, a species of conservation concern, are unknown. Native amphibian management includes (1) enforcing regulations prohibiting take of native amphibians; (2) ensuring native sensitive species persist at current sites through best management practices; (3) working with appropriate DPW employees to protect amphibian habitat during construction and other actions, e.g. ditch and stormwater management; and, (4) in accordance with FC Reg 200-6, the taking, collecting, capturing, or possessing of bullfrogs are authorized with a Fort Carson recreational permit and in accordance with state regulations. Fort Carson and PCMS invasive species management objectives will also include controlling and removing bullfrogs.

- *Reptiles*

Prairie rattlesnake

Planning-level reptile surveys and a Colorado checkered whiptail (COCW) study began on Fort Carson and the PCMS in 2017, and were completed in 2019. Fort Carson had 17 species and PCMS had 29 species. The planning-level reptile surveys provided DPW biologists with a better understanding of species richness and distribution on Fort Carson and PCMS. The surveys also documented

previously unknown species on both installations, including one species of concern, Couch's spadefoot (*Scaphiopus couchii*) on PCMS. The surveys did not document any desert massasaugas, a species of snake currently under federal review that had potential to occur on either installation. The planning-level survey also provided a baseline for biologists to continue monitoring reptile populations in the future. The two years of COCW data allowed biologists to assess whether management actions are required to maintain stable populations at Fort Carson or the PCMS. Preliminary results suggest that individuals have high site fidelity across years, with some individuals recaptured in 2019 within meters of their initial 2016 capture site.

The Colorado checkered whiptail, an endemic Army SAR and a CPW Tier 1 SGCN, occurs on both installations. Between 1991 and 2016, the Colorado checkered whiptail was identified in 14 training areas while conducting surveys for other taxa. All species records during this time period were opportunistic sightings recorded by biologists. A pilot study conducted in 2016 resulted in 255 whiptail sightings and 78 unique captures on Fort Carson, and 16 sightings and 8 captures on the PCMS.

Recurring actions for fish and wildlife management

(Please note: The following proposed actions are in priority order from 1 to 19. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

1. Integrate installation management practices, e.g., prescribed fire, revegetation, pest/invasive species management, stormwater management, and invasive species management to enhance and protect biological diversity.

2. Continue to review projects and installation activities to identify and mitigate effects on biological communities.

3. Continue cooperative management of big game populations with CPW. Any aerial flights in the future on the installations should seek out Army aircraft as a possible fiscal savings to DPW.

4. Continue baseline bat surveys on PCMS and Fort Carson.

5. Conduct amphibian planning level surveys.

6. Conduct planning level surveys of small mammals in a variety of habitats, including wetland and ponderosa pine vegetation communities, and in sites within MSO winter habitat.

7. Continue developing and maintaining water resources for mitigating movements of big game species related to effects of military training.

8. Continue CWD surveillance and require mandatory testing of harvested deer on Fort Carson. Mandatory testing of elk harvested on Fort Carson will occur as decided annually by CPW and Fort Carson. Based on annual rates of CWD prevalence, determine appropriate harvest rates with CPW.

9. On Fort Carson, continue monitoring native fish populations.

10. Continue to conduct avian monitoring including annual point-count surveys (Fort Carson), acoustic monitoring (PCMS), and summer and winter raptor surveys.

11. Identify, burn, and monitor areas to improve forage for big game species. Due to the importance to pronghorn in winter, cholla grasslands will be excluded or burned in a mosaic pattern to preserve integrity of the resource.

12. Continue to meet with CPW annually to discuss all hunting and coordination objectives.

13. Conduct annual reptile surveys on PCMS and Fort Carson, as allowed by access and staffing.

14. Complete five year (2012-2017) hunting season analysis of genetically determined susceptibility to CWD of deer harvested on FC. Base on final report, develop and apply management practices on the ground with CPW.

15. Evaluate migration patterns of deer on Fort Carson and surrounding areas to meet deer population and CWD objectives.

16. Participate in academic partnerships and regional and national working groups to increase technical knowledge and expertise needed to develop alternative management options facilitating both military training and conservation.

17. Sustain sensitive small mammal and bird populations in woodland areas by preferentially leaving large trees with natural and bird created cavities and crevices.

18. Create cover for sensitive species of reptiles, amphibians, and small mammals by leaving non- diseased, felled tree trunks in place during forestry operations. Logs are an important component of MSO habitat, and should be left in place following forestry operations in owl habitat.

19. Create slash brush piles at sites where this action will not increase intensity spread of wildland fire. This will increase habitat availability for a variety of small mammals and reptiles.

4.e. Forest management

The primary goal of the Forestry Program is to implement sound silvicultural practices for multiple uses that promote healthy, sustainable forests that contribute to biological diversity and ecosystem stability, while supporting the military mission by maintaining healthy, realistic, and resilient training lands. Forests on PCMS and Fort Carson provide wildlife habitat, ecosystem services (e.g. erosion control, carbon storage), military training options, and contribute to the overall diversity of the installation.

Currently, much of the forests on the installation are overstocked and in need of thinning. The vision for the future forest is a mosaic of stands of varying densities with trees representing a wide range of size and age classes. Generally, the goal of forest management is to maintain stands of varying acreages within the forest that are stocked with tree densities that reduce the risk of crown fire and disease. In addition to tree thinning, reducing the density of the shrub layer is critical to this effort.

The density of the shrub layer (ladder fuels) will be reduced mainly by mechanical means (mastication) but herbicides will be used when appropriate to prevent re-sprouting. Managing the forest with the goal of creating open stands will not only reduce the occurrence of disease, improve the vigor and resiliency of the trees to stressors and catastrophic wildfire, but will also promote the growth of grasses and forbs, which supports biological diversity and ecosystem stability and supports military training by providing concealment along with maneuver access. Fort Carson, including the PCMS, is approximately 374,199 acres in size. Of this area, approximately 91,577 acres are forested: 39,961 acres on PCMS and 51,616 on Fort Carson proper. The vast majority of this forested area consists of piñon-juniper forest. The remaining forested areas consist of ponderosa pine-dominated forest that cover about 5,000 acres; and willow, cottonwood and aspen stands that cover about 3,000 acres, the majority occurring in riparian areas.

Colorado State University (2001) conducted an inventory of forest resources at Fort Carson and the PCMS in 2001. Findings indicate a peak densities for both installations fall in the well-overstocked category. In 2014, a comprehensive common stand exam was conducted on the installation's forest resources to obtain data on stand densities, species composition, age class distribution and other pertinent stand information. In 2020, the data will be organized and entered into a program that will allow these data to be analyzed by the U.S. Forest Service's FS Veg software. After that is accomplished, specific forest area and stand silvicultural prescriptions can be written to guide management for the next decade or two.

For a detailed description of forest management practices, refer to Appendix 3 for information on how to review the Forest Management Plan.

4.e. (1) Ecosystem management

All natural resource programs, including forestry, are focused on managing ecosystems. The forestry program is working to restore the structure and function of the ponderosa pine forest by thinning excess trees, removing ladder fuels, reducing crown connectivity and reintroducing low-intensity fire that improves the long term health of the forest. The forestry program will continue to treat piñon and juniper woodlands in order to reduce stand densities and maintain uneven-aged stand conditions. The program is also looking at understanding and managing the encroachment of juniper trees into prairie grasslands and developing treatments using current scientific evidence and technology. In addition to tree thinning objectives, some dense timber stands will be retained for military concealment, thermal cover for wildlife species, and for turkey roost and Mexican Spotted Owl habitat.

Ponderosa Pine

Historically, these stands were 40-50 square feet (SF) of basal area (BA)/acre with periodic low-intensity fires. The threshold above which stand vigor suffers enough to increase the risk of bark beetle attack is approximately 90 SF of BA/acre. Maintaining stocking levels below this level will help ensure sufficient tree health and vigor to provide some level of insurance against bark beetles. Heavier thinning to a lower stocking level will further enhance individual tree vigor, and improve the natural resistance to beetle attack. Nearly any reduction in BA will reduce wildland fire fuel hazard.

Recommended basal areas for Colorado Front Range Ponderosa pine stands is dependent on age of the stand, overall stand objectives, and whether the stand is being managed as an even-aged or uneven- aged stand. For instance, a younger stand of 20-30 year old Ponderosa would best be kept at 70-80 SF of BA. An older stand of 150 plus year old mature "yellow bark" pines might be better served by a BA of 30-40 SF. It also depends on the silvicultural objective. A seed tree cut leaving only mature yellow bark trees for seed production to create a new stand underneath should leave about 30-40 SF of BA.

However, the general objective is to achieve and then maintain uneven-aged stand conditions (consisting of a variety of tree age and size classes) through single-tree selection prescription, or diameter-limit prescription. Therefore, we strive for a general, overall stocking level of approximately 40-70 SF of BA/acre. This may be increased in proximity to stream channels and along roads. Residual basal area may also be increased on north slopes, which tend to have less competition for moisture and typically support higher stocking levels. To enhance stand diversity, healthy piñon pine or junipers should be retained when feasible. Treatment will work towards or maintain a healthy, uneven-aged forest that includes a strong component of large mature pines. Highest priority for removal is diseased and insect-infested trees of all sizes, followed by trees that are suppressed or low in vigor. Third priority would be trees of poor form, such as those with forked tops that could present a structural weakness as they grow. Snag retention to meet wildlife habitat needs will be addressed in individual stand silvicultural prescriptions. Intermediate thinning entries or "improvement cuts" focus on improving stand health while working towards the desired uneven-aged structure.

Due to wildfires in the last few years that have destroyed or damaged some Ponderosa stands, an effort will be made to reforest these areas. Also an effort will be made to restore and expand ponderosa stands in other areas of the installation where stands were extirpated or damaged. Work to identify the areas in need of reforestation, time frames, and planting densities will be done in the future. The main focus of the forestry program at this time is thinning operations for wildfire control and mitigation. When substantial progress has been made, reforestation plans will be undertaken.

The installation forester and the fire manager for the DPW Conservation Branch and ITAM are working together to coordinate establishing maneuver lanes alongside firebreaks, establishing fire access roads on maneuver trails, and conducting vegetation management (particularly piñon-juniper density reduction) to reduce fuel loads in training areas.

Piñon and Juniper Woodlands

Maintaining low stocking levels will help ensure sufficient tree health and vigor to provide some level of insurance against bark beetles (*Ips confusus*) for piñon pine. Heavier thinning to a lower stocking level will further enhance individual tree vigor, and increase understory grasses. Nearly any reduction in basal area will reduce wildland fire fuel hazard. The general objective for forest management in piñon and juniper woodland ecosystems on Fort Carson and the PCMS is to maintain uneven-aged stand conditions (consisting of a variety of tree age and size classes) through single-tree selection prescription, diameter-limit prescription, and reducing stand density to 30-50 trees per acre. Treatment will work towards or maintain a healthy, uneven-aged forest that includes a strong component of large mature piñon pines and junipers. Trees with the highest priority for removal are diseased and insect-infested trees of all sizes, followed by trees that are suppressed or low in vigor and finally, species preference. Snag retention to meet wildlife habitat needs will be addressed in individual stand silvicultural prescriptions. Intermediate thinnings or "improvement cuts" focus on improving stand health while working towards the desired uneven-aged structure.

Juniper encroachment into native grasslands is an issue in some areas and will be addressed in conjunction with ITAM. Grazing by native mammals, natural fire ignited by lightning and human-caused fires kept prairies free of woody invasion, historically. In the 1940s cattle grazing, when the installation was comprised of ranches, also had a major effect in controlling vegetation spread and density. Lack of most of these factors in recent decades has allowed woody plant encroachment into prairies making access and maneuvering more difficult. To maintain grassland ecosystems where juniper encroachment is clearly occurring, the invading trees will be masticated with machinery or killed with prescribed burns. This work will exclude older juniper, which will be retained. These older junipers, being open-grown, provide good concealment for military training and are considered legacy trees, some being estimated at 600 to 800 years old. Some of the juniper encroachment areas were subject to wildfires or prescribed burns within the last decade which helped to limit encroachment to

some degree. Some junipers and other woody invasives are small enough to be run over by military vehicles and may be controlled to some degree by this action.

4.e. (2) Insects and disease

Forest insect and disease problems are managed using an integrated pest management program (Section 4.i.). Overall objectives are to keep the loss from insects and disease to a minimum, by using good silvicultural practices to improve ecosystem health, regular monitoring, and quick reaction to any new pest problems that might arise.

Insect and parasite threats to forests on Fort Carson and the PCMS include Ips beetles (*Ips pini* and *Ips calligraphus*), mountain pine beetle, pine pitch mass borer, emerald ash borer, piñon cone beetle, piñon pitch nodule moth, piñon needle scale, twig beetle, and dwarf mistletoe infestations. There are Ips beetle and mountain pine beetle infestations in ponderosa pine at Camp Falcon and at Turkey Creek Ranch on Fort Carson. The Camp Red Devil vicinity has Ips and twig beetle infestations. Control is primarily via thinning and removal of affected trees to achieve a residual density of about 30 to 50 trees per acre in Piñon-Juniper habitat, or a residual basal area in Ponderosa of 50 to 70 square feet per acre. Fort Carson is part of an MOU between the Department of Defense and the U.S. Forest Service, Forest Health Management section, which enables DPW Environmental to request assistance regarding forest entomology and pathology issues, with potential funding for these efforts.

American elm wood cannot be sold due to Colorado Springs and Colorado Department of Agriculture ordinances, which prohibit the storage of elm wood to reduce breeding sites for the European elm bark beetle (*Scolytus multistriatus*). This beetle is a vector for Dutch elm disease that infects most elm species and kills the tree. Elm wood may be sold after the bark is stripped off. This is no longer a significant issue as most native American elms are no longer present on the installation.

The piñon pitch mass borer commonly infests piñon pines at PCMS. Recently, staff has seen an increase in twig beetle and Ips beetle infesting piñon pines at PCMS. Expertise from other agencies may be used if new or more serious insect or disease problems are detected.

4.e. (3) Fire management/fuel reduction

The forestry program is now targeting the forested area along the boundaries of Fort Carson and the PCMS to reduce wildfire escape risks, which are likely to increase due to increased training activities and new live fire ranges. This work is focused on thinning the forest for 150 feet on either side of the midline of the firebreak at Fort Carson. Thinning the trees and masticating the understory in this area decreases fire intensity and flame lengths so that a wildfire is more likely to be stopped at the firebreak by use of a backing fire or water suppression. Interior areas will be thinned as well, in order to reduce the fuel load and improve access for military vehicles and fire suppression vehicles. Challenges in forest management on Fort Carson and the PCMS involve balancing the need for wildfire suppression with known benefits of allowing fire to provide for continued sustainment of the native forest ecosystem. Section 4.o. describes the use of wildfire control to protect forest resources and prescribed burning as a management tool.

4.e. (4) Forestry and woodland products

There is a total of approximately 90,315 acres available for forest and woodland product harvest in the forested areas of both installations combined. There is no commercial timber management due to the limited commercial forestry potential of the area. However, there is a potential for non-commercial harvesting of fuelwood. Currently, individuals are allowed to cut firewood downrange for personal use,

although most firewood buyers prefer to get it already cut to length from the wood yard. A firewood cutting by permit program is used as a management tool to remove dead/dying and down trees, as well as selected live trees, as identified by staff to improve the condition of the forest. There is some demand for firewood from the general public in the surrounding areas. The forestry staff has managed a firewood sales program since 1992 using by-products of the Fort Carson tree/shrub maintenance program and trees removed from construction sites. Fort Carson active duty, retired, and civilian personnel are eligible to participate in the sales. Proceeds are deposited in the reimbursable account of the Forestry Reserve Account (FRA) Program. A limited local market exists for wood chips and mulch and there have been exploratory conversations about the potential use of woody biomass for biofuel.

Recurring actions for forest management

(Please note: The following proposed actions are in priority order from 1 to 13. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

1. Manage the forests and woodlands to improve forest health through thinning, individual tree selection and sanitation salvage thinning.

2. Restore ponderosa pine forests by thinning, removing ladder fuels, reducing crown connectivity, and then reintroducing low-intensity fires.

3. Reduce the number of trees per acre and remove understory fuel loads to minimize the risk of catastrophic wildfire and create zones of defensible space.

4. Continually survey forests for insect and disease damage, and add any data to the forestry Geographical Information System (GIS) layer.

5. Aggressively manage against forest insect and disease pests to prevent widespread tree mortality.

6. Ensure that a complete forest inventory is completed every ten years, and that the data is added to the forestry GIS layer.

7. Restore native grassland habitats by reducing piñon-juniper (P-J) encroachment into prairie habitats.

8. Initiate reforestation efforts after human and natural disturbances, preferably using local seed sources.

9. Identify and remove hazard trees annually using the USFS Hazard Tree Rating system.

10. Continue to submit proposals to the USFS and AEC for insect and disease management projects.

11. Work cooperatively with other Directorates and external agencies such as USFS and Colorado State University on forest management issues.

12. Develop programs that generate income from the sale of forest products (such as firewood, woodchips, dimensional lumber, and fence posts), and that support standard forest management practices.

13. Investigate potential forest product markets, including firewood, fence posts, woodchips, dimensional lumber, biomass for biofuel, and innovative use of forest and woodland tree species.

4.f. Vegetation management

See the following sections for information related to vegetation management:

- 2.b. (3) Ecoregion
- 2.b. (9) Landcover
- 4.a. Species of conservation concern
- 4.e. Forest management
- 4.h. Invasive species
- 4.i. Pest management
- 4.o. Wildland fire management
- 4.t. Urban forest management
- 4.w. Integrated Training Area Management (ITAM)
- Appendix 3. Other Management Plans: Forest Management Plan, Integrated Pest Management Plan, Urban Forest Management Plan
- Appendix 6. Plant Species Lists

4.g. Migratory bird management

Burrowing Owl

The goal for this program is to manage migratory birds in accordance with 1) Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, 2) the MOU Between the U.S. Department of Defense and the U.S. Fish and Wildlife Service to promote the Conservation of Migratory Birds, 3) DoD guidance to implement the MOU to promote conservation of migratory birds, 4) *Interim Guidance-Unintentional Take of Migratory Birds for Actions Other Than Military Readiness Activities* (U.S. Department of the Army IMAE-CO Memorandum 2008), and the 5) Migratory Bird Treaty Act (MBTA). Protection of migratory birds is mandated by the MBTA, a criminal statute prohibiting the taking, killing, or possessing of migratory birds unless permitted by regulation. Historically, the MBTA protects birds from intentional and incidental (unintentional) take and imposes civil penalties for violations by individuals and organizations. The DoD is committed to strive to protect, restore, enhance, and manage the habitat of migratory birds and to develop and implement procedures and conservation measures that will avoid the take of such birds. However, if the taking of a bird is incidental to a military readiness activity, the matter is addressed in 50 CFR 21.15 and discussed in Volume 72 of the Federal Register, pages 8931 through 8950. In 2007, Congress authorized incidental take of migratory birds without a take permit for any Military Readiness Activity (MRA) conducted by members of the Armed Forces.

In December 2017, the Office of the Solicitor of the United States Department of the Interior issued Solicitor's Opinion M-37050, *The Migratory Bird Treaty Act Does Not Prohibit Incidental Take*, which states that the MBTA prohibition on "take" only applies to deliberate acts intended to take a migratory bird, their nests, or their eggs. A follow-up memorandum from the Deputy Assistant Secretary of Defense (Environment, Safety and Occupational Health), titled *Incidental Take of Migratory Birds* (6 February 2018), clarified that this opinion does not rescind Executive Order 13186 or the MOU with

the U.S. Fish and Wildlife Service. This memorandum advised that the Military should continue to follow existing DoD guidance to minimize the incidental take of migratory birds, to the point that it does not affect the mission.

The policy regarding an incidental take for non-readiness activities is controlled by the 2008 Interim Guidance included in Appendix 7 of this INRMP. Until further clarification or guidance from the DoD, Fort Carson will continue to implement this guidance and to the greatest extent practical delay activities and avoid or minimize adverse impacts on migratory birds. This policy includes guidance concerning actions that cannot be delayed until after the nesting season or modified to minimize impacts on migratory birds because of the activity's direct and essential support of MRA or vital military support activities, or when necessary due to concern for the Public Health or for untenable damage to structures. As such guidance is further extended or superseded, Fort Carson will work with USFWS and CPW to ensure implementation is well coordinated.

The USFWS enforces the MBTA and manages a permit program for the taking of migratory birds. Such a permit is required for intentional take of protected species, or for actions that have the potential to result in take, such as the relocation of the nest of a protected bird from a nuisance location. On Fort Carson and the PCMS, 287 species of migratory birds are protected by the MBTA, including hunted and non-game species, USFWS Birds of Conservation Concern, and federally listed species. The DPW Wildlife Office reviews project proposals for potential conflicts with the MBTA, identifies species present in the action area, and identifies permits, documents, collaboration, and recommendations for an action to proceed and remain in compliance with the MBTA. The DPW Wildlife Office will prepare migratory bird environmental documents and the elements required by DoD guidance.

For a summary and discussion of the Bald and Golden Eagle Protection Act (BGEPA), please see Section 4.x. of this INRMP. General migratory bird management on both installations includes 1) habitat management by seeding, prescribed fire, insecticide dusting of key prairie dog colonies for supporting burrowing owls and eagles, and erecting artificial raptor nest structures; 2) informal consultation with the USFWS regarding the limited use of poison grain for lethal control of prairie dogs; 3) prohibiting the application of above-ground pesticides that could affect nesting migratory birds; 4) conducting protected species pre-treatment surveys at sites identified for lethal control of prairie dogs; 5) conducting pre-construction nest clearance surveys as needed for projects around Fort Carson; and, 6) managing woodlands to enhance value to migratory birds, to reduce insect related diseases, and to improve wildlife habitat.

Also, prior to construction projects, clearing surveys are conducted; for example, burrowing owl surveys are conducted March 15 to October 31 for three days in accordance with CPW protocol.

Significant natural resource management actions, e.g., prescribed fire, forest thinning, and seeding, will continue to be conducted during the non-breeding season for migratory birds. Fort Carson will adhere to USFWS management guidelines (Klute et. al. 2003) for the burrowing owl and other federally sensitive species of migratory birds when and where feasible. Twenty-one species of grassland and piñon-juniper birds occurring on Fort Carson and the PCMS are identified in Colorado's State Wildlife Action Plan (2015) as species of greatest conservation need in the state. Due to the importance of piñon-juniper woodlands and grasslands to declining species of migratory birds, Bird Conservancy of the Rockies BMPs (Gillihan 2006 [piñon-juniper], Youngberg et al. 2016 [grasslands]) will be incorporated into natural resources management projects.

Recurring actions for migratory bird management

(Please note: The following proposed actions are in priority order from 1 to 20. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can

change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

1. Continue to review projects and installation activities to identify and mitigate conflicts with the MBTA and BGEPA.

2. Conduct compliance-monitoring surveys at project sites and coordinate required mitigation with action proponents and/or law enforcement.

3. Continue annual burrowing owl monitoring.

4. Continue annual grassland and piñon-juniper bird monitoring.

5. Continue annual mountain plover monitoring.

6. On both FC and PCMS, begin annual monitoring for eastern black rails.

7. Deploy wildlife escape ladders in open water tanks developed for wildlife to prevent drowning of small mammals (including bats) that fall into the tanks.

8. Continue managing artificial cavity nests throughout the installation as mitigation for tree loss due to fire, forestry practices, and training.

9. On PCMS, continue annual nightjar monitoring.

10. On PCMS, continue surveying for raptors nests and monitoring nest success rates.

11. Map grasslands and woodlands important to nesting birds with declining populations for input into the development of annual prescribed fire plans.

12. Continue migratory bird outreach and education through personal contacts, Environmental Protection Officer training, and through media available on Fort Carson.

13. Mitigate loss of owl nest sites using artificial structures. On PCMS, improve shelterbelts to replace loss of owl nesting and wintering habitat due to extensive fires. Coordinate with the DPW forester.

14. On PCMS, mitigate loss of raptor and Chihuahuan raven nest sites by installing and maintaining artificial structures.

15. Continue DOD Partners in Flight membership and support.

16. Leave standing snags at a rate of 1-4 snags per acre, during forest management or post fire management for bats, small mammals, and cavity nesting birds.

17. Assess the extent of hawk, eagle, and owl electrocutions to include identification of known sites of electrocutions of birds, identification of pole configurations and landscape features influencing pole selection, and estimating level of pole use by raptors. On Fort Carson, post-assessment recommendations to retrofit problematic utility poles will be provided to DPW operations. On PCMS post-assessment recommendations to retrofit problematic utility poles will be provided to the local electrical companies (e.g. San Isabel).

18. Pistillate-flowered oneseed and Rocky Mountain junipers will be retained during woodland thinning operations to sustain birds wintering in piñon-juniperwoodlands.

19. Piñon pine will be retained over juniper, and old growth juniper will be retained over younger trees during woodland thinning operations.

20. Continue investigating effects of off-road vehicle use on ground nesting birds.

4.h. Invasive species management

Invasive species are generally defined as non-native organisms that are directly or indirectly detrimental to economic crops or native plant and wildlife communities; and injurious to people, livestock, or wildlife and the resources they utilize. Invasive species found on the Fort Carson and the PCMS are most commonly noxious weeds that threaten wetland ecosystems, complicate land restoration projects, add to the cost of pest management, and in general, threaten ecosystem functionality. Noxious weeds are designated as such by State or Federal law. The terms noxious and invasive are often used interchangeably.

More recently, aquatic nuisance species (ANS) of plants and animals such as Eurasian watermilfoil (*Myriophyllum spicatum*) and zebra mussels (*Dreissena polymorpha*) have become of a more concern to Colorado invasive species managers. ANS exhibit invasive characteristics and threaten the ecological diversity of infested waters. The presence of ANS populations can impact aquatic resources, including recreational activities that depend on water. Once established in a given habitat, ANS can be difficult and expensive to control which is why emphasis will be placed on education and prevention to avoid introduction of ANS. Monitoring and sampling for ANS will help to detect initial introduction of these species, and allow for targeted control. Control measures for ANS would follow an integrated approach, utilizing techniques outlined in 4.h. (2).

Regulatory programs

Fort Carson is dedicated to the prevention of introduction of invasive species as well as their control, per Executive Order 13112, *Invasive Species* (1999). The Noxious Weed Management Program on Fort Carson and the PCMS is under the Conservation branch of the DPW.

Executive Order 13112 (1999) directs agencies to (i) prevent the introduction of invasive species, (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner, (iii) monitor invasive species populations accurately and reliably, (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded, (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species, and (vi) promote public education on invasive species and the means to address them. It also prohibits federal agencies from authorizing, funding, or carrying out actions that are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless the benefits of such actions clearly outweigh the potential harm caused by invasive species.

The Federal Noxious Weed Act (7 USC 2814), part of the Plant Protection Act of 2000, mandates federal agencies to (i) have an office or person trained to coordinate an undesirable plant management program, (ii) adequately fund the program, (iii) implement cooperative agreements with state agencies, and (iv) conduct integrated pest management techniques for managing undesirable plant species.

The Colorado Noxious Weed Act (C.R.S. 35-5.5) mandates the control of invasive species on all public and private lands, and empowers counties and municipalities to enter into cooperative agreements with federal agencies. State of Colorado 8 CCR 1206-2, Rules Pertaining to the Administration and Enforcement of the Colorado Noxious Weed Act, updates the list of regulated noxious weed species annually, and states that it is a violation to allow any declared List A species designated for eradication and List B species designated for elimination to produce seed or reproduce.

Other relevant legislation includes the Carlson-Foley Act of 1968, Endangered Species Act, Federal Insecticide, Fungicide and Rodenticide Act, Federal Land Policy and Management Act, National Environmental Policy Act, and the Noxious Weed Control and Eradication Act of 2004. DoDI 4150.07, and AR 200-1 also contain guidance on invasive species management.

Current conditions

There are currently 80 state-listed weed species designated for containment, control or eradication. At least 30 of these state-listed noxious weeds have invaded both natural and urbanized landscapes at Fort Carson and the PCMS. The Colorado Department of Agriculture (CDA) state “A” list is comprised of species of the highest concern, to be eradicated immediately upon detection. There has been one “A” list species found at PCMS and one found at Fort Carson. Both have been eradicated and in over ten years of monitoring reoccurrence has not been observed. Of the 39 species on the state “B” list, there are 24 plant species found on Fort Carson and the PCMS with the majority being found only on Fort Carson. List “C” species are considered to be lower priority for control based on the high populations found within the state. Of the 16 species on this list, 8 are found on Fort Carson and/or the PCMS. State Watch List species do not require control, but reporting to the state is encouraged due to their potential threat to agriculture or the environment. Of the 19 species on this list, 2 are found on Fort Carson and/or the PCMS. Additionally, Fort Carson evaluates and manages non-native species found exhibiting invasive behaviors on the installation, such as annual wheatgrass (*Eremopyrum triticeum*) and wild mignonette (*Reseda lutea*). Since various types of natural and anthropogenic disturbances, such as wildlife movement leading to weed introduction, streams with weeds upstream, fires, construction, and vehicle travel, invasive plants management requires constant monitoring and control.

There are several notable differences between Fort Carson and the PCMS that directly or indirectly affect the ability of invasive plants to invade and spread on the Installations. Other conditions will also have some bearing on the weed control strategies employed to achieve effective control.

- Fort Carson currently supports more species of invasive plants that are mandated for control, and these species tend to infest larger areas.
- There is more military and recreational traffic, and more access roads and trails on Fort Carson; therefore the potential for spreading invasive plants via vehicles is greater.
- Military training maneuvers are conducted year-round at Fort Carson, but the PCMS is currently utilized less frequently.
- There are significantly more staff resources available at Fort Carson than at the PCMS to identify, treat, and monitor weed infestations.

In general, weed populations are more widespread on Fort Carson than the PCMS. This may be due, in part, to the greater degree of ground-disturbing training, as well as the higher frequency of training that occurs at Fort Carson. Other factors may include Fort Carson’s proximity to a large population center (Colorado Springs), its proximity to I-25, and precipitation and availability of water which is a limiting factor for some weed species.

4.h. (1) Noxious weed management

The prevention of noxious weeds from populating disturbed areas is Fort Carson's first line of defense. The control of noxious weeds on Fort Carson and the PCMS is of critical importance from both a natural resources management and military readiness perspective. The installation's comprehensive, long-term weed management program promotes and sustains the military mission and protects the natural environment. Primary elements of this program are:

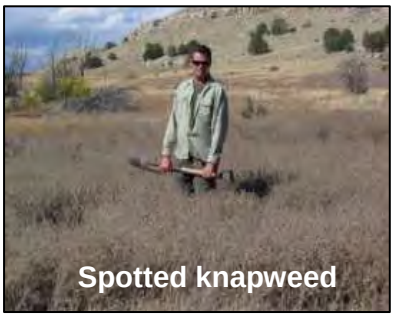
- Maintaining soil, water, and vegetation resources that provide ecological stability;
- Minimizing the impact of construction and military training activities on the spread and establishment of noxious weed species within and outside Fort Carson and PCMS boundaries;
- Cleaning vehicles prior to departing from the PCMS and Fort Carson of possible plant propagules, as well as the dirt/mud that helps transport them;
- Actively participating on County and regional weed working groups and boards; and
- Fostering a "good neighbor" relationship with adjacent land owners.

Noxious weed species priorities

Outlined below are priorities for weed control on Fort Carson and the PCMS. Species addressed include only those that are known to occur on the installations.

- Weeds designated by the CDA as "A" list species will be highest on the management priority list, followed by "B" list species and then "C" list species.
- Weed populations designated by the State of Colorado for eradication will also be high on the priority list, followed by those designated for elimination.
- Weeds that are a threat to public and soldier safety will receive higher priority than those that do not, such as Scotch thistle and leafy spurge.
- Weeds growing in ecologically sensitive habitats (e.g., wetlands, rare species habitats) will be given a high management priority.
- Small, newly identified populations of any noxious weed on the state list or a non-native species found exhibiting invasive characteristics will receive immediate management priority for control over all other weed species (*e.g.*, leafy spurge, annual wheatgrass, and aquatic nuisance species).
- Weed sites closest to Installation boundaries and on main routes will be of higher control priority than interior sites.
- Weed sites that are rapidly expanding based on monitoring information will be controlled at a higher priority than more stable sites; at this time this includes 3 of the state listed knapweeds and whitetop (hoary cress).
- Weeds growing in Training Areas that routinely experience higher training impacts, especially ground-disturbing activities, will have a high priority for control.

- Weeds growing within and adjacent to cultural resource sites will be given a high management priority; treatment will be coordinated with DPW Cultural Resources.



On Fort Carson, species such as Dalmatian toadflax, (*Linaria dalmatica and Linaria genistifolia*), yellow toadflax (*Linaria vulgaris*), Scotch thistle (*Onopordum acanthium*), leafy spurge (*Euphobia esula*), whitetop (hoary cress) (*Cardaria draba*), Russian knapweed (*Acroptilon repens*), annual wheatgrass (*Eremopyrum triticeum*), and wild mignonette (*Reseda lutea*) are among the program's highest priorities at the time of this writing. This is due, in part, to the limited populations currently established within and around the installation. Some of these species also pose a significant health risk. Diffuse knapweed (*Centaurea diffusa*), and spotted knapweed (*Centaurea stoebe*), gypsyflower (houndstongue) (*Cynoglossum officinale*) are considered the next highest priority due to limited populations and threat to ecological integrity of the installations training lands.

The PCMS priority species for management include: Russian knapweed (*Acroptilon repens*), whitetop (hoary cress) (*Cardaria draba*), Canada thistle (*Cirsium arvense*), spotted knapweed (*Centaurea stoebe*), tamarisk (*Tamarix sp.*) and if found, African rue (*Peganum harmala*) and Scotch thistle (*Onopordum acanthium*). There are no known invasive species that pose a significant impact to training on Fort Carson and the PCMS.

4.h. (2) Control measures

<u>*Biological control measures*</u>
The noxious weed biological control is an important component of the pest management program at Fort Carson and the PCMS. Biocontrol work is currently performed in cooperation with the U.S. Department of Agriculture-Animal and Plant Health Inspection Service (USDA APHIS), CDA, and Colorado State University.

Biocontrol does not achieve total eradication but provides control and population size reduction for possible elimination or eradication. Biocontrol is integrated into total vegetation management, which means using other methods, such as mowing and chemicals, when necessary. Noxious weed populations can be maintained at tolerable levels with the inclusion of biocontrol practices.

Galls formed by Russian knapweed wasp

Currently, biocontrols are used on tamarisk, Russian knapweed, Canada thistle, musk thistle, spotted knapweed, diffuse knapweed, yellow toadflax, and field bindweed. Biocontrol establishment is observed at both Fort Carson and the PCMS in tamarisk with the tamarisk leaf beetle (*Diorhabda spp*.), and in Russian knapweed with the Russian knapweed gall midge (*Jaapiella ivannikovi*) and Russian knapweed gall wasp (*Aulacidea acroptilonica*). Additionally at Fort Carson, biocontrols have also been established on Canada thistle with Canada thistle rust fungus (*Puccinia punctiformis*), musk thistle with musk thistle rosette/crown weevil, (*Trichosirocalus horridus*), and spotted and diffuse knapweeds with seed-head feeding weevil (*Larinus minutus*). The DPW Natural Resources team will track biocontrol effectiveness and make adjustment to management strategies as needed. Care will be taken to control secondary invasive species as the target weeds are managed.

Chemical control measures

Herbicides are the most widely used method for controlling weeds, and are generally considered the most economical and effective. However, herbicides can pose environmental risks, such as water contamination, animal or human toxicity, and incidental impacts on native plants. Resistance of certain plants over time to specific herbicides can occur. Closely following herbicide labeling instructions, best management practices, and careful application can greatly reduce or eliminate the possibility of these risks. The Army has developed guidance calling for the reduced use of pesticides and herbicides, therefore widespread herbicide application may not be feasible on Fort Carson and the PCMS. An effective, integrated, noxious weed program will require that chemical measures be combined with other control techniques to bring about the desired level of control. In some cases, herbicides may be the only feasible control method depending on the target species, rhizomatous reproduction, terrain, population density, availability of biocontrol agents, and acreage of area to be treated. At least initially, herbicides will have a high priority for use on the Installations to bring about rapid and effective control of both small and large weed infestations. The high priority use of herbicides may be modified as infestations are reduced and become easier to manage with alternative techniques. Currently, herbicides are applied using ground application methods. An alternative method for larger areas of infestation involves aerial applications. Aerial application may be feasible in some areas.

Cultural control measures

Cultural weed control methods include land management practices that maintain and promote healthy native plant and soil communities. For example, re-seeding disturbed areas with native vegetation can limit or prevent weed infestations by providing competition for available resources. Prescribed burning, soil amendments, and irrigation can also be used to stimulate native plant communities and thereby increase competition with weed species. Fort Carson and the PCMS already have in place an active re-vegetation and erosion control program called the Land Rehabilitation and Maintenance (LRAM) program, which is designed to mitigate training related impacts. Mitigating ground disturbance resulting from military training activities by re-seeding is beneficial for sustaining healthy plant communities and restricting invasive weed establishment. Livestock grazing is another cultural tool that has been used at the PCMS with limited success. For this technique to be effective; repeated, controlled grazing during the growing season needs to occur before the targeted weeds bloom and produce seeds or to weaken the roots of perennial species.

Physical/mechanical measures

These measures which physically disrupt weed growth and reproduction, include practices such as tillage, hoeing, hand-pulling, and mowing. Depending on the target weed species, many of these measures can be ineffective and labor intensive. In addition, soil disturbance and the fragmentation of plant parts, resulting from these measures, can actually stimulate an invasive plant population. However, with careful timing and understanding of plant reproductive mechanisms, these practices may be useful for weed control. Weed control using these methods is normally achieved by reducing the seed source or removing other reproductive plant parts (e.g., root buds, rhizomes).

Prescribed burning measures

Burning can often be effectively used as a “set-up” treatment for areas to be sprayed with herbicide. Burning may stimulate the production of weed seedlings from the soil seed bank and also removes litter and vegetation that could intercept the herbicide from making contact with the target weeds. Burning can also benefit the native vegetation by increasing nutrient availability, reducing weed competition, removing litter accumulation, and stimulating native seed production. Where feasible, the above physical/mechanical measures will be employed on Fort Carson and the PCMS.

Reclamation rehabilitation measures
The noxious weed program recognizes the importance of reclaiming areas subjected to disturbance and the LRAM program's focus on the repair of training damages. There are two basic forms of rehabilitation. Active rehabilitation is the process of planting restorative species of plants to outcompete possible weed invaders. Care must be taken in this process; planting too soon after an herbicide application will simply waste valuable resources when seeds fail. Waiting too long may allow the same weeds or another species to invade the same site. Use of native seed mixes, topsoil and/or soil amendments including compost are critical to land rehabilitation. Passive rehabilitation is preferred when appropriate populations of desirable species remain in the area of treatment to repopulate the affected area. Passive rehabilitation is the preferred method when possible firstly for the cost savings and secondly because species are composed of naturally occurring plants already well adapted to the site. The Fort Carson invasive species program works closely with the LRAM program to decide on BMPs for rehabilitation on a site by site basis. Equipment and materials are also available for small projects to be done in-house. This is important due to the time sensitive nature of such efforts.

Preventative measures
Fort Carson and the PCMS experience soil and vegetation disturbance as a result of normal Army training. Vehicle wash racks, which have been installed at Fort Carson and the PCMS, allow soldiers to arrive and depart with vehicles clean of plant propagules such as seeds, roots and other mechanisms of weed spread. Projects being conducted on Fort Carson and the PCMS need to conform to standards set by federal land management agencies. Through the NEPA process, project managers and contractors will be requested to mitigate for the potential introduction and spread of invasive plants. Construction contract requirements need to specify that only clean soil and gravel be used. Certified weed-free hay, straw, or wood-straw for soil stabilization projects, as well as, minimizing non-training related soil disturbances will also prevent the spread and introduction of noxious weeds within the installations.

4.h. (3) Partners

Fort Carson personnel hold memberships in the Upper Arkansas Weed Management Association and the Colorado Weed Management Association. Data is shared when available with organizations such as Rivers Edge West, Purgatorie Watershed Weed Management Collaborative, the Colorado Department of Agriculture, and surrounding counties in an effort to reach out to the local interests outside of our boundaries. Only through coordinated efforts can Fort Carson fulfill its role as a regional leader in weed management.

Outreach
DPW-Environmental prepares informational and educational materials on noxious weeds for use in military briefings, school programs, and public meetings. This includes the development of noxious weed environmental awareness for military trainers, Army construction components, facility managers, Army Environmental Protection Officers, and other users.

Future of the program
As control efforts continue, more and more emphasis will be placed on monitoring weed control and restoration projects in an effort to evaluate various management strategies. This process will allow Fort Carson staff to make decisions on future management direction. Techniques that show the most promise with the least environmental impact will be expanded and those that are less effective will be phased out. Management direction is a constantly evolving process. Weed infestations that respond well to a treatment in one area may respond in a completely different fashion in another area due to differences in soils or available moisture, as well as a number of other biotic and abiotic factors.

One tool used to identify trends in invasive plant populations is Geographic Information Systems (GIS). This tool will allow Fort Carson managers to analyze weed populations and discover trends in spread of weeds as well as successful management operations in control and restoration. GIS also facilitates data sharing across jurisdictional boundaries.

Recurring actions for invasive species management
(Please note: The following proposed actions are in priority order from 1 to 10. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.)

1. Continue to implement the Integrated Pest Management Plan and update the plan on a 5-year cycle.

2. Treat selected invasive species using an integrated approach (biological, chemical, cultural, physical/mechanical, and prescribed burning).

3. Continue to work with the Colorado Department of Agriculture, Colorado State University, and U.S. Department of Agriculture-APHIS to release, redistribute, and monitor biological control agents for noxious weed control.

4. Document the size and abundance of new and existing invasive species populations. Report occurrences of new species to county and state officials.

5. Actively participate with state, county, local and other federal agencies in the management of invasive species.

6. Monitor treated invasive plant populations to document the results and to assess for further actions.

7. Rehabilitate areas treated for invasive species control, where necessary.

8. Identify and implement measures in the prevention of new infestations.

9. Continue to be involved in education and outreach efforts.

10. Continue to work with Fort Carson CLEOs to regulate and educate on the prevention of aquatic nuisance species (ANS), such as by not allowing weed contaminated boats on our ponds; requiring all anglers to remove all plant matter from gear prior to coming in contact with ponds and streams; mandating that anglers do not dump bait buckets or live well water into any installation waterbody; and, providing signage and boat ramp monitors during high use seasons.

4.i. Pest management

AR 200-1 and DoDI 4150.07 require all installations to have a well-planned and implemented pest management program. Inadequately planned pest management operations can result in pesticide exposures that threaten human health and natural resources while polluting the environment. The main goal of the pest management program is to maintain and safeguard the health, environmental quality, aesthetic values, and ecological balance of the military community by protecting real estate investments from depreciation by pests, while complying with environmental protection and improvement policies.

This section includes noxious weed control performed in conjunction with routine weed control within the main post area at Fort Carson or the cantonment at PCMS, but does not include the management of noxious weeds downrange. Invasive plants and noxious weed control are discussed in Section 4.h.

Fort Carson Integrated Pest Management Plan (Fort Carson Directorate of Public Works 2015) outlines seven general categories of pests that occur on Fort Carson and the PCMS, and cause significant damage and require control or management:

- Public health pests (e.g., mosquitoes, black widow spiders, fleas, wasps, certain rodents);
- Noxious/invasive plants and animals (e.g., Colorado listed noxious weed species, ANS, bullfrogs);
- Undesirable vegetation (e.g. weeds in ornamental rock areas and turf grass, weeds along fence lines, weeds interfering with range operations, weeds/algae affecting reservoirs and ponds, and weeds on road shoulders and paved surfaces);
- Structural pests (structural/wood-destroying pests such as carpenter ants and termites);
- Pests found in and around buildings (e.g., cockroaches, flies, beetles, crickets, spiders, and ants);
- Turf and ornamental pests (e.g. tussock moths, ash sawfly larvae, and golf course pests); and
- Vertebrate pests (e.g. birds, snakes, rodents, prairie dogs, raccoons, skunks, bats, and road-killed animals).

Pest management activities on Fort Carson and the PCMS are under the supervision of the DPW, with all actions subject to the approval of the Installation Pest Management Coordinator (IPMC) and IMCOM. Assistance is required from other organizations and agencies, for example Military Police for stray and feral domestic animals; Public Health for pest and disease surveillance; forestry for pest surveillance; Natural Resources for wildlife disease surveillance, pre-treatment surveys on sites with species of conservation concern, and coordination with the USFWS.

4.i. (1) Integrated Pest Management Plan (IPMP)

The *Integrated Pest Management Plan, Fort Carson Mountain Post* (Fort Carson Directorate of Public Works 2015; Appendix 3) identifies and prioritizes pests and their destructive impacts to determine particular levels of protection. Objectives of the IPMP are to:

- Identify integrated pest management planning requirements listed in AR 200-1;
- Describe program elements for health and environmental safety, pest identification, pest management, and pesticide storage, transportation, use and disposal;
- Reduce reliance on pesticides, where possible;
- Enhance environmental protection; and
- Maximize the use of integrated pest management techniques.

The Fort Carson pest management program is consistent with the Presidential Memorandum, Environmental Practices on Federal Grounds (Office of the President 1994) to reduce pesticide use by using integrated pest management (IPM). Typically a combination of IPM techniques is required to resolve a problem on a sustained basis. IPM includes the implementation and coordination of optimum sanitation, good structural design and maintenance of facilities, and the use of mechanical, cultural, biological, and if necessary, chemical control. The IPM comprehensive approach to pest management or prevention, using methods of pest management in a compatible manner, avoids damage, and minimizes adverse side effects to non-target organisms and the environment.

Pest surveys are used to determine the type of pest, extent of the problem, and pest management technique most appropriate for safe, effective, and economic control. Chemical control is used only when non-chemical techniques are inadequate or impractical. Furthermore, chemical control is not used as a substitute for good sanitation practices or proper building maintenance. The IPMP discusses many aspects of pest management that are not directly within the scope of this INRMP, such as control of common disease vectors (fleas, cockroaches, etc.), protection of facilities, and storage of pesticides. The following discussions of animal and plant control primarily involve the management of natural resources on Fort Carson and the PCMS.

The current Fort Carson IPMP was updated and signed by the Garrison Commander on 02 November 2015. The 5-year update is anticipated to be completed in 2020. Due to an expansion in training activities and changes in the State's noxious weed laws, Fort Carson is not expected to significantly reduce pesticide use. All pesticide applicators must meet DoD or state certification requirements.

Fort Carson employs various means to minimize pesticide usage, such as the following:

- Uses mechanical oxygen-inducing devices in several ponds to reduce algaecide applications;
- Works with local beekeepers to remove and relocate honey bee swarms and hives;
- Implements a comprehensive biocontrol program for invasive weeds with the help of numerous external agencies; and,
- Distributes educational material to educate soldiers, civilians, and housing residents regarding how to reduce pest problems via non-chemical methods.

4.i. (2) Animal pests

The DPW Wildlife and the Pest Management sections, along with the Fort Carson CLEOs, collaborate to control nuisance pests on the installation. The DPW Pest Management Program primarily deals with nuisance wildlife pests, such as skunks, porcupines, raccoons, foxes, mice/rats, squirrels, rabbits, and birds. Prairie dogs are managed to minimize risks safety and property damage on locations such as airfields in accordance with the Fort Carson Wildlife Aircraft Strike Hazard program. Rock pigeon, European starling or house sparrow populations occasionally reach numbers that present health risks to military and civilian personnel. At such times, pest control efforts will include exclusionary techniques, trapping and euthanization, or shooting individuals to reduce populations to a manageable number. Pesticide options will be reviewed by the IPMC to minimize impacts on non-target species and to ensure compliance in the application of pesticides.

4.i. (3) Treatments in areas with species of conservation concern

Sensitive areas listed on pesticide labels are considered before pest management operations are conducted. No pesticides are applied directly to wetlands or water areas unless use in such sites is specifically approved on the label and the proposed application is approved by the IPMC. The IPMC periodically evaluates ongoing pest management, as well as new pest management operations to ensure compliance with the ESA, CWA, BGEPA, and the MBTA. Pest management operations that are likely to have a negative impact on endangered or protected species or their habitat require prior approval from the IMCOM Pest Management Consultant and the Fort Carson or PCMS Wildlife Office. Pest management operations will also be required to prepare management prescriptions for pest management operations when the USFWS issues new species listings. Fort Carson implemented management prescriptions or actions to reduce the chance of secondary poisoning of American Peregrine Falcons, Bald and Golden Eagles, and species protected by the MBTA by 1) informally consulting with the USFWS regarding the limited use of rodenticide for lethal control of prairie dogs; 2) prohibiting the application of above-ground pesticides that could affect nesting migratory birds; and, 3) conducting protected species pre-treatment surveys at sites identified for lethal control of prairie dogs.

Installation conservation goals include protection of prey resources of the bald eagle and golden eagle, and protection of the burrowing owl and mountain plover. Prairie dog colonies are frequently decimated by plague outbreaks. However, wide-scale epizootic events are uncommon, and some colonies in the region remain intact each year. It is not possible to predict which colonies will be impacted. To avoid complete decimation of the prairie dog population, Fort Carson Pest Control controls prairie dogs only when human health or physical damage to facilities is an issue. The use of rodenticides to control prairie dogs may be used on sites where there are values at risk such as airfields and airstrips where WASH is a concern, the Evans Army Community Hospital, schools, food storage and preparation areas, sleeping and military operation quarters, roadways, dams, high tech ranges, Military Operations on Urbanized Terrain (MOUT) facilities, pastures used by the Mounted Color Guards, and where troops frequently train and/or bivouac. A similar policy is enforced at the PCMS. Prairie dog colonies are surveyed for the burrowing owl and mountain plover prior to rodenticide application. The IPMC, DPW Wildlife Office, and DPTMS work together to develop guidelines and coordinate prairie dog control at sites where safety and property damage is at risk. The IPMC will assess pest control techniques to minimize impacts on non-target species.

Species At Risk (SAR) also include rare plants which are identified by the Colorado Natural Heritage Program (See Section 4.a. Species of conservation concern). Fort Carson and the PCMS have many occurrences of these SAR plants and some of the highest quality sites for these species. Chemical control of weeds are carefully applied to avoid impact to these species, and weeds encroaching rare plant sites are prioritized for management.

Recurring actions for pest management
(Please note: The following proposed actions are in priority order from 1 to 12. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

1. Maintain and implement the IPMP on a five-year cycle, including an update in 2020.

2. Emphasize integrated pest management techniques to minimize the use of pesticides.

3. Ensure pesticide applicators are fully certified.

4. Control plant and wildlife species that affect human health, quality of life, natural resources management (e.g. reduce ecosystem functionality, displace native species) or the military mission.

5. Coordinate with the Fort Carson Wildlife Office, and as needed with external partners such as USFWS and CPW, for the protection of wildlife particularly listed or sensitive species during pesticide operations.

6. Use chemical control as a last resort to control pests; cultural, mechanical, and biological control methods are first priority. When chemical control is required, use the least environmentally toxic pesticide. Utilize new technology, educational opportunities, and the judicious and professional use of chemicals to reduce chemical pesticide use.

7. Conduct preventive maintenance and surveillance inspections for pests.

8. Ensure pest management personnel receive adequate formal, as well as on-the-job, training to achieve required pest management certification and to operate at the most efficient level.

9. Procure, maintain, and properly store adequate supplies of pesticides and pesticide dispersal equipment.

10. Implement a safety program that provides for the safety and well-being of all pest management personnel.

11. Work with other installations in the region to include the Fort Carson pest management program within the Front Range Ecoregional Management Team.

12. Participate in Directorate and Garrison level working groups to ensure pest management activities are represented and are in agreement with Fort Carson goals and objectives.

4.j. Land management

Information related to land management can be found in the following sections:

- 4.b. Wetlands management
- 4.e. Forest management
- 4.h. Invasive species management
- 4.i. Pest management
- 4.o. Wildland fire management
- 4.t. Urban forest management
- 4.u. Water rights management
- 4.w. Integrated Training Area Management (ITAM)

4.k. Agricultural / grazing outleasing

In the past, grazing on PCMS has been considered. This action was most recently evaluated in 2014 to include compatibility with military training, to determine the capacity of the natural resources to support grazing without degrading the resources, and to assess the costs versus benefits of having such a program. It was determined that grazing would not be compatible with current mission requirements, and there would be a negative cost benefit.

4.l. Geographic Information Systems (GIS) management

The goals of the DPW Geographic Information Systems (GIS) Program are to provide customer support to staff and military troops by providing data, analysis for the enhancement of decision-making purposes, and hard copy documentation/representation to sustain Fort Carson and PCMS training and environmental missions. The DPW maintains a common server to share GIS files. Sensitive data (e.g., cultural and natural resource sites) are not commonly shared. The DPW GIS Program is required to adhere to Army GIS data standards, and all GIS layers referred to in this document are based upon these standards. A copy of these standards are available upon request. The DPW GIS Program is supported by aerial imagery that spans from 1949 to 2019. This GIS data is maintained using Global Positioning System (GPS) equipment. Some of this GPS equipment provides sub-centimeter accuracy, and other equipment provides accuracy of up to 30 feet. The ITAM GIS coordinator maintains the GIS data for that program. Currently, DPW does not have a staff member dedicated to GIS within natural resources. The GIS contract administered by DPW is staffed to provide full GIS support to the INRMP and its management efforts. GIS data is shared between DPW and ITAM, with only a few program-specific exceptions. Efforts should continue to more effectively organize the storage of this data, share it with other installation directorates that could benefit from the data, ensure that data is consistent among all personnel relying on it, and to eliminate duplication of data.

Recurring actions for GIS management
(Please note: The following proposed actions are in priority order from 1 to 4. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

1. Ensure that data meets published Army GIS standards.

2. Provide maps and spatial analyses to support natural resources management, as well as other missions.

3. Work cooperatively with all GIS users to share GIS data and products.

4. Maintain up-to-date software and data.

4.m. Outdoor recreation

The principal use of DoD lands and waters is to support mission related activities; all other land uses are subordinate. The purpose of the recreation program on Fort Carson and the PCMS is to manage the population levels of wildlife within the current carrying capacity of specific wildlife habitats on Fort Carson, maintain and enhance a sustainable ecosystem, and provide recreational opportunities for the enjoyment of the public. Fort Carson lands and waters are available for non-military purposes in accordance with 10 USC 2671, *Military Reservations and Facilities: Hunting, Fishing, and Trapping,* AR 200-1 (Environmental Protection and Enhancement), the INRMP, Sikes Act, and Army directives and policies when compatible with the military mission, installation safety and security, ecosystem sustainability, natural resources management, and fiscal responsibility. Fort Carson established and updates our local recreation regulation for installation specific rules and guidelines, FC Reg 200-6, *Wildlife Management and Recreation*, 2018. Possession of a recreation permit and a state hunting license does not guarantee access to Fort Carson or the PCMS. The Commander can limit public access for reasons of safety, security, ecosystem needs, sustainment, or interference with military

mission. The outdoor recreation program goal is to provide quality outdoor experiences for Soldiers, their families, and the public while sustaining ecosystem integrity.

Fort Carson issues recreation permit sales in accordance with DoDI 4715.03 and other Army directives and policies. Recreationists are charged a permit fee, which varies based on the type of recreation, age of the recreationist, and disability status of the recreationist. The fee structure is posted on Fort Carson's Sikes Act Permit Sales and Recreation Management Service, called iSportsman. The IMCOM supported iSportsman service website is located at: https://fortcarson.isportsman.net. Proceeds are collected per the Army's Fish and Wildlife Conservation Fee Collection Program (FWCFCP) in accordance with DoDI 4715.03, and are to be used for habitat management, improvement, or restoration projects. Proceeds can also be used for coordinating fishing and hunting activities and operating game check stations (Horne Engineering Service, LLC, 2005). Stocking fish in the reservoirs is the primary use of the funds collected from permit sales. Other uses include maintenance of the iSportsman service, and other recreation and habitat improvements.

All recreationists, including anglers going to the reservoirs, are required to complete a one-time registration on the iSportsman website, which creates their individual account with a "user name" and "password." Recreationists must then log into their account to complete all requirements to recreate on Fort Carson and the PCMS, which includes keeping personal information up-to-date, completing the annual range safety brief, purchasing recreation permits, checking-in for a down range pass and viewing their recreation history. Access is limited to a day-to-day basis due to military use of training lands, which preempts recreation. Except for the main post area, impact areas, safety fans of active ranges, and other sensitive areas, the entire installation is available for recreation. The percent of land available on any given day is determined by military use of the installation for training, construction, maintenance, or similar activities.

State and federal hunting and fishing laws and regulations apply to and are enforced on Fort Carson and the PCMS, and recreationists are required to obtain and carry the appropriate Fort Carson, state, and federal licenses. A state fishing license is not required to fish on Fort Carson. The state of Colorado manages hunting through Game Management Units (GMU) and Data Analysis Units (DAU). Fort Carson and the PCMS constitute state GMUs 591 and 142, respectively. There are several major big game hunting seasons on Fort Carson and the PCMS. Public and soldier participation in these seasons is frequently interrupted, limited geographically, or sometimes precluded due to conflicts with the military training mission. Both installations can be closed for part or the entire duration of one or more seasons when conflicting with training.

For safety reasons, hunters and recreationists, going downrange at Fort Carson and the PCMS are required to check in and out each day.

Fort Carson is considered a "hot spot" for CWD in mule deer, which has also been documented in the elk population. Hunters harvesting deer or elk on Fort Carson are required to get the animal tested for CWD at the CPW field office in Colorado Springs.

Four reservoirs on Fort Carson are currently stocked with catchable fish. Trout and catfish are the primary species stocked, but largemouth bass and bluegill can be found in some of the reservoirs. Training conflicts with the fishing program are rare because access to the stocked reservoirs is not restricted unless reservoirs are reserved for special military training events. To preserve native fish populations, game fish are not stocked at the PCMS, and fishing on the installation is not permitted.

Annual permit sales for FC and the PCMS have remained somewhat constant over the last four years. A "recreation year" is considered April 1 to March 31 of the next year, which usually coincides with

the CPW's "recreation year." The four year average permit sales (2016-17 to 2019-20), combining FC and the PCMS was 2,389. The total permits issued included all permit types. Types of permits include fishing only, hunting only, combination fishing and hunting and discounted permits for select groups. Fishing permits issued on FC is about 43% more than hunting permits issued on FC and the PCMS combined.

Currently, recreational access is managed by multiple installation directorates.

1. Fort Carson DPW staff sells wildlife recreation permits via its online iSportsman website, and proceeds earned are used for wildlife management as stipulated in the Sikes Act and FC Reg 200-6. Fort Carson DPW will continue to manage all aspects of the iSportsman service.

2. The DES enforces DoD, state, and federal natural resources regulations. DES also performs search and rescue operations, conducts background checks, issues access passes on Fort Carson, and registers firearms.

3. DPTMS determines days and times available for downrange access of training areas by recreationists, provides input on updates to the electronic recreationist downrange safety briefing, and issues downrange passes and provides changes needed to the iSportsman service, either immediate closures or informational content.

4. The DPW manages game populations, cooperatively establishes hunting seasons and the number of licenses with CPW, and manages gate access at the PCMS during major big game seasons.

Recurring actions for outdoor recreation

(Please note: The following proposed actions are in priority order from 1 to 7. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

1. Manage Sikes Act permit sales and iSportman Recreation Management Service by maintaining the iSportman website and hunter check-in kiosks at both FC and PCMS.

2. Continue management of recreational fishing on Fort Carson, to include stocking fish, improving fish habitat, and managing irrigation water to maximize angling opportunities.

3. On Fort Carson, maintain public access areas (Bird Farm, Wildlife Demonstration Area, and fishing reservoirs).

4. Continue annual meetings with CPW to share an annual comprehensive recreation report that includes permit sales, hunter check-in, and harvest data; and to discuss license numbers and other issues related to recreation.

5. Continue consulting with the state and DPTMS to resolve hunter access restrictions during big game seasons.

6. Continue to provide and assist with the free Colorado State Wounded Warrior hunting tags.

7. Review and prioritize projects for habitat management, improvement, and restoration needs on FC and the PCMS for funding with permit proceeds per DoDI 4715.03.

8. Develop a recreational fisheries management plan with stocking information and creel surveys every two to three years.

4.n. Wildlife Aircraft Strike Hazard (WASH)

Please note that many people are familiar with the term Bird Aircraft Strike Hazard, or BASH. The Army uses Wildlife Aircraft Strike Hazard (WASH). The goal of the Fort Carson WASH program is to minimize the probability and the severity of a wildlife strike hazard. Butts Army Airfield (BAAF) is utilized primarily by Fort Carson rotary aircraft. The number of daily operations (take offs or landings) varies throughout the year according to Fort Carson or visiting unit training requirements. During peak training periods the number of operations at the airfield can be as high as 300 operations daily. There are other small airfields on Fort Carson and the PCMS. All airfields need to be managed to minimize WASH potentials.

Reducing the probability of a wildlife-aircraft strike at the airfield is accomplished primarily through eliminating or modifying wildlife attractants and removing or discouraging hazardous wildlife. Management prescriptions can be found in the Fort Carson WASH Plan. Appendix 3 has information on how to review the Plan, which prescribes actions for reducing the probability of a wildlife strike.

Lethal control of wildlife may be required to eliminate hazards to aircraft. Intentional take of protected species of wildlife requires federal permits. Fort Carson maintains an Interagency Agreement with USDA – APHIS for control of hazard wildlife (primarily prairie dogs and birds) at the airfield. If APHIS is not available to respond to a particular hazard, federal take permits will be obtained prior to take of any protected species, including mammals and birds.

The MBTA protects birds from intentional and incidental (unintentional) take and imposes civil penalties for violations by individuals and organizations taking protected species. In 2007, Congress authorized incidental take of migratory birds without a take permit for military readiness activity (MRA) conducted by members of the Armed Forces. Except for military readiness training, DoD guidance advises that installations should seek to minimize incidental take of migratory birds in the execution of an otherwise lawful management action (e.g., prescribed fire, mowing, timber management, maintenance, and construction).

Incidental take may occur during habitat management. Management of airfield grasslands to reduce attractiveness to wildlife are conducted during the bird-nesting season. To reduce the attractiveness to wildlife, airfield grasslands will be maintained at heights between 6 and 12 inches in accordance with AR 95-2. This activity cannot be delayed until after the nesting season due to threats posed to aviators. Setting mower blade height to 10 inches will reduce the probability of unintentional take of a protected bird species. Some of the species potentially affected by grassland mowing include horned lark, killdeer, western meadowlark, and vesper sparrow.

Prairie dogs are discouraged from colonizing in and around the airfield, as animals that prey on them (e.g. raptors, coyotes) can present a WASH hazard to aviators. Prairie dogs that are found in these areas will be eradicated in accordance with approved pest control methods outlined in the 2015 Black-tailed Prairie Dog Management Plan. Intensive control efforts took place in 2018 and 2019 to eliminate prairie dogs within the airfield, as the population had greatly increased after several years with no control efforts. These control efforts have significantly reduced the prairie dog populations, which has led to fewer predators seen on the airfield. The reduction in prairie dog numbers has also allowed sod to re-establish in previously bare areas, which has resulted in less brown-out conditions for aviators. The airfield also recently constructed an interior perimeter road just inside the main fence that has made it more difficult for prairie dogs to recolonize the airfield after elimination.

In the future, smaller-scale annual maintenance treatments will be used in and adjacent to the airfield to prevent prairie dogs from re-establishing within the airfield. The burrowing owl, a state threatened species and a USFWS species of conservation concern, is often present at the airfield in association with prairie dogs. While incidental take of burrowing owls during treatment of prairie dogs on airfields would be covered under 50 CFR 21.15, Fort Carson will still attempt to minimize population-level impacts on this state-threatened species. Pre-treatment burrowing owl surveys will be conducted throughout the year in accordance with protocol established by CPW (CDOW 2008). In order to minimize both the chance of prairie dog recolonization and the presence of burrowing owls on the airfield, prairie dog holes should be filled in following eradication efforts.

Due to substantial risks to bald and golden eagles and other non-target species, Fort Carson consulted with the USFWS regarding the limited use of poison grain to control prairie dogs. Prairie dogs are important prey for eagles and the ferruginous hawk year-round. Golden eagles nesting west of Fort Carson are frequently observed hunting in colonies in the vicinity of and at the airfield. The Bald and Golden Eagle Protection Act (16 USC 668-668c) generally prohibits the disturbance of protected eagles. Actions which may disturb eagles must be avoided or fully coordinated in advance with USFWS.

Recurring actions for Wildlife Aircraft Strike Hazard (WASH)

(Please note: The following proposed actions are in priority order from 1 to 9. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

1. On Fort Carson and PCMS, evaluate and manage WASH hazards, such as prairie dogs, at BAAF and downrange aircraft landing sites to reduce the probability of a strike.

2. Conduct pre-treatment surveys for burrowing owls prior to lethal control of prairie dogs.

3. Consult with the USFWS regarding migratory bird depredation permits and eagles as related to airfield operations.

4. Maintain grass heights at the airfield between 6” and 12” to reduce the attractiveness of the airfield to wildlife.

5. Participate in the BAAF WASH Working Group.

6. Continue participation in the National Military Fish and Wildlife Association WASH working group.

7. Conduct small mammal trapping to determine if population densities are likely to increase the number of raptors hunting at or near the airfield. Increased seasonal raptor activity would be filed as a Notice to Airmen (NOTAM) for pilot briefings.

8. Continue to perform quarterly inspection of boundary fence for evidence of mammal encroachment and identify sites for repair.

9. Consult with CPW regarding big game issues related to airfield operations.

4.o. Wildland fire management

Wildland fires generated by military training activities occur on a regular basis due to the nature of the munitions used, a substantial and receptive fuel bed, and low humidity. Lightning strikes and human caused fires are also potential ignition sources. The elevated frequency and shortened regenerative growth cycle created by these wildland fires has a potential to cause damage to natural resources. The Fire Management Program on Fort Carson and the PCMS is focused on prevention, responding quickly, and containing wildland fires.

Fire prevention aspect of the Program is through the use of prescribed (Rx) fire to reduce the frequency and intensity of catastrophic wildland fires while managing natural resources needs to be increased. The Fort Carson Fire Department (FCFD) is the primary proponent of the wildland fire program. The DPW Conservation Branch is the primary proponent of prescribed burns to maintain fire regimes for fire-dependent ecosystem management. The Conservation Branch has resource advisors that can provide fire return intervals and fire ecology information, and advice on when and how to apply fire. This information is given to the Prescribed Fire Burn Boss and other decision-makers in the FCFD who plan and conduct Rx burns. The Conservation Branch also designs and surveys pre- and post-burn study plots in order to investigate if Rx fire objectives related to this INRMP (e.g., ecosystem management, invasive weed control, forestry) are being met by the Rx burns that are planned and conducted.

On wildfire incidents, the DPW Wildland Fire Team operates within the Incident Command System for wildland fire suppression and prescribed fire planning, implementation, and management. Resource experts within DPW serve as onsite advisors to the Incident Commander and recommend fire suppression options as they relate to natural resource management and protection. Army policy is being revised at this time, which may result in changes to planning, operations, and management regarding wildland and Rx fires on post.

4.o. (1) Wildfire Risk Assessment

In 2016, the Center for Environmental Management of Military Lands (CEMML) developed a Wildfire Risk Assessments (WFRA) for Fort Carson (Wildland Fire Support Center 2017) and the PCMS (Wildland Fire Support Center 2018). Figures 4-1 and 4-2 are mean fire expectancy maps for Fort Carson and the PCMS. The WFRAs provided insight into the potential for problematic fire behavior and locations of high probability fire, as well as, assessment of potential for impacts to valued resources, including natural resources, for both installations.

Key points regarding Fort Carson

1. Fort Carson has a high annual number of munitions related ignitions relative to some other military installations, averaging 125.6 mission-related ignitions per year.

2. Overall wildfire risk is low due to little overlap between high value assets and high fire frequencies and/or intensities, though there are acute locations of moderate risk primarily associated with range infrastructure.

3. There is significant risk associated with fire leaving the installation across the eastern border adjacent to the large impact area.

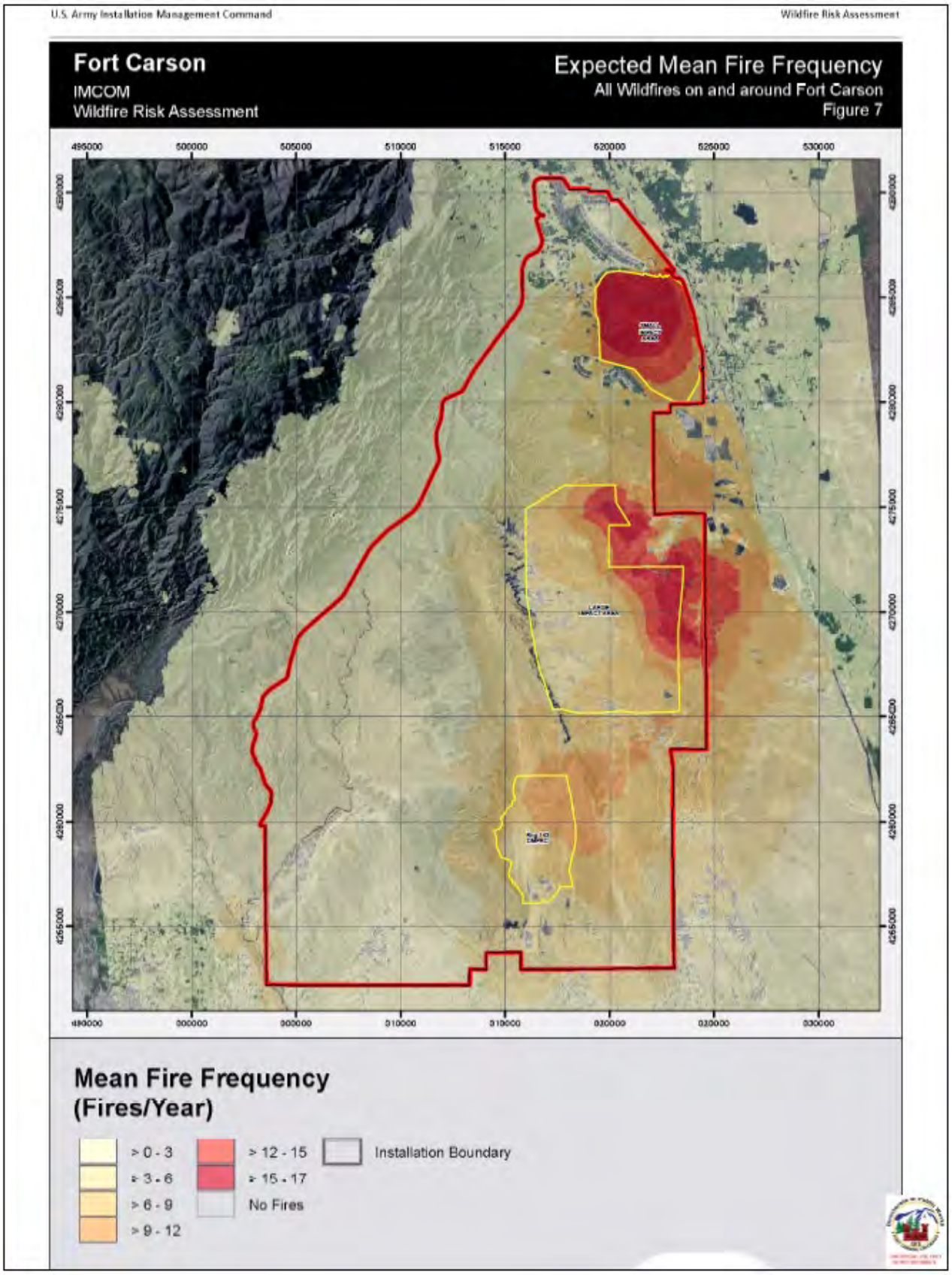


Figure 4-1. Mean fire expectancy for Fort Carson

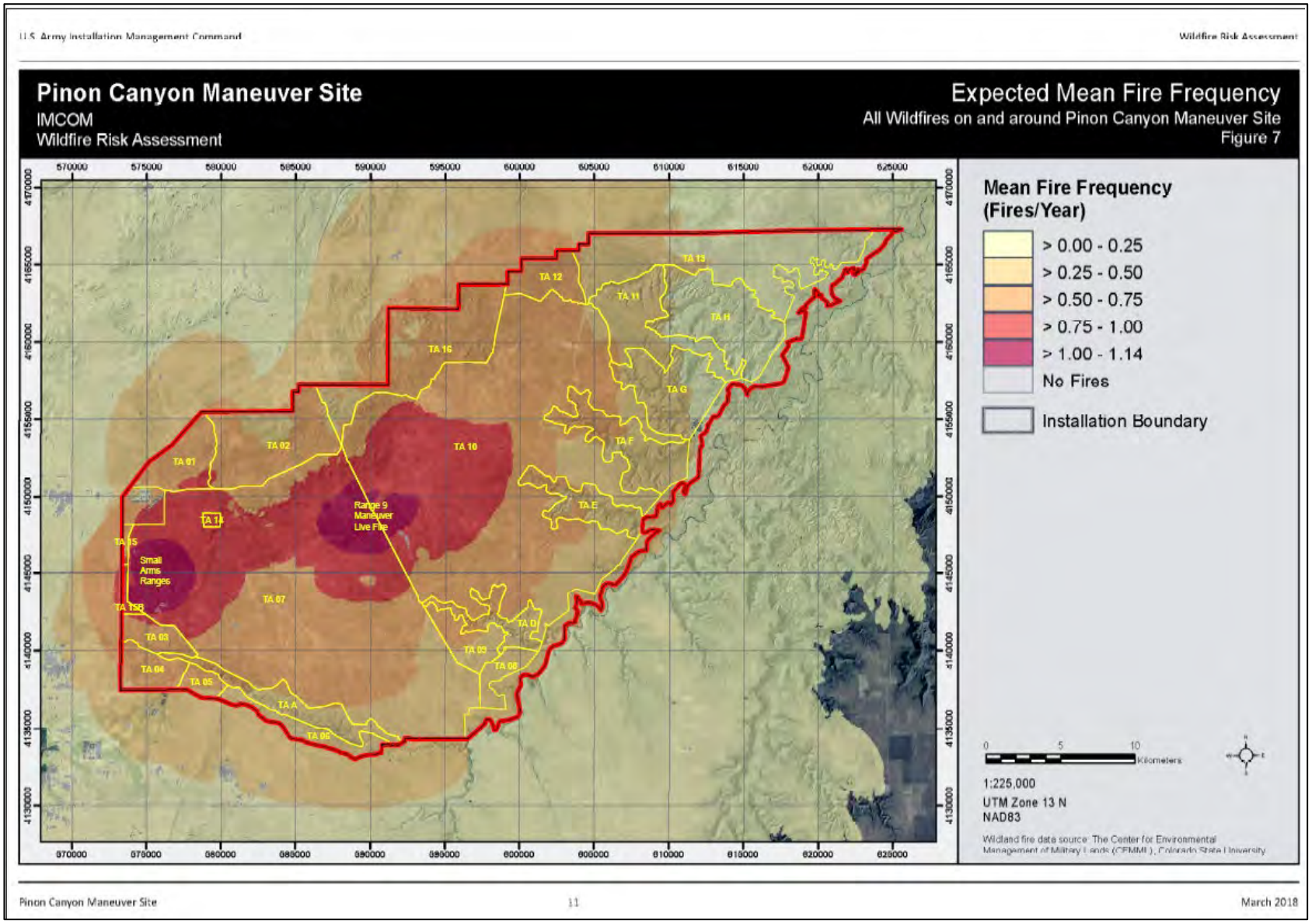


Figure 4-2. Mean fire expectancy for PCMS.

4. There is high potential for rapidly spreading, large fires. As a result, fires may reach sensitive resources in a short period of time, possibly before firefighting resources can arrive on scene.

5. Fires are likely to exceed initial attack capabilities 20 to 40% of the time across large portions of the installation, indicating severe burning conditions are likely to be encountered on a regular basis.

Key points regarding PCMS

1. Wildfires at PCMS have the potential to grow to a very large size in a very short period of time due to large tracts of continuous, high spread rate fuels (grass) and weather that is highly conducive to rapid fire spread.

2. Wildfire ignition potential is very low for a military installation, with an average of 5.325 ignitions per year, only 3.125 of which are associated with human activity.

3. The highest risk is associated with widely separated natural gas infrastructure, though many of these are already properly mitigated.

4. Secondary risk is associated with downrange power lines, targetry, fiber optic junction nodes, and the northern boundary of the installation.

5. Without effective initial attack, wildfires have the potential to leave the installation. The boundary to the west of the Small Arms Firing Range and the north/northwest boundary have the highest potential for a wildfire leaving the installation.

4.o. (2) Integrated Wildland Fire Management Plan

The Fort Carson Integrated Wildland Fire Management Plan (IWFMP; Fort Carson Directorate of Emergency Services 2014) is a comprehensive 5-year plan that lays out specific guidance, procedures, and protocols for the prevention and suppression of wildfires on training areas with wildland fuels. It conveys methods and protocols necessary to minimize fire frequency, severity, and size. The plan is currently being revised per Army Wildland Fire Policy Guidance (September 4, 2002) and AR 200-1. The anticipated completion of the new 5-year plan is early 2021 for Fort Carson and early 2022 for the PCMS. The current IWFMP may be obtained for review by calling the FCFD at 719–526–5737.

Wildfires
Wildfires may be started by military training (e.g. tracer rounds, flares) or other causes (e.g. lightning, arson) and may burn with intensities capable of causing loss of life, property, or detrimental impacts to natural resources. In areas where a high level of protection is required, fire suppression consists of responses that usually completely suppress or control the fire. Wildfires in areas that do not pose a risk to structures, training, life, natural or cultural resources, or escape from installation boundaries should be used to accomplish defined fuel management objectives, as per a written Incident Action Plan. In addition, some fires are inaccessible due to safety concerns related to unexploded ordnance.

Prescribed Fire
Prescribed fire, as defined by the National Wildfire Coordinating Group (NWCG), is the “controlled application of fire to wildland fuels in either their natural or modified state, under specific environmental conditions that allow the fire to be confined to a pre-determined area, and produce the

fire behavior and fire characteristics required to attain planned fuel treatment and resource management objectives." Prescribed fire strategies differ from wildfire suppression strategies in that the primary goal is to use fire to achieve pre-determined objectives within a given set of fire behavior constraints. Prescribed fires occur within a defined area having identified control boundaries, a written prescribed fire plan, and a smoke permit from the Colorado Department of Public Health - Environment Air Quality Control Division (CDPHE-AQCD).

Prescribed fire is often used to mimic the fire regime that occurred within its historic range of variability on our local ecosystems. Prescribed fire provides for the reduction of fuel loading on the training ranges of Fort Carson and the PCMS. The reduction of wildfire fuels increases protection to the high value natural resources on these installations by reducing the risk of a catastrophic landscape scale wildland fire. Additionally, Fort Carson has both mixed and short grass prairie habitats where the fire and recovery times are different. Ecoregional and landcover level analysis are used to determine the frequency of prescribed fires.

The Army wildland fire implementation guidance encourages the use of prescribed fire to the greatest extent practical as a low-cost management tool to support mission needs and to attain the goals and objectives of the INRMP through fuel and wildfire risk reduction, vegetation management for training accessibility, and maintenance of fire-dependent ecosystems with related biodiversity and natural fire return intervals. The Army recognizes two types of prescribed fires: 1) those ignited by qualified personnel in accordance with an approved prescribed burn plan, and 2) wildfires managed under prescribed conditions as addressed in an approved IWFMP.

The FCFD, in coordination with DPW, develops a five-year Prescribed Burn Plan and an annual Prescribed Fire Plan for Fort Carson and the PCMS. The five-year plan outlines broad-scale prescribed burn objectives and implementation. The annual plan includes proposed burn areas selected for potential prescribed fires to accomplish fuel management objectives, and help in managing natural resources. Often more burn areas are proposed than are implemented since it is not possible to predict when conditions are suitable for a prescribed fire or when a site will not be in use for military training. This plan is assessed through the NEPA process to identify potential issues, including negative impacts to natural and cultural resources. The five-year and annual Prescribed Fire Plan may be obtained for review by calling the FCFD at 719-526-5737.

Fire monitoring

Operational monitoring can be defined as the systematic process of collecting and recording data for fuels, topography, weather, air quality, fire behavior, and fire effects to provide a basis for evaluating and adjusting the current and future fire management program. This concept of changing the methods used for altering the environment based on data is termed "adaptive management" and the DPW Conservation Branch uses this method as much as possible to guide its management actions. The primary intent of wildfire monitoring is to gain information necessary to make daily decisions regarding fire suppression actions, meet agency requirements, and provide sufficient information for documentation of fire management decisions and to evaluate the success of accomplishing the fire objectives.

4.o. (3) Fuels Management Plan

The Fort Carson and PCMS Fuels Management Plan (Fort Carson Directorate of Public Works – Conservation Branch 2020) which is a component of the the IWFMP, links and integrates conservation management actions in accordance with the INRMP and with Army military mission activities in order to maintain high-quality lands for training, biodiversity, and recreation. Wildfire fuels are managed by a combination of mechanical means, herbicides, and prescribed fire.

In order to classify and prioritize burn projects, the Fuels Management Plan creates three types of projects: 1) military training areas that should be burned ahead of large scale training exercises and all live-fire range Surface Danger Zones (SDZ), 2) firebreaks that encircle Fort Carson, and 3) burns that return fire to fire-adapted systems, improve wildlife habitat, and implement forest management plans. The annual Prescribed Fire Plan includes burn areas identified in the Fuels Management Plan.

Firebreaks
Approximately 72 miles of graded perimeter firebreaks encircle Fort Carson. They are maintained by DPW by mechanically removing the vegetation 3-4 times annually using a grader. A fuel break is currently being created along the northern and eastern boundary of the PCMS. The five-year Fuels Management Plan further describes the approved firebreak standard.

Forested area thinning
In cooperation with the forestry program (Section 4.e.), thinning operations are conducted in heavily-timbered areas to reduce the risk of fires leaving installation boundaries and to protect man-made structures. Thinning also provides the added benefit of enhancing military training options in the thinned areas. The installation forester and the wildland fire coordinator within the DPW – Conservation Branch will plan and coordinate the removal of fire fuels from areas adjacent to the installation firebreak or fuels break using mechanical methods, prescribed fire, and herbicides.

4.o. (4) Fire management coordination

Fort Carson personnel coordinate and consult with federal, state, and local agencies, universities, and adjacent landowners regarding wildland fire management or the use of prescribed fire on post. Applicable permits, such as an air quality smoke permit from CDPHE or Section 404 permit from the United States Corps of Engineers (USACE), are acquired prior to any fire management activity. Fort Carson has cooperative fire protection agreements with the Colorado Springs Fire Department, El Paso County Sheriff's Office, USFS, and with 36 other agencies and organizations to provide mutual aid for the suppression of wildland fires on or off of the installation.

Fire-related training
Firefighters in both the FCFD and the DPW Conservation Branch are required to meet National Wildfire Coordinating Group (NWCG) standards for qualifications (PMS 310-1) for their level of involvement in wildland and prescribed fire management. Regular training opportunities are provided by IMCOM, FCFD staff and other agencies (e.g., local Fire Academies) in the region and state.

Recurring actions for the wildland fire management
(Please note: The following proposed actions are in priority order from 1 to 13. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

1. Request annual funding to replace PPE, to maintain/replace equipment, and for annual training.

2. Assist fire department personnel in suppressing wildfires.

3. Annually assist Fort Carson Fire and Emergency Services in preparing and implementing the Prescribed Fire Burn Plan covering both Fort Carson and the PCMS.

4. Ensure Prescribed Fire Burn Plan and Smoke Permits are in compliance with the INRMP, Land Use Plans, Army Wildland Policy Guidance, and CDPHE requirements.

5. Suppress wildfires in Mexican spotted owl (MSO) habitat. Prescribe burn a buffer zone between Booth Mountain and training ranges to keep military mission-related fires from entering MSO habitat.

6. Ensure soil, flora, and faunal resources, and endangered species habitat enhancement and protection are considered during fire management activities.

7. Use prescribed burning to support the Forestry, Vegetation, and Invasive Species Management programs.

8. Coordinate with cultural resource and natural resource personnel during wildfires and prior to conducting prescribed burns.

9. Describe fire use benefits in education and outreach programs such as the Environmental Protection Officer (EPO) training, and Earth and Arbor Day Events for local schools.

10. Maintain and improve approximately 72 miles of firebreaks on Fort Carson.

11. On active firing ranges create a minimum of a 100-foot wide strip of burned area along all perimeters, where feasible, that will be sufficient to contain any unintentional starts and therefore, assist in maintaining planned training schedules.

12. Implement other fuel reduction techniques beyond prescribed fire (as appropriate), to include mastication, limbing, forest thinning, mowing, and herbicides, in coordination with the installation forester.

13. Assist the ITAM Program in maintaining Range and Training Land Assessment (RTLA) Land Management Objectives, and utilize RTLA data in monitoring the effects of prescribed fires on the landscape.

4.p. Training of personnel

The natural resource programs on Fort Carson and the PCMS are dedicated to recruiting and retaining highly qualified professionals. Personnel are encouraged to continue their professional development by participating in regional and national conferences and training opportunities.

Recurring actions for training of personnel
(Please note: The following proposed actions are in priority order from 1 to 3. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs**.**

1. For government employees, include in their Individual Development Plans refresher training needed to fulfill job requirements (e.g., enforcement, GIS, NEPA, endangered species documentation/consultation, firefighter, pesticide application) and ensure that they are trained.

2. Provide funding for personnel to attend annual workshops or professional conferences.

3. Encourage personnel to join and be active in professional societies and cooperative groups.

4.q. Coastal / marine management

This section is not applicable to Fort Carson or the PCMS.

4.r. Floodplains management

The overall goal of floodplains management is to minimize potential damage and associated costs that might be incurred due to future flooding of Fort Carson and the PCMS. Fort Carson completed two independent studies (2001 and 2008) to determine the 100-year floodplain in the drainages of the main post area. The study in 2001 was initially completed in support of the planned development under Base Realignment and Closure (BRAC) and to assess the capacity of the existing stormwater conveyance system to support the development. The 2008 study was completed as part of the Phase II MS4 permit requirements and to also assess more recent and planned development under the Grow the Army initiative. In 2012, USACE completed an authoritative floodplain study that established floodplains for Fort Carson cantonment areas per Federal Emergency Management Agency (FEMA) and National Flood Insurance Program (NFIP) standards. The USACE report is stored on the Fort Carson DPW Portal and is available to review upon request. If projects must be located in a floodplain they should be constructed so that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood. These projects may also need a NEPA to assess for a Finding of No Practicable Alternative (FNPA).

Current floodplain maps are maintained in the DPW GIS database. All future construction of buildings downrange should be reviewed by the Stormwater program as part of the NEPA review of the plans, in order to avoid placing expensive facilities in a floodplain. Encroachments, including fill, and other development should not result in any increase in 100-year flood heights, 100-year discharge, or 100-year floodplain width.

Recurring action for floodplains management
(Please note: The following proposed action will be implemented as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

- Review, via the NEPA process, all projects proposed for the Fort Carson main post area for impacts to floodplains and risks to life and property; propose mitigation measures for any such risks.

4.s. Mineral resources

The DPW, in consultation with the Colorado Division of Reclamation, Mining, and Geology, ensures that the clay mines at Stone City on Fort Carson are properly maintained under their operating permits and that reclamation efforts by mining companies are in accordance with approved plans. All reclamation plans have been coordinated with the DPW and approved by the state. Fort Carson retains options to mine sand or gravel from its quarries if required by the military mission, and/or if quarry operations benefit the government during the course of installation construction projects.

Fort Carson
The Stone City Mining District is near the southern border of Fort Carson in TA 45. Mining in the District started in the 19th Century and continued into the 1950s, producing refractory clay, and sandstone block. Mineral rights for one section were not included in the Army's expansion of Fort Carson in the 1960's that included the surface rights to the District. A section of Stone City Mining District, Section 36, has minerals that are owned by the State of Colorado (School Trust Section). Two leases have been issued by the State to mine refractive clay in Section 36. Under lease M-91-003 for 240 acres, the General Shale Company may mine clay three months each year and has often done so. Also, under lease M-90-143, DFC Ceramics, Inc. (lease sold to Thermal Ceramic in 1991) may mine 400 acres, although it has not done so. The mine sites are located near the Stone City site near the southern boundary of Fort Carson. Fort Carson has several inactive sand and gravel borrow pits that were used for road base material and building foundations. Over fifty abandoned mines exist at Fort Carson and the PCMS. The State of Colorado funded a contract to close the entrances to all the old Fort Carson mines; that work was completed in early 2012. Approximately twenty of the Fort Carson mines have locked access doors that allow access for wildlife biologists for bat and wildlife assessments.

PCMS
Historically, coal and helium was mined in limited quantities on the PCMS. Today, there are no active mines on the installation. At the time of this writing, we are not aware of any other leases pertaining to natural resources.

Certain lands included within Fort Carson and the PCMS must be withdrawn from public availability for mining every few years. In 2007, as part of the Transformation EIS, the Army requested that Congress withdraw those lands for another 15 years. That process is now complete. The Federal Register of 23 September 2011 (pages 59157 and 59158), noted the extension of the withdrawals for 15 years. Therefore, the Army will have to once again request that Congress renew the withdrawal of those lands, beginning the process prior to the year 2026.

Recurring action for mineral resources
(Please note: The following proposed action will be implemented beginning as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

- Continue working with Congress to withdraw certain lands within Fort Carson and the PCMS from public availability for mining.

4.t. Urban forest management

The Urban Forest Resource on Fort Carson is located within the main post area. The cantonment area at the PCMS is limited, but is defined by a treed windbreak. Both areas are typical with similar challenges for growing trees as compared with most communities on the Front Range of Colorado.

The Army manages the Urban Forest Resource on Fort Carson primarily to improve the quality of life for the soldiers, families and civilians who live and/or work on the installation. A functional urban landscape is aesthetically pleasing while also protecting the residents from harsh winds, blowing snows, extremes in temperature and noise. The urban forest is further managed to improve wildlife habitat, air quality and protect water resources by minimizing erosion and absorbing stormwater runoff. The urban forest is also managed for its effects on energy and water conservation, pollution control, extending the life of paved surfaces and lastly to improve sociological benefits. The leadership of Fort Carson has vigorously supported this program. In 2019, the National Arbor Day Foundation

recognized Fort Carson as a “Tree City USA” participant for 31 years. Fort Carson also earned the prestigious “Tree City Sterling Award” for 10 consecutive Growth Awards.

The urban forest program involves coordination among DPW, Colorado State University, Colorado State Forest Service, City of Colorado Springs Forestry Department, and other local agencies involved in urban forest management. This coordination is designed to implement and improve urban forest planning and implementation, while ensuring adherence to all federal, state and local laws and regulations. Natural Resources staff advises on all aspects of applied urban forestry, such as species selection, planting, site selection, xeriscaping, and proper pruning. Natural resources personnel support the DPW Base Operations urban forestry contract staff as subject matter experts and provide guidance for the development of work specifications and other aspects of contract documentation. Upon request, personnel interact directly with contractors providing interpretation and/or clarification as deemed necessary.

The urban forestry contractor plants, waters, and maintains new and transplanted trees on Fort Carson and the PCMS. Trees, shrubs, and ground covers are drought-tolerant species recommended by the Colorado State University Extension Service for Fort Carson and the PCMS. The *Installation Design Guide* (available on the Fort Carson website) includes information related to urban landscape management including pruning guidelines, watering guide, landscape specifications for low maintenance seeding, sod establishment, non-irrigated seeding, and irrigated turfgrass maintenance. DPW encourages the planting of tree species that are native to the area to reduce water use and to increase survival of planted specimens. The DPW completed a Xeriscape Master Plan in 2003 in response to growing requirements to conserve water. An Urban Forest Management Plan is currently being developed by the installation forester.

Recurring actions for urban forestry

(Please note: The following proposed actions are in priority order from 1 to 9. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

1. Prevent damage or loss of valuable resources from insects, disease, wind, construction, and/or neglect.
2. Provide technical advice to the grounds maintenance contractor to ensure all turfgrass and landscaped areas are properly maintained.
3. Provide guidance on how to select, plant and maintain trees and shrubs on Fort Carson main post and the PCMS cantonment area to enhance aesthetics and provide benefits, such as visual barriers, windbreaks, decreased heating costs, reduced soil erosion, and safety enhancements.
4. Provide guidance on proper pruning of shrubs and trees and remove dead plants as an essential objective for the long-term health of trees and shrubs on the installation and to ensure the safety of people and structures.
5. Annually participate in Arbor Day celebrations and meet standards established by the National Arbor Day Foundation to achieve recognition as a ‘Tree City USA”.
6. Work with contractors and other directorates to include improved urban forestry requirements in solicitations for new contracts.
7. Provide ongoing support in the implementation of the Xeriscape Master Plan.

8. Encourage implementation of practices listed in the 1994 White House Memorandum on federal landscaped grounds.

9. Complete and maintain an Urban Forest Management Plan for Fort Carson by December of 2020.

4.u. Water rights management

The Constitution of the State of Colorado, under Article XVI as added in 1876, *Mining and Irrigation*, establishes that the waters of every natural stream, except those previously appropriated, within the state are property of the public and that they are to be administered under the doctrine of prior appropriation. Colorado Revised Statutes, Title 37, *Water and Irrigation*, contains the statutes through which water rights are to be implemented, managed, and enforced. To be effective against other appropriators, water rights must be adjudicated and decreed for stated beneficial uses. Except for certain water rights set apart for the military installation, water rights must be put to the decreed beneficial uses or they can be subject to being ruled by the state as abandoned. Accordingly, the DPW is responsible for managing Installation water rights for beneficial use. Military training activities may be dependent on these rights, and their loss could have a significant impact on Fort Carson and the PCMS.

Water rights on Fort Carson and the PCMS directly support the training mission by providing water bodies for amphibious vehicles, 10th Special Forces scuba exercises, and training on use of water purification units. These water rights also assure adequate water supplies for the support and rehabilitation of natural resources on Fort Carson and the PCMS, and for fire suppression. The loss of a water right could cause a significant impact on the native resources that utilize that water for survival. The purpose of DPW water rights management is to maintain compliance with all applicable laws, regulations, and policies.

A 2016 study of Fort Carson water rights (HDR 2016) included an updated inventory. Previously, the number of water rights on Fort Carson was overestimated and some rights are no longer sustained. Currently, the Army owns approximately 16 surface and 9 subsurface water rights on Fort Carson. The surface rights include diversion ditches and reservoir storage rights. The subsurface rights include both wells already installed and future wells, which will not be installed until required.

The Army owns approximately 120 surface and subsurface water rights on the PCMS (RAND Arroyo Center, 2015). Of the 113 known wells, only about 30 are active. Maps showing the approximate locations of most of these water rights can be observed in the offices of the DPW Operations Division.

4.u. (1) Surface Water

Surface water rights include a decreed amount of water that may be applied to the decreed beneficial use(s). Surface water rights must be measured with calibrated gauges such as ones provided by the United States Geological Survey (USGS) or similar measuring devices that are acceptable to the Colorado Division of Water Resources, also known as the Office of the State Engineer. Records obtained through the monitoring phase of the water rights program support the utilization requirements of water rights. These records are provided monthly by the USGS to the Colorado Division of Water Resources, the agency that implements and enforces Colorado water law. Fort Carson has an Intragovernmental Support Agreement with the USGS that provides a means for the monitoring and reporting.

Fort Carson

Streams entering and originating on Fort Carson are intermittent. Stream flow is diverted under authority of adjudicated water right decrees. Actual water use has been for the following:

- Recreation
- Fisheries
- Firefighting
- Irrigation
- Re-vegetation
- Military training
- Wildlife
- Domestic
- Water Storage
- Federal Reserve

Water rights for Fort Carson are administered by Water Division Number 2, Water Districts 10 and 14. These rights are on tributaries that originate generally to the west of Fort Carson; however, some tributaries originate within the installation. The tributaries involved are as follows:

- Little Fountain Creek
- Little Turkey Creek
- Rock Creek
- Turkey Creek

The combined inflow upstream of Fort Carson from Little Fountain, Little Turkey, Rock, and Turkey Creeks is estimated to average 8.64 cubic feet/second, or 6,240 acre-feet/year. The actual inflow to Fort Carson is less than this quantity because of stream flow diversions for municipal and domestic water supplies. Pumping groundwater from alluvial aquifers upstream from Fort Carson also reduces the quantity of stream flow entering the installation (Leonard 1984). In years when streamflow is less than normal, available water is distributed according to priority – the senior right is satisfied first, then the next earliest right, and so on. Some of Fort Carson's water rights are quite senior, while others are not. Therefore, in any given year, flows in the various tributary drainages may or may not be sufficient to support Fort Carson's right to divert or to store flows. A recent study that was completed in 2016 has recommendations for Fort Carson including maintenance, potential abandonment of some water rights, and further studies and analysis (HDR 2016).

The ad hoc Fort Carson Water Rights Working Group presented a prioritized list of recommendations to Fort Carson leadership, including infrastructure repairs. Currently, not all water rights can be utilized due to the condition of the infrastructure. Funding is being sought for infrastructure repair. A timeline regarding infrastructure improvements will be outlined in 2020.

PCMS

Water rights for the PCMS are judicially administered under Water Division Number 2, Water Districts 17 and 19. Water rights are administered on arroyos and canyons that originate on the installation proper, or, in the case of the Van Bremer, that originate west of the installation. Arroyos and canyons that supply water to the installation and are administered by Water Division Number 2 are as follows:

- Bent Canyon
- Big Arroyo
- Van Bremer Arroyo
- Lockwood Arroyo

- Red Rock Canyon
- Stage Canyon
- Taylor Arroyo
- Welsh Canyon

There are a few surface water rights at PCMS, but they are inactive currently. Most of the Army's water rights on PCMS are subsurface rights (wells).

DPW has the responsibility to monitor, operate, and maintain water rights, with legal support from the Fort Carson Office of the Staff Judge Advocate, as supported by the Environmental Law Division at Headquarters, Department of the Army, and the Environmental and Natural Resources Division, U.S. Department of Justice. Each water right, with the exception of some early rights, for Fort Carson and the PCMS contains the following information:

- Appropriation date - The date the water was first diverted
- Adjudication date - The date the court recognizes for priority assignments
- Decreed use (beneficial use) - A decreed amount of water measured in either cubic feet per second or acre-feet
- Point of diversion - The location of the point of appropriation in a township and range grid coordinate system

As a result of personnel turnover and institutional reorganization, the DPW's water rights expertise and recordkeeping require improvement as funding and personnel authorizations permit.

4.u. (2) Subsurface water rights

Colorado has applied the doctrine of prior appropriation to subsurface (well) water (otherwise called "groundwater" or "underground water") rights, although that application occurred much later than with surface water. Statutes pertaining to underground water and wells are in Colorado Revised Statutes, Title 37, Articles 90 through 91. Because groundwater rights are often junior to the controlling rights and because wells have a lagged effect on stream flow, specific rules have been adopted to ensure that the use of wells does not injure more senior water rights. These rules and regulations do not apply to exempt domestic, stock, or fire protection wells. Also, wells that are permitted and/or decreed as non-tributary are exempted from these rules. See the Division of Water Resources' quick link title *Guide to Colorado Well Permits, Water Rights, and Water Administration*, January 2008, *found at:* http://water.state.co.us/groundwater/wellpermit/Pages/RegisterExistingWell.aspx

To allow the use of wells without injury to senior water rights, the Colorado State Engineer has developed the "*Amended Rules and Regulations Governing the Diversion and Use of Tributary Ground Water in the Arkansas River Basin*". These Rules require that wells cease use unless they are used in accordance with an "*Augmentation Plan*" approved by the state and State Engineer or a "*Substitute Water Supply Plan*" approved by the State Engineer. Augmentation water can be water that is imported from another basin or a non-tributary source or water from a right in priority that is not diverted, but rather is left in the stream so that it is available to other rights. Such augmentation water must be made available to the stream in the appropriate amount, time, and place so as to offset any injury to a senior water right caused by well use. Fort Carson adheres to these "*Amended Use Rules*" by maintaining membership in the Colorado Water Protective Development Association (CWPDA) and by paying annual fees in lieu of procuring water for augmentation.

To determine the amount of augmentation water needed for each well, accurate measurements of well use are necessary. The "*Amended Rules Governing the Measurement of Tributary Ground Water Diversions Located in the Arkansas River Basin*" was developed for this purpose. These Rules require

that the well owner install a totalizing flow meter or that a power coefficient be determined that allows the amount of water diverted to be calculated using the electrical consumption of the pump.

All wells (seven wells, with two of these wells having two meters) classed as tributary and active on Fort Carson have totalizing flow meters to measure use. Measurements are reported monthly to the CWPDA. A person certified by the State Engineer must verify every four years that these flow meters are in accurate working condition. For wells that are not being used and are not connected to a power source, these metering requirements can be avoided by submitting a Notice of Inactive Well. Fort Carson has two inactive wells falling into this category.

The following are wells on Fort Carson that are classed by the State Engineer as tributary and therefore fall under jurisdiction of the *Amended Rules Governing the Measurement of Tributary Ground Water Diversions Located in the Arkansas River Basin*. They are all adjudicated for non-irrigation uses.

Fort Carson Tributary Wells - *monthly meter reports and meter calibration rules required*

- Well # 1005880 – Wildlife Well (aka Well # 1; Mary Helen Ranch well; Rod & Gun Club well
- Well # 1005881 – ARA Well (aka Well # 2; Wilderness well)
- Well # 1005882 – ASA Well (aka Well # 3)
- Well # 1005884 – Turkey Creek Ranch Well (aka Well # 5; Strobel spring or well)
- Well # 1005886 – South Recondo Well (aka Well # 7; Red Creek well; Red Devil South well)
- Well # 1005887 – MPRC Well (aka Well # 8; Tank Table VII well)
- Well # 1005888 – Range 145 Well (aka Well # 9; Tank Table VIII well)

Fort Carson Tributary Wells – inactive

- Well # 1005883 – ASA Well #2 (aka Well # 4)
- Well # 1005885 – Red Devil Well (aka Well # 6; Recondo well)

PCMS Wells
Approximately 100 wells are known at PCMS, almost all of which were drilled prior to Army ownership. More than half are inactive at present, but 35 wells have been repaired and are currently being maintained. More wells may be repaired and monitored in the future, subject to availability of funding. The PCMS does not have any wells classed by the State Engineer as tributary.

Recurring actions for water rights management
(Please note: The following proposed actions are in priority order from 1 to 7. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs**.**

1. Monitor stream flows diversion.

2. Repair and maintain all water right infrastructures, including ditches, reservoirs, and wells.

3. Utilize water per decrees.

4. Send monthly water use reports to the State District Water Commissioner.

5. Send USGS quarterly gauge reports to the State.

6. Send monthly well reports to CWPDA.

7. Maintain approximately 35 wells at the PCMS.

4.v. Cultural resources

Information about management of cultural resources on Fort Carson and the PCMS can be found in the Integrated Cultural Resources Management Plan (ICRMP), which is available on the Fort Carson website at URL: http://www.carson.army.mil/DPW/nepa.html

The Natural Resources Management program takes into account cultural resources considerations by means of NEPA review of proposed projects or actions, prior to start of the project or action. NEPA review of proposed natural resource projects includes coordination with the Cultural Resources Manager (CRM) prior to implementation of a proposed project.

4.w. Integrated Training Area Management (ITAM)

The ITAM Program is an Army-wide program to provide quality, sustainable training environments to support the Army's military mission and help ensure no net loss of training capability, which is a Sikes Act requirement. The ITAM Program was initiated with the realization that Army training lands were being degraded to the point where their capabilities to sustain military missions were in jeopardy. In other words, training lands are long-term assets that have to be managed so that they are available for both present and future training needs. Proper management to support both the military mission and other activities is a challenge unique to the DoD among managers of public lands.

ITAM provides Army range officers with the capabilities to manage and maintain training lands and support mission readiness. ITAM integrates mission requirements derived from the Range and Training Land Assessment (RTLA) Program with environmental requirements and environmental management practices. It establishes policies and procedures to achieve optimum, sustainable use of training and testing lands by implementing a uniform land management program. Several documents provide policy and procedural guidance for the ITAM Program.

4.w. (1) Policies and procedural guidance

Army-wide Goal

The Army-wide goal for ITAM is to: "*achieve optimum, sustainable use of training lands by inventorying and monitoring land condition, integrating training requirements with land capacity, educating land users to minimize adverse impacts, and providing for land rehabilitation and maintenance*" (ITAM Program Strategy, U.S. Department of the Army 1995).

ITAM Program Strategy

The ITAM Program Strategy (U.S. Department of the Army 1995) describes roles, responsibilities, and relationships among the functional proponent and supporting organizations, provides an overview of the ITAM policy and guidance, and describes the four ITAM components. The ITAM Program Strategy, along with input provided by Army conservation staff and RTLA outcomes,

provided the foundation and guidance for the ITAM Regulation (AR 350-19) and the Procedural Manual (U.S. Department of the Army 1999).

AR 350-19, The Army Sustainable Range Program

AR 350-19, The Army Sustainable Range Program, assigns responsibilities and provides policy and guidance for the Army ITAM Program (ITAM Program Strategy, Department of the Army 2005). The regulation includes support for sustainable ranges, assessment of range sustainability, and management of automated and manual systems that support sustainable ranges.

ITAM Procedural Manual

ITAM Procedural Manual defines Headquarters, Department of the Army, Major Army Command, and installation roles, responsibilities, and Army-wide guidance to implement ITAM (U.S. Department of Army 1999). Policies, procedures, and guidance in this manual are essential to achieve and maintain the Army ITAM Program. Army mechanisms for program management, review, and information exchange include Program Management Reviews, quarterly newsletters published online by the AEC, the Sustainable Range Program (SRP) website, and the annual Training Service Support (TSS) workshop.

4.w. (2) Program management at Fort Carson and the PCMS

Fort Carson Reg 350-9, *Integrated Training Area Management (ITAM)* was generated based upon the above documents. This regulation defines roles and responsibilities of Fort Carson applicable parties.

As part of the ITAM budgetary and planning process, Fort Carson is designated as a Category 1 installation (with the PCMS considered an off-site training location). Category 1 installations are the largest installations, with most critical training missions and/or greatest environmental sensitivities to missions.

Primary goals of the ITAM Program at Fort Carson and the PCMS are to:

- Align Fort Carson and the PCMS training land management priorities with the training needs and readiness priorities on Fort Carson;
- Facilitate training to current military standards while advocating tactically responsible conservation and land management practices;
- Achieve optimal sustained use of lands for the execution of realistic training and testing by maximizing ITAM efforts;
- Support a management and decision-making process, which integrates training and other mission requirements for land use with sound natural resource management on Fort Carson and the PCMS;
- Sustain lands for training readiness and multiple use in accordance with DoD policy;
- Ensure cost-effective and technically sound land management methods are applied to LRAM projects;
- Educate land users in reasonable and sound land use practices and environmental stewardship; and

- Aid in sustaining the installation through sound land management practices and environmental stewardship.

The ITAM Program includes the following five component areas (modified from *Integrated Training Area Management (ITAM) Program Strategy* (U.S. Department of the Army 1995)):

- The Range and Training Land Assessment (RTLA) component is used to inventory and monitor specific physical and biological resources to meet the sustainable multiple-use demands of Fort Carson.

- The Land Rehabilitation and Maintenance (LRAM) component includes planning, designing, programming, and executing land rehabilitation and maintenance projects to support and sustain the military mission.

- The Training Requirements Integration (TRI) component integrates Fort Carson military training requirements for land use with natural resources conditions and capabilities to support these requirements.

- The Sustainable Range Awareness (SRA) component improves land user understanding of the impacts of their activities on the environment and how to use the land more efficiently.

- The Geographic Information System (GIS) supports planning decision processes to effectively manage land use and natural resources.

Goals and objectives specific to ITAM are found in the *ITAM Program Strategy*, Section 2.1 (U.S. Department of Army 1995) and AR 350-19, The Army Sustainable Range Program, Chapters 5-7 (Department of Army 2005). These are incorporated as objectives within this INRMP. ITAM planning involves the development of land health monitoring strategies and land rehabilitation and maintenance projects, and budgeting for ITAM needs.

4.w. (3) Range and Training Land Assessment (RTLA)

RTLA supports the Army mission by informing military land management to maximize the capability and sustainability of the land to support live training and testing opportunities. The program develops assessments to monitor natural resources on training lands, analyzes land conditions and trends, and provides recommendations for implementation of land management activities.

In short, the RTLA component is a centralized, installation-level program that focuses first and foremost on installation needs and may provide information to major commands and Headquarters, Department of the Army, as requested. For greater detail, refer to the *Handbook of Effective Practices for RTLA Coordinators* (Colorado State University 2006). Installations use RTLA data and information to:

- Develop conceptual models to define those thresholds in terms of suitability for training for each ecotype including all possible land uses;

- Establish specific assessments to determine the status of the training lands with respect to those thresholds as well as success of rehabilitation efforts once implemented;

- Recommend boundaries and training load distribution for newly acquired and existing training land, so that the capacity of training land can best support a new or changing training mission and a new intensity load;

- Identify potential LRAM project sites;
- Ensure that biological considerations are part of the LRAM project prioritization process;
- Determine the effectiveness of LRAM projects;
- Work with the GIS component to create maps that depict the availability, suitability, accessibility, and capacity of training lands; and
- Conduct internal encroachment assessments by routinely reviewing plans, such as the INRMP, Integrated Cultural Resources Management Plan, annual prescribed fire plan, and Endangered Species Management Plans.

Background

RTLA developed out of the Land Condition Trends Analysis (LCTA) program. LCTA operated while the ITAM Program was under the auspices of the Directorate of Environmental Compliance and Management (DECAM; now DPW Environmental Division). LCTA established 204 permanent plots at Fort Carson by 1987 and 206 at PCMS by 1989. Data was collected on a wide variety of attributes related to flora and soils (particle size analysis, organic matter, etc.). However, many of the attributes collected did not directly relate to military training functionality, and minimum local analysis or data reporting failed to assist with immediate installation needs. RTLA and DPW Environmental Division maintain all data collected during these periods within their archives.

After responsibility for the ITAM Program was transferred to Range Control, the assessment reduced its emphasis on comprehensive resource surveys. RTLA adapted the sampling design to better serve management objectives for sustainable training land use. Changes to the LCTA plots included switching from 100 meter LCTA plots to 50 meter line plots; reestablishing plots by proportionally stratifying across each training area and vegetation class on Fort Carson and PCMS; and, modifying protocols to reflect assessment goals. The permanent plots are now considered the RTLA Large Scale Assessment.

In 2001, RTLA established 356 50-meter line plots at Fort Carson, which included 43 of the original LCTA plots. Observers collected data on 100 of the plots in 2011 and on the remaining 256 in 2002. In 2002, RTLA established 375 50-meter line plots at the PCMS, which included 62 of the original LCTA plots. Data was recorded in 2003. Results from this period serve as the beginning year for analyzing land condition trends.

Methods

RTLA protocols are periodically reviewed and modified as required by the training mission and land condition. The program has added several additional assessments to improve monitoring and management effectiveness on the training lands. The current RTLA Protocol (Burnett 2019) is maintained at the Fort Carson ITAM office.

The RTLA program currently includes the following nine assessments, which rotate on a 3-year cycle:

- Large-Scale Assessment: Evaluates land condition and long-term trends across training areas and landscapes. It addresses the ability of the land to sustain training by collecting qualitative and quantitative data on vegetation and soil properties. Determining land condition assists ITAM in enacting land management that facilitates training land access and safety, and that continues to provide a diversity of realistic training opportunities.

- High Use Area Assessment: Evaluates land condition at intensively or repeatedly used sites in training areas. The assessment recognizes the utility and/or necessity of these sites to current operations, as well as that the heavy use often pushes the vegetative community away from a natural condition. It focuses on collecting information to determine the most appropriate management actions to enable continued high intensity use in the short term.

- Limited Use Area Assessment: Provides periodic re-evaluation of land condition at sites placed within the limited use designation. Designated limited use sites have a realized or potential loss of maneuver access, or legal non-compliance, within the present or next 20 years. The designation defers heavy vehicle and excavation impacts from sites with a goal of prompt return to training use. Along with deferment, the sites may require extensive rehabilitation projects to facilitate recovery. Periodic reassessment of limited use areas evaluates the success of rehabilitation efforts, recommends appropriate management actions, and determines if sites may be returned to full training access.

- LRAM Reseeding Recovery Assessment: Documents the progress of LRAM reseeding projects. Reseeding may occur following completion of another LRAM project, in high use and limited use areas, or due to other disturbance or management activities that result in large amounts of bare ground. Rapid reestablishment of vegetation helps to maintain sites in a condition suitable for long-term maneuver exercises.

- LRAM Project Assessment: Surveys LRAM construction projects for proper functioning and recommends maintenance needs or opportunities to improve maneuver access by adapting existing structures. Projects assessed may include EMTs, check dams, and bank sloping.

- Trail Assessment: Surveys the existing location and condition of trails in the training areas. It maps the trail network classifying the condition of each segment and recording maneuver impediments.

- Maneuver Limitation and Woody Encroachment Assessment: Identifies current and potential areas where tree density negatively impacts training and maneuverability or poses a safety hazard. It recommends suitable sites for tree clearing and thinning.

- Disturbance Event Assessment: Evaluates land condition following a disturbance event. It may include surveys of maneuver impacts following training exercises, site evaluations following wildfire or flash floods, or other assessments required after disturbance events to evaluate training land condition.

- Ad-Hoc Assessments: LRAM project and weed population ad-hoc assessments occur while conducting other assessments. Weed mapping information is shared with DPW to contribute and assist with weed treatment prioritization in the training areas. Erosion features and maneuver impacts are reported to LRAM to for project consideration or land management needs.

RTLA Goals

Goal 1. Provide, in an efficient manner, data, analytical capabilities, and recommendations associated with sustained use of testing and training lands.

Goal 2. Provide data to support training land management and land use decisions.

Goal 3. Provide data to identify and monitor LRAM sites and evaluate the effectiveness of LRAM efforts.

Goal 4. Provide data input to an installation's plans, such as the INRMP, ICRMP, installation master plan, Range and Training Land Plan (RTLP), etc.

Goal 5. Provide a means for installation training land managers to measure and monitor natural resources.

Goal 6. Provide methods to assess the effects and impacts of training and testing on natural resources.

Goal 7. Assess the impacts of natural resources management on training and testing (e.g., prescribed burning, agricultural leasing, livestock grazing, etc.).

4.w. (4) Land Rehabilitation and Maintenance (LRAM)

The LRAM component is a key enabler for sustaining realistic training conditions, supporting training, and satisfying the mission requirements for military units using the installation (Army Reg. 350-19 Army Sustainable Range Program, Department of Army 2005). The LRAM component includes planning, designing, programming, and executing land rehabilitation and maintenance projects based on requirements and priorities identified by TRI, RTLA, and LRAM components of ITAM, and others. Projects follow established and accepted requirements of the LRAM program (e.g., Natural Resource Conservation Service and Colorado Division of Water Resources requirements, and the Colorado Department of Transportation BMPs for erosion control methods).

LRAM can mitigate for and/or minimize impacts from the military mission at Fort Carson and the PCMS.

LRAM projects are specifically designed to:

- Maintain quality military training lands;
- Mitigate severe safety hazards limiting training opportunities;
- Minimize long-term costs associated with land rehabilitation, vehicle maintenance, or additional land purchase;
- Modify training areas to enhance training possibilities; and
- Reduce erosion caused by, or unduly impacting, military training.

More specifically, the LRAM component can be used to achieve the following:

- Improve vegetation cover and alter topography to reduce soil loss caused by military training, protect long-term soil productivity, and to comply with air quality standards by reducing fugitive dust by following Fort Carson's Fugitive Dust Control Plan;
- Control water runoff to reduce soil loss and protect riparian areas adjacent to where training activities have occurred or are occurring, and to comply with water quality standards by reducing suspended sediment in streams and rivers;
- Reduce safety risks to soldiers and return land for training use by repairing gullies and other watershed damage, and construct projects such as hardened low water crossings, maneuver trail rehabilitation, Forward Aerial Refuel and Rearm Points (FARRP), Helicopter

Landing/Pickup Zones (not pads), etc. to enhance the possibilities for military training in the training areas of both Fort Carson and the PCMS.

LRAM project funding applies to land that has been damaged by training and/or is negatively impacted by training. It also applies to projects designed to enhance training possibilities where current training needs are not met. An LRAM project is not eligible for LRAM funding if one or more of the following situations exist: 1) either a pending or existing notice of violation has been issued by a regulatory agency for a given site; 2) a degraded site is not affecting training capability or the degradation is not directly caused by military activities; 3) responsibility for repair and maintenance falls to a different Directorate (e.g. The Directorate of Public Works is responsible for the repair and maintenance of real property including all Military Supply Routes (MSRs) and Tank Trails); or 4) it is a range modernization project. Installations are required to coordinate with the range modernization planning team members to identify, plan, and execute approved LRAM projects. The SRP website provides detailed information to support the LRAM project life cycle. Funding guidance can be reviewed in the Management Decision Package (mDEP) TATM (four letter code for IRAM MDEP) 16 September 2009.

BMPs for LRAM project implementation and annual/longer term LRAM project lists are modified as necessary and maintained in the Fort Carson ITAM office (see Appendices 9 and 10). This list remains flexible to react to immediate needs. LRAM projects are implemented on a proactive basis. High Use Areas (HUAs) damaged to the point where they restrict military training or create safety hazards are given the highest priority.

Reseeding

Reseeding is often completed in areas that have been intensively used for training. Reseeding is required following completion of LRAM projects that include a lot of soil disturbance like EMT construction and bank sloping. A no-till drill seeder is used for these types of operations. Some areas may be too rocky or steep to seed with a no-till drill. In these areas, seed may be broadcast using an appropriate broadcast seeder. Critical areas are those where erosion is a significant concern, generally steeper slopes. These areas are seeded at twice normal rates. All seed mixes are adapted to the southeastern Colorado region, but current efforts are underway to find native varieties that are more resistant to fire and military impacts. New seed mixes and cover crops were approved in 2019. These species additions will also be recommended for addition to the Installation Design Guide. The use of fertilizers is discouraged in all seedings. ITAM will continue to work closely with the DPW Environmental Division to determine acceptable seed mixes for use on Fort Carson and the PCMS. Salvaging existing top soil and or bringing in top soil is critical to getting native seeds mixes to take in an arid/semi-arid environment. Soil amendments such as compost can be used. It is worth working with the CSU extension office to get soil tested to determine organic matter and nutrients to determine if it is a suitable seed bed. There should also be a schedule that outlines preferred seeding time frames. If seed is planted during summer or too late in the year, it might have a lower probability of getting established.

Erosion Control

Erosion control in its broadest definition includes most LRAM projects. LRAM's BMPs for erosion control usually involve bank sloping, various water flow control structures, and often the use of geotextile and/or rip-rap.

At Fort Carson and the PCMS, historical land use has caused degradation of the vegetation that normally traps, uptakes, and transpires rainfall and snowmelt. Reduction in plant cover results in soil loss by sheet and rill erosion, headcutting, and the formation of large gullies. Montmorillonite clays in the soils allow the sides of eroded waterways to remain steep instead of collapsing to a shallower angle of repose, facilitating the formation of deep gullies that interfere with training activities.

Reduced plant cover and disturbed soil caused by military training activities can cause accelerated soil loss due to water and wind erosion. The amount of plant cover on the soil surface at the time of a rain or wind storm is the primary factor in preventing erosion. Canopy and basal cover, species composition, root structure, and distribution are all important factors to reduce erosion. Plants and litter form a protective cover that can mitigate impacts of wind and water, promoting favorable surface conditions to improve water uptake by vegetation.

Bank sloping is the process of contouring the banks of gullies to an angle where vegetation can be successfully established, stabilizing and bringing an area into hydraulic balance. Bank sloping also enhances military training by facilitating maneuvers and reducing safety hazards. Bank sloping, using various methods, has been conducted on a modest scale for years at Fort Carson and the PCMS. Some gullies and arroyos are natural, and, if those are not in highly utilized areas, will likely be retained in their natural state. Each location will be addressed individually. Areas that are safety risks but need to be retained for wildlife habitat will be marked with boulders or Seibert stakes.

Another BMP used to help curtail erosion due to military training at Fort Carson and the PCMS is enhancing existing EMTs (historically known as erosion control dams or sediment basins). Whereas previous design criteria were based solely on slowing surface water movement across the training areas, the current design criteria involve building up material on the back side of existing dams to widen the top of the dams (from less than 25 feet wide to a maximum of 40 feet wide) such that military vehicles can traverse them, even during runoff events (minimizing soil and vegetation impacts). Culverts are installed at a height that allows a maximum basin capacity of 2 acre-feet in older dams where culverts were not part of the original design. Sides of dams are also reduced to no steeper than a 4:1 slope, allowing vehicles to climb and descend them with far less impact, and minimizing the rollover hazard. Any damage to original erosion control dams is repaired at the time of enhancement. Enhanced dams are reseeded, and after vegetation recovery, are re-opened for military training use.

Bank sloping has been used in conjunction with other hydraulic controls, such as EMTs, aggressive plant material management, and other erosion control structures. Fort Carson has approximately 450 erosion control dams and over 60 EMTs. PCMS has approximately 430 erosion control dams and over 70 EMTs. ITAM maintains the database for these dams, with ITAM providing data as new and enhanced EMT projects are completed.

Maneuver Trail Management

Since first used for military training, the number and length of roads and trails on both facilities have been increasing. Maneuver trails often contribute to soil erosion and sedimentation by reducing infiltration and concentrating runoff. Eroded maneuver trails, the network of unpaved trails within a training area that are used by tactical vehicles and equipment for light or heavy maneuver training, can be improved with rehabilitation, the construction of low water crossings, and certain erosion control structures such as water bars and wing ditches. Duplicate or unnecessary maneuver trails are recovered by ripping (if necessary), installing water bars, smoothing and/or reseeding. Major, lettered Tank Trails downrange and major, numbered MSRs at Fort Carson and the PCMS are maintained by DPW.

Hardened Sites

Some staging areas, bivouac sites, wet area crossings, Forward Aerial Refuel and Rearm Points (FARRPs), Helicopter Landing/Pickup Zones, etc. on Fort Carson and the PCMS are used repeatedly for training purposes. This repeated use has resulted in areas that are denuded of vegetation with compacted soils. As a result, these areas significantly contribute to fugitive dust and increased sedimentation. They also have very limited realistic training features. These areas cannot be easily rehabilitated in a cost effective manner to a sustainable state that can continue to support heavy use, but they often can be hardened using layers of gravel, road base, and small rock to facilitate military use and reduce soil erosion and associated sedimentation into nearby drainages and waterways.

Coordination

- Fort Carson

LRAM projects often require coordination with other Fort Carson organizations, particularly DPW. NEPA review is generally required. Prior to any construction activities that create any soil disturbance, NEPA review and an archaeological clearance is obtained. Other activities that require coordination include projects that affect wildlife or its habitat and similar activities.

- U.S. Army Corps of Engineers

There may be instances where LRAM structures are planned to be placed in areas that contribute water directly to existing drainages recognized by the USACE as being Waters of the United States, as identified in Section 404 of the Clean Water Act. Any construction of LRAM structures is coordinated with the USACE in Pueblo, Colorado, to determine if a 404 permit is necessary prior to construction. If a permit is required, it is processed prior to construction. Fort Carson has received Army Regional Permit No. SPA-2014-1002-SCO from the USACE, which allows most LRAM activities on Fort Carson and the PCMS to occur without separate permitting actions. Fort Carson obtained a new five-year regional permit in 2019.

- Colorado State Permits

The State of Colorado requires that an application for every EMT on Fort Carson or the PCMS be submitted and approved prior to construction. Required information is submitted to the Colorado Division of Water Resources along with a processing fee for approval and processing. This requirement is contained in the Erosion Control Act of Colorado, CRS 37-87-122.

LRAM Goals

Goal 1. Use LRAM efforts to restore and maintain lands to full training support capability.

Goal 2. Coordinate with adjoining private, state, and federal land managers to protect lands from the effects of military training by reducing fugitive dust, soil erosion, and sedimentation (caused by military training) within current land management strategies.

Goal 3. Reduce the safety hazards and improve Field Training Exercises (FTX)/maneuverability training for the units using Fort Carson and the PCMS.

Goal 4. Improve the maneuver trails network to facilitate the movement and resupply operations for all units training on Fort Carson and the PCMS.

Goal 5. Maintain the line of sight and the capability for all units to provide Command and Control (C2) and assembly areas in the training areas.

Goal 6. Enhance the capability of dismounted and mounted units to train in preparation for operations in other areas of the globe.

Goal 7. Improve and/or sustain drop FARRPs and Helicopter Landing/Pickup Zones.

4.w. (5) Training Requirements Integration (TRI)

The TRI component provides a decision support capability based on the integration of training requirements, land conditions, range facilities, and environmental management requirements. The installation ITAM Coordinator must consult with the DPTM Range Officer, other range organization personnel, trainers, environmental technical staff, natural and cultural resources managers, and other environmental staff members to integrate the following inputs:

- Training requirements;
- Land management, training management, and natural and cultural resources management data; and
- Data derived from the RTLA and Army conservation program components, among others.

TRI provides input for developing and updating the INRMP. TRI also supports range modernization project siting, and training event scheduling and allocation.

Coordination
Close coordination between DPTMS and DPW is key to the successful implementation of the Fort Carson ITAM Program/TRI. ITAM, based upon recommendations from the LRAM and RTLA Coordinators, initiates processes to recommend land use design and management considerations to trainers and planners. ITAM coordinates with them on scheduling and allocating sustainable land use for military training with minimum environmental damage. Interfacing land rehabilitation actions with training needs helps ensure mission support.

Mission Safety
Some environmental restrictions and programs enhance mission safety. For example, the revegetation of bare landing zones reduces dangerous “brownouts” for helicopters. Proper road construction and maintenance improves driving safety. Bank sloping reduces rollover risk for maneuvering vehicles. Fire restrictions reduce the potential for wildfires, which can injure troops or damage equipment and facilities.

Training Restrictions
Restrictions on training are sometimes necessary for long-term sustainment of training and ecosystem protection, including environmental compliance. Restrictions on troops training on Fort Carson and the PCMS are within FC Reg 350-1 *Mountain Post Training*, FC Reg 350-10 *Maneuver Damage Control Program*, FC Reg 350-11 *Firing Ammunition for Training, Target Practice, Administration and Control of Ranges and Training Areas* and supplemental maps of both installations which delineate off-limits and limited-use areas and are updated periodically. Some restrictions are directly tied to compliance with various laws and regulations (*e.g.*, cultural/archeological resource sites), but many are being implemented according to clear guidance from both Department of Defense and Department of the Army to manage natural resources for long-term sustained military use (*e.g.*, limited-use areas, described below).

In some cases, troop units using either Fort Carson or the PCMS must coordinate with the DPTMS and DPW for site-specific restrictions needed for safety and compliance purposes (*e.g.*, permission to dig large excavations, precluding hitting buried utilities and archeological sites). Troops are briefed regarding training restrictions via monthly, or as necessary, Sustainable Range Awareness classes and/or informed of expectations and rules during the scheduling process (see below). Restrictions

are often "invisible" to troops and are imposed during the scheduling process (*e.g.*, training area not available; certain firing positions not available for live fire). Other restrictions can be incorporated into training scenarios. For example, military leaders can inform their units that fenced areas represent "known mine fields."

Restrictions on off-road travel, removal of vegetation, and the filling of holes can be tactically sound. Off-road travel leaves signs for the enemy to track units or determine unit strength. Removed vegetation and foxholes and other dug areas are indications of unit strength to enemy intelligence. This type of damage can also be defined as "tactical signature" - information produced by a unit's activities that can be seen and used by the enemy to determine where it is, where it has been, how big it is, the type of vehicles it has, and what it is doing. Reducing tactical signature can equate to reducing maneuver damage in the training areas, a concept taught at Fort Carson during Sustainable Range Awareness briefs. Thus, it is important to fit environmental restrictions into tactically-realistic training scenarios.

Limited-Use/Rest Rotation/Deferment Program

The purpose of Fort Carson's limited-use area program is to recover key military terrain in as cost- and time-efficient a manner as possible. Downrange at Fort Carson, key terrain that has been heavily impacted by military training will be evaluated for possible inclusion in the limited-use area program. Areas impacted to the point of imminent critical erosion loss will be included, to provide rest from use, required by the rangeland resource to meet the essential biological and physiological requirements needed to maintain proper health and vigor for maintenance, growth and recovery of the area, while still providing for effective, sustainable military training. Placement in limited-use status also provides the time and means to perform land rehabilitation and land maintenance operations in heavily degraded areas. In these designated areas, vehicles may drive through on roads and trails, and dismounted training may be conducted off the trails. However, it is not permitted to dig, to bivouac, or to drive vehicles off the roads in these areas. All limited-use areas are reviewed on a three-year cycle, in order to determine their recovery status. Under optimum conditions, an area may be re-opened to training after approximately three growing seasons.

TRI Goal
Improve communication between training and land management staff to facilitate the integration of Fort Carson's military training needs for land use on both Fort Carson and the PCMS with the sustained capability of the land to support such use.

4.w. (6) Sustainable Range Awareness (SRA)

The SRA component provides a proactive means to:

- Develop and distribute educational materials to users of range and training land assets;
- Integrate SRA into existing command and/or installation operational awareness activities and events; and
- Initiate new events that maximize outreach for the command.

SRA materials relate procedures that reduce the potential for inflicting avoidable impacts on range and training land assets, including the local natural and cultural resources.

The Environmental Battle Book, prepared by DPW, is designed to provide commanders, unit leaders, and soldiers with an overview of Fort Carson environmental programs. The Handbook includes

environmental training programs, pollution prevention and waste minimization, hazardous materials and wastes, spill prevention and response, air emissions, noise pollution, energy conservation, natural and cultural resources, public and agency involvement, and similar topics. ITAM, in conjunction with DPW, has produced a Soldiers Field Card, which lists some “do’s and don’ts” of training area usage for military personnel.

The Maneuver Damage Control Program briefing is part of an exportable package, which can be transferred to off-post units, to be used to teach those units prior to their arrival for training on Fort Carson or the PCMS, thereby reducing travel costs and administration time on their arrival.

ITAM-supported environmental training that is available to military personnel who use Fort Carson and/or the PCMS include:

- Monthly (or as needed) courses for maneuver damage control personnel,
- Leaders’ walk-through courses for incoming unit commanders,
- National Guard/Reserve Component pre-camp briefings, and
- SRA/Maneuver Damage Control classes at units’ home stations.

An education strategy encompasses the integration of educational materials with command support. Educational materials provide information about the problem, why it is everyone’s problem, and how following existing rules and regulations will help alleviate it. Materials also address issues concerning combat effectiveness and the environment.

Information about environmental conservation and protection is provided in presentations, formal and informal briefings, pamphlets, videos, and instructional classes. Materials contain examples of appropriate and inappropriate training actions or vehicular movements along with their effects. The concepts of the Maneuver Damage Control Program are emphasized. The major theme stressed is that environmental deterioration affects overall success of the training and/or tactical mission. The following are also emphasized within the SRA program:

- Maneuver Damage Control Program;
- Notification on the location of areas that are off-limits, as well as areas that are designated limited-use areas (the Limited-Use/Rest Rotation/Deferment Program);
- Proper field operation tactics (to include tactical signature awareness), which minimize damage to land and vegetation;
- Establishment of a conservation ethic that also promotes the accomplishment of the military training mission;
- Adherence to federal, state, Fort Carson and Department of the Army/DoD laws and regulations, training procedures that best protect the environment, and training restrictions;
- Safety hazards, such as gullying, etc., which can lead to the loss of personnel (*i.e.*, serious injury or loss of life), and/or to the loss of, or serious damage to equipment;
- Badly damaged acreage in training areas reduces land available for quality training;

- Minimize damage to trees, wetlands, and wildlife habitat (where necessary);

- Costs resulting from damage to natural resources place added burdens on already strained budgets (*e.g.*, cleaning up roadways; construction, operation and maintenance of sediment basins; litigation from adjoining landowners; fines for violations of natural resource laws/regulations; lost training time; repair of damaged equipment); and
- Damage to highly valued natural resources can discredit the Army in the minds of local citizenry (and others).

However, SRA also makes it clear that military and/or security considerations are sometimes more important than environmental issues, while still demonstrating that such environmental issues are being considered.

SRA Goals

Goal 1. Improve communication between training and land management staff to facilitate the integration of Fort Carson's military training needs for land use on both Fort Carson and PCMS with the sustained capability of the land to support such use.

Goal 2. Facilitate the reduction of training restrictions on Fort Carson and the PCMS.

Goal 3. Increase awareness of tactical signature by increasing combat effectiveness while decreasing environmental damage.

4.w. (7) Geographic Information System

All aspects of the Fort Carson ITAM Program utilize GIS to support land use planning decision processes. RTLA data provides information to help effectively manage land use and natural resources. Resulting maps and other data are used to help prioritize potential LRAM projects. TRI utilizes the GIS information to ensure adequate, available training lands for military training. Problems due to improper land use are identified in GIS, to be communicated, along with acceptable tactical solutions, to land users during SRA briefings.

The ITAM GIS is a state-of-the-art information source for military decision makers. Accurate spatial information is available for map production or detailed site analysis.

There are two GIS operations that directly affect implementation of this INRMP. DPW has GIS databases that are needed to implement certain projects within this INRMP (*e.g.*, utility lines, facilities, etc.). This GIS database contains a great deal of data on natural resources on Fort Carson and the PCMS. The following paragraphs describe the GIS operations within the ITAM Program.

Uses of the ITAM GIS include recording locations of RTLA plots, providing spatial analyses (soil types, slope, vegetation, etc.) for LRAM project design, showing environmentally sensitive areas, planning military training missions, etc. Given that the Army has evolved around the "Digital Division" concept, GIS technology has become a tool more prevalently used for decision-making and problem solving.

There is a need to monitor changes to the Fort Carson and the PCMS landscape on a regular basis, particularly to quantify impacts of military activities on the land. The acquisition of aerial photographs and other imagery on a regular basis of both Fort Carson and the PCMS has facilitated such change detection analyses.

It is important for ITAM to be able to directly assist military units planning training missions at Fort Carson and the PCMS. More effective prior planning, due to supplied SRA materials, GIS data and specialized map products, allows non-tenant units more field time during training periods at Fort Carson and the PCMS.

Fort Carson's ITAM Program is working closely with the military (geospatial) "Terrain Teams" on post, to share data, coordinate efforts and enhance each organization's decision-support systems, all in an attempt to promote more effective use of Fort Carson and the PCMS's training lands.

Fort Carson is using virtual reality (simulated) training to more cost-effectively train its soldiers. This training requires GIS databases that accurately portray training features in a 3-D setting. The ITAM GIS has and is developing additional features that have assisted with database development for this type of training.

GIS Goal
Provide spatial products and analyses to support ITAM Program implementation, military mission planning and training, and land use decision-making.

Recurring actions for Integrated Training Area Management (ITAM)
(Please note: The following proposed actions are in priority order from 1 to 5. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

1. Provide training to military units and civilians to understand safety hazards, as well as, cultural and environmental resource issues.

2. Develop and implement safety, maneuver access projects, and provide erosion control measures and structures to mitigate maneuver impacts within the training areas.

3. Monitor and assess maneuver impacts on the condition of soils, vegetation, and watersheds.

4. Develop and provide map products, as well as, provide documentation and information for the Range Operations Sustainable Range Program and military customers.

5. Update and maintain databases on downrange training facilities, structures, and resources.

4.x. Bald and golden eagle management

Golden eagle nest

The Bald and Golden Eagle Protection Act (BGEPA), which prohibits the taking of bald or golden eagles, regulates protection of eagles. The statutory definition of take includes disturbance as a form of take. In the Code of Federal Regulations (50 CFR § 22.3), "disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." Additionally, bald and golden eagles are protected by the MBTA, by DoD policy expressed

in the MOU with USFWS to promote the conservation of migratory birds, and by permit requirements at 50 CFR parts 13 and 22.

The golden eagle is a year-round resident of Fort Carson and the PCMS, and is most abundant in winter. Several golden eagle eyries (nests) are present on Fort Carson and two to three of those nests are occupied annually from January-August. On PCMS, golden eagles nest annually on the hogback between February and August. Active golden eagle nests at the PCMS are usually found annually on the hogback during the same time frame.

The bald eagle is known to nest within three miles of Fort Carson's northeastern boundary, but has not been observed to nest on Fort Carson or the PCMS or within their region of influence. The bald eagle is primarily present on Fort Carson and the PCMS in migration and winter from late October through March, and there have been a small number of bald eagles observed foraging on Fort Carson during the nesting season.

An Eagle Incidental Take Permit (#MB24802C-1) was issued to Fort Carson in 2017 for a five-year term with an effective date of 4 April 2017. This permit was issued to Fort Carson due to on-going disturbance to the nest from military training and anticipated work to Teller Reservoir Dam. This permit also has mitigation measures for historical nest locations at Rule Canyon, Teller Reservoir, and TA 56. In accordance with the permit, when a golden eagle nest is known to be occupied at Fort Carson, a no-surface-disturbance buffer zone of ½ mile is established, with the exception of approved Teller Dam work. The aircraft buffer zone is 500' or 1000' above ground level (AGL), depending upon the location of the nest. The permit also requires annual reporting to USFWS on nest monitoring efforts and nest status. New nest locations within the general vicinity of three nests outlined in the permit will also be monitored per the permit requirements.

When a golden eagle nest is known to be occupied at either installation, protection is achieved by restricting activities in a half-mile radius buffer zone until the young have fledged, as recommended by the USFWS National Bald Eagle Management Guidelines, May 2007. The buffer zone is to exclude aircraft operations, and vehicle and foot traffic. On Fort Carson and the PCMS, as soon as a nest is declared to be active, a NOTAM is issued and barriers with signage are placed on all roads that lead to the nest. Active eyries are protected January through the fledging season, generally in July.

Both species depend on the prairie dog, a significant prey resource. On Fort Carson, the most important eagle hunting areas are Sullivan Park; Training Areas 9, 10, 16, 50, and 54; and colonies along the eastern boundary of the Large Impact Area. However, both golden and bald eagles are observed throughout the installation. Bald eagles scavenge big game viscera and coyote carcasses during the hunting season, which can expose eagles to lead. Eagles nesting west of Fort Carson have been observed hunting and carrying prey from the installation. On PCMS, golden eagles have been observed throughout the installation, usually associated with prairie dog colonies. The use of lead shot for waterfowl hunting was banned nationwide in 1991. Hunters on Fort Carson and the PCMS are encouraged to use nontoxic shot, especially for harvested meat.

The primary threats to eagles are risk of secondary poisoning, electrocution, disturbance during the breeding season, particularly low-level helicopter flights and human activity in the vicinity of an active eyrie, loss of prey to sylvatic plague, and lead ingestion. Both species make extensive use of power poles for perching, and there is a recent record of a golden eagle killed on Fort Carson and a juvenile golden eagle killed on the PCMS by electrocution. In both cases, the eagle fatalities were reported to CPW and the "killer poles" were quickly mitigated to prevent future electrocutions.

Recurring actions for bald and golden eagle management

(Please note: The following proposed actions are in priority order from 1 to 4. They will be implemented beginning with 1 as funding and manpower become available. However, priorities can change for various reasons such as changes in military mission, and events such as storms and fires.) Appendix 8 of this INRMP has a column in the tables showing which projects are requirements and which are BMPs.

1. Continue to review project proposals for potential conflicts with the BGEPA and identify permits, documents, collaboration, and recommend mitigation to avoid violations. Consultation with USFWS law enforcement and permit office may be required to ensure actions are adequately mitigated.

2. Continue to conduct compliance-monitoring surveys at project sites and coordinate required mitigation with action proponents and/or law enforcement.

3. Continue to conduct annual eagle eyrie surveys. Identify and map active eyries and provide locations to Range Control and Butts Army Airfield for protecting occupied sites. Active eyries will be protected with a buffer zone from January through the fledging season, generally in July.

4. Continue assessment of risk of electrocution of hawks, eagles, and owls to include identification and mitigation of high-risk poles.

5. IMPLEMENTATION

5.a. Process of preparing management prescriptions

Management prescriptions are prepared by program managers and supporting staff. In addition to the recurring actions listed in Chapter 4, annual work plans are created, within the framework of the prescriptions, to accomplish specific objectives (Appendix 8). These projects are then reviewed by appropriate DPW staff, to include NEPA review, and eventually approved by the Conservation Branch Chief. Once approved, projects are accomplished as funding permits.

The U.S. Fish and Wildlife Service and the Colorado Division of Parks and Wildlife will have opportunities to review the project list approved by the Conservation Branch Chief, as well as the list of projects approved by IMCOM, during the annual reviews of this INRMP.

ITAM projects go through a similar process of development, from prescription to projects, review by NEPA, and approval by the DPTMS/ITAM chain of command.

5.b. No net loss

This INRMP strives to ensure no permanent net loss of military training capability on Fort Carson and PCMS lands as a result of discretionary natural resource restrictions.

Currently, there are no significant restrictions to training because of natural resource issues. Although training is restricted at Fort Carson and the PCMS within a half-mile buffer of active nests, nests are few, and the restrictions are temporary.

5.c. Cooperative agreements

Fort Carson has an Intragovernmental Support Agreement (IGSA) with USGS to assist with management of water resources, and includes hydrological, water quality, and water rights monitoring. Fort Carson also has an IGSA with the USDA Animal and Plant Health Inspection Service (APHIS) Wildlife Services for wildlife damage activities, to include migratory bird and beaver damage mitigation activities and prairie dog control work at airfields.

5.d. Funding process

In order to function effectively, the INRMP must be integrated with the funding cycle. Appendix 8 contains the annual work plan for natural resources programs. The specific projects listed in Appendix 8 are prioritized and then funded as monies are available. Natural resource management relies on a variety of funding mechanisms, some of which are self-generating and all of which have different application rules. Most require relatively long lead times, typically one to three years.

All requirements set forth in this INRMP requiring the expenditure of funds are expressly subject to the availability of appropriations and the requirements of the Anti-Deficiency Act (31 U.S.C. Section 1341). No obligation undertaken by Fort Carson under the terms of this INRMP will require or be interpreted to require a commitment to expend funds not obligated for a particular purpose.

Below are general discussions about different sources of funding to implement this INRMP. As noted, not all of these are now used by Fort Carson. Funding requested by the directorates to execute their portions of this INRMP is distributed by IMCOM based on the General Fund Enterprise Business

System (GFEBS) decision process. It enables successful uniform delivery of the Army's highest priority installation services, with available funds.

Environmental program funds

The GFEBS provides the primary means for identifying the current and projected environmental requirements and resources needed to execute the Fort Carson natural resources program and achieve the Conservation Strategic Goal. GFEBS is used for a variety of purposes, such as planning, programming, budgeting, and forecasting costs; as well as tracking project execution, monitoring performance, and documenting expenditures.

Environmental funds are set aside by DoD for environmental purposes, but these funds are subject to restrictions. Compliance with laws is a significant factor in prioritizing environmental funding. Environmental funds are most commonly used for projects that return the installation to compliance with federal or state laws, especially if noncompliance is accompanied by notices of violation or other enforcement agency actions.

"Must fund" classifications include mitigation identified within NEPA documents and items required within federal facilities compliance agreements. In addition, the Sikes Act requires implementation of INRMPs, which makes implementation of this INRMP a priority for funding. Most funding for this INRMP implementation is anticipated to come from environmental funds.

Forestry funds

There are several sources of funds for forest management: Environmental; Army Reimbursable Account; Forestry Reserve Account; USFS pest control funds, and DoD Legacy Program. At present, the main source of funds used is from the Environmental funds. The focus is on forest ecosystem management. Funds can be used for such things as density management or thinning, inventories, tree marking, inspections, contract preparation, GIS work, personnel training, etc.

In order to receive funds from the Reimbursable Account, an installation must have contributed funds from the sale of forest products. Fort Carson and the PCMS typically contribute less than $5,000 per year, and thus can expect to usually receive funds in approximately that amount. AR 200-1, Chapter 4, outlines collection and expenditure systems.

When the reimbursable account, managed centrally by AEC, has income in excess of its expenses, the excess goes into the Forestry Reserve Account (FRA). Any installation may apply and compete for those funds, whether that installation has sold forest products or not. The FRA is normally used for forest management and wildland fire type projects or procurement, however it can also be used for other natural resource projects. Guidance is published annually.

If an installation is experiencing an outbreak of forest insect or disease pests, application can be made to the USFS for technical assistance, as well as funding to control the pest(s).

Sikes Act funds

Sikes Act funds are collected via sales of licenses to hunt or fish. They are authorized by the Sikes Act and regulated by AR 200-1 and AR 215-1. These funds may be used only for the protection, conservation, and management of fish and wildlife on the installation where they are collected, in accordance with this INRMP. These funds are available for obligation until expended; they are not annual funds. Fort Carson receives on average $40,000 annually to fund fish and wildlife programs through the sale of permits. Army policy encourages self-sufficiency with regard to managing game populations on military lands. Fort Carson will, from time to time, examine options to increase Sikes Act income to maintain its quality hunting and fishing program.

Agricultural funds
Agricultural funds are derived from agricultural leases on installations. They are centrally controlled at Department of Army and Army Command levels with no requirements for spending where they were generated. AR 200-1, Chapter 4, outlines procedures for collecting and spending these funds. They are primarily intended to offset costs of maintaining agricultural leases, but they are also available for preparing and implementing INRMPs. These are the broadest use funds available exclusively to natural resources managers. Fort Carson is authorized to request agricultural funds since there is no requirement for funds to be generated at spending installations. Fort Carson DPW-Environmental Division has not competed for these funds for many years.

Operations and maintenance funds
Certain projects within this INRMP are either partially or fully funded with DPW Operations and Maintenance funds. Invasive species management (Section 4.h), Urban forestry management (Section 4.t.), Water rights management (Section 4.u.), and Pest Management (Section 4.i) are in this category.

Training funds
Fort Carson and the PCMS, combined, is a Category I installation with regard to DPTMS implementation and funding (Department of the Army 1995). The Web-based Work plan Analysis Module is used to channel DPTMS funding requests from Fort Carson, through IMCOM and the Army Training Support Center, to the Office of the Deputy Chief of Staff for Operations and Plans.

Natural resources enforcement funds
The DES is responsible for funding natural resources law enforcement.

Other Funding
The portions of the outdoor recreation program that are not directly involved with hunting and fishing are funded with non-appropriated funds and are not included within this INRMP's costs.

5.e. Staffing

The following staffing is currently authorized within DPW to implement this INRMP.

Table 5-1. DPW Environmental Division/Conservation Branch staffing

Position	Number	Type
Supervisory Natural Resources Specialist	1	GS-13
Natural Resources Team Lead	1	GS-12
Natural Resources Specialist	2	GS-11
Wildlife Biologist	2	GS-11
Wetlands Program Manager	1	GS-11
Invasive Species/Pest Management Program Manager	1	GS-11
Forester	1	GS-11
Wildland Fire Program Manager	1	GS-9

LITERATURE CITED

Armstrong, D.M. 1972. Distribution of Mammals in Colorado. Monograph 3. Museum of Natural History, University of Kansas, Lawrence, KS.

Blake, M. 2019. Piñon Canyon Maneuver Site Prairie Dog and Burrowing Owl Survey 2019. Fort Carson, CO.

Brown and Cadwell and Pikes Peak Regional Water Authority. 2019. Fountain Creek Watershed Environmental Protection Agency Nine-Element Plan for the Management of *Escherichia Coli*. Prepared for the Section 319 Nonpoint Source Pollution Control Program, Water Quality Control Division, Colorado Department of Public Health and Environment.

Burnett, S. 2019. Fort Carson Military Reservation and Piñon Canyon Maneuver Site Range and Training Land Assessment Plan and Protocols 2018-2025. Integrated Training Area Management Plan, Fort Carson, CO.

Center for Biological Diversity, And Defenders of Wildlife. 2016. Petition to list the tri-colored bat, *Perimyotis subflavus*, as a Threatened or Endangered under the Endangered Species Act. The Center for Biological Diversity, San Francisco, California, USA and Defenders of Wildlife. http://publicpower.org/files/PDFs/TricoloredBatPetition_06-14-2016.pdf (6 February 2019).

Center for Environmental Management of Military Lands and Army Environmental Center. 2006. Handbook of Effective Practices for Range and Training Land Assessment (RTLA) Coordinators. Colorado State University, Fort Collins, CO.

Colorado Division of Wildlife. 2008. Recommended survey protocol and actions to protect nesting Burrowing owls. Revised 2/2008.

Colorado Natural Heritage Program. 2007a. Rare Plant Surveys on Fort Carson 2006-2007. Prepared for the U.S. Fish and Wildlife Service, Lakewood, CO.

Colorado Natural Heritage Program. 2007b. Rare Plant Surveys on Piñon Canyon Maneuver Site 2006-2007. Prepared for the U.S. Fish and Wildlife Service, Lakewood, CO.

Colorado Parks and Wildlife. 2015. State Wildlife Action Plan: A Strategy for Conserving Wildlife in Colorado. Denver, Colorado. https://cpw.state.co.us/aboutus/Pages/StateWildlifeActionPlan.aspx

Colorado State University. 2001. Forest Inventory of the U.S. Army Fort Carson Military Reservation and the Piñon Canyon Maneuver Site. Final report. Fort Collins, CO.

Dames and Moore. 1978. Fort Carson, Colorado: Terrain Analysis. Washington, D.C. Under direction of Terrain Lab, Fort Belvoir, VA.

Follett, D. 2014. Space and habitat use by non-migratory female mule deer (*Odocoileus hemionus*) in a semi-arid environment. Thesis with the University of Colorado at Colorado Springs.

Fort Carson Directorate of Emergency Services. 2014. Integrated Wildland Fire Management Plan – Fort Carson/Piñon Canyon Maneuver Site, 2014-2019, Department of the Army. Fort Carson, Colorado.

Fort Carson Directorate of Public Works. 2015. Integrated Pest Management Plan for Fort Carson and Piñon Canyon Maneuver Site. Fort Carson Mountain Post, Fort Carson, Colorado.

Fort Carson Directorate of Public Works – Conservation Branch. 2020. Fort Carson and Pinon Canyon Maneuver Site Fuels Management Plan, FYs 2020-2025. Fort Carson, Colorado.

Fort Carson Directorate of Public Works, Environmental Division. 2017. Stormwater Management Plan. Fort Carson, Colorado. 270 pp.

Fort Carson Public Affairs and Information Office. 1972. Fort Carson: A tradition of victory. Fort Carson, Colorado.

Gene Stout and Associates. 2002a. Biological Assessment and Management Plan for the Mountain Plover on Fort Carson and Piñon Canyon Maneuver Site. Prepared for the Directorate of Environmental Compliance and Management, Fort Carson, CO. Loveland, CO. 32 pp. + appendix.

Gene Stout and Associates. 2002b. Biological Assessment and Management Plan for the MSO on Fort Carson. Prepared for the Directorate of Environmental Compliance and Management, Fort Carson, CO. Loveland, CO. 26 pp.

Gene Stout and Associates. 2007. Fort Carson and the PCMS Integrated Natural Resources Management Plan, 2007-2011. Loveland, CO.

Gillihan, S.W. 2006. Sharing the land with pinyon-juniper birds. Partners in Flight Western Working Group. Salt Lake City, Utah.

Horne Engineering Services, LLC. 2015. The Conservation Reimbursable and Fee Collection Programs Handbook. Participating in the U.S. Army's Forestry Program, Agriculture and Grazing Outlease Program, and Fish and Wildlife Conservation Fund. Prepared for U.S. Army Environmental Center.

HDR. 2016. Fort Carson Water Rights Inventory and Master Plan, W912DQ-11-D-3007-DK02. Prepared for Fort Carson Directorate of Public Works.

IMCOM/AEC Memorandum. 28 July 2008. Subject: Interim Guidance – Unintentional Take of Migratory Birds for Actions Other Than Military Readiness Activities.

Klute, D.S., L.W. Ayers, M.T. Green, W.H. Howe, S.L. Jones, J.A. Shaffer, S.R. Sheffield, and T.S. Zimmerman. 2003. Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States. U.S. Department of Interior, Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R6001-2003. Washington, D.C.

Leonard, G.J. 1984. Assessment of Water Resources at Fort Carson Military Reservation near Colorado Springs, Colorado. Water Resources Investigation Report 83-4270. Prepared for U.S. Department of the Army, Fort Carson Military Reservation, by U.S. Geological Survey, Lakewood, CO. 78 pp.

Linn, J.C. 2007. African Rue Management Plan. Fort Carson, CO.

Linn, J.C. 2007. Invasive Plants Management Plan for Fort Carson and the Piñon Canyon Maneuver Site. Fort Carson, CO.

Linn, J.C. 2007. Myrtle Spurge Management Plan. Fort Carson, CO.

Office of the Assistant Secretary of the Army for Installations, Energy, and Environment. 2017. Army Environment, Safety, & Occupational Health Strategy 2025.

Office of the President. 1994. Presidential Memorandum, Environmental Practices on Federal Grounds. http://govinfo.library.unt.edu/npr/library/direct/memos/25f2.html

Peyton, R.D. 2008. Multiple scale habitat affinities of small mammal assemblages on the Niobrara Chalk Barrens at Fort Carson Military Reservation in Pueblo County, Colorado. M.S. thesis, University of Colorado at Colorado Springs. Colorado Springs, Colorado.

Polzin, C. 2000. Plant Community Associations of Fort Carson, Colorado. Prepared by the U.S. Fish and Wildlife Service for the Directorate of Environmental Compliance and Management, Fort Carson, CO. Denver, CO. 218 pp.

RAND Arroyo Center. 2015. A Guide to Army Installation Water Rights. Santa Monica, California.

Riddle, R.R. 2018. Management Plan for the Black-tailed Prairie Dog at Fort Carson and Piñon Canyon Maneuver Site. Fort Carson, CO.

Shaw, R.B., S.L. Anderson, K.A. Schulz, and V.E. Diersing, 1989. Plant Communities, Ecological Checklist, and Species List for the U.S. Army Piñon Canyon Maneuver Site, Colorado. Colorado State University, Fort Collins, CO. 71 pp.

U.S. Army Corps of Engineers. 2008. Regional Permit No. SPA-2008-00058-SCO. US Army Corps of Engineers Southern Colorado Project Office, Pueblo, CO.

U.S. Department of the Army. 1995. Integrated Training Area Management (ITAM) Program Strategy. Headquarters, Washington, DC. 66 pp. + appendices.

U.S. Department of the Army. 1999. ITAM Procedural Manual. Washington, D.C.

U.S. Fish and Wildlife Service. 2019. Endangered Species, Listing and Critical Habitat, National Listing Workplan. https://www.fws.gov/endangered/what-we-do/listing-workplan.html

Von Guerard, P., P.O. Abbott, and R.C. Nickless. 1987. Hydrology of the U.S. Army Piñon Canyon Maneuver Site, Las Animas County, Colorado. Water-Resources Investigations Report 87-4227. Prepared in cooperation with U.S. Department of the Army, Fort Carson Military Reservation, CO. U.S. Geological Survey, Pueblo, CO. 117 pp.

Von Guerard et al. 1993. Fort Carson 2013 weather data.

Western Association of Fish and Wildlife Agencies. 2017. Recommendations for Adaptive Management of Chronic Wasting Disease in the West. WAFWA Wildlife Health Committee and Mule Deer Working Group. Edmonton, Alberta, Canada and Fort Collins, Colorado, USA.

Wildland Fire Support Center. 2017. Wildfire Risk Assessment Fort Carson. Prepared for Army Installation Management Command by The Center for Environmental Management of Military Lands, Fort Carson, CO.

Wildland Fire Support Center. 2018. Wildfire Risk Assessment Pinon Canyon Maneuver Site. Prepared for Army Installation Management Command by The Center for Environmental Management of Military Lands, Fort Carson, CO.

Youngberg, E., A. Panjabi, R. Sparks and A. Shaw. 2016. Bird Conservancy of the Rockies Best Management Practices for Grassland Birds. Prepared for the Colorado State Land Board, September, 2016.

APPENDIX 1: Acronyms

Acronyms used in this document

AAS	Alternatives Analysis Study
ACUB	Army Compatible Use Buffer
ACR	Armored Cavalry Regiment
AEC	Army Environmental Command
AGL	Above Ground Level
ANS	Aquatic Nuisance Species
AOA	Aircraft Operating Area
APHIS	Animal and Plant Health Inspection Service
AR	Army Regulation
ARPA	Archeological Resources Protection Act of 1979
AWP	Annual Work Plan
BAAF	Butts Army Airfield
BASH	Bird Aircraft Strike Hazard
BFF	Black-Footed Ferret
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BMP	Best Management Practice
BOID	Business Operations and Integration Division
BRAC	Base Realignment and Closure
CDA	Colorado Department of Agriculture
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CDPHE-AQCD	Colorado Department of Public Health and Environment Air Quality Control Division
CEMML	Center for Environmental Management of Military Lands
CFR	Code of Federal Regulations
CGP	Construction General Permit
CLEO	Conservation Law Enforcement Officer
CLS	Common Levels of Support
CNHP	Colorado National Heritage Program
CPW	Colorado Division of Parks and Wildlife
CRM	Cultural Resources Manager
CRS	Colorado Revised Statutes
CSFS	Colorado State Forest Service
CSP	Central Shortgrass Prairie
CSU	Colorado State University
CWA	Clean Water Act
CWD	Chronic Wasting Disease
CWPDA	Colorado Water Protective Development Association
CX	Categorical exclusion (NEPA process)
DAU	Data Analysis Unit
DECAM	Directorate of Environmental Compliance and Management
DES	Directorate of Emergency Services
DoD	Department of Defense
DoDI	Department of Defense Instruction
DPTMS	Directorate of Plans, Training, Mobilization and Security
DPW	Directorate of Public Works
DFMWR	Directorate of Family, Morale, Welfare, and Recreation
EA	Environmental Assessment
EC	Erosion Control

ECM	Encroachment Condition Module
EIS	Environmental Impact Statement
EMT	Elevated Maneuver Trail
EPA	Environmental Protection Agency
EPO	Environmental Protection Officer
ESA	Endangered Species Act
ESD	Ecological Site Descriptions
FARRP	Forward Aerial Refuel and Rearm Points
FC	Fort Carson
FC Reg	Fort Carson Regulation
FCFD	Fort Carson Fire Department
FEMA	Federal Emergency Management Agency
FNPA	Finding of No Practicable Alternative
FNSI	Finding of No Significant Impact
FOB	Forward Operating Base
FRA	Forestry Reserve Account
FREP	Front Range Ecoregional Partnership
FTX	Field Training Exercises
FWCFCP	Fish and Wildlife Conservation Fee Collection Program
FY	Fiscal Year
GFEBS	General Fund Enterprise Business System
GIS	Geographic Information System
GMU	Game Management Unit
HUA	High Use Area
ICRMP	Integrated Cultural Resources Management Plan
ID	Infantry Division
IGSA	Intragovernmental Support Agreement
IMCOM	Installation Management Command
INRMP	Integrated Natural Resources Management Plan
IPM	Integrated Pest Management
IPMC	Integrated Pest Management Coordinator
IPMP	Integrated Pest Management Plan
ITAM	Integrated Training Area Management
IWFMP	Integrated Wildland Fire Management Plan
LBB	Little Brown Bat
LCTA	Land Condition Trend Analysis
LRAM	Land Rehabilitation and Maintenance
LZ	Landing Zone
MBTA	Migratory Bird Treaty Act
MDEP	Management Decision Package
MILCON	Military Construction
MOPL	Mountain Plover
MOU	Memorandum of Understanding
MOUT	Military Operations on Urbanized Terrain
MRA	Military Readiness Activity
MS4	Municipal Separate Storm Sewer System
MSGP	Multisector General Permit
MSO	Mexican Spotted Owl
MSR	Main Supply Route
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act of 1966
NOI	Notice of Intent

NOTAM	Notice To Airmen
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NWCG	National Wildfire Coordinating Group
NWI	National Wetlands Inventory
NWP	Nationwide Permit
O&M	Operations and Maintenance
P-J	Piñon – juniper woodlands
PCMS	Piñon Canyon Maneuver Site
PCN	Pre-Construction Notification
PL	Public Law
PMS	Publication Management System
RCMP	Range Complex Master Plan
REC	Record of Environmental Consideration
REG	Regulation
REPI	Readiness and Environmental Protection Initiative
RGP	Regional General Permit
RTLA	Range and Training Land Assessment
RTLP	Range and Training Land Plan
Rx	Prescribed
SAR	Species at Risk
SDZ	Surface Danger Zone
SERDP	Strategic Environmental Research and Development Program
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SOP	Standard Operating Procedure
SRA	Sustainable Range Awareness
SRP	Sustainable Range Program
SWMP	Stormwater Management Plan
SWPPP	Stormwater Pollution Prevention Plan
T&E	Threatened and Endangered
TCP	Traditional Cultural Property
TNC	The Nature Conservancy
TRI	Training Requirements Integration
TSS	Training Service Support
U.S.	United States
UCCS	University of Colorado at Colorado Springs
USACE	United States Army Corps of Engineers
USAFA	United States Air Force Academy
USC	United States Code
USDA	United States Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WASH	Wildlife Aircraft Strike Hazard
WFRA	Wildfire Risk Assessments

APPENDIX 2: Species Management Plans

Species Management Plans for Federally Petitioned Species

Annex A: Colorado Checkered Whiptail Management Plan

Introduction

The purpose of this management plan is to present information on the state-endemic Colorado checkered whiptail (*Aspidoscelis neotesselata*), define conservation goals for the species, and describe actions that will enable those goals to be achieved.

Colorado Checkered Whiptail Information

Description

The Colorado checkered whiptail is an all-female, triploid parthenogenetic lizard species derived from hybridization (Walker, Cordes, and Taylor 1995). The Colorado checkered whiptail was first described as a distinct species in 1997 (Walker, Cordes, and Taylor 1997), having formerly been grouped with the diploid common checkered whiptail (*Aspidoscelis tesselata*). Colorado checkered whiptails originated from hybridization between the parthenogenetic common checkered whiptail and the sexually-reproducing six-lined racerunner (*Aspidoscelis sexlineata*; Walker, Taylor, and Cordes 1995).

The Colorado checkered whiptail is a medium-sized lizard with a slender body and a long tail. Pattern and base coloration varies widely, with grayish-brown stripes, often fusing with spots, on a black ground color. Their rear legs have numerous pale spots, often fused into a reticulum, and their underside is usually white with dark flecking on the throat area. The snout-vent length (SVL) of sexually mature individuals ranges from 73 – 101 mm, with an average SVL of 87 mm (Hammerson, 1999). Hatchling size ranges from 39 – 48 mm SVL.

Habitat and Ecology

The entire known range of the Colorado checkered whiptail encompasses approximately 21,000 km^2 across 6 counties (Pueblo, Fremont, Otero, Las Animas, El Paso, and Teller) in southeastern Colorado, with Fort Carson and Piñon Canyon Maneuver Site (PCMS) representing the approximate northern and southern boundaries of the species' range, respectively. Within this range, the distribution of populations is patchy and some local populations have been extirpated or have declined significantly (Walker, Cordes, and Taylor 1996). Most whiptail populations are found in the Arkansas River valley, along the Huerfano River, associated with tributaries of the Apishapa River, or in the canyons and arroyos of the Purgatoire River and its tributaries (Walker, Cordes, and Taylor 1997). The northernmost whiptail records are from Fountain Creek Regional Park in Fountain, Colorado, just south and west of Fort Carson's Gate 20. The southernmost records are from the Purgatoire River in Las Animas County, approximately 10 miles north of the New Mexico border.

Within its narrow range, the Colorado checkered whiptail occurs in areas dominated by plains grassland or juniper woodland, often associated with Niobrara chalk barrens. Within these broader locations they are most frequently found in areas of exposed rock in small valleys, arroyos, and canyons and on hillsides. Populations have been found in areas with frequent human use and disturbance, such as in parks, around parking lots, and around trash dumps (Walker, Cordes, and Taylor 1997).

The Colorado checkered whiptail is an all-female, obligate parthenogenetic species. Parthenogenesis is a form of asexual reproduction in which embryos develop from an unfertilized egg cell, producing offspring that are clones of their mother. This greatly reduces the genetic diversity of whiptail populations, which may in turn reduce the ability of a population to respond to threats such as changing environmental conditions or disease. Obligate parthenogenesis also makes populations more susceptible to random adverse mutations (Stelzer et al. 2010). Egg development begins in mid-June and goes through late July. Individuals retain eggs for 3 – 7 days before laying, generally producing a clutch of 1 – 4 eggs (average 3). Eggs are laid 18 – 23 cm below the surface in burrows dug in soft, well-drained soil.

Distribution on Fort Carson and Current Conservation Status

On Fort Carson, Colorado checkered whiptails are found in mixed piñon pine – juniper habitat throughout the southern portion of the installation, with concentrations in Training Areas 28, 29, 41, 45, 48, 49, 55, and 56. On PCMS, whiptails are found primarily in Taylor Arroyo, Lockwood Canyon, Red Rock Canyon, and rocky areas in Training Areas 1, 2, and 11. These areas are not suited to vehicle travel, and so are restricted to military training that can be done on foot. The southern portion of Training Area 45 is the impact area for the Airburst range, and is not used for training, though it is open occasionally for hunting. The area of highest known whiptail concentration is in Training Area 48, within the footprint of a land navigation course. In 2012 Range Control created this land navigation course without properly staffing it though NEPA, which prevented wildlife staff from recommending whiptail-specific mitigation measures. Because the whiptail population was not surveyed prior to the construction of the land navigation course, it is unknown whether the increased training presence negatively impacted whiptails.

The Colorado checkered whiptail is considered an Army Species at Risk (SAR), is a Colorado State Species of Special Concern and a Tier I Species of Greatest Conservation Need (Colorado Parks and Wildlife 2015), is categorized as Imperiled by NatureServe (2019), and is classified as Near Threatened on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species (Hammerson 2007).

The Center for Biological Diversity petitioned the United States Fish and Wildlife Service (USFWS) to list the Colorado checkered whiptail under the Endangered Species Act in April 2012 as part of petition that included 52 other species of amphibians and reptiles. The primary threats listed in the petition were the species' naturally restricted range, combined with habitat loss and population extirpation within that range (Adkins Giese et al. 2012). In July 2015 the USFWS determined that the petition did not present enough evidence to warrant listing (Federal Register Vol. 80, No. 126). This decision does not preclude the submission or consideration of future listing petitions. Because a significant proportion of the entire population is found on Fort Carson and PCMS, such a future listing could have the potential to interfere with training if there is not already a management plan in place.

The Army funded a two-year study by researchers at Colorado State University and Utah State University to determine the distribution and demographic parameters of whiptails on Fort Carson and to examine potential training-related stress. The field work portion of the project will be completed by the end of summer 2019 with a final report due in 2020. A concurrent reptile baseline survey conducted by the Colorado Natural Heritage Program will provide additional information on the distribution and habitat associations of the Colorado checkered whiptail on both Fort Carson and PCMS. The results of these studies will help Fort Carson biologists determine if additional protections are warranted for Colorado checkered whiptails. Fort Carson and PCMS biologists will continue annual monitoring of Colorado checkered whiptail populations on both installations to track changes in population size and distribution.

Colorado Checkered Whiptail Conservation Goals

1. Assess COCW populations on Fort Carson (CNHP).
2. Assess military training impacts to COCW populations on Fort Carson (CSU).
3. Protect, maintain and enhance habitat, where feasible.
4. Protect, individuals and populations from human-induced injury.
5. Initiate Conservation Partnerships.

Protect, maintain and enhance habitat
Areas containing suitable habitat will be identified and maintained. Management practices such as burning, mowing, spot-spraying herbicides for weed control or a combination of all may need to be implemented in order to maintain the habitat in suitable condition.

Action: If listed, a variety of common best management practices will be implemented to maintain suitable habitat for the COCW.

Protect, individuals and populations from human-induced injury
Action: If listed, in areas identified as having high road mortality, post signs and reduce allowable automobile speeds.

Action: Increase awareness of the species to Fort Carson personnel via informational brochures and educational outreach.

Initiate Conservation Partnerships
Develop conservation partnerships with adjoining private and public landowners, Colorado Parks and Wildlife as well with other non-governmental agencies to promote conservation and awareness of the species.

Actions: If listed, private and public lands adjacent to Fort Carson and Piñon Canyon Maneuver Site may also contain suitable habitat for this species. These lands should be considered as an opportunity to provide additional quality habitat to support the local population of COCW within the region. A conservation initiative implemented in cooperation with partners will promote stewardship of the species throughout the region. Regional lands will be evaluated for the potential to improve or maintain habitat for through mutual agreements such as woody plant removal, noxious weed control, conservation grazing and prescribed burning.

Literature Cited

Adkins Giese, C.L., D.N. Greenwald, and T. Curry. 2012. Petition to List 53 Amphibians and Reptiles in the United States as Threatened or Endangered Species Under the Endangered Species Act. Center for Biological Diversity. Available for download at https://www.biologicaldiversity.org/campaigns/amphibian_conservation/pdfs/Mega_herp_petition_7-9-2012.pdf

Colorado Parks and Wildlife. 2015. State Wildlife Action Plan. Available for download at https://cpw.state.co.us/LRuments/WildlifeSpecies/SWAP/CO_SWAP_FULLVERSION.pdf.

Hammerson, G.A. 1999. Amphibians and reptiles in Colorado. Second edition. University Press of Colorado, Boulder, Colorado.

Hammerson, G.A. 2007. *Aspidoscelis neotesselata*. The IUCN Red List of Threatened Species 2007:e.T64279A12752503 http://dx.doi.org/10.2305/IUCN.UK.2007.RLTS.T64279A12752503.en. Accessed on 15 August 2019.

NatureServe. 2019. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://explorer.natureserve.org. (Accessed: August 15, 2019).

Stelzer C-P., J. Schmidt, A. Wiedlroither, and S. Riss. 2010. Loss of sexual reproduction and dwarfing in a small metazoan. PLoS ONE 5(9): e12854. https://doi.org/10.1371/journal.pone.0012854

Walker, J.M., J. E. Cordes, and H.L. Taylor. 1996. Extirpation of the parthenogenetic lizard Cnemidophorus tesselatus from historically significant sites in Pueblo County, Colorado. Herpetological Review 27:16-17.

1997. Parthenogenetic *Cnemidophorus tesselatus* complex (Sauria teiidae): A neotype for diploid *C. tesselatus* (Say, 1823), redescription of the taxon, and description of a new triploid species. Herpetologica 53:233-259.

Walker, J.M., H.L. Taylor, and J.E. Cordes. 1995. Parthenogenetic *Cnemidophorus tesselatus* complex at Higbee, Colorado: Resolution of more than 30 years of controversy. Copeia 1995:650-658.

Annex B: Little Brown Bat Management Plan

Introduction

The purpose of this management plan is to present information on the little brown bat (*Myotis lucifugus*), define conservations goals, and describe actions that will enable achievement of those goals.

Little Brown Bat Information

Description

The little brown bat is one of seven *Myotis* species found in Colorado, and one of five that have been detected on Fort Carson and the Piñon Canyon Maneuver Site (PCMS). Total length is between 90 and 100 mm (3.5 – 4 in), tail length is between 36 and 47 mm (1.4 – 1.8 in), wingspan is between 22 and 27 cm (8.6 – 10.6 in), and average weight is between 4.5 and 5.5 g (0.16 – 0.2 oz.). Females are slightly larger than males.

Little brown bats can have a variety of fur colors, ranging from pale tan to reddish or dark brown, with paler fur on the underside. The hairs are relatively long with a glossy appearance. Little brown bats can be confused with multiple other *Myotis* species throughout their range, and may be most easily identified by first ruling out other *Myotis* species with more distinct features. The Yuma myotis (*Myotis yumanensis*) is the most similar Colorado species. The little brown bat can be distinguished by the presence of long hair on the toes, extending past the tips of the claws.

Habitat and Ecology

Little brown bats are the most widespread *Myotis* species in North America, extending from Alaska to Newfoundland on the northern edge of their range and from South Carolina to southern California on the southern edge, excluding the southern Great Plains region. They are also found in high-elevation areas in Mexico. Historically, the largest concentrations were found in the karstic regions of the eastern United States, with some hibernacula populations reaching into the hundreds of thousands. Within this range, they are associated with wooded and urban areas and generally exhibit tolerance for a wide variety of roost sites. Little brown bats are the most-studied bat species in the United States (Armstrong et al. 2011), though most research has been focused on eastern populations.

Throughout the year, little brown bats will use three different types of roosts: night roosts, day roosts, and hibernacula. Day and night roosts are similar and may be found under tree bark, in hollow trees, in woodpiles, in buildings (including under siding), and less frequently in caves or mines (Armstrong et al. 2011). Maternity colonies, which can contain hundreds of bats, use roosting sites that are hot and humid, ranging from 23.3° C to 34.4° C (74° F to 94° F; Burnett and August 1981). These colonies are frequently found in dead or dying trees, caves, and attics and other anthropogenic structures. Males generally roost alone or in small groups. In the eastern and central United States, winter hibernacula are formed in caves and mines with high humidity and constant temperatures and can contain hundreds of thousands of individuals of both sexes (Humphrey and Cope 1976). Hibernacula sites are poorly understood in Colorado; surveys of abandoned mines found a very small number of roosting bats, and tracking studies suggest that they may use rock crevices as hibernacula (Neubaum 2018). In the central and eastern portion of their range, little brown bats have been documented moving over 100 miles from summer habitat to hibernacula. Such long-distance movements have not been documented in the West, though there is little information about winter habits of little brown bats in Colorado and the West in general. Breeding takes place in late fall and winter, near the hibernacula. Mating is promiscuous, with both males and females mating with multiple partners. Mating may take

place when both bats are active, or males may mate with torpid females. Females store sperm over the winter, and fertilization takes place after leaving the hibernaculum (Buchanan 1987). Gestation is 50 to 60 days, and females rarely give birth to more than one pup. Young can fly by about 3 weeks of age and reach adult weight about 1 month after their first flight (Armstrong et al. 2011). Little brown bats are long-lived compared to other small mammals, with an average longevity over 10 year (Barbour and Davis 1969) and a reported record of over 30 years (Fenton and Barclay 1980).

The greatest current threat facing little brown bats is white-nose syndrome (WNS), a disease caused by the cold-loving fungus *Pseudogymnoascus destructans*. The disease was first found in the United States in 2006 in a hibernaculum in New York, and has since spread to 38 states and 7 Canadian provinces. The disease is transferred by migrating bats and by humans entering caves and mines. Bats infected with WNS wake from torpor more frequently, which uses up crucial fat reserves and leads to starvation (Reeder et al. 2012). White-nose syndrome has killed millions of bats since 2006, with mortality rates over 90% in some infected hibernacula. White-nose syndrome affects multiple bat species, but little brown bats have seen the largest population decline. While some bats do seem to be more naturally resistant to the fungus, a low reproductive rate means that any potential population recovery would take decades. While WNS has not yet been detected in Colorado, it is present in four neighboring states (Oklahoma, Nebraska, Kansas, and Wyoming).

Because of the threat posed by WNS, the International Union for the Conservation of Nature (IUCN) recently changed the status of the little brown bat to Endangered (Solari 2018), a dramatic change from its previous designation of Least Concern (Arroyo-Cabrales and Álvarez-Castañeda 2008). The species is listed as endangered in Canada and in seven US states, and listed as threatened in two other states. In Colorado, the little brown bat is considered a Tier 1 Species of Greatest Conservation Need according to the State Wildlife Action Plan (2015). A 2010 status review by Kunz and Reicherd concluded that the bat deserved immediate protection under the Endangered Species Act. The United States Fish and Wildlife Service currently lists the status of the bat as “under review,” and no federal protections have been extended as of 2019.

In addition to the threat posed by WNS, little brown bats are threatened by wind turbines, habitat disruption or destruction, extermination or exclusion from anthropogenic structures, and food supply disruption as a result of pesticide use.

On Fort Carson, little brown bats appear to be widespread. Prior to WNS acoustic surveys started by CPW in 2012, there was only a single confirmed species record from then 1970s. Acoustic surveys started by CPW in 2012 recorded little brown bats in the Stone City area, and broader acoustic surveys started in 2016 recorded little brown bats elsewhere on Fort Carson. Acoustic monitoring begun in fall of 2018 detected likely little brown bat calls at all 10 acoustic recording sites on Fort Carson, suggesting that the species is widespread on Fort Carson. Bat netting surveys in the spring and summer of 2019 caught little brown bats at four locations on Fort Carson, with lactating females caught at two sites. Five lactating females were caught exiting a large entrance to the Stone City mine complex, confirming the presence of a maternity colony within the mine. Lactating females were also caught in a wooded area of Training Area 28, indicating the presence of a maternity colony in the area. On PCMS, a single non-reproductive female was caught at Bernacki Ranch. At the time of the writing of this plan, PCMS acoustic data has not yet been analyzed.

Little Brown Bat Conservation Goals

1. Assess little brown bat populations on Fort Carson and PCMS (AZGFD).
2. Protect, maintain and enhance habitat.
3. Monitor little brown bat populations for presence of white-nose syndrome.
4. Prevent human transmission of white-nose syndrome.
5. Initiate Conservation Partnerships

Little Brown Bat Management Prescriptions and Actions

Assess little brown bat populations on Fort Carson and PCMS
While baseline bat surveys have suggested that little brown bats are more numerous and widespread on Fort Carson and PCMS than formerly known, detailed information on population size and distribution is still unknown. Future studies should assess the approximate population size of this species, the extent and area of habitat currently utilized, the location of maternity roosts, and the potential presence of hibernacula. These more detailed data will assist in targeting specific areas for habitat manipulations and protections.

Action: Bat baseline surveys are currently ongoing on both Fort Carson and PCMS and will likely continue through 2020. These surveys include both continuous nocturnal acoustic monitoring and bat capture surveys. After the baseline surveys are completed, Fort Carson staff, with the assistance of interested partners, will continue to monitor the population and attempt to find new roosting and maternity colony locations. Data will be maintained in a GIS database which will be updated whenever new data are available.

Protect, maintain and enhance habitat
Areas containing suitable habitat will be identified and maintained. If little brown bats are found roosting in human structures, every effort will be made to remove the bats in a non-lethal manner. Human access to roost areas will be restricted to prevent disturbance and human-caused introduction of WNS.

Action: If listed, a variety of common best management practices will be implemented to maintain suitable habitat for the little brown bat, including the possible construction of bat boxes throughout the installation. Bat gates on entrances to the Stone City mine complex will continue to be maintained, and new openings will be closed to human entry as needed.

Action: Increase awareness of the species to Fort Carson personnel and families via informational brochures and educational outreach.

Monitor little brown bat populations for presence of white-nose syndrome
White-nose syndrome has not yet been detected in Colorado, though it is present in four neighboring states and is likely to reach Colorado in the near future. Consistent monitoring of the installation's bats will provide valuable information to CPW biologists.

Action: Fort Carson biologists, with the assistance of interested partners, will perform regular surveys (both internal mine and external capture) to monitor bats for the presence of WNS.

Prevent human transmission of white-nose syndrome
White-nose syndrome can be introduced to new sites via the natural movements of bats or by humans carrying fungal spore from infected sites to non-infected sites. Fort Carson will enforce mine access restrictions, as well as access to other roosting sites as they are found. When Fort Carson and partner biologists enter mine sites or handle bats on other areas of the installation, they will follow recommended gear cleaning protocols to prevent the spread of pathogens such as white-nose syndrome.

Action: Maintain existing bat gates on entrances to the Stone City mine complex and install new entrance barriers on recently discovered opening as needed. Follow recommended USFWS and/or CPW cleaning protocol when handling bats or entering mines.

Initiate Conservation Partnerships

Develop conservation partnerships with adjoining private and public landowners, Colorado Parks and Wildlife, and other non-governmental agencies to promote conservation and awareness of the species.

Action: If listed, private and public lands adjacent to Fort Carson and PCMS may also contain suitable habitat for this species. These lands should be considered as an opportunity to provide additional quality habitat to support the local population of little brown bats within the region. A conservation initiative implemented in cooperation with partners will promote stewardship of the species throughout the region.

Action: Increase participation in the Colorado Bat Working Group to stay up-to-date on information on WNS in the state, as well as the status of little brown bats and any ongoing or upcoming conservation efforts.

Literature Cited

Armstrong, D.M., J.P. Fitzgerald, and C.A. Meaney. 2011. Mammals of Colorado. University Press of Colorado. Denver, Colorado.

Arroyo-Cabrales, J. and S.T. Álvarez-Castañeda. 2008. *Myotis lucifugus. The IUCN Red List of Threatened Species* 2008: e.T14176A4415269. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS. T14176A4415269.en. Accessed on 15 August 2019.

Barbour, R.W, and W.H. Davis. 1969 Bats of America. The University Press of Kentucky. Lexington, KY.

Buchanan, E.R. 1987. Timing of ovulation and early embryonic development in *Myotis lucifugus* (Chiroptera: Vespertilionidae) from northern central Ontario. American Journal of Anatomy 178:335 – 340.

Burnett, C.D. and P.V. August. 1981. Time and energy budgets for dayroosting in a maternity colony of Myotis lucifugus. Journal of Mammalogy 62(4): 758 - 766.

Colorado Parks and Wildlife State Wildlife Action Plan. Available: https://cpw.state.co.us/Documents/WildlifeSpecies/SWAP/CO_SWAP_FULLVERSION.pdf

Fenton, M.B. and R.M. Barclay. 1980. *Myotis lucifugus*. Mammalian Species 142:1-8.

Humphrey, S.R. and J.B. Cope. 1976. Population ecology of the little brown bat, *Myotis lucifugus,* in Indiana and North-Central Kentucky. American Society of Mammalogists: Special Publication 4.

Kunz, T.H. and J.D. Reichard. 2010. Status review of the little brown myotis (*Myotis lucifugus*) and determination that immediate listing under the Endangered Species Act is scientifically and legally warranted. Boston University. Available: http://www.bu.edu/cecb/files/2010/12/Final-Status-Review.pdf.

Neubaum, D.J. 2018. Unsuspected retreats: autumn roosts and presumed hibernacula used by little brown myotis in Colorado. Journal of Mammalogy 99(6): 1294 – 1306.

Reeder, D., C.L. Frank, G.G. Turner, C.U. Meteyer, A. Kurta, E.R. Britzke, M.E. Vodzak, S.R. Darling, C.W. Stihler, A.C. Hicks, R. Jacob, L.E. Grieneisen, S.A. Brownlee, L.K. Muller, D.S. Blehert. 2012. Frequent arousal from hibernation linked to severity of infection and mortality in bats with White-nose syndrome. PLoS ONE 7: e38920. doi:10.1371/journal.pone.0038920

Solari, S. 2019. *Myotis lucifugus. The IUCN Red List of Threatened Species* 2008: e.T14176A22056344. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T14176A22056344.en. Accessed on 15 August 2019.

Annex C: Monarch Butterfly Management Plan

Introduction

This management plan for the monarch butterfly *(Danaus plexippus)* provides guidance for the U.S. Army to manage the monarch butterfly on Fort Carson (FC) and the Piñon Canyon Maneuver Site (PCMS). This plan includes a species description, and outlines conservation objectives and actions. Consultation with the USFWS and management of the monarch butterfly will be undertaken by the Army with the goal of precluding a species listing by protecting monarch butterflies and their habitats on FC and PCMS, in accordance with the Endangered Species Act of 1973, as amended, while continuing to support military training missions that might negatively impact the monarch butterfly.

Monarch Butterfly Information

Description

The monarch butterfly is one of the most iconic and familiar butterflies in North America, and is easily recognized by its brilliant orange and black coloration. Monarch butterflies are members of the family *Nymphalidae*, also known as brush-footed butterflies, or four-footed butterflies. Monarch butterflies are in the subfamily *Danaianae*, commonly referred to as “milkweed butterflies”, since they are specialists and only lay their eggs on milkweeds (*Asclepias*). Adult monarch butterflies have an 8-10 cm wingspan with a very conspicuous bright orange, white and black pattern. Both males and females have prominent black veining, which creates a ‘stained glass’ look, and two rows of fine white dots inside a black border on the wing margins and on the body. The undersides of the wings are yellow-brown with larger white spots. Monarch display sexual dimorphism. The males are larger and possess two black spots on their hind wings. The females are a less striking shade of deep orange and have thicker, darker veins. Monarchs are described as having a “slow and sailing” flight pattern. Monarch butterflies look very similar to the viceroy butterfly; however, vicroy butterflies are smaller and have a black line crossing the postmedial hindwing. Monarch caterpillars are approximately two inches long with vivid yellow, black and white vertical stripes.

Habitat and Ecology

There are four stages of the monarch butterfly life cycle; the egg, the larvae (caterpillar), the pupa (chrysalis), and the adult butterfly. The entire metamorphosis process takes approximately one month to complete. First, the female monarch lays beige-colored eggs, specifically on a milkweed plant and the eggs hatch in approximately three to eight days. The larva begin eating milkweeds and incorporating the plant’s alkaloids, cardenolides, and other toxins into its own body. During the next 9-14 days the caterpillar will grow and molt several times, passing through five separate instars, increasing its weight by 2000 times and growing up to 45mm long. Prior to the third stage of development, the pupa or chrysalis stage, the monarch larvae hangs upside down and spins a silk mat and sheds a final time as it begins the pupa stage of metamorphosis. The chrysalis, which is approximately 3 cm long and bright green-turquoise with gold spots, remains in place for 8-15 days before the adult butterfly emerges. The fourth and final stage is the adult stage, which for the first few generations, lasts two to five weeks. During this time the adult monarchs feed on nectar and mate. After mating, the females immediately lay eggs to complete the cycle. Both males and females can mate several times, creating multiple generations. In addition to reproducing, the final generation must also migrate south to the monarch’s overwintering location where they remain all winter (up to nine months) clustered in trees until the conditions are suitable for them to migrate northward back to their summer breeding grounds.

Distribution

Monarch butterflies have an impressive, complex multi-generational migration of over 3,000 miles, which is the longest migration of any butterfly species. The butterflies use environmental cues to determine when it is time to migrate, and then use a combination of air currents and thermals to fly to their overwintering locations. Scientists believe the position of the sun and the magnetic pull of the earth may enable the monarchs to navigate to specific locations.

There are two distinct major populations of monarch butterflies. The population to the east of the Rocky Mountains is called the eastern population, and comprises the majority of the monarch population, with the largest concentration located in the primary migratory flyway in central Texas. This population migrates between northern Mexico, Texas, the Midwest, and into the very southern portion of Canada. The smaller western population, located west of the Rocky Mountains, is primarily located in coastal California, and migrates between the inland mountains and meadows and the coast. There is a third very small non-migratory population of monarch butterflies in Florida, and there are additional small non-migratory populations in Mexico. Many migration routes and potential overwintering locations in Mexico are not well understood. Colorado is not in the primary migratory pathway of the monarch butterfly, and consequently, has fewer monarchs than other states. Along the Front Range, most of the monarchs belong to the eastern population that overwinters in Mexico. Monarchs typically occur in Colorado from June through September. Although no recent invertebrate surveys have been conducted, Fort Carson and the PCMS lie within the range of the monarch butterfly, and monarchs have been documented on both PCMS and Fort Carson.

Habitat Requirements

The monarch butterfly is dependent on milkweed plants, which are perennial, flowering plants in the genus *Asclepias*. Milkweeds derive their name from their latex, a milky substance consisting of cardiac glycosides and cardenolides, which is excreted when the plant is damaged. Most species of milkweed are toxic. Adult monarch butterflies lay their eggs exclusively on milkweeds, and when the caterpillars emerge they consume the toxic plants and become toxic themselves, thus deterring predation. They carry this toxicity into their adult form. Of the approximately 73 species of milkweeds in the U.S., 30 species support caterpillars. The most common host milkweed is *A. syriaca*. The other milkweeds most frequently used by monarch butterflies include*: A. californica, A. cryptoceras, A. eriocarpa, A. erosa, A. glaucescens, A. linaria, A. oenotheroides, A. subulata, A. subverticillata, and A. vestita.* In Colorado there are 19 native milkweed species, 14 of which have been documented on Fort Carson and/or the PCMS, including: *A. arenaria* (PCMS), *A. asperula, A. engelmanniana, A. incarnate, A. latifolia* (FC), *A. macrotis* (PCMS), *A. pumilla* (FC), *A. speciose, A. subverticillata, A. tuberosa* (FC)*, A. verticillata* (PCMS), *A. uncialis, A.viridiflora,* and *Sarcostemma crispum*. Adult butterflies require a variety of nectar-producing flowering plants from spring through fall as a source of food while they travel along their migratory routes**,** especially plants in the *Asteraceae* family including asters (*Symphyotrichum* spp. and *Eurybia* spp.), coneflowers (*Echinacea* spp.), goldenrods (*Solidago* spp.), and gayfeathers (*Liatris* spp.), along with sunflowers, alfalfa, and clover. The availability of these flowering plants, and other nectar producing species along the entire migratory pathway for the duration of the migration, is critical**.** To support the monarch population, preservation of open habitat with an abundance of native milkweeds and nectar producing plants, and a reduction in the application of pesticides and herbicides, is essential.

Current Conservation Status

Historically, the monarch butterfly was common throughout its range, which includes most of North America (where milkweeds occur). Since the 1990s the eastern monarch population has declined by 90 percent, and the western population has declined by over 50 percent. During 1997, the number of monarchs was estimated at one billion, but during the last 20 years that number has plummeted to

fewer than 22 million by 2016. This precipitous decrease is primarily the result of the loss of the milkweeds that the monarchs depend on through conversion of grasslands to corn and soybean fields, and habitat loss from development. According to the Monarch Joint Venture (MJV), "Changing farm practices and suburbanization of agricultural land in the United States are resulting in losses of approximately 876,000 hectares/year of monarch habitat." Another cause is the introduction of genetically engineered Roundup Ready crops, which now account for 94 percent of soybean, and 89 percent of all corn, grown in the U.S. The timing and increased application of herbicides (e.g. 204 million pounds of Roundup per year), illegal logging in the monarch's overwinter grounds in Mexico, the spread of invasive plants (e.g., *Vincetoxicum*) which can displace native milkweeds, climate change, natural storms/events (e.g., one individual storm killed over 500 million monarch butterflies), diseases (e.g., *Ophryocystis elektroscirrha (OE)*), ozone pollution, mowing/herbicide applications along roadsides, and the collection of monarchs for commercial purposes have furthered the population decline.

On 26 August 2014, the Center for Biological Diversity, Center for Food Safety, Xerces Society for Invertebrate Conservation and Dr. Lincoln Brower petitioned the U.S. Fish & Wildlife Service (USFWS) to protect the monarch butterfly under the Endangered Species Act of 1973. Based on the information provided in that petition, the USFWS determined that federally protecting the monarch may be warranted, and the monarch is currently under review. The deadline to determine whether the species warrants federal protection was extended to 15 December 2020.

Monarch Butterfly Conservation Goals

1. Assess monarch butterfly and milkweed abundance and distribution on Fort Carson.
2. Protect existing monarch butterflies and their habitat.
3. Enhance/expand monarch butterfly habitat, where feasible.
4. Develop conservation partnerships and initiate education/outreach efforts.

<u>Assess Monarch Butterfly and Milkweed Abundance and Distribution on Fort Carson</u>
Action: Systematic surveys should be conducted to collect essential baseline data on the distribution, abundance and habitat quality of the monarch butterfly and its host plants, *Asclepias*, on the Installation. This data will aid in the development of effective management strategies for supporting the monarch butterfly population (if any) and their critical habitat, and define target areas of specific conservation efforts. Surveys should be conducted from mid-summer to early fall when monarch observation is most likely to occur. If the monarch butterfly is listed, surveys for milkweeds and monarchs should be implemented annually.

<u>Protect Existing Monarch Butterflies and Their Habitat</u>
Action: Areas with a high density of milkweeds and/or individual monarch butterflies should be protected to the extent possible. If the monarch butterfly is listed, and it is essential that training occur in prime monarch habitat, then creating separate areas (of equal or greater size) of monarch habitat should be considered. (Note: Research indicates that female monarchs may favor small patches of milkweed). This effort would help offset any loss of milkweeds and individual monarch butterflies from training activities.

Action: Develop roadside mowing regimes that are compatible with monarch habitat. Since milkweeds often grow along roadsides and drainages, mowing should be scheduled for late winter when the impact is minimal. However, some research indicates that monarch oviposition and caterpillar survival may be greater on regenerating (mowed) stems.

Action: Limit application of biocides (herbicides/pesticides) on monarch populations and their habitat. The application of herbicides should be avoided, limited or carefully applied to prevent the loss of milkweeds and the other nectar producing plants which are essential for the long term success of

monarch butterflies. Since all stages of monarch butterflies are highly sensitive to most pesticides, it is crucial to limit or exclude pesticides in areas where monarch butterflies, eggs or caterpillars are present, or expected to be present.

Action: Plan prescribed burns to support monarch butterfly habitat. Fire can have beneficial or negative impacts on the monarch butterflies' survival, depending on the timing of the fire. Prescribed burns during the summer can stimulate the regeneration of milkweed plants, which provides a late-season breeding opportunity. However, at other times of the year fire can cause grave damage by killing monarch butterfly eggs and caterpillars or by removing the nectar producing plants that the adult monarch butterflies require for survival.

Action: Create canopy gaps. Thinning the dense forest stands can create canopy gaps, enabling more sunlight to reach the forest floor, stimulating an herbaceous understory and fostering the growth of host and nectar producing plants.

<u>Enhance/ Expand Monarch Butterfly Habitat</u>
Action: Include native milkweed species in seed mixtures. One strategy to help support the monarch population is to include specific native milkweed and nectar producing plant seeds in the ITAM range seed mixture which can be used for restoration/reseeding projects, and along riparian buffer zones, MSRs, soil stabilization areas, and rights-of-way.

Action: Create pollinator gardens. Planting butterfly gardens throughout the Installation will benefit numerous pollinators, including bumblebees, are aesthetically pleasing, and provide educational opportunities.

<u>Develop conservation partnerships and initiate education/outreach</u>
Action: Expand communication and information sharing to support monarch conservation. If the monarch butterfly becomes listed, develop partnerships with other government agencies, non-government organizations (NGOs), private land owners, and adjacent properties (e.g., Comanche National Grasslands) especially since many of these may have suitable habitat for monarch butterflies. Opportunities may exist through mutual agreements and partnerships with Colorado Parks and Wildlife, national citizen-science programs (e.g., MonarchNet) and the MJV. MJV enables Federal and State agencies, NGOs, and private industries to coordinate on monarch conservation initiatives including restoration, monarch habitat improvement/protection, research/monitoring activities and outreach.

Action: Place interpretive signs at pollinator gardens. Signage can improve the public's understanding of monarchs and pollinators. Creating pollinator displays for use at Earth Day and other outreach events will further increase awareness.

Action: Encourage private landowners and urban leaders to plant milkweeds in their gardens and parks. Education is critical to ensure that only native milkweeds are planted, as planting non-native species can be very detrimental to monarch butterflies.

Literature Cited

"Conservation and Management of Monarch Butterflies: A Strategic Framework." United States Department of Agriculture Forest Service, FS-1044 March 2015 https://www.fs.fed.us/wildflowers/pollinators/Monarch_Butterfly//documents/ConservationManagementMonarchButterflies.pdf

Fish & Wildlife Service, https://www.fws.gov/savethemonarch/SSA.html

Gonzaga, Shireen. "What Monarch butterflies prefer" *EarthSky Earth/Human World,* 21 November 2017 https://earthsky.org/earth/monarch-butterfly-egg-laying-farmlands-vs-roadsides

Haan, Nathan L. and, Douglas A Landin, "Grassland disturbance increases monarch butterfly oviposition and decreases arthropod predator abundance" *Biological Conservation* Vol 233 May 2019 Pages 185-192

"Interactions with Milkweed" *Monarch Lab University of Minnesota* https://monarchlab.org/biology-andresearch/biology-and-natural-history/breeding-life-cycle/interactions-with-milkweed/

Landis, Thomas D. and Dumroese, R. Kasten "Propagating Native Milkweeds for Restoring Monarch Butterfly Habitat" *The International Plant Propagators' Society* Vol 64 2014

"Migration and Overwintering" *USDA U.S. Forest Service* https://www.fs.fed.us/wildflowers/pollinators/Monarch_Butterfly/migration/index.shtml

"Milkweed Species Beneficial to the Monarch Butterfly" *USDA U.S. Forest Service* https://www.fs.fed.us/wildflowers/pollinators/Monarch_Butterfly/habitat/milkweed_list.shtml

"Monarch Migration" *Monarch Joint Venture,* https://monarchjointventure.org/monarch-biology/monarch-migration

"North American Monarch Conservation Plan" *Monarch Joint Venture* https://monarchjointventure.org/images/uploads/documents/5431_Monarch_en.pdf

Monarch Butterfly *Wikipedia* https://en.wikipedia.org/wiki/Monarch_butterfly#migration

"Petition to Protect the Monarch Butterfly (Danaus Plexippus Plexippus) under the Endangered Species Act." http://ecos.fws.gov/docs/petitions/92210//730.pdf

Wade, Lizzie. "Plan to save monarch butterflies backfires." *Science,* 13 January 2015 https://www.sciencemag.org/news/2015/01/plan-save-monarch-butterflies-backfires

Annex D: Plains Spotted Skunk Management Plan

Introduction

The purpose of this management plan is to present information on the plains spotted skunk (*Spilogale putorius interrupta*), define conservations goals and describe actions that will enable achievement of those goals.

Plains Spotted Skunk Information

Description

The plains spotted skunk is one of three subspecies of the Eastern spotted skunk. It is a small, relatively slender skunk with a weasel-like body shape. It has a body length between 30 and 34 cm (12 -13.5 inches), a tail length between 17 and 21 cm (6.5 - 8.5 inches) and weighs between 0.5 and 1 Kg (1 - 2.25 lbs.).

Body mass can range from 0.2 to 1.8 kg (0.44 to 3.97 lb.), with males averaging around 700 g (1.5 lb.), in comparison to the female's average of 450 g (0.99 lb.). Skull length is 43–55 mm (1.7–2.2 inches). The spotted skunk is a very small skunk, which (for comparison sake) is no larger than a good-sized tree squirrel.

These skunks have a fine, medium length coat with striking black and white coloration and 4 to 6 broken white stripes (Bullock). Two of the stripes are located at the median of the body and four stripes are placed on the side running from the back of the head to the rear. White markings are present on both cheeks, as well as on the tip of the tail. This is known as an aposematic fur pattern and is thought to act as a warning to predators. They have short, round ears and small eyes that are set wide apart and low on their face.

Like all skunks, the spotted skunk has well developed anal glands that emit musk from if they are threatened. These glands contain a "nipple" that allows the skunk to aim its spray accurately at its attackers for a distance of 4- 5 m (13.1 - 16.4 ft.). To defend themselves against predators they carry out a rapid sequence of handstands which act as a warning device. If this doesn't deter the predator they will drop to all fours and stand in a horseshoe shaped stance and emit their fowl smelling musk. Their feet are equipped with pads on the soles that aid in climbing and large claws of the forefeet help the skunk dig and grasp prey.

Habitat and Ecology

Spotted skunks are found in woodlands, prairies and sometimes rocky areas of the eastern and central US, Canada (southeast Manitoba and northwestern Ontario) and northeast Mexico (Drago and Honeycutt 1981). They seem to prefer forest edges and upland prairie grasslands, especially where rocky outcrops and shrub clumps are present. In the western part of its range, they rely heavily on riparian corridors where woody shrubs and woodland edges are present. Woody fencerows, odd areas, and abandoned farm buildings are also important habitat for the species. An opportunistic omnivore, the spotted skunk’s diet consists primarily of small mammals, grubs and other insects, corn, grapes, berries, etc.

Like most skunk species, spotted skunks are nocturnal and tend to be more active during dry cool nights rather than warm wet nights. They do not hibernate, but do tend to greatly reduce their activity during intensely warm summers or very cold winters. Although they are mainly solitary animals, up to 8 individuals may share a den in winter. Their home range is approximately 64 ha (Schwartz and Schwartz 1981). When inactive or bearing young, it occupies dens or burrows abandoned by other

mammals, under brush piles, in hollow logs or trees, in rock crevices, under buildings, or in similar protected sites.

Spotted skunks breed mostly in the later winter months and give birth in late spring to early summer. Gestation lasts 50-65 days. On average, the female skunk will give birth to one litter per year consisting of 4–5 baby skunks (kits) at a time. It takes twelve weeks before newborn skunks will become fully developed into adult skunks and 9-10 months to reach sexual maturity. Kits are weaned and develop skunk musk to use as self-defense at about 2 months of age.

The spotted skunk has seen sharp declines in populations across much of its range, particularly in the upper Midwest, like Minnesota and Wisconsin. The exact reason behind the decrease is not known, considering the species was very quick to adapt to human settlement and was commonly trapped up until the second half of the 20th century. Prior to that, they were frequently seen on farmlands and were known to dig burrows under barns and prey on mice that were attracted to stored grains. In Minnesota, after a peak in the number of reported trapped specimen in 1949, during which over 19,400 spotted skunks were taken in that year alone, yearly reports of trapped spotted skunks in that state sharply fell in the following years. Populations of this formerly abundant species declined sharply throughout much of the range in the 1940s and 1950s (Kinlaw 1995).

The large range-wide decline of this species in the mid-twentieth century point to it being highly vulnerable to one of more threats. Pesticide use, modernization of farming techniques, over-trapping and consolidation of barns and other man-made structures are all believed to have had a negative effect on spotted skunk populations. Some carnivores, such as skunks, are also more vulnerable to pathogenic diseases (e.g., rabies, distemper, parvovirus) (Gompper and Hackett 2005). Additionally, because they move slowly and tend to be nocturnal, skunks are particularly vulnerable to being struck and killed by automobiles. Urbanization may also be a contributor to their decline (Rosatte1987). One of the few documented cases of a plains spotted skunk (*S. putorius interrupta*) in CO involved a road kill Pueblo County.

Plains Spotted Skunk Conservation Goals

1. Assess plains spotted skunk populations on Fort Carson.
2. Protect, maintain and enhance habitat.
3. Protect, individuals and populations from human-induced injury.
4. Initiate Conservation Partnerships

<u>Assess plains spotted skunk populations on Fort Carson</u>
Assessment of approximate population size of this species, and the extent and area of habitat currently utilized, should be determined. Such baseline data will also assist in targeting specific areas for habitat manipulations and protections.

Action: If listed, a comprehensive species survey will be conducted on both Fort Carson and Piñon Canyon Maneuver Site. The survey will record number of plains spotted skunks seen, as well as habitat type and location. Data will be maintained in a GIS database which can be updated annually.

<u>Protect, maintain and enhance habitat</u>
Areas containing suitable habitat will be identified and maintained. Management practices such as burning, mowing, spot-spraying herbicides for weed control or a combination of all may need to be implemented in order to maintain the habitat in suitable condition.

Action: If listed, a variety of common best management practices will be implemented to maintain suitable habitat for the plains spotted skunk.

Protect, individuals and populations from human-induced injury
Action: If listed, in areas identified as having high road mortality, post signs and reduce allowable automobile speeds.

Action: Increase awareness of the species to Fort Carson personnel via informational brochures, educational outreach, etc.

Initiate Conservation Partnerships
Develop conservation partnerships with adjoining private and public landowners, Colorado Parks and Wildlife as well with other non-governmental agencies to promote conservation and awareness of the species.

Action: If listed, private and public lands adjacent to Fort Carson and Piñon Canyon Maneuver Site may also contain suitable habitat for this species. These lands should be considered as an opportunity to provide additional quality habitat to support the local population of plains spotted skunk within the region. A conservation initiative implemented in cooperation with partners will promote stewardship of the species throughout the region. Regional lands will be evaluated for the potential to improve or maintain habitat for through mutual agreements such as woody plant removal, noxious weed control, conservation grazing and prescribed burning.

Literature Cited

Bullock, Lindsay (December 2008). "Mammals of Mississippi". Department of Wildlife and Fisheries.

Dragoo, J. W. and R. L. Honeycutt. 1997. Systematics of mustelid-like carnivores. Journal of Mammalogy 78:426-443.

Gompper, M. E., and H. M. Hackett. 2005. The long-term, range-wide decline of a once common carnivore: the Eastern Spotted Skunk (*Spilogale putorius*). Animal Conservation 8:195-201.

Kinlaw, A. 1995. *Spilogale putorius*. American Society of Mammalogists, Mammalian Species 511:1-7.

Rosatte, R.C. 1987. Striped, Spotted, Hooded, and Hog-nosed Skunk. Pp. 598-613. in Novak, M., Baker, J.A., Obbard, M.E., and B. Malloch (eds). 1987. Wild Furbearer Management and Conservation in North America. Ontario Ministry of Natural Resources. Toronto. 1150 pp.

Schwartz, C. W., and E. R. Schwartz. 1981. The wild mammals of Missouri. University of Missouri Press, Columbia. 356 pp.

Annex E: Tri-colored Bat Management Plan

Introduction

The tri-colored bat (*Perimyotis subflavus*) is a relativity small bat compared to others in its range, at 4.5 to 8 grams in weight and 70 to 90 mm in length. Its fur is brownish to yellowish gray with each individual hair being "tricolored" with brown, yellow, and dark. The tri-colored bat prefers to hibernate in caves, rock crevices and mines, and may use these sites for summer roosts as well. During the summer months, it also roost in trees using foliage for diurnal cover. The bat prefers riparian areas with large insect food sources. Tri-colored bats are not a strong migratory species, generally staying within 60 to 100 km of hibernacula. (Armstrong 2011). Historically, the tri-colored bat is most common in eastern United States, but is also found is Canada, Guatemala, Honduras, and Mexico (ECOS website, 2019). Until recently, the tri-colored bats range was not thought to extend into Colorado. The first confirmed sighting of the species in Colorado was in 1987 in the northern section of the state, and confirmed sightings have continued since then, still primarily in northern Colorado, but these sightings are rare.

Since 2006, the tri-colored bat has been devastated by the invasive fungal disease known as white-nose syndrome (WNS). As WNS has spread across the continent, numbers of the tri-colored bat have plummeted along with a numbers of other bat species. Mortality rates up to 100 percent have been reported in affected hibernacula. As a result, the Center of Biological Diversity has petitioned the U.S. Fish and Wildlife Service (USFWS) to list the tri-colored bat (Center for Biological Diversity, 2016) as threatened or endangered under the Endangered Species Act of 1973, as amended. The USFWS responded in December 2017, making an initial finding that the petition was warranted and added the species to the national 5-year work plan. The USFWS's work plan lists species that need ESA listing evaluation. The work plan lists the tri-colored bat action type as, "12-month finding on a petition to list a species. If listing is warranted, we generally intend to proceed with a concurrent proposed listing rule and proposed critical habitat designation, if critical habitat is prudent and determinable (USFWS, 2019)." The listing decision is projected for completion by fiscal year 2021.

Fort Carson Distribution and Management

Colorado was thought to be outside of its range with only a few documented "accidental" observations of the bat without established populations. Recent observations within the state as well as new records of the bat within South Dakota, Texas, and New Mexico suggest that instead of accidental events, we are observing a western expansion of the tri-colored bat's range (Armstrong 2006). Several confirmed sightings have occurred within the state, including Fort Carson.

The first documented occurrence of the tri-colored bat on Fort Carson was in an abandoned mine on the southern end of the installation on April 2, 2008. Fort Carson has three separate ecosystems utilized by the tri-colored bat: riparian zones, forests, and mines. The mines on Fort Carson are located in a narrow canyon area consisting of piñon pine-juniper landscape. No bat surveys have occurred since then until recently when a planning level survey of all bat species on Fort Carson was conducted. In 2019 capture surveys did not result in any captured tri-colored bats. Acoustic captures through acoustic monitoring recorders, which are also part of the current survey, tri-colored bats detected most predominately at the PCMS Lockwood Canyon area with about 200 confirmed calls. Also just under 50 calls were detected at both the PCMS Biernacki Ranch and FC TA45 Quarry site. Calls were confirmed during most months of the year with highest numbers recorded between April and September, with highest numbers in June. Another year of bat surveys is proposed, which will provide further data to finalize our synopsis of the species occurrence on the installations.

Tri-Colored Bat Conservation Goals

1. Assess tri-colored bat populations and habitat selection (AZGFD).
2. Assess military training impacts to tri-colored bat populations on FC.
3. Protect, maintain, and enhance habitat.
4. Protect individuals and populations from human-induced injury.
5. Prevent human transmission of white-nose syndrome.
6. Initiate conservation partnerships focused on tri-colored bat conservation.

Literature Cited

Armstrong, David M.; Adams, Rick A.; and Taylor, Karen E. (2006) "New records of the eastern pipistrelle (*Pipistrellus subflavus*) in Colorado, "Western North American Naturalist: Vol. 66: No. 2, Article 18.

Armstrong, David M., Fitzgerald, James P. and Meaney, Carron A. (2011) Mammals of Colorado, 2nd Edition. University Press of Colorado.

Mixan, Ronald J.; Scobie, Emily H.; Diamond, Joel M.; and Ingraldi, Michael. Arizona Game and Fish Department. 2020. Bat surveys at Fort Carson & Pinon Canyon Maneuver Site. Prepared for the U.S. Department of the Army, Directorate of Public Works, Conservation Branch, Fort Carson, CO.

U.S. Fish and Wildlife Service (USFWS), Environmental Conservation Online System (ECOS). 2019. https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=A0L8

USFWS, Endangered Species, Listing and Critical Habitat, National Listing Workplan. 2019. https://www.fws.gov/endangered/what-we-do/listing-workplan.html

The Center for Biological Diversity, And Defenders of Wildlife. 2016. Petition to list the tri-colored bat, *Perimyotis subflavus*, as a Threatened or Endangered under the Endangered Species Act. The Center for Biological Diversity, San Francisco, California, USA and Defenders of Wildlife. http://publicpower.org/files/PDFs/TricoloredBatPetition_06-14-2016.pdf (6 February 2019).

APPENDIX 3: Other Management Plans

Other Natural Resource Management Plans

The following management plans and other documents, mentioned in Chapters 1 through 5 of this INRMP, were too large to be included here. They may be reviewed in the office of the Fort Carson DPW Conservation Branch Chief. To arrange such a review, please call 719-524-5395.

- Black-tailed Prairie Dog Management Plan
- Endangered Species Management Plan for the Mexican Spotted Owl
- Integrated Pest Management Plan
- Forest Management Plan
- Fort Carson Water Rights Inventory and Master Plan
- Fuels Management Plan
- Urban Forest Management Plan
- Wildlife Aircraft Strike Hazard Plan

The Fort Carson and PCMS Integrated Wildland Fire Management Plan, as well as the Prescribed Burn Plan, may be reviewed by calling the Fort Carson Fire and Emergency Services Fire Chief at 719-526-2679.

The Fort Carson Military Reservation and Piñon Canyon Maneuver Site Range and Training Land Assessment Plan and Protocols 2018-2025 may be reviewed by contacting the Fort Carson ITAM office at 719-526-6374.

APPENDIX 4: Environmental Assessment

FINDING OF NO SIGNIFIGANT IMPACT (FNSI)

PROGRAMMATIC ENVIRONMENTAL ASESSMENT FOR THE IMPLEMENTATION OF THE 2020 -2025 FORT CARSON AND PIÑON CANYON MANEUVER SITE INTEGRATED NATURAL RESOURCE MANAGEMENT PLAN

Fort Carson has prepared this Programmatic Environmental Assessment (EA) to identify and evaluate potential environmental effects from implementing the Integrated Natural Resource Management Plan 2020-2025 for Fort Carson and Piñon Canyon Maneuver Site (2020 – 2025 INRMP).

Description of the Proposed Action

The Proposed Action is implementation of the 2020 - 2025 INRMP. There are 164 reoccurring activities under the Proposed Action which, for the purpose of this Environmental Assessment, have been organized into eight categories: adaptive management, administration, coordination, monitoring, outreach, planning, studies, and training.

Alternatives Considered

For the purpose of this project Fort Carson considered two alternatives, the Proposed Action and the No Action Alternative. The No Action Alternative served as a baseline against which impacts associated with the Proposed Action could be evaluated.

No Action Alternative

Under the No Action Alternative the 2013 – 2017 Integrated Natural Resources Management Plan (updated 2015) (2013 -2017 INRMP) will remain in effect and guide policy and management of natural resources on Fort Carson and Piñon Canyon Maneuver Site without the additional benefits associated with updates and revisions in 2020 - 2025 INRMP.

Environmental Consequences

No significant environmental consequences were identified in the Environmental Assessment. Implementation of the Proposed Action would result in positive benefits to biological, water, and soil resources with neither positive nor negative benefits associated with air quality. The ecosystem-based management approach espoused in the 2020 – 2025 INRMP strives to maintain sustainable training lands, maintain biodiversity, conserve terrestrial and aquatic habitat, and support recreational activities when and where appropriate.

Conclusion

The EA on which this FNSI was prepared is pursuant to 32 Code of Federal Regulations (CFR) 651 and U.S. Council on Environmental Quality (CEQ) regulations (Title 40, U.S. Code, Parts 1500-1508) for implementing the procedural requirements of the National Environmental Policy Act (NEPA). Based on the analysis contained in the EA and the Army's intent to follow prescribed regulations and comply with applicable permits, the Army has determined that the Proposed Action would have no significant direct, indirect, or cumulative impact on the human or natural environment.

Therefore, based on review of the EA, I hereby incorporate the entire EA and the 2020 - 2025 INRMP by reference and conclude that the Proposed Action is not a major federal action that would significantly affect the quality of the environment within the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969, as amended. Accordingly, an Environmental Impact Statement (EIS) is not required. With this finding, I approve selection of the Proposed Action.

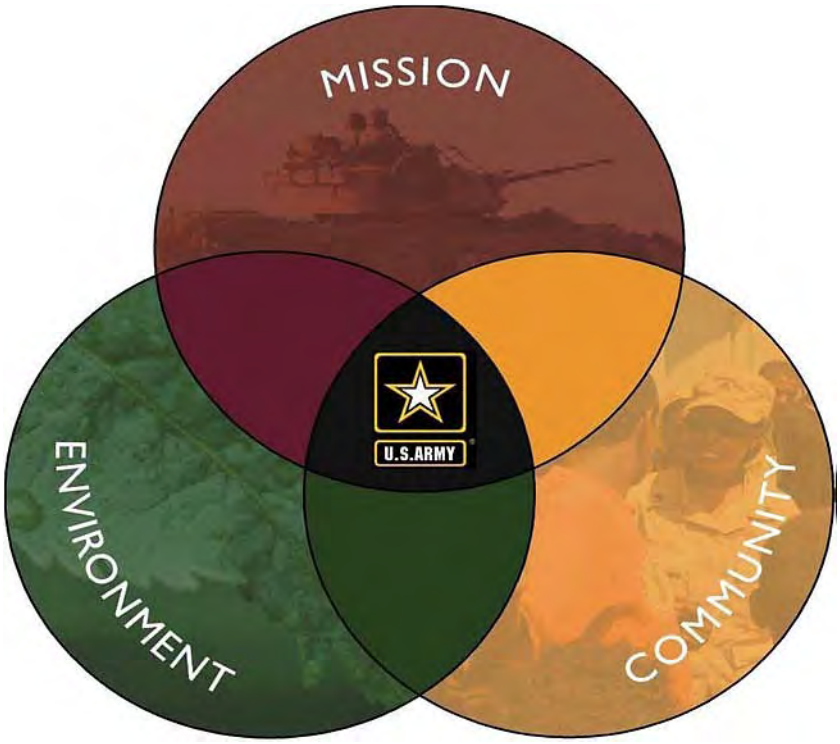
9 September 2020

NATHAN R. SPRINGER
COL, AR
GARRISON COMMANDER
FORT CARSON, COLORADO

DATE

PROGRAMMATIC ENVIRONMENTAL ASSESSMENT FOR THE IMPLEMENTATION OF THE INTEGRATED NATURAL RESOURCE MANAGEMENT PLAN FOR FORT CARSON AND PIÑON CANYON MANEUVER SITE

MAY 2020



Fort Carson

Directorate of Public Works, Environmental Division

PROGRAMMATIC ENVIRONMENTAL ASSESSMENT FOR THE IMPLEMENTATION OF THE INTEGRATED NATURAL RESOURCE MANAGEMENT PLAN FOR FORT CARSON AND PIÑON CANYON MANEUVER SITE

Prepared By:
Angie Bell
NEPA Program Manager
Directorate of Public Works
Fort Carson, CO 80913

Reviewed By:
Directorate of Public Works
Staff Judge Advocate Office

Submitted By:
HAL K. ALGUIRE
Director
Public Works
Fort Carson, CO 80913

2 Sept 2020
Date

Approved By:
NATHAN R. SPRINGER
COL, AR
Garrison Commander
Fort Carson, CO 80913

9 September 2020
Date

1.0 PURPOSE, NEED, AND SCOPE

1.1 INTRODUCTION

Fort Carson has prepared this Programmatic Environmental Assessment (EA) to identify and evaluate potential environmental effects from implementing the Integrated Natural Resource Management Plan 2020-2025 for Fort Carson and Piñon Canyon Maneuver Site (2020 – 2025 INRMP). The 2020 -2025 INRMP will update and replace the 2013 – 2017 Integrated Natural Resources Management Plan (updated 2015) (2013 -2017 INRMP) and specify the best management practices and adaptive management strategies to conserve ecological integrity, facilitate Army training, and promote the sustainability of ecosystems at both Fort Carson and Pinon Canyon Maneuver Site (PCMS).

The EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 US Code [USC] 4321 *et seq*.), the Council on Environmental Quality (CEQ) Regulations Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] Part 1500-1508), and the Army NEPA Regulation (*Environmental Analysis of Army Actions*; 32 CFR Part 651, 1 January 2007). This EA provides the basis for determining if a Finding of No Significant Impacts (FNSI) is appropriate, or if an Environmental Impact Statement (EIS) is required.

1.2 PURPOSE AND NEED FOR PROPOSED ACTION

The purpose of the 2020 – 2025 INRMP is to link and integrate conservation management actions with Army military mission activities in order to maintain high-quality lands for training, biodiversity, and recreation. It is developed to guide land management to follow two major land management goals. First, it integrates natural resources stewardship and compliance responsibilities with operational requirements to help achieve sustainable ranges, training areas, and other land assets. Secondly, it outlines the requirements to develop, initiate, and maintain programs for the conservation, utilization, and rehabilitation of natural resources on Fort Carson and PCMS.

Specifically, the 2020 – 2025 INRMP will facilitate the following installation specific goals:

- Conserve the environment for the purpose of supporting the militarymission;
- Strive to achieve no net loss of capability of installation lands to support the military mission;
- Eliminate or minimize both permanent and temporary land restrictions on military training;
- To the greatest extent possible, shape the landscape to meet the training needs of the military;
- Achieve 100 percent compliance with environmental laws and regulations;
- Use an ecosystem-based approach to natural resource management, managing for values such as biodiversity, recreation, water quality, native species, and aesthetics;
- Practice adaptive management, improving our approaches and techniques using the best available science, and sound Best Management Practices(BMPs);

- Foster a sense of environmental stewardship among soldiers, employees, and neighbors who use or have in interest in natural resources on Fort Carson and PCMS;
- Improve communication, coordination, and participation among interested parties and partners in the region; and,
- In conjunction with Army Integrated Training Area Management (ITAM) program, facilitate sustainable training by promoting education and by managing the natural resources to meet the needs of the trainers and the missionscape.

1.3 SCOPE OF ANALYSIS

This Programmatic Environmental Assessment documents the analysis for implementing the reoccurring actions outlined in the 2020 – 2025 INRMP.

United States Army policy, as set forth in 32 CFR Part 651 (Environmental Analysis of Army Actions; Final Rule), requires that an environmental assessment be completed for the development and implementation of an Integrated Natural Resource Management Plan. The programmatic nature of this environmental assessment serves as the basis for tiering subsequent environmental documentation related to conservation, management, research, and program activities associated with the plan.

Effects of training, infrastructure improvements, maintenance and other installation projects and uses are analyzed in other environmental analysis. A list of existing Environmental Assessments and Environmental Impact Statements can be found on the Fort Carson NEPA webpage at https://www.carson.army.mil/organizations/dpw.html#three. The effects of past, ongoing and reasonably foreseeable actions are incorporated into the cumulative effects analysis.

1.4 AGENCY AND PUBLIC INVOLVEMENT

Agency and public participation in development of an Integrated Natural Resource Management Plan begin early. The U.S. Fish and Wildlife Service (USFWS) and the Colorado Division of Parks and Wildlife (CPW) are signatories of the Plan and as such, provide comments to the Plan throughout its development. Additional agencies and the general public will have the opportunity to review and comment on the 2020 – 2025 INRMP, the EA and FNSI. The thirty-day public comment period to solicited public feedback on the plan began May 13, 2020 and ended on June 12, 2020. A notice of availability was published in local newspapers in Colorado Springs, Fountain, Canon City, Pueblo, Trinidad and La Junta, Colorado. No comments were received.

1.5 LEGAL FRAMEWORK

Development and implementation of the INRMP was guided by the Sikes Act (16 USC 670a-f, *as amended by* The Sikes Act Improvement Act of 1997, Pub. L. No. 105-85, 2901-2914). The Sikes Act mandates not only the preparation of an INRMP but also the implementation of the management activities contained in the plan. According to the Sikes Act, the conservation program must be consistent with the mission-essential use of the installation and its lands and

cause no net loss of military land use. The 2020 – 2025 INRMP has been prepared to meet natural resources regulatory requirements while ensuring no net loss in the capability of military lands to support the military mission of the Fort Carson and PCMS.

32 CFR Part 651, Environmental Analysis of Army Actions (AR 200-2) (March 2002), provides Army guidance and procedures for complying with NEPA and sets forth policy for integrating environmental considerations into Army planning and decision making. Embodying the intent and spirit of NEPA, 32 CFR Part 651 (AR 200-2) directs installations to integrate environmental reviews concurrently with other Army planning and decision-making actions. An INRMP is the type of document that should be environmentally reviewed prior to implementation. Therefore, the requirements of 32 CFR Part 651 (AR 200-2) must be addressed in the context of assessing the potential environmental effects of a proposed action to implement an INRMP once it has been developed.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The proposed action is the implementation of the 2020 – 2025 INRMP. The 2020 – 2025 INRMP contains 164 reoccurring actions. The reoccurring actions are found at the end of each Program Element in Chapter 4 and consolidated in Appendix 8 of the 2020 – 2025 INRMP. The reoccurring actions can be broken down into eight categories for the purpose of this EA. A brief description of each category is provided below and the action, and its category type can be found in Appendix A of this EA.

Adaptive Management – Adaptive management is the implementation of actions, monitoring of those actions, assessment of the outcomes, and re-evaluation and re-implementation based on empirical results. Adaptive management activities span all of the resource types found on Fort Carson including air, water, soils, fish and wildlife, and vegetative communities. Examples of adaptive management include the development of water resource, erosion control measures, prescribed burning, and creating cover for sensitive species.

Administrative – Administrative actions include actions that are primarily associated with budgeting and personnel and are largely confined to an office environment. Examples of administrative actions include funding for professional development, budgeting for fire-related expenses and maintaining databases.

Coordination – Coordination activities are required for the Fort Carson Environmental Division to actively work with organizations within Fort Carson and PCMS, as well as outside organizations that include state and federal regulatory organizations, universities, natural resource professional organizations and stakeholder working groups. Examples of coordination actions include formal and informal consultation with regulatory agencies and work group attendance.

Monitoring – Monitoring is an integral component of successful natural resource management and directly supports the adaptive management actions. Examples of monitoring include monitoring water and soil conditions, monitoring sensitive species, and monitoring of vegetative community health.

Outreach – Fort Carson participates in outreach actions to engage the larger community regarding natural resource issues on the installation. Examples of outreach include maintaining access to recreational areas on Fort Carson and participating in the Wounded Warrior program.

Planning – Planning actions seek to address natural resource related goals and objectives through formal processes which engage interdisciplinary expertise. Examples of planning actions include developing and updating supplemental natural resource management plans and addressing environmental impacts on natural resources during the NEPA process.

Studies – Studies provide natural resource managers with critical data on the state and trends of natural resources. Examples of studies include learning more about the effects of off-road vehicle use on ground-nesting birds.

Training – Training and professional development are a critical element of natural resource management. Examples of training needs identified in the 2020 - 2025 INRMP include training for personnel involved in prescribed fire and wildland fire fighting.

2.2 NO ACTION

Fort Carson would continue natural resource management under the 2013-2017 INRMP which can be found on the Fort Carson website at https://www.carson.army.mil/assets/docs/dpw/NEPA/ftc-inrmp-dec-2017-update.pdf

2.3 PROPOSED ACTION VERSUS NO ACTION

The specific differences between the No Action and Proposed Action including the re-occurring actions added, removed and changes in priorities can be found in Appendix B of this EA. Below is a narrative summary of the differences.

2.3.1 Species of Conservation Concern

Existing Conditions were updated in the 2020 – 2025 INRMP. Many of the changes to re-occurring actions for Species of Conservation Concern between the No Action and Proposed Action are driven by the changes in the existing condition.

Species were added to the Federal Review for listing under the Endangered Species Act. Species Management Plans were developed for the Colorado checkered whiptail, little brown bat, the monarch butterfly, plains spotted skunk, and the tri-colored bat. No management plan was created for the desert massasauga as neither installation is within the known range and reptile baseline surveys conducted in 2018 and 2019 did not detect the species on Fort Carson or PCMS. Surveys and inventories will clarify the presence of the western bumble bee, eastern black rail, Colorado checkered whiptail and habitat associations that will help in the management of the species on Fort Carson and PCMS. The addition of amphibian surveys will allow natural resource managers to respond more quickly to future new and potential Species of Conservation Concern listings.

Management considerations for the eastern black rail were added to the Federally Proposed Species section. Surveys will clarify whether this species is present and if future consultation with USFWS is warranted. The Arkansas darter was removed from the Federal Candidate Species list under the Endangered Species Act. The leopard frog was removed from the Federally Petitioned Species list under the Endangered Species Act. This lead to the removal of leopard frog re-occurring actions from the Proposed Action.

Changes to the Army Species at Risk (SAR) lead to additional species for consideration in the 2020 – 2025 INRMP. They are the mountain plover, the tri-colored bat, Arkansas Valley primrose, and the rayless goldenweed. The triploid checkered whiptail was renamed the Colorado checkered whiptail. The list of species on the Colorado Natural Heritage Program and CPW species of State Special Concern changed between the 2020 – 2025 INRMP and the 2013 – 2017 INRMP. There are now one species of fish, three species of amphibians, two species of reptiles, five species of birds, three species of mammals and fifteen species of vascular plants. Species list can be found in Appendices 5, 6, and 7 of the 2020 – 2025 INRMP.

Species of Conservation Concern such as Mexican spotted owl, mountain plover, Arkansas dater, redbelly dace, and others will continue to be managed under the 2020 – 2025 INRMP as they were under the 2013-2017 INRMP.

2.3.2 Wetlands Management

Wetlands on Fort Carson and PCMS will continue to be managed to meet the goal of zero net loss of wetland resources. Under the 2020 – 2025 INRMP, there is a renewed focus on avoiding or minimizing impacts to wetland resources from training activities. A re-occurring action to implement spill containment measures for temporary refueling points was also added to meet the goal of zero net loss of wetland resources.

2.3.3 Conservation Law Enforcement

There are no changes to the re-occurring actions for Conservation Law Enforcement between the 2020 – 2025 INRMP and the 2013 – 2017 INRMP. The focus remains on enforcement of regulations and outreach to recreationists about compliance with the regulations.

2.3.4 Fish and Wildlife Management

In the 2020 – 2025 INRMP, there has been a shift of focus from gathering data to using the data previously collected to better understand big game species on the installation and the prevalence of chronic wasting disease in the deer population. Natural resource managers will continue to work with Colorado Parks and Wildlife on wildlife management options to improve the quality and abundance of big game habitat on Fort Carson and PCMS.

The 2020 – 2025 INRMP takes advantage of the information collected to increase the priority of habitat improvement by integrating prescribed fire, revegetation, invasive species treatment, and stormwater management to improve biodiversity. Bat surveys have been

added to the Proposed Action as a result of the new bat species being considered for Species of Conservation Concern and the increase risk from white nose syndrome.

2.3.5 Forestry Management

In the 2020 – 2025 INRMP, forestry management has one additional re-occurring action compared to the 2013 – 2017 INRMP. It is to ensure that a complete forest inventory is completed every ten years. This is to provide data for meeting the program goal of implementing sound silvicultural practices for multiple uses that promote healthy, sustainable forests that contribute to biological diversity and ecosystem stability.

2.3.6 Migratory Bird Management

The 2020 – 2025 INRMP moves toward managing shelterbelt planted under the 2013 – 2017 INRMP. The 2020 – 2025 INRMP adds re-occurring actions to begin monitoring of newly listed or proposed species such as the eastern black rail, the nightjar, and the pinon-juniper bird species. Monitoring for other migratory birds will continue as described in the 2013 – 2017 INRMP. The 2020 – 2025 INRMP includes the re-occurring actions for the loss of nest sites that are included in the 2013 – 2017 INRMP such as constructing nesting cavities and platforms and maintaining snags on the landscape.

2.3.7 Invasive Species Management

The goals for monitoring myrtle spurge and African rue have been accomplished as required in the 2013 – 2017 INRMP and have been removed from the 2020 – 2025 INRMP. Monitoring for aquatic nuisance species has been added to the 2020 – 2025 INRMP. The emphasis of the Invasive Species Management in the 2020 – 2025 INRMP has been shifted toward cooperation with partners and other agencies by moving up the cooperation re-occurring action up on the priority list from the 2013 – 2017 INRMP.

2.3.8 Pest Management

There was an additional integration with other activities on the installation with pest management by adding the re-occurring action to Participate in Directorate and Garrison level working groups in the 2020 – 2025 INRMP. The priority of minimizing pesticide and chemical treatment options and minimizing effects on wildlife and human safety was moved up in the 2020 – 2025 INRMP compared to the 2013 – 2017 INRMP. Safety and the prioritization on training remains an important part of the pest management program on the installation.

2.3.9 Geographic Information System

The program will continue to manage natural resource data, creating maps and doing essential analysis. There was one added re-occurring action added to this program for the 2020 – 2025 INRMP which requires the data to be managed using the Army data standards.

2.3.10 Outdoor Recreation

This was previously known as Wildlife Recreation in the 2013 – 2017 INRMP. The focus of the program has changed under the 2020 – 2025 INRMP because of the development of the iSportsman web-based recreation management program. The re-occurring actions in the 2013 – 2017 INRMP to continue hunter check stations and implement an automated recreation control system. The priority of the program under the 2020 – 2025 INRMP is to Manage Sikes Act permit sales via iSportsman and hunter check-in kiosks. Warm-water fisheries have been established where possible and are self-sustaining so the re-occurring action to establish a warm water fisheries has been removed from the 2020 – 2025 INRMP.

Coordination with other directorates such as the Directorate of Plans, Training, Mobilization and Security or the Directorate of Emergency Services will continue to be ongoing to allow access to recreationist during big game seasons. Areas such as the Bird Farm, Wildlife Demonstration Area, and the fishing reservoirs will remain open to the public in the 2020 – 2025 INRMP. Outreach activities will remain similar to those in the 2013 – 2017 INRMP with the additional of participation with Wounded Warriors programs. The re-occurring action to review and prioritize projects for habitat management, improvement, and restoration needs on FC and the PCMS for funding with permit proceeds is added to help prioritize funding toward habitat improvement in the 2020 – 2025 INRMP.

2.3.11 Wildlife Aircraft Strike Hazard

There was an additional requirement added to the 2020 – 2025 INRMP to maintain grass at the airfield to between 6 inches to 12 inches to reduce the attractiveness of wildlife to the airfield. The re-occurring actions have been reprioritized in the 2020 – 2025 INRMP to focus first on prairie dog management at the airfield. Coordination and participation in working groups was moved up in priority in the 2020 – 2025 INRMP compared to the 2013 – 2017 INRMP.

2.3.12 Wildland Fire Management

The program will continue to assist with wildfire suppression and the preparation of the prescribed burn plans just as in the 2013 – 2017 INRMP. Under the 2020 – 2025 INRMP, fire management activities will continue to consider cultural resources, wildlife resources, endangered species, Mexican spotted owl habitat, smoke management and other natural resources. Fire breaks around Fort Carson will be maintained in the 2020 – 2025 INRMP as in the 2013 – 2017 INRMP. The 2020 – 2025 INRMP, contains two changes to the wildland fire management program. The first is the addition of the use of mastication, forest thinning,

mowing and herbicide use to reduce fuels on the installations. The second is the addition of cooperation with the ITAM program on monitoring effects of prescribed fire on natural resources.

2.3.13 Training of Personnel

There were no changes made between the 2013 – 2017 INRMP and the 2020 – 2025 INRMP.

2.3.14 Floodplain Management

The 2020 – 2025 INRMP added the requirement to use the NEPA input process to provide mitigations and recommendations for projects during the planning phases. The re-occurring action still requires the compliance with all legal requirements regarding floodplains.

2.3.15 Mineral Resources

There are no differences between the 2013 – 2017 INRMP and the 2020 – 2025 INRMP for this element.

2.3.16 Urban Forestry

The requirements and best management practices remain the same for the 2013 – 2017 INRMP and the 2020 – 2025 INRMP with one exception. The 2020 – 2025 INRMP added the development to an Urban Forest Management for Fort Carson.

2.3.17 Water Rights

Under the 2020 – 2025 INRMP, the water rights program will continue to send monthly reports to the State District Water Commissioner, send reports to State on stream gauges, and well reports to Colorado Water Protective Development Association. The water rights program is adding focus on actively managing water infrastructure including repair and maintain ditches, reservoirs and wells in the 2020 – 2025 INRMP. It also added requirement to monitor stream flows and maintain approximately 35 wells at PCMS.

2.3.18 Integrated Training Area Management

The ITAM program has increased focus on communicating sustainable use of training lands including education on safety issues, cultural resources and natural resources in the 2020 – 2025 INRMP. The program will continue to implement projects that will ensure safety, maneuver access, erosion control and mitigate other impacts of land use. The impacts to vegetation, soil resources and watersheds will continue to be monitored. So projects can be prioritized and maps can be provided when needed for safety or other uses.

2.3.19 Bald and Golden Eagle Management

There has been a change in the temporary training restrictions that would be implemented around eagle nests. The bald and golden eagle nest buffer was 200 meters in 2013-2017 INRMP. The 2013 - 2017 INRMP to change the buffer to 800 meters. The nest buffer for the 2020 – 2025 INRMP has been revised to one-half mile for maneuver and live fire training. Aircraft cannot fly within 500 feet of an occupied eagle nest.

2.4 SUPPLEMENTAL MANAGEMENT PLANS

Supplemental Management Plans are incorporated by reference and include:

- Black-tailed Prairie Dog Management Plan
- Endangered Species Management Plan for the Mexican Spotted Owl
- Integrated Pest Management Plan
- Forest Management Plan
- Fort Carson Water Rights Inventory and Master Plan
- Fuels Management Plan
- Urban Forest Management Plan
- Wildlife Aircraft Strike Hazard Plan
- Integrated Wildland Fuels Management Plan.

3.0 ENVIRONMENTAL CONSQUENCES

3.1 INTRODUCTION

This portion of the EA presents the direct and indirect impacts of the No Action and Proposed Action alternatives based on an analysis of current information and data related to natural resources and their conservation and management.

3.2 RESOURCES NOT ADDRESSED

The following natural resource, social, and socioeconomic factors have been screened from further review in this EA as they were found to be negligible when reviewed by an interdisciplinary team of environmental scientists, biologists, economists, planners and archaeologists. A brief synopsis is provided below for each factor screened and dismissed.

3.2.1 Land Use

There would not be any permanent changed to land use as a result of either the No Action or Proposed Action. Designation for limited use for rehabilitation under the ITAM program would be temporary.

3.2.2 Noise

It is not anticipated that the reoccurring actions in either the No Action or Proposed Action Alternatives would result in any measureable change in noise levels in and around Fort Carson or PCMS.

3.2.3 Socioeconomics

Small, limited duration contracts may be awarded, under either the No Action or Proposed Action alternatives, to accomplish projects associated with natural resource management at Fort Carson or PCMS. It is anticipated that such contracts will be well below any threshold that would impact the regional economic or socioeconomic climate.

3.2.4 Environmental Justice

It is not anticipated that any of the activities, research, studies or programs associated with natural resource management under either the No Action or Proposed Action alternative will have an adverse impact on minority and/or low-income populations in or around Fort Carson or PCMS.

3.2.6 Hazardous Substances

Under the No Action and Proposed Action herbicides and pesticides will continue to be utilized in accordance with their prescribed usage by trained and licensed personnel. Such substances will be utilized in a manner that reflects the benefit of their application in the context of the broader ecological community and accounts for human health concerns. Additionally, approved biological controls will be employed in areas where the use of herbicides are limited and access is difficult.

3.3 AFFECTED ENVIRONMENT FOR RESOURCES ADDRESSED

The affected environment for each Program Element is captured in detail in the Current Conditions Section of the 2020 – 2025 INRMP and are summarized below.

3.3.1 Air Quality

DPW Environmental Division Air Quality Program aims to achieve flexible Colorado permitting conditions to sustain the military mission without compromising air quality for the region. Fort Carson is within the air quality control areas of El Paso, Fremont, and Pueblo counties, including the City of Colorado Springs. The northern portion of Fort Carson's cantonment area is located in a maintenance area for carbon monoxide. The *Revised Carbon Monoxide Attainment/Maintenance Plan Colorado Springs Attainment/Maintenance Area* covers Colorado Springs, and subsequently the northern portion of Fort Carson, as a maintenance area through calendar year 2020 (CDPHE 2009). PCMS is in in attainment areas for all criterial pollutants.

3.3.2 Soils

A goal of soils management is to provide quality, sustainable training environments to support the Army's military mission and help ensure no net loss of training capability. On Fort Carson, soil erosion (primarily from water runoff) is a significant problem on the installation. Soils of greatest concern for erosion control are clays, silty clays, and clay loams. At PCMS, soils are generally silty and weakly developed and are calcareous throughout.

3.3.3 Water Resources

Fort Carson lies within the Arkansas River basin. The average water flow on and near Fort Carson is about 2-5 cubic feet/second. Some streams can be expected to have no flow at some time during the year. There are approximately 64 surface acres in 12 water bodies for fishery and wildlife resources. The current estimate of wetlands on Fort Carson, based on the 2004 NWI, is 1,389 acres.

The PCMS is also in the Arkansas River basin. The Purgatoire River runs within and adjacent to PCMS. During years with average and above-average snowpack, such as occurred in 1984, 30-50 percent of the annual stream flow of the Purgatoire River occurs during April and May. The current estimate of wetlands on the PCMS, based on the 2004 NWI, is 361 acres.

Water resource related goals include ensuring no net loss of wetlands on Fort Carson or PCMS. The programs also want to meet requirements of the CWA and implement the Stormwater Management Plan. Water rights will be managed for beneficial uses.

3.3.4 Biological Resources

The INRMP outlines actions to ensure Army lands meet current and future training needs for realistic training through the sustainment of biological diversity of terrestrial and aquatic ecosystems on Fort Carson and PCMS. The 2020 – 2025 INRMP outlines the management of species of Conservation Concern include Federal threatened and endangered species such as the Mexican Spotted Owl and the black-footed ferret, as well as proposed, candidate and under-review species. It also covers Army Species at Risk (SAR), Colorado listed species, Colorado Natural Heritage Program (CNHP) and Colorado Parks and Wildlife (CPW) species of State Special Concern, migratory birds and Birds of Conservation Concern. Big and small game species management is also included in the 2020 - 2025 INRMP to manage the population levels of wildlife within the current carrying capacity of specific wildlife habitats on Fort Carson and PCMS in order to maintain and enhance a sustainable ecosystem, and provide recreational opportunities for the enjoyment of the public.

Currently, much of the forests on Fort Carson and PCMS are overstocked and in need of thinning. The vision for the future forest is a mosaic of stands of varying densities with trees representing a wide range of size and age classes. Generally, the goal of forest management is to maintain stands of varying acreages within the forest that are stocked with tree densities that reduce the risk of crown fire and disease.

There are 30 species of state-listed noxious weeds that have invaded both natural and urbanized landscapes at Fort Carson and PCMS. In general, weed populations are more widespread at Fort Carson than the PCMS. This may be due, in part, to the greater degree of ground disturbing training as well as the higher frequency of training that occurs at Fort Carson. Other factors may include Fort Carson's proximity to a large population center (Colorado Springs), its proximity to I-25, and precipitation and availability of water which is a limiting factor for some weed species.

The main goal of the pest management program is to maintain and safeguard the health, environmental quality, aesthetic values, and ecological balance of the military community by protecting real estate investments from depreciation by pests, while complying with environmental protection and improvement policies. Pest Management primarily deals with insects that vector diseases and nuisance wildlife pests, such as skunks, porcupines, raccoons, foxes, mice/rats, squirrels, rabbits, birds, and species such as prairie dogs are managed to minimize risks involving safety and property on locations such as airfields in accordance with the Fort Carson Wildlife Aircraft Strike Hazard program.

3.3.5 Cultural Resources

Cultural resources are the non-renewable remnants of past human activities that have cultural or historical value and meaning to a group of people or a society. For the purposes of this EA, the term "cultural resources" includes historic properties, as defined in the National Historic Preservation Act (NHPA); archaeological resources, as defined in the Archaeological Resources Protection Act (ARPA); cultural items, as defined in the Native American Graves Protection and Repatriation Act (NAGRPA); sacred sites, as defined in Executive Order 13007; and collections, as defined in 36 CFR 79.

USAG Fort Carson manages over 8,000 cultural resources at Fort Carson and PCMS. These resources represent every period of human occupation from the Paleoindian stage to the present, and include prehistoric lithic scatters, camps, and architecture; prehistoric and historic quarries and mining sites; prehistoric and historic rock art; historical homesteads and ranches; stage and trail remnants; historic districts; historic buildings, structures, and objects; and sacred sites. The 2017-2021 Fort Carson Integrated Cultural Resources Management Plan (ICRMP) provides a framework to integrate cultural resources management into the everyday operation of Fort Carson and PCMS, including Standard Operating Procedures in Chapter 7, to ensure compliance with cultural resource-related legislation and protection of cultural resources.

3.4 ENVIROMENTAL EFFECTS FOR RESOURCES ADDRESSED

There are several of the categories of reoccurring actions that will not have measurable direct or indirect effects on the human environment of Fort Carson, PCMS or the surrounding communities. Administrative actions include budgeting and human resources actions. Coordination with other regulatory agencies, partners and stakeholders will improve the effectiveness of natural resource management on Fort Carson and PCMS but no measurable

effect. Monitoring is the act of observing conditions and capturing the findings in a database. This information does influence the adaptive management actions but monitoring itself does not have any effect on natural resources.

Planning activities, including the development of supplemental plans, will not have an effect on the human environment in. The implementation of any recommendations, which would be covered under adaptive management actions, may have an effect on natural resources. The effects of implementing recommendations of supplemental plans is considered under the adaptive management actions. Training of natural resource personnel will have no measurable effect on natural resources.

Studies take monitoring further in that they use information to establish or predict trends and baseline conditions for natural resources. Some studies may require small amounts of disturbance to natural resources. Examples are taking core samples for a geotechnical study or trapping individuals of a species to gather biometric or other information. These effects will be temporary and negligible.

The two categories of reoccurring actions that may have an effect on the human environment are adaptive management and outreach, specifically outdoor and wildlife recreation on Fort Carson and PCMS. These two categories are considered in the effects analysis below.

3.4.1 Air Quality

The Adaptive Management and Outreach actions that would affect air quality are wildland and prescribed fire management as well as dust from native surface roads used by recreationists and Soldiers training.

No Action Alternative

Under the No Action Alternative both wildfire and prescribed burning on Fort Carson and Piñon Canyon Maneuver Site would continue to be managed in accordance with the 2013-2017 INRMP. Air quality under this alternative would be maintained in a satisfactory state as any planned burning under this alternative would continue to be overseen by the state of Colorado through issuance of Air Quality Smoke Management Permits. Under this alternative newly established goals with regard to prescribed fire for the benefit of wildlife and habitat would not be undertaken. Additionally, the use of prescribed burning would only be pursued to the extent that such activities are consistent with the 2013-2017 INRMP. Adaptive Management activities that may create fugitive dust will adhere to the Fort Carson Fugitive Dust Plan to minimize dust and avoid dust from leaving the installation boundary.

Proposed Action

Under the Proposed Action air quality on Fort Carson and Piñon Canyon would continue to be maintained in a satisfactory state. Updated natural resource management goals that are addressed in full or in part as a result of prescribed burning will continue to be executed in compliance with all federal, state, and local permit requirements. Air quality under this alternative would be maintained in a satisfactory state as any planned burning under this alternative would continue to be overseen by the state of Colorado through issuance of Air

Quality Smoke Management Permits. Adaptive Management activities that may create fugitive dust will adhere to the Fort Carson Fugitive Dust Plan to minimize dust and avoid dust from leaving the installation boundary.

3.4.2 Soils

The adaptive management actions that may have an effect on soil resources include the re-occurring action carried out under the Integrated Training Area Management (ITAM) program such as erosion control and maneuver access projects. Actions recommended by the Stormwater Management Plan (DPW, 2017) may also have an effect on soil resources. Prescribed burning can reduce the intensity of wildfires by reducing fuel in areas.

No Action Alternative

Under the No Action Alternative soils will continue to see slight benefits at both Fort Carson and PCMS as conservation and protection measures offered under the No Action and the annual Integrated Training Area Management plan continue to be utilized. On Fort Carson the implementation of an aggressive Stormwater Management Plan (DPW, 2017) also continues to benefit and protect soils on the post from degradation as a result of stormwater related erosion. Minor improvements to the soils at Fort Carson and Piñon Canyon Maneuver Site are anticipated under this alternative as a result of ongoing management activities.

Proposed Action

Under the Proposed Action it is anticipated that soils will benefit from an increase in protection as a result of updated and validated projects and an adaptive management strategy presented in the 2020 - 2025 INRMP. Coupled with ongoing management activities encompassed in the ITAM and Stormwater Management plans the benefits to soils will be greater than those of the No Action Alternative. Examples of increased soil protection offered in the 2020 - 2025 INRMP include reoccurring projects at Fort Carson and PCMS that include construction of erosion control dams and the implementation of stormwater best management practices (BMPs). Finally, prescribed burns that result in low intensity fires maintain the established seedbank in the soil thereby allowing rapid vegetative regrowth which ameliorates the effects of water and wind erosion.

3.4.3 Water Resources

The reoccurring actions that may affect water resources are the ITAM actions including erosion control measures and the implementation of the Stormwater Management Plan (DPW, 2017). Floodplain protection throughout the planning process may also have a benefit to floodplains and water resources on Fort Carson.

No Action Alternative

Under the No Action Alternative water resources on Fort Carson and Piñon Canyon Maneuver Site will continue to be maintained through erosion mitigation efforts in conjunction with the ITAM program and the implementation of stormwater runoff BMPs. Floodplain protection will continue to be enforced as per Executive Order 11988, Floodplain

Management. Positive benefits from these activities will continue to accrue if the status quo is maintained.

Proposed Action

Under the Proposed Action the positive benefits obtained through erosion control projects will continue. Small benefits may be gained from improved suppression of riparian invasive species such as tamarisk (*Tamarix spp.*) and updated prescribed burn plans and riparian rehabilitation. Floodplains and their associated benefits such as flood control, wetlands maintenance, and riparian habitat, will continue to be protected.

3.4.4 Biological Resources

The framework for managing biological resources on Fort Carson and PCMS have been established in the 2013 – 2017 INRMP. Each revision uses the data and experience uncovered from previous versions to improve upon management strategies. The 2020 – 2025 INRMP is no different. Changes to the reoccurring actions such as being more intentional about dusting prairie dog colonies to control the plague in select locations, maintaining nesting platforms for raptors or artificial nesting cavities for migratory birds are a result of this adaptive management approach. The installation will use tools such as mastication, limbing trees, mowing and using herbicides to manage fuel loads to reduce the probability and intensity of wildfires.

No Action Alternative

Flora

Under the No Action alternative, vegetative communities will continue to be managed as part of an ecosystem- based management approach. This natural resource management approach recognizes ecosystems as complex systems and accounts for potential cascading consequences and non-linear processes associated with changes to ecological communities.

Species of special conservation concern on Fort Carson and PCMS will be managed within an ecosystem-based management paradigm under the No Action alternative. The emphasis on a multispecies community approach would continue to be used to manage species of concern. The management framework views conservation efforts through a broad ecological community scope with an eye toward cascading consequences. Understanding and addressing issues associated with species of concern at larger spatial scales and ecological context, coupled with stakeholder engagement, will increase the likelihood of success in maintaining species populations resulting in positive long-term benefits.

Wetlands

Under the No Action alternative wetlands on Fort Carson and PCMS will continue to be managed by a three- tiered mitigation procedure that encompasses avoidance, minimization, and compensation, thus streamlining the four-tiered process from prior INRMPs. The Clean Water Act and Executive Order 11990 (Wetlands Protection) (May 24, 1977), underpin wetlands management and protection on both installations. There are no anticipated impacts or benefits to wetlands associated with the Proposed Action.

Fauna

Under the No Action alternative vertebrate wildlife, to include terrestrial, aquatic, and avifauna, will continue to be managed under an ecosystem-based management paradigm. This natural resource management approach recognizes ecosystems as complex systems and accounts for potential cascading consequences and non-linear processes associated with ecological communities.

Proposed Action

Flora

The effects of the Proposed Action will be similar to the effects described as the No Action alternative. This is because the framework for ecosystem management created in earlier versions of the INRMP is incorporated into the 2020 – 2025 INRMP. The use of selective mastication, limbing of trees, mowing and herbicide use to reduce wildfire intensity are a benefit to the flora on both Fort Carson and PCMS. Lower intensity burning, both prescribed and wildland fire, will reduce the risk of loss of vegetation communities across the landscape.

Wetlands

The effects of the Proposed Action will be similar to the effects described as the No Action alternative. This is because the framework for ecosystem management created in earlier versions of the INRMP is incorporated into the 2020 – 2025 INRMP. The requirement of no net loss of wetlands on the installation will have a beneficial effect on species dependent on wetlands for habitat and cover.

Fauna

The effects of the Proposed Action will be similar to the effects described as the No Action alternative. This is because the framework for ecosystem management created in earlier versions of the INRMP is incorporated into the 2020 – 2025 INRMP. Additions to the reoccurring actions such as dusting select prairie dog colonies to minimize the risk of the plague will have beneficial effects on populations of eagles, burrowing owls and other raptors. Providing nesting platforms and cavities in areas where nesting opportunities are limited will have a benefit to raptors and migratory birds.

Reoccurring actions such as planning level surveys of game and non-game species, the determination of species abundance and distribution, and analysis of protection measures such as those under the “monitoring” category in Appendix A of this EA, provide relevant examples of data gathered to support this approach. It is anticipated that long-term positive benefits will result from the Proposed Action through an ecosystem-based management paradigm encompassed in the 2020 - 2025 INRMP that allows for greater coordination, a focus on multispecies solutions, and a focus on ecosystem structure and function.

3.4.5 Cultural Resources

Natural resource management re-occurring adaptive management activities may have an impact (beneficial or negative) to cultural resources. Erosion control activities and grounds maintenance

activities, such as prescribed burns, forestry activities, and invasive plant species management activities.

No Action Alternative

Natural resource management activities may have an impact (beneficial or negative) to cultural resources. Erosion control activities and grounds maintenance activities, such as prescribed burns, forestry activities, and invasive plant species management activities that occur within the Fort Carson cantonment area are categorized as exempted undertakings in accordance with the *Programmatic Agreement among U.S. Army Garrison Fort Carson, the Colorado State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding Construction, Maintenance, and Operations Activities for Areas on Fort Carson, Colorado,* executed on March 27, 2013, and amended on December 27, 2020 (Fort Carson Built Environment PA). All natural resource management activities that occur on downrange Fort Carson and PCMS are considered exempted undertakings in accordance with the *Programmatic Agreement among U.S. Army Garrison Fort Carson, Colorado State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding Military Training and Operational Support Activities Down Range Fort Carson, Colorado,* executed on March 31, 2014, and amended on May 2, 2018 (Fort Carson Downrange PA), and the *Programmatic Agreement among U.S. Army Garrison Fort Carson, Colorado State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding Military Training and Operational Support Activities at Piñon Canyon Maneuver Site, Fort Carson, Colorado,* executed on April 23, 2014, and amended on April 24, 2018 (PCMS PA). Per these programmatic agreements, these activities must occur outside the boundary of a protected cultural resource. The effects of any activity not covered by one of the exemptions in the Fort Carson Built Environment PA, Fort Carson Downrange PA, or PCMS PA or occurring within a protected resource must be consulted upon in accordance with Section 106 of the NHPA and its implementing regulations, 36 CFR Part 800.

Procedures are outlined in Chapters 6 and 7 of the ICRMP to ensure that protected cultural resources are avoided or minimally impacted by these activities. Coordination procedures outlined in Chapter 3 of the INRMP and Chapter 7 of the ICRMP require project proponents to submit all project plans to the Cultural Resources Management Program via the NEPA compliance review prior to contract award and project implementation. All proposed projects will be reviewed by the Cultural Resources Manager to assess effects to historic properties. The Cultural Resources Management Program also provides limited information on protected cultural resources to project proponents to reduce the risk of inadvertent entries into these resources, as well as for project planning purposes in order to avoid and minimize adverse effects to historic properties.

Proposed Action

The effects of the Proposed Action will be the same as described above under the No Action alternative. The coordination and review process will remain the same as described under the No Action alternative.

3.5 CUMULATIVE EFFECTS

NEPA requires the analysis of cumulative impacts on the human and natural environment. Guidance on cumulative impacts from the Council on Environmental Quality (CEQ) is provided in the following quote:

Cumulative impact is the impact on the human and natural environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non- federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

The effects of the reoccurring actions proposed in the 2020 -2025 INRMP are considered in the context of the past, present and reasonably foreseeable actions within the installation. These actions include training activities, infrastructure improvement activities, and new construction to meet Fort Carson and PCMS mission requirements. The actions and their effects can be found in existing environmental documents found on the Fort Carson NEPA webpage (https://www.carson.army.mil/organizations/dpw.html#three). Projects and documents of note are:

- 2019 Environmental Assessment for the Conversion of the Infantry Brigade Combat Team to a Stryker Brigade Combat Team
- 2015 Environmental Impact Statement for Pinon Canyon Maneuver Site Training and Operations
- 2015 Environmental Assessment for MQ-1C Gray Eagle Unmanned Aerial Systems (UAS) at Fort Carson, Colorado
- 2014 Environmental Assessment for Conversion of 4ID Brigade Combat Teams at Fort Carson, Colorado
- 2012 Environmental Assessment for Fort Carson Net Zero Waste, Water and Energy Implementation
- 2012 Environmental Assessment for Fort Carson Combat Aviation Brigade (CAB) Stationing Implementation
- 2009 Environmental Impact Statement for Implementation of Fort Carson Grow the Army Stationing Decisions

Cumulative impacts associated with natural resource management span the entirety of both Fort Carson and PCMS. As such, potential past, present, and reasonably foreseeable actions (positive as well as negative) with implications for natural resource management include game species management, the control of invasive species, and wildfire management. Given the geographic scope of the INRMP, consideration must be given to potential impacts outside the boundaries of both Fort Carson and PCMS.

The Colorado Department of Parks and Wildlife will continue to assess the population of game species within defined management units. The department's assessment of game species populations and their health will determine the level of hunting pressure that is acceptable or necessary at both Fort Carson and PCMS. Game species and habitat

management by the Army will impact game populations both on and off Fort Carson and PMCS.

The introduction and spread of floral invasive species continues to produce challenges on public lands, whether state or federal, and on private property. Controlling the spread of invasive species within Fort Carson and PCMS will continue under the 2013-2017 INRMP. An ongoing challenge is to identify routes and vectors for new introductions of invasive species from adjacent public and private land. Long-term invasive species control requires a coordinated effort with regional stakeholders at both Fort Carson and PCMS.

The escape of wildfire from within installation boundaries to adjacent land or the movement of a wildfire from adjacent land onto the installation is an ongoing concern. Wildfires are random and unpredictable events that can produce impacts beyond Fort Carson and PCMS even if the wildfire itself is confined to the installation. Wildfire, as an ecological disturbance, is beneficial to the shortgrass prairie and ponderosa pine ecosystems. Nevertheless, wildfire can in some instances result in economic loss, social disruption, and produce human health impacts.

Air Quality

The past, present and reasonably foreseeable actions will create dust and smoke which are mitigated with the Fort Carson Fugitive Dust Plan and the oversight by regulators. The small amount of dust created from the 2020 – 2025 INRMP cumulatively will be less than significant.

Soil Resources

The past, present and reasonably foreseeable actions may have effects on soil resources such as compaction from maneuver training, rilling created along two tracks with poor drainage, soil erosion from unvegetated areas created from training activities and the increase in impervious surfaces due to construction of facilities and infrastructure. These are mitigated through the implementation of BMPs and the stormwater management plan.

The actions proposed in the 2020 – 2025 INRMP will reduce the number of areas with rilling, soil compaction and soil erosion through the implementation of the ITAM program and other projects that increase the resiliency of the vegetation. The cumulative effects of the INRMP when combined with the past, present and reasonably foreseeable actions will not be significant.

Water Resources

The past, present and reasonably foreseeable actions may have effects on water resources such as sediment delivery to the stream, increased flow from stormwater run-off, changes to stream channels as a result of infrastructure projects that require stream crossings.

The actions proposed in the 2020 – 2025 INRMP will reduce the probability of sediment delivery to the stream through the implementation of the ITAM program and other projects that increase the resiliency of the vegetation. The cumulative effects of the INRMP when combine with the past, present and reasonably foreseeable actions will not be significant.

Biological Resources

The past, present and reasonably foreseeable actions may have effects on biological resources such as the reduction of vegetation in areas used for training. This can reduce the available habitat for wildlife species. Training can also increase the risk of spread of invasive species. Training can directly affect wildlife by causing them to move out of an area during the training event. This can lead to displacement of wildlife and loss of eggs or young during certain parts of the year. Construction may remove habitat and increases the impervious surfaces in the area. This can lead to increased stormwater runoff which can cause erosion and degradation of wildlife habitat.

These effects are reduced by Best Management Practices such as limiting the timing of training and construction during nesting and rearing activities in an area. Best Management Practices outlined in the Stormwater Management Plan reduce erosion and stormwater runoff concerns. The actions proposed in the 2020 – 2025 INRMP will reduce the probability of sediment delivery to the stream through the implementation of the ITAM program and other projects that increase the resiliency of the vegetation. The cumulative effects of the INRMP when combine with the past, present and reasonably foreseeable actions will not be significant.

Cultural Resources

The past, present and reasonably foreseeable actions may have effects on soil resources such as compaction from maneuver training, rilling created along two tracks with poor drainage, soil erosion from unvegetated areas created from training activities. Areas affected by wildland fire or prescribed could have cultural resources that are now more visible than they were prior to the wildfire or prescribed fire event. These effects are overall minor to moderate

The effects of re-occurring actions proposed in the Proposed Action are overall negligible because of the opportunity to avoid cultural resource sites or mitigate effects as a result of the project review process. The cumulative effects on cultural resources will be negligible.

4.0 CONCLUSIONS

The purpose of the Integrated Natural Resource Management Plan is to further sustainable natural resource management on military training lands while supporting the Army's critical training missions. Impacts associated with implementing the 2020 - 2025 INRMP range from neutral to beneficial, while maintaining the status quo through the continuation of the 2013 – 2017 INRMP also continues to provide limited benefits to natural resources, albeit to a lesser extent than the Proposed Action. Cumulative impacts are unclear, although it is understood that active management of game species, invasive species, and to the extent possible wildfire, will reduce negative impacts.

Table 1 provides a succinct summary of the effects associated with both the Preferred Action and the No Action Alternative from this EA.

Table 1: Summary of effects on resource for Proposed Action and No Action.

Resource Area	Proposed Action	No Action Alternative
Air Quality	o	o
Biological Resources	+	o
Soils	+	+
Water Resources	+	+
Cultural Resources	o	o

1. Neither positive benefit or negative impacts are denoted by 'o'
2. Positive benefits are denoted by '+'

Based on this Environmental Assessment, implementation of the Proposed Action would result in no significant impacts. Because no significant impacts are associated with implementing the Proposed Action, preparation of a Finding of No Significant Impact (FNSI) is appropriate.

5.0 PERSONS CONTACTED

Roger Peyton- Conservation Branch Chief, DPW

Cecily Mui–Invasive Species and Pest Program Manager and Natural Resources and Forestry Team Lead, Conservation Branch, DPW

Jeffrey McLemore– Forester, DPW

Anna Joy Lehmicke– Wildlife Biologist, DPW

Michelle Blake– Wildlife Biologist, DPW

Leonard Cook– Wildland Fire Team Lead, DPW

James Kulbeth- CWA Section 404 Coordinator, DPW

G. Wayne Thomas– NEPA and Cultural Management Branch Chief, DPW

Jennifer Kolise– Cultural Resource Program Manager, DPW

John Wachter, Compliance Branch Chief, DPW

Richard Yohn- Air Quality Program Manager, DPW

Cheryl Frischkorn- RCRA Program Manager, DPW

Kenneth Morris– Stormwater Program Manager, DPW

Trina Hopkins– Attorney Advisor, Fort Carson Office of the Staff Judge Advocate

Angie Bell- NEPA Program Manager, DPW

6.0 REFERENCES

Council on Environmental Quality (CEQ). 1978. Regulations for Implementing the National Environmental Policy Act (40 CFR Parts 1500-1508).

Department of the Army. 1995. Integrated Training Area Management (ITAM) Program Strategy. Headquarters, Washington, DC. 66 pp. + appendices.

DPW. 2017. Stormwater Management Plan (SWMP), Fort Carson, Colorado. Prepared for Fort Carson by AECOM Technical Services, Inc.

EA APPENDIX A: 2020 - 2025 INRMP RE-OCCURING ACTIONS

Recurring actions for managing species of conservation concern

Actions for species of special concern	Action Type
1. Continue annual (PCMS)/biennial (Fort Carson) prairie dog monitoring for colony extent and plague status.	Monitoring
2. Continue annual monitoring of prairie dog colonies for the presence of burrowing owls and mountain plovers.	Monitoring
3. Continue evaluation, at three-year intervals, of Mexican spotted owl (MSO) roost tree buffer zones for compliance with access restrictions specified in the MSO Management Plan (2016).	Monitoring
4. Continue to inventory Army SAR populations and evaluate persistence and relationship to training annually, as scheduled around training.	Adaptive Management
5. On Fort Carson, continue Arkansas darter and southern redbelly dace population monitoring and inventory annually, as scheduled around training.	Monitoring
6. Conduct baseline inventory of arthropod populations, with a focus on subphylum Hexapoda. This will allow Fort Carson staff to determine the presence and distribution of sensitive arthropod species, including those that are being considered for federal listing.	Studies
7. Conduct baseline inventory of amphibian populations. This will allow staff to determine the presence and distribution of sensitive amphibian species. A more complete species list will also allow wildlife staff to rapidly respond to potential future ESA listings.	Studies
8. On Fort Carson, maintain bat gates to prevent disturbance and the spread of white-nose syndrome (WNS) from anthropogenic sources, to include annual inspections and monitoring. Monitor other bat roosting sites for disturbance and presence of WNS. Because several bat species on Fort Carson are susceptible to WNS, proactive monitoring and management will make future restrictions less likely if any of the species are listed.	Coordination
9. Continue monitoring population trends and investigating the effect of training on Colorado checkered whiptail populations as funding and staffing allow.	Monitoring
10. Annually survey for and maintain inventory of raptor nests. This allows wildlife staff to respond more rapidly to projects that involve removal of trees.	Monitoring

Actions for species of special concern	Action Type
11. On PCMS, support nesting raptors by installing/ maintaining raptor nesting platforms. Support cavity nesting birds by installing/ maintaining nest boxes.	Monitoring
12. Continue mapping distribution of species of conservation concern, annually as encountered.	Monitoring
13. Continue pesticide dusting and exploring other alternatives to prevent plague in prairie dog colonies important to nesting and wintering eagles, ferruginous hawks, and nesting burrowing owls.	Adaptive Management
14. On Fort Carson, continue to assist (by providing fish) the USFWS and CPW with translocating Arkansas darter and southern redbelly dace to additional sites to improve population stability. Identify potential additional sites for reintroductions on Fort Carson, pending IMCOM approval and conservation assurances from CPW and USFWS. By creating more stable populations of species at risk, the chance of federal listing (and thus the risk of future training restrictions) is reduced.	Coordination
15. Sustain small mammal and bird populations in woodland areas by preferentially leaving large trees with natural and bird created cavities and crevices.	Adaptive Management
16. Create cover for sensitive species of reptiles, amphibians, and small mammals by leaving non- diseased, felled tree trunks in place during forestry operations. On Fort Carson, logs are an important component of MSO habitat and should be left in place following forestry operations in owl habitat.	Adaptive Management
17. Create slash brush piles at sites where not increasing risk of spread of wildland fire to increase habitat availability for small mammals and reptile.	Adaptive Management

Recurring actions for wetlands management

Actions for wetlands management	Action Type
1. Ensure no-net-loss of wetland acreage on either installation.	Adaptive Management
2. Use the NEPA process to evaluate impacts on wetlands, which could result from new construction or other activities, and assist with coordination between proponent and USACE.	Planning

Actions for wetlands management	Action Type
3. Continue to minimize training impacts on wetlands with recommendations such as dismounted training only or driving on established crossings and roads, or avoiding steep slope traverses that affect safety and erosion.	Adaptive Management
4. Submit quarterly Regional General Permit (RGP) reports, and review/ update the RGP on a 5-year basis.	Coordination
5. Maintain/update database of Waters of the US delineations with the USACE.	Coordination
6. Requirement for SOPs to include spill containment measures when setting up temporary refueling points and that drip pans are required under stationary vehicles.	Adaptive Management

Recurring actions for conservation law enforcement

Actions for conservation law enforcement	Action Type
1. Ensure military and civilian personnel and activities are in compliance with natural, cultural and environmental laws and regulations on Fort Carson and the PCMS.	Administrative
2. Coordinate enforcement activities with other stakeholder agencies and organizations.	Coordination
3. Assist in providing education and awareness classes to various groups that use Fort Carson and the PCMS, including online classes.	Outreach

Recurring actions for fish and wildlife management

Actions for fish and wildlife management	Action Type
1. Integrate installation management practices, e.g., prescribed fire, revegetation, pest/invasive species management, and stormwater management, to enhance and protect biological diversity.	Adaptive Management
2. Continue to review projects and installation activities to identify and mitigate effects on biological communities.	Planning
3. Continue cooperative management of big game populations with CPW. Any aerial flights in the future on the installations should seek out Army aircraft as a possible fiscal savings to DPW.	Coordination
4. Continue baseline bat surveys on PCMS and Fort Carson.	Monitoring
5. Conduct amphibian planning level surveys.	Monitoring

Actions for fish and wildlife management	Action Type
6. Conduct planning level surveys of small mammals in a variety of habitats, including wetland and ponderosa pine vegetation communities, and in sites within MSO winter habitat.	Monitoring
7. Continue developing and maintaining water resources for mitigating movements of big game species related to effects of military training.	Adaptive Management
8. Continue CWD surveillance and require mandatory testing of harvested deer on Fort Carson. Mandatory elk harvesting on Fort Carson, as decided annually by CPW and Fort Carson. Based on annual rates of CWD prevalence, determine appropriate harvest rates with CPW.	Coordination
9. On Fort Carson, continue monitoring native fish populations.	Monitoring
10. Continue to conduct avian monitoring including annual point-count surveys (Fort Carson), acoustic monitoring (PCMS), and summer and winter raptor surveys.	Monitoring
11. Identify, burn, and monitor areas to improve forage for big game species. Due to the importance to pronghorn in winter, cholla grasslands will be excluded or burned in a mosaic pattern to preserve integrity of the resource.	Adaptive Management
12. Continue to meet with CPW annually to discuss all hunting and coordination objectives.	Coordination
13. Conduct annual reptile surveys on PCMS and Fort Carson, as allowed by access and staffing.	Monitoring
14. Complete five year (2012-2017) hunting season analysis of genetically determined susceptibility to CWD of deer harvested on FC. Base on final report, develop and apply management practices on the ground with CPW.	Coordination
15. Evaluate migration patterns of deer on Fort Carson and surrounding areas to meet deer and CWD objectives.	Studies
16. Participate in academic partnerships and regional and national working groups to increase technical knowledge and expertise needed to develop alternative management options facilitating both military training and conservation.	Coordination
17. Sustain sensitive small mammal and bird populations in woodland areas by preferentially leaving large trees with natural and bird created cavities and crevices	Adaptive Management

Actions for fish and wildlife management	Action Type
18. Create cover for sensitive species of reptiles, amphibians, and small mammals by leaving non- diseased, felled tree trunks in place during forestry operations. Logs are an important component of MSO habitat, and should be left in place following forestry operations in owl habitat.	Adaptive Management
19. Create slash brush piles at sites where this action will not increase intensity spread of wildland fire. This will increase habitat availability for a variety of small mammals and reptiles.	Adaptive Management

Recurring actions for forest management

Actions for forest management	Action Type
1. Manage the forests and woodlands to improve forest health through thinning, individual tree selection and sanitation salvage thinning.	Adaptive Management
2. Restore ponderosa pine forests by thinning, removing ladder fuels, reducing crown connectivity, and then reintroducing low-intensity fires.	Adaptive Management
3. Reduce the number of trees per acre and remove understory fuel loads to minimize the risk of catastrophic wildfire and create zones of defensible space.	Adaptive Management
4. Continually survey forests for insect and disease damage, and add any data to the forestry Geographical Information System (GIS) layer.	Monitoring
5. Aggressively manage against forest insect and disease pests to prevent widespread tree mortality.	Adaptive Management
6. Ensure that a complete forest inventory is completed every ten years, and that the data is added to the forestry GIS layer.	Administrative
7. Restore native grassland habitats by reducing piñon-juniper encroachment into prairie habitats.	Adaptive Management
8. Initiate reforestation efforts after human and natural disturbances, preferably using local seed sources.	Adaptive Management
9. Identify and remove hazard trees annually using the USFS Hazard Tree Rating system.	Adaptive Management
10. Continue to submit proposals to the USFS and AEC for insect and disease management projects.	Administrative
11. Work cooperatively with other Directorates and external agencies such as USFS and Colorado State University on forest management issues.	Coordination

Actions for forest management	Action Type
12. Develop programs that generate income from the sale of forest products (such as firewood, woodchips, dimensional lumber, and fence posts), and that support standard forest management practices.	Administrative
13. Investigate potential forest product markets, including firewood, fence posts, woodchips, dimensional lumber, biomass for biofuel, and innovative use of forest and woodland tree species.	Studies

Recurring actions for migratory bird management

Actions for migratory bird management	Action Type
1. Continue to review projects and installation activities to identify and mitigate conflicts with the MBTA and BGEPA.	Planning
2. Conduct compliance-monitoring surveys at project sites and coordinate required mitigation with action proponents and/or law enforcement.	Monitoring
3. Continue annual burrowing owl monitoring.	Monitoring
4. Continue annual grassland and piñon-juniper bird monitoring.	Monitoring
5. Continue annual mountain plover monitoring.	Monitoring
6. On both FC and PCMS, begin annual monitoring for eastern black rails.	Monitoring
7. Deploy wildlife escape ladders in open water tanks developed for wildlife to prevent drowning of small mammals (including bats) that fall into the tanks.	Adaptive Management
8. Continue managing artificial cavity nests throughout the installation as mitigation for tree loss due to fire, forestry practices, and training.	Adaptive Management
9. On PCMS, continue annual nightjar monitoring	Monitoring
10. On PCMS, continue surveying for raptors nests and monitoring nest success rates.	Monitoring
11. Map grasslands important to nesting birds with declining populations for input into the development of annual prescribed fire plans.	Monitoring
12. Continue migratory bird outreach and education through personal contacts, Environmental Protection Officer training, and through media available on Fort Carson.	Outreach

Actions for migratory bird management	Action Type
13. Mitigate loss of owl nest sites using artificial structures. On PCMS, improve shelterbelts to replace loss of owl nesting and wintering habitat due to extensive fires. Coordinate with the DPW forester.	Adaptive Management
14. On PCMS, mitigate loss of raptor and Chihuahuan raven nest sites by installing and maintaining artificial structures.	Adaptive Management
15. Continue DOD Partners in Flight membership and support.	Coordination
16. Leave standing snags at a rate of 1-4 snags per acre, during forest management or post fire management for bats, small mammals, and cavity nesting birds.	Adaptive Management
17. Assess the extent of hawk, eagle, and owl electrocutions to include identification of known sites of electrocutions of birds, identification of pole configurations and landscape features influencing pole selection, and estimating level of pole use by raptors. On Fort Carson, post-assessment recommendations to retrofit problematic utility poles will be provided to DPW operations. On PCMS post-assessment recommendations to retrofit problematic utility poles will be provided to the local electrical companies (e.g. San Isabel).	Studies
18. Pistillate-flowered oneseed and Rocky Mountain junipers will be retained during woodland thinning operations to sustain birds wintering in piñon-juniper woodlands.	Adaptive Management
19. Piñon pine will be retained over juniper, and old growth juniper will be retained over younger trees during woodland thinning operations.	Adaptive Management
20. Continue investigating effects of off-road vehicle use on ground nesting birds.	Studies

Recurring actions for the invasive species management

Actions for invasive species management	Action Type
1. Continue to implement the Integrated Pest Management Plan and update the plan on a 5-year cycle.	Planning
2. Treat selected invasive species using an integrated approach (biological, chemical, cultural, physical or mechanical, and prescribed burning).	Adaptive Management

Actions for invasive species management	Action Type
3. Continue to work with Colorado Department of Agriculture, Colorado State University, and U.S. Department of Agriculture-APHIS to release, redistribute, and monitor biological control agents for noxious weed control.	Coordination
4. Document the size and abundance of new and existing invasive species populations. Report occurrences of new species to county and state officials.	Coordination
5. Actively participate with state, county, local and other federal agencies in the management of invasive species.	Coordination
6. Monitor treated invasive plant populations to document the results and to assess for further actions.	Monitoring
7. Rehabilitate areas treated for invasive species control, where necessary.	Adaptive Management
8. Identify and implement measures in the prevention of new infestations.	Adaptive Management
9. Continue to be involved in education and outreach efforts.	Outreach
10. Continue to work with Fort Carson CLEOs to regulate and educate on the prevention of aquatic nuisance species (ANS), for example, not allowing weed contaminated boats on our ponds; requiring all anglers to remove all plant matter from gear prior to coming in contact with ponds and streams; mandating that anglers do not dump bait buckets or live well water into any installation waterbody; and, providing signage and boat ramp monitors during high use seasons.	Coordination

Recurring actions for pest management

Actions for pest management	Action Type
1. Maintain and implement the IPMP on a five-year cycle, including an update in 2020.	Planning
2. Emphasize integrated pest management techniques to minimize the use of pesticides.	Adaptive Management
3. Ensure pesticide applicators are fully certified.	Training
4. Control those plant and wildlife species that affect human health, quality of life, natural resources management (e.g. reduce ecosystem functionality, displace native species) or the military mission.	Adaptive Management

Actions for pest management	Action Type
5. Coordinate with the Fort Carson Wildlife Office, and as needed with external partners such as USFWS and CPW, for the protection of wildlife (particularly listed or sensitive species) during pesticide operations.	Coordination
6. Use chemical control as a last resort to control pests; cultural, mechanical, and biological control methods are first priority. When chemical control is required, use the least environmentally toxic pesticide. Utilize new technology, educational opportunities, and the judicious and professional use of chemicals to reduce chemical pesticide use.	Adaptive Management
7. Conduct preventive maintenance and surveillance inspections for pests.	Monitoring
8. Ensure pest management personnel receive adequate formal, as well as on-the-job, training to achieve required pest management certification and to operate at the most efficient level.	Training
9. Procure, maintain, and properly store adequate supplies of pesticides and pesticide dispersal equipment.	Administrative
10. Implement a safety program that provides for the safety and well-being of all pest management personnel.	Training
11. Work with other installations in the region to include the Fort Carson pest management program within the Front Range Ecoregional Management Team.	Coordination
12. Participate in Directorate and Garrison level working groups to ensure pest management activities are represented and are in agreement with Fort Carson goals and objectives.	Coordination

Recurring actions for Geographic Information Systems (GIS) management

Actions for GIS management	Action Type
1. Ensure that data meets published Army GIS standards.	Administrative
2. Provide maps and spatial analyses to support natural resources management, as well as other missions.	Administrative
3. Work cooperatively with all GIS users to share GIS data and products.	Administrative
4. Maintain up-to-date software and data.	Administrative

Recurring actions for outdoor recreation

Actions for outdoor recreation	Action Type
1. Manage Sikes Act permit sales and iSportman Recreation Management Service by maintaining the iSportman website and hunter check-in kiosks at both FC and PCMS.	Outreach
2. Continue management of recreational fishing on Fort Carson, to include stocking fish, improving fish habitat, and managing irrigation water to maximize angling opportunities.	Adaptive Management
3. On Fort Carson, maintain public access areas (Bird Farm, Wildlife Demonstration Area, and fishing reservoirs).	Outreach
4. Continue annual meetings with CPW to share an annual comprehensive recreation report that includes permit sales, hunter check-in, and harvest data; and to discuss license numbers and other issues related to recreation.	Coordination
5. Continue consulting with the state and DPTMS to resolve hunter access restrictions during big game seasons.	Coordination
6. Continue to provide and assist with the free Colorado State Wounded Warrior hunting tags.	Coordination
7. Review and prioritize projects for habitat management, improvement, and restoration needs on FC and the PCMS for funding with permit proceeds per DoDI 4715.03.	Administrative

Recurring actions for Wildlife Aircraft Strike Hazard (WASH)

Actions for Wildlife Aircraft Strike Hazard (WASH)	Action Type
1. On Fort Carson and PCMS, evaluate and manage WASH hazards, such as prairie dogs, at BAAF and downrange aircraft landing sites to reduce the probability of a strike.	Adaptive Management
2. Conduct pre-treatment surveys for burrowing owl prior to lethal control of prairie dogs.	Monitoring
3. Consult with the USFWS regarding migratory bird depredation permits and eagles as related to airfield operations.	Coordination
4. Maintain grass heights at the airfield between 6” and 12” to reduce the attractiveness of the airfield to wildlife.	Adaptive Management
5. Participate in the BAAF WASH Working Group.	Coordination
6. Continue participation in the National Military Fish and Wildlife Association WASH working group.	Coordination

Actions for Wildlife Aircraft Strike Hazard (WASH)	Action Type
7. Conduct small mammal trapping to determine if population densities are likely to increase the number of raptors hunting at or near the airfield. Increased seasonal raptor activity would be filed as a Notice to Airmen (NOTAM) for pilot briefings.	Studies
8. Continue to perform quarterly inspection of boundary fence for evidence of mammal encroachment and identify sites for repair.	Monitoring
9. Consult with CPW regarding big game issues related to airfield operations.	Coordination

Recurring actions for wildland fire management

Actions for the wildland fire management	Action Type
1. Request annual funding to replace PPE, to maintain/replace equipment, and for annual training.	Administrative
2. Assist fire department personnel in suppressing wildfires.	Training
3. Annually assist Fort Carson Fire and Emergency Services in preparing and implementing the Prescribed Fire Burn Plan covering both Fort Carson and the PCMS.	Coordination
4. Ensure Prescribed Fire Smoke Plan and Burn Permits are in compliance with the INRMP, Land Use Plans, Army Wildland Policy Guidance, and CDPHE requirements.	Administrative
5. Suppress wildfires in Mexican spotted owl (MSO) habitat. Prescribe burn a buffer zone between Booth Mountain and training ranges to keep military mission-related fires from entering MSO habitat.	Adaptive Management
6. Ensure wildlife and endangered species habitat enhancement and protection are considered during fire management activities.	Coordination
7. Use prescribed burning to support the Forestry and Invasive Species Management Programs.	Adaptive Management
8. Coordinate with cultural resource and natural resource personnel during wildfires and prior to conducting prescribed burns.	Coordination
9. Describe fire use benefits in education and outreach programs such as the Environmental Protection Officer (EPO) training, and Earth and Arbor Day Events for local schools.	Outreach
10. Maintain and improve approximately 72 miles of firebreaks on Fort Carson.	Adaptive Management

Actions for the wildland fire management	Action Type
11. On active firing ranges create a minimum of a 100-foot strip of burn along all perimeters where feasible, which will be sufficient to contain any unintentional starts and assist in maintaining planned training schedules.	Adaptive Management
12. Implement other fuel reduction techniques beyond prescribed fire (as appropriate), to include mastication, limbing, forest thinning, mowing, and herbicides, in coordination with the installation forester.	Adaptive Management
13. Assist the ITAM program in maintaining Range and Training Land Assessment (RTLA) Land Management Objectives, and utilize RTLA data in monitoring the effects of prescribed fires on the landscape.	Coordination

Recurring actions for training of personnel

Actions for training of personnel	Action Type
1. For government employees, include in their Individual Development Plans refresher training needed to fulfill job requirements (e.g., enforcement, GIS, NEPA, endangered species documentation/consultation, firefighter, pesticide application) and ensure that they are trained.	Training
2. Provide funding for personnel to attend annual workshops or professional conferences.	Administrative
3. Encourage personnel to join and be active in professional societies and cooperative groups.	Training

Recurring action for floodplains management

Action for floodplain management	Action Type
1. Review, via the NEPA process, all projects proposed for the Fort Carson main post area for impacts to floodplains and risks to life and property; propose mitigation measures for any such risks.	Planning

Recurring action for mineral resources

Action for mineral resources	Action Type
1. Continue working with Congress to withdraw certain lands within Fort Carson and the PCMS from public availability for mining.	Administrative

Recurring actions for urban forest management

Actions for urban forest management	Action Type
1. Prevent damage or loss of valuable resources from insects, disease, wind, construction, and/or neglect.	Adaptive Management
2. Provide technical advice to the grounds maintenance contractor to ensure all turfgrass and landscaped areas are properly maintained.	Coordination
3. Provide guidance on how to select, plant and maintain trees and shrubs on Fort Carson main post and the PCMS cantonment area to enhance aesthetics and provide benefits, such as visual barriers, windbreaks, decreased heating costs, reduced soil erosion, and safety enhancements.	Coordination
4. Provide guidance on proper pruning of shrubs and trees and remove dead plants as an essential objective for the long-term health of trees and shrubs on the installation and to ensure the safety of people and structures.	Coordination
5. Annually participate in Arbor Day celebrations and meet standards established by the National Arbor Day Foundation to achieve recognition as a 'Tree City USA".	Outreach
6. Work with contractors and other directorates to include improved urban forestry requirements in solicitations for new contracts.	Coordination
7. Provide ongoing support in the implementation of the Xeriscape Master Plan.	Planning
8. Encourage implementation of practices listed in the 1994 White House Memorandum on federal landscaped grounds.	Administrative
9. Complete and maintain an Urban Forest Management Plan for Fort Carson by December of 2020.	Planning

Recurring actions for water rights management

Actions for water rights management	Action Type
1. Monitor stream flow diversions.	Monitoring
2. Repair and maintain all water right infrastructures, including ditches, reservoirs, and wells.	Adaptive Management
3. Utilize water per decrees.	Administrative
4. Send monthly water use reports to the State District Water Commissioner.	Administrative
5. Send USGS quarterly gauge reports to the State.	Administrative
6. Send monthly well reports to Colorado Water Protective Development Association (CWPDA).	Administrative
7. Maintain approximately 35 wells at the PCMS.	Adaptive Management

Recurring actions for Integrated Training Area Management (ITAM)

Actions for Integrated Training Area Management	Action Type
1. Provide training to military units and civilians to understand safety hazards, as well as, cultural and environmental resource issues.	Training
2. Develop and implement safety, maneuver access project, and provide erosion control measures and structures to mitigate maneuver impacts within the training areas.	Adaptive Management
3. Monitor and assess maneuver impacts on the condition of soils, vegetation, and watersheds.	Monitoring
4. Develop and provide map products, as well as, provide documentation and information for the Range Operations Sustainable Range Program and military customers.	Outreach
5. Update and maintain databases on downrange training facilities, structures, and resources.	Administrative

Recurring actions for bald and golden eagle management

Actions for bald and golden eagle management	Action Type
1. Continue to review project proposals for potential conflicts with the BGEPA and identify permits, documents, collaboration, and recommend mitigation to avoid violations. Consultation with USFWS law enforcement and permit office may be required to ensure actions are adequately mitigated.	Planning
2. Continue to conduct compliance-monitoring surveys at project sites and coordinate required mitigation with action proponents and/or law enforcement.	Monitoring
3. Continue to conduct annual eagle eyrie surveys. Identify and map active eyries and provide locations to Range Control and Butts Army Airfield for protecting occupied sites. Active eyries will be protected with a buffer zone from January through the fledging season, generally in July.	Monitoring
4. Continue assessment of risk of electrocution of hawks, eagles, and owls to include identification and mitigation of high-risk poles.	Studies

EA APPENDIX B: CHANGES BETWEEN NO ACTION AND PROPOSED ACTION ALTERNATIVES

The 2020 – 2025 INRMP incorporates the changes suggested by the annual review of the 2013-2017 INRMP. These include additions to the recurring actions.

Program Element	Changes to Re-occurring Action
Species of Conservation Concern	On Fort Carson, maintain bat gates to prevent disturbance and the spread of white-nose syndrome (WNS) from anthropogenic sources, to include annual inspections and monitoring. Monitor other bat roosting sites for disturbance and presence of WNS. Because several bat species on Fort Carson are susceptible to WNS, proactive monitoring and management will make future restrictions less likely if any of the species are listed.
Migratory Bird Management	Continue annual grassland and piñon-juniper bird monitoring.
Wildland Fire Management	Ensure Prescribed Fire Burn Plan and Smoke Permits are in compliance with the INRMP, Land Use Plans, Army Wildlife Policy Guidance and CDPHE requirements.
Wildland Fire Management	Assist ITAM Program in maintaining Range and Training Land Assessment (RTLA) Land Management Objectives, and utilize RTLA data in monitoring the effects of prescribed fires on the landscape.

New Re-occurring Actions were added to the 2020-2025 INRMP.

Program Element	Re-occurring Action Added
Species of Conservation Concern	Conduct baseline inventory of arthropod populations, with a focus on subphylum Hexapoda. This will allow Fort Carson staff to determine the presence and distribution of sensitive arthropod

Program Element	Re-occurring Action Added
	species, including those that are being considered for federal listing.
Species of Conservation Concern	Conduct baseline inventory of amphibian populations. This will allow staff to determine the presence and distribution of sensitive amphibian species. A more complete species list will also allow wildlife staff to rapidly respond to potential future ESA listings.
Species of Conservation Concern	Continue monitoring population trends and investigating the effect of training on Colorado checkered whiptail populations as funding and staffing allow.
Species of Conservation Concern	On PCMS, support nesting raptors by installing/maintaining raptor nesting platforms. Support cavity nesting birds by installing / maintaining nest boxes.
Species of Conservation Concern	Annually survey for and maintain inventory of raptor nests. This allows wildlife staff to respond more rapidly to projects that involve removal of trees.
Wetlands Management	Continue to minimize training impacts on wetlands with recommendations such as dismounted training only or driving on established crossings and roads, or avoiding steep slope traverses that affect safety and erosion.
Wetlands Management	Requirement for SOPs to include spill containment measures when setting up temporary refueling points and that drip pans are required under stationary vehicles.
Fish and Wildlife Management	Complete five year (2012-2017) hunting season analysis of genetically determined susceptibility to CWD of deer harvested on FC. Base of final report, develop and apply management practices on the ground with CPW.

Program Element	Re-occurring Action Added
Fish and Wildlife Management	Evaluate migration patterns of deer on Fort Carson and surrounding areas to meet deer and CWD objectives.
Forestry Management	Ensure that a complete forest inventory is completed every ten years, and that the data is added to the forestry GIS layer.
Migratory Bird Management	On both FC and PCMS, begin annual monitoring for eastern black rails.
Migratory Bird Management	On PCMS, continue annual nightjar monitoring.
Migratory Bird Management	On PCMS, continue surveying for raptors nests and monitoring nest success rates.
Invasive Species Management	Continue to work with Fort Carson CLEOs to regulate and educate on the prevention of aquatic nuisance species (ANS), for example, not allowing weed contaminated boats on our ponds; requiring all anglers to remove all plant matter from gear prior to coming in contact with ponds and streams; mandating that anglers do not dump bait buckets or live well water into any installation waterbody; and, providing signage and boat ramp monitors during high use seasons.
Pest Management	Participate in Directorate and Garrison level working groups to ensure pest management activities are represented and are in agreement with Fort Carson goals and objectives.
GIS Management	Ensure that data meets published Army GIS standards.
Outdoor Recreation	Manage Sikes Act permit sales and iSportman Recreation Management Service by maintaining the iSportman

Program Element	Re-occurring Action Added
	website and hunter check-in kiosks at both FC and PCMS.
Outdoor Recreation	Continue to provide and assist with the free Colorado State Wounded Warrior hunting tags
Outdoor Recreation	Review and prioritize projects for habitat management, improvement, and restoration needs on FC and the PCMS for funding with permit proceeds per DoDI 4715.03
Wildlife Aircraft Strike Hazard (WASH)	Maintain grass heights at the airfield between 6” and 12” to reduce the attractiveness of the airfield to wildlife.
Wildland Fire Management	Implement other fuel reduction techniques beyond prescribed fire (as appropriate), to include mastication, thinning, limbing, mowing, and herbicides, in coordination with the installation forester.
Floodplain Management	Review, via the NEPA process, all projects proposed for the Fort Carson main post area for impacts to floodplains and risks to life and property; propose mitigation measures for any such risks
Urban Forest Management	Complete and maintain an Urban Forest Management Plan for Fort Carson by December of 2020.
Water Rights Management	Monitor stream flow diversions.
Water Rights Management	Repair and maintain water right infrastructures, including ditches, reservoirs, and wells.
Water Rights Management	Utilize water per decrees.
Water Rights Management	Send monthly water use reports to the State District Water Commissioner.

Program Element	Re-occurring Action Added
Water Rights Management	Maintain approximately 35 wells at the PCMS.
Integrated Training Area Management	Provide training to military units and civilians to understand safety hazards, as well as, cultural and environmental resource issues.
Integrated Training Area Management	Develop and implement safety, maneuver access project, and provide erosion control measures and structures to mitigate maneuver impacts within the training areas.
Integrated Training Area Management	Monitor and assess maneuver impacts on the condition of soils, vegetation, and watersheds.
Integrated Training Area Management	Develop and provide map products, as well as, provide documentation and information for the Range Operations Sustainable Range Program and military customers.
Integrated Training Area Management	Actions for Integrated Training Area Management
Integrated Training Area Management	Update and maintain databases on downrange training facilities, structures, and resources.

Re-occurring Actions Removed from 2020 – 2025 INRMP

Program Element	Re-occurring Action Removed
Species of Conservation Concern	Continue inventory of northern leopard frog populations on Fort Carson.
Fish and Wildlife Management	Operate a hunter check station to facilitate CWD specimen collection, aging harvested deer, collecting location data for deer testing positive for CWD, and tracking recreational use of Fort Carson training lands.

Program Element	Re-occurring Action Removed
Fish and Wildlife Management	Organize and operate a Fort Carson hunting and fishing working group to facilitate communication among sportsmen for improving hunting and fishing opportunities for Soldiers.
Fish and Wildlife Management	Develop monitoring program for northern leopard frogs on Fort Carson.
Invasive Species Management	Continue to monitor the original population of myrtle spurge at Fort Carson annually through calendar year 2016
Invasive Species Management	Continue to monitor the original population of African rue at PCMS annually through calendar year 2014
Outdoor Recreation	Develop warm-water sport fishing on Fort Carson.
Outdoor Recreation	Fully implement and maintain an automated, web based recreational control system.
Floodplain Management	Complete legal requirements in the stormwater management plan.
Integrated Training Area Management	Reseeding and erosion control downrange;
Integrated Training Area Management	Know and understand the changing training requirements of military units;
Integrated Training Area Management	Vegetation monitoring;
Integrated Training Area Management	Prepare maps and provide decision support;
Integrated Training Area Management	Educate military and civilian personnel.

The re-occurring actions in the INRMP are listed in order of priority. The actions are implemented beginning with the first action (action number 1) working down the list as funding and manpower are available. Order of Priority was changed on reoccurring actions in the 2020-2025 INRMP.

Program Element	Reoccurring Action	Order of Priority in 2013-2017 INRMP	Order of Priority in 2020-2025 INRMP
Species of Conservation Concern	Continue annual monitoring of prairie dog colonies for the presence of burrowing owls and mountain plovers.	1	2
Species of Conservation Concern	Continue evaluation, at three-year intervals, of Mexican spotted owl (MSO) roost tree buffer zones for compliance with access restrictions specified in the MSO Management Plan (2016).	2	3
Species of Conservation Concern	Continue to inventory Army SAR populations and evaluate persistence and relationship to training annually, as scheduled around training.	6	4
Species of Conservation Concern	On Fort Carson, maintain bat gates to prevent disturbance and the spread of white-nose syndrome from anthropogenic sources, to include annual inspections and monitoring. Monitor other bat roosting sites for disturbance and presence of white-nose syndrome. Because several bat species on Fort Carson are susceptible to white-nose syndrome, proactive monitoring and management will make future restrictions less likely if any of the species are listed.	10	8
Species of Conservation Concern	Continue mapping distribution of species of conservation concern, annually as encountered.	8	12

Program Element	Reoccurring Action	Order of Priority in 2013-2017 INRMP	Order of Priority in 2020-2025 INRMP
Species of Conservation Concern	Continue pesticide dusting and exploring other alternatives to prevent plague in prairie dog colonies important to nesting and wintering eagles, ferruginous hawks, and nesting burrowing owls.	3	13
Species of Conservation Concern	On Fort Carson, continue to assist (by providing fish) the USFWS and CPW with translocating Arkansas darter and southern redbelly dace to additional sites to improve population stability. Identify potential additional sites for reintroductions on Fort Carson, pending IMCOM approval and conservation assurances from CPW and USFWS. By creating more stable populations of species at risk, the chance of federal listing (and thus the risk of future training restrictions) is reduced.	7	14
Species of Conservation Concern	Create cover for sensitive species of reptiles, amphibians, and small mammals by leaving non-diseased, felled tree trunks in place during forestry operations. On Fort Carson, logs are an important component of MSO habitat and should be left in place following forestry operations in owl habitat.	11	16

Program Element	Reoccurring Action	Order of Priority in 2013-2017 INRMP	Order of Priority in 2020-2025 INRMP
Species of Conservation Concern	Create slash brush piles at sites where not increasing risk of spread of wildland fire to increase habitat availability for small mammals and reptiles.	12	17
Fish and Wildlife Management	Integrate installation management practices, e.g., prescribed fire, revegetation, pest/invasive species management, and storm water management, to enhance and protect biological diversity.	10	1
Fish and Wildlife Management	Continue to review projects and installation activities to identify and mitigate effects on biological communities.	17	2
Fish and Wildlife Management	Continue cooperative management of big game populations with CPW. Any aerial flights in the future on the installations should seek out Army aircraft as a possible fiscal savings to DPW.	4	3
Fish and Wildlife Management	Continue baseline bat surveys on PCMS and Fort Carson.	5	4
Fish and Wildlife Management	Conduct amphibian planning level surveys.	7	5
Fish and Wildlife Management	Conduct planning level surveys of small mammals in a variety of habitats, including wetland and ponderosa pine vegetation communities, and in sites within MSO winter habitat.	15	6

Program Element	Reoccurring Action	Order of Priority in 2013-2017 INRMP	Order of Priority in 2020-2025 INRMP
Fish and Wildlife Management	Continue CWD surveillance and require mandatory testing of harvested deer on Fort Carson. Mandatory elk harvesting on Fort Carson, as decided annually by CPW and Fort Carson. Based on annual rates of CWD prevalence, determine appropriate harvest rates with CPW.	2	8
Fish and Wildlife Management	On Fort Carson, continue monitoring native fish populations.	11	9
Fish and Wildlife Management	Identify, burn, and monitor areas to improve forage for big game species. Due to the importance to pronghorn in winter, cholla grasslands will be excluded or burned in a mosaic pattern to preserve integrity of the resource.	8	11
Fish and Wildlife Management	Continue to meet with CPW annually to discuss all hunting and coordination objectives.	1	12
Fish and Wildlife Management	Conduct annual reptile surveys on PCMS and Fort Carson, as allowed by access and staffing.	14	13
Fish and Wildlife Management	Participate in academic partnerships and regional and national working groups to increase technical knowledge and expertise needed to develop alternative management options facilitating both military training and conservation.	6	16

Program Element	Reoccurring Action	Order of Priority in 2013-2017 INRMP	Order of Priority in 2020-2025 INRMP
Fish and Wildlife Management	Sustain sensitive small mammal and bird populations in woodland areas by preferentially leaving large trees with natural and bird created cavities and crevices.	18	17
Fish and Wildlife Management	Create cover for sensitive species of reptiles, amphibians, and small mammals by leaving non-diseased, felled tree trunks in place during forestry operations. Logs are an important component of MSO habitat, and should be left in place following forestry operations in owl habitat.	16	18
Forest Management	Reduce the number of trees per acre and remove understory fuel loads to minimize the risk of catastrophic wildfire and create zones of defensible space.	4	3
Forest Management	Continually survey forests for insect and disease damage, and add the date to the forestry Geographical Information System (GIS) layer.	5	4
Forest Management	Aggressively manage against forest insect and disease pests to prevent widespread tree mortality.	3	5
Migratory Bird Management	Continue to review projects and installation activities to identify and mitigate conflicts with the MBTA and BGEPA.	4	1

Program Element	Reoccurring Action	Order of Priority in 2013-2017 INRMP	Order of Priority in 2020-2025 INRMP
Migratory Bird Management	Conduct compliance- monitoring surveys at project sites and coordinate required mitigation with action proponents and/or law enforcement.	5	2
Migratory Bird Management	Continue annual burrowing owl monitoring.	1	3
Migratory Bird Management	Continue annual mountain plover monitoring.	3	5
Migratory Bird Management	Deploy wildlife escape ladders in open water tanks developed for wildlife to prevent drowning of small mammals (including bats) that fall into the tanks.	16	7
Migratory Bird Management	Continue managing artificial cavity nests throughout the installation as mitigation for tree loss due to fire, forestry practices, and training.	13	8
Migratory Bird Management	Map grasslands and woodlands important to nesting birds with declining populations for input into the development of annual prescribed fire plans.	8	11
Migratory Bird Management	Continue migratory bird outreach and education through personal contacts, Environmental Protection Officer training, and through media available on Fort Carson.	9	12

Program Element	Reoccurring Action	Order of Priority in 2013-2017 INRMP	Order of Priority in 2020-2025 INRMP
Migratory Bird Management	Mitigate loss of owl nest sites using artificial structures. On PCMS, plant and improve shelterbelts to replace loss of owl nesting and wintering habitat due to extensive fires. Coordinate with the DPW forester.	14	13
Migratory Bird Management	Continue DOD Partners in Flight membership and support.	6	15
Migratory Bird Management	Leave standing snags at a rate of 1-4 snags per acre, during forest management or post fire management for bats, small mammals, and cavity nesting birds.	15	16
Migratory Bird Management	Pistillate-flowered oneseed and Rocky Mountain junipers will be retained during woodland thinning operations to sustain birds wintering in piñon-juniper woodlands.	11	18
Migratory Bird Management	Piñon pine will be retained over juniper, and old growth juniper will be retained over younger trees during woodland thinning operations.	12	19
Migratory Bird Management	Continue investigating effects of off-road vehicle use on ground nesting birds.	17	20

Program Element	Reoccurring Action	Order of Priority in 2013-2017 INRMP	Order of Priority in 2020-2025 INRMP
Invasive Species Management	Continue to work with Colorado Department of Agriculture, Colorado State University, and U.S. Department of Agriculture-APHIS to release, redistribute, and monitor biological control agents for noxious weed control.	10	3
Invasive Species Management	Document the size and abundance of new and existing invasive species populations. Report occurrences of new species to county and state officials	6	4
Invasive Species Management	Actively participate with state, county, local and other federal agencies in the management of invasive species.	4	5
Invasive Species Management	Monitor treated invasive plant populations to document the results and to assess for further actions.	7	6
Invasive Species Management	Rehabilitate areas treated for invasive species control, where necessary.	8	7
Invasive Species Management	Identify and implement measures in the prevention of new infestations.	9	8
Invasive Species Management	Continue to be involved in education and outreach efforts.	11	9
Pest Management	Maintain and implement the IPMP on a five-year cycle, including an update in 2020.	2	1

Program Element	Reoccurring Action	Order of Priority in 2013-2017 INRMP	Order of Priority in 2020-2025 INRMP
Pest Management	Emphasize integrated pest management techniques to minimize the use of pesticides	3	2
Pest Management	Ensure pesticide applicators are fully certified	5	3
Pest Management	Control those plant and animal species that affect human health, quality of life, natural resources management (e.g. reduce ecosystem functionality, displace native species) or the military mission.	1	4
Pest Management	Coordinate with the Fort Carson Wildlife Office, and as needed with external partners such as USFWS and CPW, for the protection of wildlife (particularly listed or sensitive species) during pesticide operations.	10	5
Pest Management	Use chemical control as a last resort to control pests; cultural, mechanical, and biological control methods are first priority. When chemical control is required, use the least environmentally toxic pesticide. Utilize new technology, educational opportunities, and the judicious and professional use of chemicals to reduce chemical pesticide use.	4	6
Pest Management	Conduct preventive maintenance and surveillance inspections for pests.	6	7

Program Element	Reoccurring Action	Order of Priority in 2013-2017 INRMP	Order of Priority in 2020-2025 INRMP
Pest Management	Ensure pest management personnel receive adequate formal, as well as on-the-job, training to achieve required pest management certification and to operate at the most efficient level	7	8
Pest Management	Procure, maintain, and properly store adequate supplies of pesticides and pesticide dispersal equipment.	8	9
Pest Management	Implement a safety program that provides for the safety and well-being of all pest management personnel.	9	10
GIS Management	Provide maps and spatial analyses to support natural resources management, as well as other missions	1	2
GIS Management	Work cooperatively with all GIS users to share GIS data and products	2	3
GIS Management	Maintain up-to-date software and data	3	4
Outdoor Recreation	Continue management of recreational fishing on Fort Carson, to include stocking fish, improving fish habitat, and managing irrigation water to maximize angling opportunities.	1	2
Outdoor Recreation	On Fort Carson, maintain public access areas (Bird Farm, Wildlife Demonstration Area, and fishing reservoirs).	2	3

Program Element	Reoccurring Action	Order of Priority in 2013-2017 INRMP	Order of Priority in 2020-2025 INRMP
Outdoor Recreation	Continue annual meetings with CPW to share an annual comprehensive recreation report that includes permit sales, hunter check-in, satisfaction, and harvest data; and to discuss license numbers and other issues related to recreation.	3	4
Outdoor Recreation	Continue consulting with the state and DPTMS to resolve hunter access restrictions during big game seasons.	3	5
Wildlife Aircraft Strike Hazard (WASH)	On Fort Carson and PCMS, evaluate and manage WASH hazards, such as prairie dogs, at BAAF and downrange aircraft landing sites to reduce the probability of a strike.	5	1
Wildlife Aircraft Strike Hazard (WASH)	Conduct pre-treatment surveys for burrowing owl prior to lethal control of prairie dogs.	1	2
Wildlife Aircraft Strike Hazard (WASH)	Consult with the USFWS regarding migratory bird depredation permits and eagles as related to airfield operations.	2	3
Wildlife Aircraft Strike Hazard (WASH)	Participate in the BAAF WASH Working Group.	3	5
Wildlife Aircraft Strike Hazard (WASH)	Continue participation in the National Military Fish and Wildlife Association WASH working group.	4	6

Program Element	Reoccurring Action	Order of Priority in 2013-2017 INRMP	Order of Priority in 2020-2025 INRMP
Wildlife Aircraft Strike Hazard (WASH)	Conduct small mammal trapping to determine if population densities are likely to increase the number of raptors hunting at or near the airfield. Increased seasonal raptor activity would be filed as a Notice to Airmen (NOTAM) for pilot briefings.	6	7
Wildlife Aircraft Strike Hazard (WASH)	Continue to perform quarterly inspection of boundary fence for evidence of mammal encroachment and identify sites for repair.	7	8
Wildlife Aircraft Strike Hazard (WASH)	Consult with CPW regarding big game issues related to airfield operations.	8	9
Water Rights Management	Send USGS quarterly gauge reports to the State.	2	5
Water Rights Management	Send monthly well reports to Colorado Water Protective Development Association (CWPDA).	3	6
Water Rights Management	Maintain approximately 35 wells at the PCMS.	4	7
Integrated Training Area Management	Provide training to military units and civilians to understand safety hazards, as well as, cultural and environmental resource issues.	5	1

Program Element	Reoccurring Action	Order of Priority in 2013-2017 INRMP	Order of Priority in 2020-2025 INRMP
Integrated Training Area Management	Develop and implement safety, maneuver access project, and provide erosion control measures and structures to mitigate maneuver impacts within the training areas.	1	2

APPENDIX 5: Vertebrate Species Lists

[1]Federal

FE (Federal Endangered) – Plants and animals that are in danger of extinction throughout all or a significant portion of their range.

FT (Federal Threatened) – Plants and animals likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

FR (Federal Review) – Species that have been petitioned for listing, and for which a 90-day substantial ruling has been published, but a 12-month finding has not yet been published.

BCC (Birds of Conservation Concern) – Species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973.

[2]State

SE (State Endangered) – Any species which is in danger of extinction throughout all or a significant portion of its range.

ST (State Threatened) – An animal or plant likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

SC (State Special Concern) – Declining or potentially declining species of greatest conservation need.

T1 (Tier 1) – Species which, according to the 2015 Colorado State Wildlife Action Plan, are truly of highest conservation priority in the state, and to which CPW will likely focus resources over the life of the plan.

T2 (Tier 2) – Species which, according to the 2015 Colorado State Wildlife Action Plan, remain important in light of forestalling population trends or habitat conditions that may lead to a threatened or endangered listing status, but the urgency of such action has been judged to be less.

[3]Colorado Natural Heritage Program (CNHP)

G/S – Species ranked by the Colorado Natural Heritage Program and NatureServe with Global/State status that are either: 1 = Critically imperiled; 2 = Imperiled; or 3 = Vulnerable.

FT (Fully Tracked) – These species are vulnerable and imperiled at any location.

PT (Partial Tracking) – These species are common if you find the right habitat, but healthy populations or high quality occurrences are of conservation concern.

WL (Watchlisted) – These species are common if you find the right habitat, but are still species of concern due to either habitat imperilment or a general decline in the species population.

4 Species At Risk (SAR)

The Department of Defense identifies Species At Risk (SAR) as species that are not yet federally listed as threatened or endangered under the Endangered Species Act, but are federally designated as proposed or candidates for listing, are regarded by NatureServe as critically imperiled (G1) or imperiled (G2) throughout their range; or are birds that are regarded as vulnerable (G3) throughout their range or have an IUCN status of critically endangered, endangered, vulnerable, or near threatened.

5 Non-native Species

Non-native species are noted after the species's common name.

Fort Carson Vertebrates

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
FISH				
Black bullhead	*Ameiurus melas*			
Central stoneroller	*Campostoma anomalum*			
White sucker	*Castostomus commersonii*			
Grass carp[5]	*Ctenopharyngodon idella*			
Brook stickleback	*Culaea inconstans*			
Common carp[5]	*Cyprinus carpio*			
Arkansas darter	*Etheostoma cragini*		ST; T1	G3; FT
Plains killifish	*Fundulus zebrinus*			
Western mosquitofish[5]	*Gambusia affinis*			
Channel catfish	*Ictalurus punctatus*			
Green sunfish	*Lepomis cyanellus*			
Bluegill[5]	*Lepomis macrochirus*			
Largemouth bass[5]	*Micropterus salmoides*			
Golden shiner[5]	*Notemigonus crysoleucas*			
Sand shiner	*Notropis stramineus*			
Snake River finespotted cutthroat trout	*Oncorhynchus clarkii behnkei*			
Rainbow trout[5]	*Oncorhynchus mykiss*			
Southern redbelly dace	*Phoxinus erythrogaster*		SC; T1	FT
Fathead minnow	*Pimephales promelas*			
Flathead chub	*Platygobio gracilis*		SC; T1	FT
Black crappie[5]	*Pomoxis nigromaculatus*			
Longnose dace	*Rhinichthys cataractae*			
Brook trout[5]	*Salvelinus fontinalis*			
Creek chub	*Semotilus atromaculatus*			
AMPHIBIANS				
Tiger salamander	*Ambystoma tigrinum*			
Red-spotted toad	*Anaxyrus punctatus*			
Woodhouse's toad	*Anaxyrus woodhousii*			
Striped chorus frog	*Pseudacris triseriata*			
American bullfrog[5]	*Lithobates catesbeianus*			
Northern leopard frog	*Lithobates pipens*		SC; T1	FT
Plains spadefoot	*Spea bombifrons*			
New Mexico spadefoot	*Spea multiplicata*			
Couch's spadefoot	*Scaphiopus couchii*		SC; T2	FT
REPTILES				
Snapping turtle	*Chelydra serpentina*			
Western box turtle	*Terrapene ornata ornata*			
Painted turtle	*Chrysemys picta*			PT
Six-lined racerunner	*Aspidoscelis sexlineata*			

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
Colorado checkered whiptail	*Aspidoscelis neotesselata*		SC; T1	G3/S2; FT
Many-lined skink	*Eumeces multivirgatus*			FT
Lesser earless lizard	*Holbrookia maculata*			
Short-horned lizard	*Phrynosoma douglassi*			
Eastern fence lizard	*Sceloporus undulatus*			
Glossy snake	*Arizona elegans*			
Eastern yellowbelly racer	*Coluber constrictor flaviventris*			
Prairie rattlesnake	*Crotalus viridis viridis*			
Western hognose snake	*Heterodon nasicus*			
Night snake	*Hypsiglena torquata*			
Coachwhip	*Masticophis flagellum*			
Bullsnake	*Pituophis catenifer*			
Plains black-headed snake	*Tantilla nigriceps*			
Western terrestrial garter snake	*Thamnophis elegans*			
Plains garter snake	*Thamnophis radix*			
BIRDS				
Snow Goose	*Anser caerulescens*			
Greater White-fronted Goose	*Anser albifrons*			
Cackling Goose	*Branta hutchinsii*			
Canada Goose	*Branta canadensis*			
Tundra Swan	*Cygnus columbianus*			
Wood Duck	*Aix sponsa*			
Blue-winged Teal	*Sptaula discors*			
Cinnamon Teal	*Sptaula cyanoptera*			
Northern Shoveler	*Sptaula clypeata*			
Gadwall	*Mareca strepera*			
American Wigeon	*Mareca americana*			
Mallard	*Anas platyrhynchos*			
Northern Pintail	*Anas acuta*			
Green-winged Teal	*Anas crecca*			
Canvasback	*Aythya valisineria*			
Redhead	*Aythya americana*			
Ring-necked Duck	*Aythya collaris*			
Lesser Scaup	*Aythya affinis*			
Bufflehead	*Bucephala albeola*			
Common Goldeneye	*Bucephala clangula*			
Hooded Merganser	*Lophodytes cucullatus*			
Common Merganser	*Mergus merganser*			
Red-breasted Merganser	*Mergus serrator*			
Ruddy Duck	*Oxyura jamaicensis*			
Northern Bobwhite	*Colinus virginianus*			
Scaled Quail	*Callipepla squamata*			
Ring-necked Pheasant[5]	*Phasianus colchicus*			
Merriam's Wild Turkey	*Meleagris gallopavo merriami*			
Pied-billed Grebe	*Podilymbus podiceps*			
Horned Grebe	*Podiceps auritus*	BCC		

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
Eared Grebe	*Podiceps nigricollis*			
Western Grebe	*Aechmophorus occidentalis*			
Clark's Grebe	*Aechmophorus clarkii*			
Rock Pigeon[5]	*Columba livia*			
Band-tailed Pigeon	*Patagioenas fasciata*			
Eurasian Collared-Dove[5]	*Streptopelia decaocto*			
White-winged Dove	*Zenaida asiatica*			
Mourning Dove	*Zenaida macroura*			
Greater Roadrunner	*Geococcyx californianus*			
Yellow-billed Cuckoo	*Coccyzus americanus*			
Common Nighthawk	*Chordeiles minor*			
Common Poorwill	*Phalaenoptilus nuttallii*			
Black Swift	*Cypseloides niger*		T2	FT
Chimney Swift	*Chaetura pelagica*			
White-throated Swift	*Aeronautes saxatalis*			
Black-chinned Hummingbird	*Archilochus alexandri*			
Broad-tailed Hummingbird	*Selasphorus platycercus*			
Rufous Hummingbird	*Selasphorus rufus*		T2	
Calliope Hummingbird	*Selasphorus calliope*			
Virginia Rail	*Rallus limicola*			
Sora	*Porzana carolina*			
American Coot	*Fulica americana*			
Sandhill Crane	*Antigone canadensis*		SC; T1	FT
Black-necked Stilt	*Himantopus mexicanus*			FT
American Avocet	*Recurvirostra americana*			
Black-bellied Plover	*Pluvialis squatarola*			
Killdeer	*Charadrius vociferus*			
Semipalmated Plover	*Charadrius semipalmatus*			
Mountain Plover[4]	*Charadrius montanus*	BCC	SC; T1	G3; FT
Whimbrel	*Numenius phaeopus*			
Long-billed Curlew	*Numenius americanus*	BCC	SC; T2	FT
Stilt Sandpiper	*Calidris himantopus*			
Sanderling	*Calidris alba*			
Baird's Sandpiper	*Calidris bairdii*			
Least Sandpiper	*Calidris minutilla*			
Pectoral Sandpiper	*Calidris melanotos*			
Semipalmated Sandpiper	*Calidris pusilla*			
Western Sandpiper	*Calidris mauri*			
Long-billed Dowitcher	*Limnodromus scolopaceus*			
American Woodcock	*Scolopax minor*			
Wilson's Snipe	*Gallinago delicata*			
Spotted Sandpiper	*Actitis macularius*			
Solitary Sandpiper	*Tringa solitaria*			
Lesser Yellowlegs	*Tringa flavipes*			
Willet	*Tringa semipalmata*			FT
Greater Yellowlegs	*Tringa melanoleuca*			

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
Wilson's Phalarope	*Phalaropus tricolor*			FT
Red-necked Phalarope	*Phalaropus lobatus*			
Bonaparte's Gull	*Chroicocephalus philadelphia*			
Franklin's Gull	*Leucophaeus pipixcan*			
Ring-billed Gull	*Larus delawarensis*			
California Gull	*Larus californicus*			
Herring Gull	*Larus argentatus*			
Black Tern	*Chlidonias niger*		T2	
Forster's Tern	*Sterna forsteri*			FT
Common Loon	*Gavia immer*			
Double-crested Cormorant	*Phalacrocorax auritus*			
American White Pelican	*Pelecanus erythrorhynchos*		T2	FT
American Bittern	*Botaurus lentiginosus*	BCC	T2	
Great Blue Heron	*Ardea herodias*			
Great Egret	*Ardea alba*			
Snowy Egret	*Egretta thula*			FT
Cattle Egret	*Bubulcus ibis*			
Green Heron	*Butorides virescens*			
Black-crowned Night-Heron	*Nycticorax nycticorax*			
White-faced Ibis	*Plegadis chihi*		T2	FT
Turkey Vulture	*Cathartes aura*			
Osprey	*Pandion haliaetus*			
Golden Eagle	*Aquila chrysaetos*	BCC	SC; T1	
Northern Harrier	*Circus hudsonius*		T2	
Sharp-shinned Hawk	*Accipiter striatus*			
Cooper's Hawk	*Accipiter cooperii*			
Northern Goshawk	*Accipiter gentilis*		T2	WL
Bald Eagle	*Haliaeetus leucocephalus*	BCC	SC; T2	FT
Mississippi Kite	*Ictinia mississippiensis*			
Broad-winged Hawk	*Buteo platypterus*			
Swainson's Hawk	*Buteo swainsoni*		T2	
Red-tailed Hawk	*Buteo jamaicensis*			
Harlan's Hawk	*Buteo jamaicensis harlani*			
Rough-legged Hawk	*Buteo lagopus*			
Ferruginous Hawk	*Buteo regalis*	BCC	SC; T2	FT
Barn Owl	*Tyto alba*			
Western Screech-Owl	*Megascops kennicottii*			
Great Horned Owl	*Bubo virginianus*			
Northern Pygmy-Owl	*Glaucidium gnoma*			WL
Burrowing Owl	*Athene cunicularia*	BCC	ST; T1	WL
Mexican Spotted Owl	*Strix occidentalis lucida*	FT	ST; T2	FT
Long-eared Owl	*Asio otus*			
Short-eared Owl	*Asio flammeus*	BCC	T2	FT
Northern Saw-whet Owl	*Aegolius acadicus*			
Belted Kingfisher	*Megaceryle alcyon*			
Lewis's Woodpecker	*Melanerpes lewis*	BCC	T2	FT
Red-headed Woodpecker	*Melanerpes erythrocephalus*	BCC		

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
Acorn Woodpecker	*Melanerpes formicivorus*			
Williamson's Sapsucker	*Sphyrapicus thyroideus*			
Yellow-bellied Sapsucker	*Sphyrapicus varius*			
Red-naped Sapsucker	*Sphyrapicus nuchalis*			
Downy Woodpecker	*Picoides pubescens*			
Ladder-backed Woodpecker	*Picoides scalaris*			
Hairy Woodpecker	*Picoides villosus*			
Northern Flicker	*Colaptes auratus*			
American Kestrel	*Falco sparverius*			
Merlin	*Falco columbarius*			
Peregrine Falcon	*Falco peregrinus*	BCC	SC; T2	FT
Prairie Falcon	*Falco mexicanus*	BCC	T2	WL
Ash-throated Flycatcher	*Myiarchus cinerascens*			
Cassin's Kingbird	*Tyrannus vociferans*			
Western Kingbird	*Tyrannus verticalis*			
Eastern Kingbird	*Tyrannus tyrannus*			
Olive-sided Flycatcher	*Contopus cooperi*		T2	
Western Wood-Pewee	*Contopus sordidulus*			
Willow Flycatcher	*Empidonax traillii*	BCC		WL
Least Flycatcher	*Empidonax minimus*			
Hammond's Flycatcher	*Empidonax hammondii*			
Gray Flycatcher	*Empidonax wrightii*			
Dusky Flycatcher	*Empidonax oberholseri*			
Cordilleran Flycatcher	*Empidonax occidentalis*			
Eastern Phoebe	*Sayornis phoebe*			
Say's Phoebe	*Sayornis saya*			
Loggerhead Shrike	*Lanius ludovicianus*	BCC	T2	
Northern Shrike	*Lanius borealis*			
White-eyed Vireo	*Vireo griseus*			
Gray Vireo	*Vireo vicinior*	BCC	T2	FT
Cassin’s Vireo	*Vireo cassinii*			
Blue-headed Vireo	*Vireo solitarius*			
Plumbeous Vireo	*Vireo plumbeus*			
Warbling Vireo	*Vireo gilvus*			
Red-eyed Vireo	*Vireo olivaceus*			
Pinyon Jay[4]	*Gymnorhinus cyanocephalus*	BCC	T2	G3/S3; FT
Steller's Jay	*Cyanocitta stelleri*			
Blue Jay	*Cyanocitta cristata*			
Woodhouse's Scrub-Jay	*Aphelocoma woodhouseii*			
Clark's Nutcracker	*Nucifraga columbiana*			
Black-billed Magpie	*Pica hudsonia*			
American Crow	*Corvus brachyrhynchos*			
Chihuahuan Raven	*Corvus cryptoleucus*			
Common Raven	*Corvus corax*			
Horned Lark	*Eremophila alpestris*			
Bank Swallow	*Riparia riparia*			
Tree Swallow	*Tachycineta bicolor*			

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
Violet-green Swallow	*Tachycineta thalassina*			
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*			
Barn Swallow	*Hirundo rustica*			
Cliff Swallow	*Petrochelidon pyrrhonota*			
Black-capped Chickadee	*Poecile atricapillus*			
Mountain Chickadee	*Poecile gambeli*			
Juniper Titmouse	*Baeolophus ridgwayi*	BCC	T2	
Bushtit	*Psaltriparus minimus*			
Red-breasted Nuthatch	*Sitta canadensis*			
White-breasted Nuthatch	*Sitta carolinensis*			
Pygmy Nuthatch	*Sitta pygmaea*			
Brown Creeper	*Certhia americana*			
Rock Wren	*Salpinctes obsoletus*			
Canyon Wren	*Catherpes mexicanus*			
House Wren	*Troglodytes aedon*			
Marsh Wren	*Cistothorus palustris*			
Bewick's Wren	*Thryomanes bewickii*			
Blue-gray Gnatcatcher	*Polioptila caerulea*			
American Dipper	*Cinclus mexicanus*			
Golden-crowned Kinglet	*Regulus satrapa*			
Ruby-crowned Kinglet	*Regulus calendula*			
Eastern Bluebird	*Sialia sialis*			
Western Bluebird	*Sialia mexicana*			
Mountain Bluebird	*Sialia currucoides*			
Townsend's Solitaire	*Myadestes townsendi*			
Veery	*Catharus fuscescens*	BCC	T2	WL
Swainson's Thrush	*Catharus ustulatus*			
Hermit Thrush	*Catharus guttatus*			
American Robin	*Turdus migratorius*			
Gray Catbird	*Dumetella carolinensis*			
Curve-billed Thrasher	*Toxostoma curvirostre*			WL
Brown Thrasher	*Toxostoma rufum*			
Sage Thrasher	*Oreoscoptes montanus*	BCC		
Northern Mockingbird	*Mimus polyglottos*			
European Starling[5]	*Sturnus vulgaris*			
Bohemian Waxwing	*Bombycilla garrulus*			
Cedar Waxwing	*Bombycilla cedrorum*			
House Sparrow[5]	*Passer domesticus*			
American Pipit	*Anthus rubescens*			
Evening Grosbeak	*Coccothraustes vespertinus*			
Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*			
Brown-capped Rosy-Finch	*Leucosticte australis*	BCC	T2	PT
House Finch	*Haemorhous mexicanus*			
Cassin's Finch	*Haemorhous cassinii*	BCC	T2	PT
Common Redpoll	*Acanthis flammea*			
Red Crossbill	*Loxia curvirostra*			
Pine Siskin	*Spinus pinus*			

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
Lesser Goldfinch	*Spinus psaltria*			
American Goldfinch	*Spinus tristis*			
Lapland Longspur	*Calcarius lapponicus*			
Chestnut-collared Longspur	*Calcarius ornatus*	BCC	T2	FT
McCown's Longspur	*Rhynchophanes mccownii*	BCC	T2	FT
Cassin's Sparrow	*Peucaea cassinii*		T2	WL
Grasshopper Sparrow	*Ammodramus savannarum*	BCC	T2	
Black-throated Sparrow	*Amphispiza bilineata*			
Lark Sparrow	*Chondestes grammacus*			
Lark Bunting	*Calamospiza melanocorys*	BCC	T2	
Chipping Sparrow	*Spizella passerina*			
Clay-colored Sparrow	*Spizella pallida*			
Brewer's Sparrow	*Spizella breweri*	BCC	T2	
Fox Sparrow	*Passerella iliaca*			
American Tree Sparrow	*Spizelloides arborea*			
Dark-eyed Junco	*Junco hyemalis*			
White-crowned Sparrow	*Zonotrichia leucophrys*			
Harris' Sparrow	*Zonotrichia querula*			
White-throated Sparrow	*Zonotrichia albicollis*			
Vesper Sparrow	*Pooecetes gramineus*			
Savannah Sparrow	*Passerculus sandwichensis*			
Song Sparrow	*Melospiza melodia*			
Lincoln's Sparrow	*Melospiza lincolnii*			
Swamp Sparrow	*Melospiza georgiana*			
Canyon Towhee	*Melozone fusca*			
Rufous-crowned Sparrow	*Aimophila ruficeps*			FT
Green-tailed Towhee	*Pipilo chlorurus*			
Spotted Towhee	*Pipilo maculatus*			
Yellow-breasted Chat	*Icteria virens*			
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*			
Bobolink	*Dolichonyx oryzivorus*		T2	WL
Western Meadowlark	*Sturnella neglecta*			
Orchard Oriole	*Icterus spurius*			
Bullock's Oriole	*Icterus bullockii*			
Red-winged Blackbird	*Agelaius phoeniceus*			
Brown-headed Cowbird	*Molothrus ater*			
Brewer's Blackbird	*Euphagus cyanocephalus*			
Common Grackle	*Quiscalus quiscula*			
Great-tailed Grackle	*Quiscalus mexicanus*			
Ovenbird	*Seiurus aurocapilla*			FT
Worm-eating Warbler	*Helmitheros vermivorus*			
Northern Waterthrush	*Parkesia noveboracensis*			
Golden-winged Warbler	*Vermivora chrysoptera*			
Black-and-white Warbler	*Mniotilta varia*			
Orange-crowned Warbler	*Oreothlypis celata*			
Nashville Warbler	*Oreothlypis ruficapilla*			
Virginia's Warbler	*Oreothlypis virginiae*		T2	

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
MacGillivray's Warbler	*Geothlypis tolmiei*			
Common Yellowthroat	*Geothlypis trichas*			
Hooded Warbler	*Setophaga citrina*			
American Redstart	*Setophaga ruticilla*			
Northern Parula	*Setophaga americana*			
Yellow Warbler	*Setophaga petechia*			
Chestnut-sided Warbler	*Setophaga pensylvanica*			
Blackpoll Warbler	*Setophaga striata*			
Western Palm Warbler	*Setophaga palmarum palmarum*			
Yellow-rumped Warbler	*Setophaga coronata*			
Black-throated Gray Warbler	*Setophaga nigrescens*			
Townsend's Warbler	*Setophaga townsendi*			
Black-throated Green Warbler	*Setophaga virens*			
Wilson's Warbler	*Cardellina pusilla*			
Hepatic Tanager	*Piranga flava*			
Western Tanager	*Piranga ludoviciana*			
Rose-breasted Grosbeak	*Pheucticus ludovicianus*			
Black-headed Grosbeak	*Pheucticus melanocephalus*			
Blue Grosbeak	*Paaerina caerulea*			
Lazuli Bunting	*Passerina amoena*		T2	
Indigo Bunting	*Passerina cyanea*			
Dickcissel	*Spiza americana*			
MAMMALS				
Virginia opossum	*Didelphis virginiana*			
Beaver	*Castor canadensis*			
Plains pocket gopher	*Geomys bursarius*			
Botta's pocket gopher	*Thomomys bottae*		SC;T2	FT
Northern pocket gopher	*Thomomys talpoides*		SC	FT
Ord's kangaroo rat	*Dipodomys ordii*			
Hispid pocket mouse	*Chaetodipus hispidus*			
Olive-backed pocket mouse	*Perognathus fasciatus*		T1	FT
Plains pocket mouse	*Perognathus flavescens*			FT
Silky pocket mouse	*Perognathus flavus*			S2; FT
Porcupine	*Erethizon dorsatum*			
Long-tailed vole	*Microtus longicaudus*			
Prairie vole	*Microtus ochrogaster*			
Meadow vole	*Microtus pennsylvanicus*			
Muskrat	*Ondatra zibethicus*			
Bushy-tailed woodrat	*Neotoma cinerea*			
Eastern woodrat	*Neotoma floridana*			
Mexican woodrat	*Neotoma mexicana*			
Brush mouse	*Peromyscus boylii*			
White-footed mouse	*Peromyscus leucopus*			
Deer mouse	*Peromyscus maniculatus*			
Northern rock mouse	*Peromyscus nasutus*			
Pinyon mouse	*Peromyscus truei*			

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
Western harvest mouse	*Reithrodontomys megalotis*			
Plains harvest mouse	*Reithrodontomys montanus*			
Northern grasshopper mouse	*Onychomys leucogaster*			
Hispid cotton rat	*Sigmodon hispidus*			
Norway rat[5]	*Rattus norvegicus*			
House mouse[5]	*Mus musculus*			
Abert's squirrel	*Sciurus aberti*		T2	
Fox squirrel	*Sciurus niger*			
Black-tailed prairie dog	*Cynomys ludovicianus*		SC; T2	PT
Spotted ground squirrel	*Xerospermophilus spilosoma*			
Thirteen-lined ground squirrel	*Ictidomys tridecemlineatus*			
Rock squirrel	*Otospermophilus variegatus*			
Colorado chipmunk	*Tamias quadrivittatus*			PT
Desert cottontail	*Sylvilagus audubonii*			
Nuttall's cottontail	*Sylvilagus nuttallii*			
Black-tailed jackrabbit	*Lepus californicus*			
Montane shrew	*Sorex monticolus*			
Pallid bat	*Antrozous pallidus*			
Townsend's big-eared bat	*Corynorhinus townsendii*		SC; T1	FT
Big brown bat	*Eptesicus fuscus*			
Silver-haired bat	*Lasionycteris noctivagans*			WL
Hoary bat	*Lasiurus cinereus*		T2	WL
Western small-footed myotis	*Myotis ciliolabrum*			
Little brown myotis	*Myotis lucifugus*	FR	T1	G3
Fringed myotis	*Myotis thysanodes*		T1	FT
Long-legged myotis	*Myotis volans*			
Yuma myotis	*Myotis yumanensis*			
Big free-tailed bat	*Nyctinomos macrotis*		T2	FT
Brazilian free-tailed bat	*Tadarida brasiliensis*			WL
Tricolored bat[4]	*Perimyotis subflavus*			G2/S2
Bobcat	*Lynx rufus*			
Mountain lion	*Puma concolor*			
Swift fox	*Vulpes velox*		SC; T2	G3; FT
Red fox	*Vulpes vulpes*			
Gray fox	*Urocyon cinereoargenteus*			
Coyote	*Canis latrans*			
Black bear	*Ursus americanus*			
Western spotted skunk	*Spilogale gracilis*			
Striped skunk	*Mephitis mephitis*			
Ermine	*Mustela erminea*			
Long-tailed weasel	*Mustela frenata*			
Black-footed ferret*	*Mustela nigripes*	FE	SE; T1	FT
Badger	*Taxidea taxus*			
Ringtail	*Bassariscus astutus*			
Raccoon	*Procyon lotor*			
Pronghorn	*Antilocapra americana*			

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
Elk	*Cervus elaphus*			
Mule deer	*Odocoileus hemionus*			
White-tailed deer	*Odocoileus virginianus*			
Bighorn sheep	*Ovis canadensis*		T2	

*Fort Carson has a Programmatic Safe Harbor agreement with the USFWS to ensure no land use or training restrictions result from the presence of black-footed ferrets.

Piñon Canyon Maneuver Site Vertebrates

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
FISH				
Black bullhead	*Ameiurus melas*			
Central stoneroller	*Campostoma anomalum*			
White sucker	*Castostomus commersonii*			
Red shiner	*Cyprinella lutrensis*			
Common carp[5]	*Cyprinus carpio*			
Plains killifish	*Fundulus zebrinus*			
Channel catfish	*Ictalurus punctatus*			
Green sunfish	*Lepomis cyanellus*			
Sand shiner	*Notropis stramineus*			
Fathead minnow	*Pimephales promelas*			
Flathead chub	*Platygobio gracilis*		SC; T1	FT
Longnose dace	*Rhinichthys cataractae*			
AMPHIBIANS				
Tiger salamander	*Ambystoma tigrinum*			
Red-spotted toad	*Anaxyrus punctatus*			
Woodhouse's toad	*Anaxyrus woodhousii*			
American bullfrog[5]	*Lithobates catesbeianus*			
Plains leopard frog	*Lithobates blairi*		SC; T2	FT
Couch's spadefoot	*Scaphiopus couchii*		SC; T2	FT
Plains spadefoot	*Spea bombifrons*			
New Mexico spadefoot	*Spea multiplicata*			
REPTILES				
Snapping turtle	*Chelydra serpentina*			
Western box turtle	*Terrapene ornata ornata*			
Six-lined racerunner	*Aspidoscelis sexlineata*			
Colorado checkered whiptail	*Aspidoscelis neotesselata*		SC; T1	G3/S2; FT
Common checkered whiptail	*Aspidoscelis tesselata*			
Collared lizard	*Crotaphytus collaris*			
Great Plains skink	*Eumeces obsoletus*			
Lesser earless lizard	*Holbrookia maculata*			
Texas horned lizard	*Phrynosoma cornutum*		SC; T2	FT
Short-horned lizard	*Phrynosoma douglasii*			
Hernandez's short-horned lizard	*Phrynosoma hernandesi*			WL
Eastern fence lizard	*Sceloporus undulatus*			
Glossy snake	*Arizona elegans*			
Eastern yellowbelly racer	*Coluber constrictor flaviventris*			
Prairie rattlesnake	*Crotalus viridis viridis*			
Ring-necked snake	*Diadophis punctatus*			
Corn snake	*Elaphe guttata*			
Western hognose snake	*Heterodon nasicus*			
Night snake	*Hypsiglena torquata*			

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
Milk snake	*Lampropeltis triangulum*		T2	
Texas blind snake	*Leptotyphlops dulcis*			
Coachwhip	*Masticophis flagellum*			
Bullsnake	*Pituophis catenifer*			
Ground snake	*Sonora semiannulata*			WL
Plains black-headed snake	*Tantilla nigriceps*			
Black-necked garter snake	*Thamnophis cyrtopsis*		T2	WL
Western terrestrial garter snake	*Thamnophis elegans*			
Plains garter snake	*Thamnophis radix*			
Lined snake	*Tropidoclonion lineatum*			WL
BIRDS				
Snow Goose	*Anser caerulescens*			
Ross's Goose	*Anser rossii*			
Cackling Goose	*Branta hutchinsii*			
Canada Goose	*Branta canadensis*			
Wood Duck	*Aix sponsa*			
Blue-winged Teal	*Sptaula discors*			
Northern Shoveler	*Sptaula clypeata*			
Gadwall	*Mareca strepera*			
American Wigeon	*Mareca americana*			
Mallard	*Anas platyrhynchos*			
Northern Pintail	*Anas acuta*			
Green-winged Teal	*Anas crecca*			
Canvasback	*Aythya valisineria*			
Redhead	*Aythya americana*			
Ring-necked Duck	*Aythya collaris*			
Lesser Scaup	*Aythya affinis*			
White-winged Scoter	*Melanitta fusca*			
Bufflehead	*Bucephala albeola*			
Common Goldeneye	*Bucephala clangula*			
Ruddy Duck	*Oxyura jamaicensis*			
Northern Bobwhite	*Colinus virginianus*			
Scaled Quail	*Callipepla squamata*			
Merriam's Wild Turkey	*Meleagris gallopavo merriami*			
Pied-billed Grebe	*Podilymbus podiceps*			
Eared Grebe	*Podiceps nigricollis*			
Rock Pigeon[5]	*Columba livia*			
Band-tailed Pigeon	*Patagioenas fasciata*			
White-winged Dove	*Zenaida asiatica*			
Mourning Dove	*Zenaida macroura*			
Greater Roadrunner	*Geococcyx californianus*			
Yellow-billed Cuckoo	*Coccyzus americanus*			
Black-billed Cuckoo	*Coccyzus erythropthalmus*	BCC		
Common Nighthawk	*Chordeiles minor*			
Common Poorwill	*Phalaenoptilus nuttallii*			
Chimney Swift	*Chaetura pelagica*			

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
White-throated Swift	*Aeronautes saxatalis*			
Black-chinned Hummingbird	*Archilochus alexandri*			
Broad-tailed Hummingbird	*Selasphorus platycercus*			
Rufous Hummingbird	*Selasphorus rufus*		T2	
Calliope Hummingbird	*Selasphorus calliope*			
Virginia Rail	*Rallus limicola*			
Sora	*Porzana carolina*			
American Coot	*Fulica americana*			
Sandhill Crane	*Antigone canadensis*		SC; T1	FT
Black-necked Stilt	*Himantopus mexicanus*			FT
American Avocet	*Recurvirostra americana*			
Killdeer	*Charadrius vociferus*			
Semipalmated Plover	*Charadrius semipalmatus*			
Mountain Plover[4]	*Charadrius montanus*	BCC	SC; T1	G3; FT
Upland Sandpiper	*Bartramia longicauda*	BCC	T2	
Long-billed Curlew	*Numenius americanus*	BCC	SC; T2	FT
Marbled Godwit	*Limosa fedoa*	BCC		
Sanderling	*Calidris alba*			
Baird's Sandpiper	*Calidris bairdii*			
Pectoral Sandpiper	*Calidris melanotos*			
Semipalmated Sandpiper	*Calidris pusilla*			
Western Sandpiper	*Calidris mauri*			
Long-billed Dowitcher	*Limnodromus scolopaceus*			
Wilson's Snipe	*Gallinago delicata*			
Spotted Sandpiper	*Actitis macularius*			
Solitary Sandpiper	*Tringa solitaria*			
Lesser Yellowlegs	*Tringa flavipes*			
Willet	*Tringa semipalmata*			FT
Greater Yellowlegs	*Tringa melanoleuca*			
Wilson's Phalarope	*Phalaropus tricolor*			FT
Franklin's Gull	*Leucophaeus pipixcan*			
Ring-billed Gull	*Larus delawarensis*			
Double-crested Cormorant	*Phalacrocorax auritus*			
American White Pelican	*Pelecanus erythrorhynchos*		T2	FT
American Bittern	*Botaurus lentiginosus*	BCC	T2	
Least Bittern	*Ixobrychus exilis*	BCC		
Great Blue Heron	*Ardea herodias*			
Snowy Egret	*Egretta thula*			FT
Green Heron	*Butorides virescens*			
Black-crowned Night-Heron	*Nycticorax nycticorax*			
White-faced Ibis	*Plegadis chihi*		T2	FT
Turkey Vulture	*Cathartes aura*			
Osprey	*Pandion haliaetus*			
Golden Eagle	*Aquila chrysaetos*	BCC	SC; T1	
Northern Harrier	*Circus hudsonius*		T2	
Sharp-shinned Hawk	*Accipiter striatus*			
Cooper's Hawk	*Accipiter cooperii*			

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
Northern Goshawk	*Accipiter gentilis*		T2	WL
Bald Eagle	*Haliaeetus leucocephalus*	BCC	SC; T2	FT
Mississippi Kite	*Ictinia mississippiensis*			
Broad-winged Hawk	*Buteo platypterus*			
Swainson's Hawk	*Buteo swainsoni*		T2	
Red-tailed Hawk	*Buteo jamaicensis*			
Rough-legged Hawk	*Buteo lagopus*			
Ferruginous Hawk	*Buteo regalis*	BCC	SC; T2	FT
Barn Owl	*Tyto alba*			
Western Screech-Owl	*Megascops kennicottii*			
Great Horned Owl	*Bubo virginianus*			
Burrowing Owl	*Athene cunicularia*	BCC	ST; T1	WL
Long-eared Owl	*Asio otus*			
Short-eared Owl	*Asio flammeus*	BCC	T2	FT
Belted Kingfisher	*Megaceryle alcyon*			
Lewis's Woodpecker	*Melanerpes lewis*	BCC	T2	FT
Red-headed Woodpecker	*Melanerpes erythrocephalus*	BCC		
Red-naped Sapsucker	*Sphyrapicus nuchalis*			
Downy Woodpecker	*Picoides pubescens*			
Ladder-backed Woodpecker	*Picoides scalaris*			
Hairy Woodpecker	*Picoides villosus*			
Northern Flicker	*Colaptes auratus*			
American Kestrel	*Falco sparverius*			
Merlin	*Falco columbarius*			
Peregrine Falcon	*Falco peregrinus*	BCC	SC; T2	FT
Prairie Falcon	*Falco mexicanus*	BCC	T2	WL
Ash-throated Flycatcher	*Myiarchus cinerascens*			
Cassin's Kingbird	*Tyrannus vociferans*			
Western Kingbird	*Tyrannus verticalis*			
Eastern Kingbird	*Tyrannus tyrannus*			
Scissor-tailed Flycatcher	*Tyrannus forficatus*			
Olive-sided Flycatcher	*Contopus cooperi*		T2	
Western Wood-Pewee	*Contopus sordidulus*			
Least Flycatcher	*Empidonax minimus*			
Gray Flycatcher	*Empidonax wrightii*			
Dusky Flycatcher	*Empidonax oberholseri*			
Cordilleran Flycatcher	*Empidonax occidentalis*			
Eastern Phoebe	*Sayornis phoebe*			
Say's Phoebe	*Sayornis saya*			
Loggerhead Shrike	*Lanius ludovicianus*	BCC	T2	
Northern Shrike	*Lanius borealis*			
Gray Vireo	*Vireo vicinior*	BCC	T2	FT
Cassin’s Vireo	*Vireo cassinii*			
Plumbeous Vireo	*Vireo plumbeus*			
Warbling Vireo	*Vireo gilvus*			
Red-eyed Vireo	*Vireo olivaceus*			

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
Pinyon Jay[4]	*Gymnorhinus cyanocephalus*	BCC	T2	G3/S3; FT
Steller's Jay	*Cyanocitta stelleri*			
Blue Jay	*Cyanocitta cristata*			
Woodhouse's Scrub-Jay	*Aphelocoma woodhouseii*			
Clark's Nutcracker	*Nucifraga columbiana*			
Black-billed Magpie	*Pica hudsonia*			
American Crow	*Corvus brachyrhynchos*			
Chihuahuan Raven	*Corvus cryptoleucus*			
Common Raven	*Corvus corax*			
Horned Lark	*Eremophila alpestris*			
Bank Swallow	*Riparia riparia*			
Tree Swallow	*Tachycineta bicolor*			
Violet-green Swallow	*Tachycineta thalassina*			
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*			
Barn Swallow	*Hirundo rustica*			
Cliff Swallow	*Petrochelidon pyrrhonota*			
Black-capped Chickadee	*Poecile atricapillus*			
Mountain Chickadee	*Poecile gambeli*			
Juniper Titmouse	*Baeolophus ridgwayi*	BCC	T2	
Bushtit	*Psaltriparus minimus*			
Red-breasted Nuthatch	*Sitta canadensis*			
White-breasted Nuthatch	*Sitta carolinensis*			
Pygmy Nuthatch	*Sitta pygmaea*			
Brown Creeper	*Certhia americana*			
Rock Wren	*Salpinctes obsoletus*			
Canyon Wren	*Catherpes mexicanus*			
House Wren	*Troglodytes aedon*			
Marsh Wren	*Cistothorus palustris*			
Bewick's Wren	*Thryomanes bewickii*			
Blue-gray Gnatcatcher	*Polioptila caerulea*			
Golden-crowned Kinglet	*Regulus satrapa*			
Ruby-crowned Kinglet	*Regulus calendula*			
Mountain Bluebird	*Sialia currucoides*			
Townsend's Solitaire	*Myadestes townsendi*			
Swainson's Thrush	*Catharus ustulatus*			
Hermit Thrush	*Catharus guttatus*			
American Robin	*Turdus migratorius*			
Gray Catbird	*Dumetella carolinensis*			
Curve-billed Thrasher	*Toxostoma curvirostre*			WL
Brown Thrasher	*Toxostoma rufum*			
Sage Thrasher	*Oreoscoptes montanus*	BCC		
Northern Mockingbird	*Mimus polyglottos*			
European Starling[5]	*Sturnus vulgaris*			
Bohemian Waxwing	*Bombycilla garrulus*			
Cedar Waxwing	*Bombycilla cedrorum*			
House Sparrow[5]	*Passer domesticus*			

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
American Pipit	*Anthus rubescens*			
Evening Grosbeak	*Coccothraustes vespertinus*			
House Finch	*Haemorhous mexicanus*			
Cassin's Finch	*Haemorhous cassinii*	BCC	T2	PT
Common Redpoll	*Acanthis flammea*			
Red Crossbill	*Loxia curvirostra*			
Pine Siskin	*Spinus pinus*			
Lesser Goldfinch	*Spinus psaltria*			
American Goldfinch	*Spinus tristis*			
Lapland Longspur	*Calcarius lapponicus*			
Chestnut-collared Longspur	*Calcarius ornatus*	BCC	T2	FT
McCown's Longspur	*Rhynchophanes mccownii*	BCC	T2	FT
Cassin's Sparrow	*Peucaea cassinii*		T2	WL
Grasshopper Sparrow	*Ammodramus savannarum*	BCC	T2	
Black-throated Sparrow	*Amphispiza bilineata*			
Lark Sparrow	*Chondestes grammacus*			
Lark Bunting	*Calamospiza melanocorys*	BCC	T2	
Chipping Sparrow	*Spizella passerina*			
Clay-colored Sparrow	*Spizella pallida*			
Brewer's Sparrow	*Spizella breweri*	BCC	T2	
American Tree Sparrow	*Spizelloides arborea*			
Dark-eyed Junco	*Junco hyemalis*			
White-crowned Sparrow	*Zonotrichia leucophrys*			
Harris' Sparrow	*Zonotrichia querula*			
White-throated Sparrow	*Zonotrichia albicollis*			
Vesper Sparrow	*Pooecetes gramineus*			
Savannah Sparrow	*Passerculus sandwichensis*			
Song Sparrow	*Melospiza melodia*			
Lincoln's Sparrow	*Melospiza lincolnii*			
Canyon Towhee	*Melozone fusca*			
Rufous-crowned Sparrow	*Aimophila ruficeps*			FT
Green-tailed Towhee	*Pipilo chlorurus*			
Spotted Towhee	*Pipilo maculatus*			
Yellow-breasted Chat	*Icteria virens*			
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*			
Bobolink	*Dolichonyx oryzivorus*		T2	WL
Western Meadowlark	*Sturnella neglecta*			
Orchard Oriole	*Icterus spurius*			
Bullock's Oriole	*Icterus bullockii*			
Baltimore Oriole	*Icterus galbula*			
Scott's Oriole	*Icterus parisorum*			
Red-winged Blackbird	*Agelaius phoeniceus*			
Brown-headed Cowbird	*Molothrus ater*			
Brewer's Blackbird	*Euphagus cyanocephalus*			
Common Grackle	*Quiscalus quiscula*			
Great-tailed Grackle	*Quiscalus mexicanus*			
Ovenbird	*Seiurus aurocapilla*			FT

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
Northern Waterthrush	*Parkesia noveboracensis*			
Orange-crowned Warbler	*Oreothlypis celata*			
Nashville Warbler	*Oreothlypis ruficapilla*			
Virginia's Warbler	*Oreothlypis virginiae*		T2	
MacGillivray's Warbler	*Geothlypis tolmiei*			
Common Yellowthroat	*Geothlypis trichas*			
American Redstart	*Setophaga ruticilla*			
Northern Parula	*Setophaga americana*			
Yellow Warbler	*Setophaga petechia*			
Chestnut-sided Warbler	*Setophaga pensylvanica*			
Yellow-rumped Warbler	*Setophaga coronata*			
Black-throated Gray Warbler	*Setophaga nigrescens*			
Townsend's Warbler	*Setophaga townsendi*			
Wilson's Warbler	*Cardellina pusilla*			
Hepatic Tanager	*Piranga flava*			
Summer Tanager	*Piranga rubra*			
Western Tanager	*Piranga ludoviciana*			
Rose-breasted Grosbeak	*Pheucticus ludovicianus*			
Black-headed Grosbeak	*Pheucticus melanocephalus*			
Blue Grosbeak	*Paaerina caerulea*			
Lazuli Bunting	*Passerina amoena*		T2	
Indigo Bunting	*Passerina cyanea*			
Dickcissel	*Spiza americana*			
MAMMALS				
Beaver	*Castor canadensis*			
Yellow-faced pocket gopher	*Cratogeomys castanops*			
Botta's pocket gopher	*Thomomys bottae*		SC; T2	FT
Ord's kangaroo rat	*Dipodomys ordii*		SC	FT
Hispid pocket mouse	*Chaetodipus hispidus*			
Plains pocket mouse	*Perognathus flavescens*			FT
Silky pocket mouse	*Perognathus flavus*			S2; FT
Porcupine	*Erethizon dorsatum*			
Mogollon vole	*Microtus mogollonensis*			
Meadow vole	*Microtus pennsylvanicus*			
Muskrat	*Ondatra zibethicus*			
White-throated woodrat	*Neotoma leucodon*			
Eastern woodrat	*Neotoma floridana*			
Mexican woodrat	*Neotoma mexicana*			
Southern plains woodrat	*Neotoma micropus*			FT
Brush mouse	*Peromyscus boylii*			
White-footed mouse	*Peromyscus leucopus*			
Deer mouse	*Peromyscus maniculatus*			
Northern rock mouse	*Peromyscus nasutus*			
Pinyon mouse	*Peromyscus truei*			
Western harvest mouse	*Reithrodontomys megalotis*			
Plains harvest mouse	*Reithrodontomys montanus*			

Common Name	Scientific Name	Federal[1]	State[2]	CNHP[3]
Northern grasshopper mouse	*Onychomys leucogaster*			
Hispid cotton rat	*Sigmodon hispidus*			
House mouse[5]	*Mus musculus*			
Black-tailed prairie dog	*Cynomys ludovicianus*		SC; T2	FT
Spotted ground squirrel	*Xerospermophilus spilosoma*			
Thirteen-lined ground squirrel	*Ictidomys tridecemlineatus*			
Rock squirrel	*Otospermophilus variegatus*			
Colorado chipmunk	*Tamias quadrivittatus*			PT
Desert cottontail	*Sylvilagus audubonii*			
Black-tailed jack rabbit	*Lepus californicus*			
Desert shrew	*Notiosorex crawfordi*			
Pallid bat	*Antrozous pallidus*			
Townsend's big-eared bat	*Corynorhinus townsendii*		SC; T1	FT
Big brown bat	*Eptesicus fuscus*			
Western mastiff bat	*Eumops perotis*			
Silver-haired bat	*Lasionycteris noctivagans*			WL
Hoary bat	*Lasiurus cinereus*		T2	WL
Western small-footed myotis	*Myotis ciliolabrum*			
Little brown myotis	*Myotis lucifugus*	FR	T1	G3
Fringed myotis	*Myotis thysanodes*		T1	FT
Yuma myotis	*Myotis yumanensis*			
Big free-tailed bat	*Nyctinomos macrotis*		T2	FT
Canyon bat	*Parastrellus hesperus*			
Brazilian free-tailed bat	*Tadarida brasiliensis*			WL
Bobcat	*Lynx rufus*			
Mountain lion	*Puma concolor*			
Swift fox	*Vulpes velox*		SC; T2	G3; FT
Gray fox	*Urocyon cinereoargenteus*			
Coyote	*Canis latrans*			
Black bear	*Ursus americanus*			
Striped skunk	*Mephitis mephitis*			
Badger	*Taxidea taxus*			
Ringtail	*Bassariscus astutus*			
Raccoon	*Procyon lotor*			
Pronghorn	*Antilocapra americana*			
Elk	*Cervus elaphus*			
Mule deer	*Odocoileus hemionus*			
White-tailed deer	*Odocoileus virginianus*			
Bighorn sheep	*Ovis canadensis*		T2	

APPENDIX 6: Plant Species Lists

Code
The USDA plant code is the unique symbol for each plant species, usually comprosing of the the first two letters of the genus followed by the first two letters of the species, along with the first letter of the terminal infraspecific name, plus a tiebreaking number (if needed). Genus and family symbols are the first five (genus) or six (family) letters of the name, plus tiebreaking number (if needed). Symbols were first used in the Soil Conservation Service's National List of Scientific Plant Names (NLSPN), and have been perpetuated into the USDA PLANTS system.

Life
A=annual, B=biennial, P=perennial
Origin
N=native, I=introduced
Form
F=forb, G=grass, V=vine, S=shrub, T=tree

Species of special concern
G1=globally critically imperiled, G2=globally imperiled, G3=globally vulnerable, G4=apparently secure globally; T-rank=the status a subspecies or varieties of a species' global rank
S1=state critically imperiled, S2=state imperiled, S3=state vulnerable
* = Species At Risk (SAR) plants are defined by the Department of Defense as plant species that are not yet federally listed as threatened or endangered under the Endangered Species Act, but are federally designated as proposed or candidates for listing, are regarded by NatureServe as critically imperiled (G1 or T1) or imperiled (G2 or T2) throughout their range.

Plant List for Fort Carson

FERNS & FERN ALLIES

Scientific Name	Common Name	Code	Life	Origin	Form
EQUISETACEAE	**Horsetail Family**				
Equisetum arvense	Horsetail	EQAR	P	N	F
Hippochaete laevigata	Smooth horsetail	EQLA	P	N	F
SELAGINELLACEAE	**Little Club-Moss Family**				
Selaginella densa	Lesser Spikemoss	SEDE2	P	N	F
Selaginella mutica	Bluntleaf spikemoss	SEMU	P	N	F
SINOPTERIDACEAE	**Lipfern Family**				
G3/S3 *Argyrochosma fendleri*	Fendler's false cloak fern	ARFE5	P	N	F
S3 *Cheilanthes eatonii*	Eaton's lipfern	CHEA	P	N	F
Cheilanthes fendleri	Fenderler's lipfern	CHFE2	P	N	F
WOODSIACEAE	**Woodsia Family**				
Woodsia oregana ssp. *cathcartiana*	Oregon cliff fern	WOORC2	P	N	F

GYMNOSPERMS

Scientific Name	Common Name	Code	Life	Origin	Form
CUPRESSACEAE	**Cypress Family**				
Juniperus monosperma	Oneseed juniper	JUMO	P	N	T
Juniperus scopulorum	Rocky Mountain juniper	JUSC2	P	N	T
PINACEAE	**Pine Family**				
Abies concolor	White fir	ABCO	P	N	T
Picea pungens	Blue spruce	PIPU	P	N	T
Pinus edulis	Two needle pinyon	PIED	P	N	T
Pinus ponderosa	Ponderosa pine	PIPO	P	N	T
Pseudotsuga menziesii	Douglas-fir	PSME	P	N	T

ANGIOSPERMS, FLOWERING PLANTS

Scientific Name	Common Name	Code	Life	Origin	Form
ACERACEAE	**Maple Family**				
Acer glabrum	Rocky Mountain maple	ACGL	P	N	S/T
Acer negundo var. *negundo*	Boxelder	ACNEN	P	I	T
AGAVACEAE	**Agave Family**				
Yucca glauca	Soapweed yucca	YUGL	P	N	S
ALLIACEAE	**Onion Family**				
Allium cernuum	Nodding onion	ALCE2	P	N	F
Allium textile	Textile onion	ALTE	P	N	F
ALSINACEAE	**Chickweed Family**				
Arenaria fendleri var. *fendleri*	Fendler's sandwort	ARFEF3	P	N	F
Cerastium fontanum	Common mouse-ear chickweed	CEFO2	P	N	F
Eremogone hookeri	Hooker's sandwort	ERHO13	P	N	F
Paronychia jamesii	James' nailwort	PAJA	P	N	F
Paronychia sessiliflora	Creeping nailwort	PASE	P	N	F
AMARANTHACEAE	**Amaranth Family**				
Amaranthus blitoides	Mat amaranth	AMBL	A	N	F
Amaranthus retroflexus	Redroot amaranth	AMRE	A	N	F
ANACARDIACEAE	**Sumac Family**				
Rhus aromatica	Fragrant sumac	RHAR4	P	N	S
Rhus glabra	Smooth sumac	RHGL	P	N	S
Toxicodendron rydbergii	Western poison ivy	TORY	P	N	S/V

Scientific Name	Common Name	Code	Life	Origin	Form
APIACEAE	**Carrot Family**				
Berula erecta	Cutleaf waterparsnip	BEER	P	N	F
Conium maculatum	Poison hemlock	COMA2	B	I	F
Cymopterus montanus	Mountain springparsley	CYMO	P	N	F
Daucus carota	Queen Anne's lace	DACA6	A	I	F
Heracleum maximum	Common cowparsnip	HEMA80	P	N	F
[G3] *Ligusticum porteri*	Porter's licorice-root	LIPO	P	N	F
Lomatium orientale	Northern Idaho biscuitroot	LOOR	P	N	F
APOCYNACEAE	**Dogbane Family**				
Apocynum cannabinum	Indian hemp	APCA	P	N	F
ASCLEPIADACEAE	**Milkweed Family**				
Asclepias asperula	Spider milkweed	ASAS	P	N	F
Asclepias engelmanniana	Engelmann's milkweed	ASEN	P	N	F
Asclepias incarnata	Swamp milkweed	ASIN	P	N	F
Asclepias latifolia	Broadleaf milkweed	ASLA4	P	N	F
Asclepias pumila	Plains milkweed	ASPU	P	N	F
Asclepias speciosa	Showy milkweed	ASSP	P	N	F
Asclepias subverticillata	Horsetail milkweed	ASSU2	P	N	F
Asclepias tuberosa ssp. *interior*	Butterflyweed	ASTUI	P	N	F
[G3G4/T2T3/S2*] *Asclepias uncialis ssp. unicalis*	Wheel (dwarf) milkweed	ASUNU2	P	N	F
Asclepias viridiflora	Green comet milkweed	ASVI	P	N	F
[S1] *Funastrum crispum*	Wavyleaf twinevine	FUCR	P	N	F
ASPARAGACEAE	**Asparagus Family**				
Asparagus officinalis	Garden asparagus	ASOF	P	I	F
ASTERACEAE	**Sunflower Family**				
Achillea millefolium var. *occidentalis*	Western yarrow	ACMIO	P	N	F
Acroptilon repens	Russian knapweed	ACRE3	P	I	F
Ageratina herbacea	Fragrant snakeroot	AGHE5	P	N	F
Ambrosia psilostachya	Western ragweed	AMPS	P	N	F
Ambrosia tomentosa	Skeletonleaf bur ragweed	AMTO3	P	N	F
Ambrosia trifida	Giant ragweed	AMTR	A	I	F
Antennaria parvifolia	Small-leaf pussytoes	ANPA4	P	N	F
Antennaria rosea	Rosy pussytoes	ANRO2	P	N	F
Arctium minus	Lesser burdock	ARMI2	P	I	F
Artemisia biennis	Biennial wormwood	ARBI2	B	I	F
Artemisia bigelovii	Bigelow sage	ARBI3	P	N	S
Artemisia campestris ssp. *caudata*		ARCAC	P	N	F
Artemisia dracunculus	Tarragon	ARDR4	P	N	F
Artemisia filifolius	Sand Sagebrush	ARFI2	P	N	S
Artemisia frigida	Prairie sagewort	ARFR4	P	N	S
Artemisia ludoviciana	White sagebrush	ARLU	P	N	F
Artemisia pacifica	Field sagewort	ARPA28	P	N	F
[G3] *Aster porteri*	Smooth white aster	ASPO5	P	N	F

Scientific Name	Common Name	Code	Life	Origin	Form
Bahia dissecta	Ragleaf bahia	BADI	P	N	F
Bidens tripartita	Threelobe beggarticks	BITR	A	N	F
Brickellia californica	California Brickellbush	BRCA3	P	N	S
Brickellia eupatorioides	False prairie boneset	BREU	P	N	F
Brickellia grandiflora	Tasselflower brickellbush	BRGR	P	N	F
Brickellia eupatorioides var. *chlorolepis*	False boneset	BREUC2	P	N	F
Carduus nutans	Musk thistle	CANU4	P	I	F
Centaurea diffusa	Diffuse knapweed	CEDI3	B	I	F
Centaurea x psammogena	Knapweed	CEPS	B	I	F
Centaurea stoebe	Spotted knapweed	CEST8	B	I	F
Chaetopappa ericoides	Rose heath	CHER2	P	N	S
Cichorium intybus	Chicory	CIIN	P	I	F
Chrysothamnus nauseosus	Rubber rabbitbrush	CHNA2	P	N	F
Chrysothamnus parryi ssp. *howardii*	Rabbitbrush	CHPAH	P	N	S
Cirsium arvense	Canada thistle	CIAR4	P	I	F
Cirsium undulatum	Wavyleaf thistle	CIUN	P	N	F
Cirsium vulgare	Bull thistle	CIVU	P	I	F
Conyza canadensis	Canadian horseweed	COCA5	A	N	F
Conyza coultereri	Coulter's horseweed	COCO4	A	N	F
Coreopsis lanceolata	Lanceleaf tickseed	COLA5	P	I	F
Coreopsis tinctoria	Golden tickseed	COTI3	A	N	F
Cyclachaena xanthiifolia	Careless weed	CYXA2	A	N	F
Dyssodia aurea	Manyawn pricklyleaf	DYAU	A	N	F
Dyssodia papposa	Fetid marigold	DYPA	A	N	F
Erigeron colomexicanus	Nelson,Running fleabane	ERCO28	P	N	F
Erigeron divergens	Spreading fleabane	ERDI4	P	N	F
Erigeron engelmannii	Engelmann’s fleabane	EREN	P	N	F
Erigeron flagellaris	Trailing fleabane	ERFL	P	N	F
Erigeron pumilus	Shaggy fleabane	ERPU2	P	N	F
Erigeron subtrinervis	Threenerve fleabane	ERSU2	P	N	F
Gaillardia pinnatifida	Red dome blanketflower	GAPI	P	N	F
Grindelia inornata	Colorado gumweed	GRIN2	P	N	F
Grindelia revoluta	Rolled gumweed	GRRE	B	N	F
Grindelia squarrosa	Curleycup gumweed	GRSQ	B	N	F
Gutierrezia sarothrae	Broom snakeweed	GUSA2	P	N	F
Helianthus annuus	Common sunflower	HEAN3	A	N	F
Helianthus petiolaris	Prairie sunflower	HEPE	A	N	F
Heliomeris multiflora	Showy goldeneye	HEMU3	P	N	F
Heterotheca canescens	Hoary false golden aster	HECA8	P	N	F
Heterotheca villosa	Hairy false goldenaster	HEVI4	P	N	F
Hymenopappus filifolius	Fineleaf hymenopappus	HYFI	P	N	F
[S2] *Lactuca ludoviciana*	Western wild lettuce	LALU	P	N	F
Lactuca serriola	Prickly lettuce	LASE	P	I	F
Lactuca tatarica ssp. *pulchella*	Blue lettuce	LATAP2	P	N	F
Leucanthemum vulgare	Oxeye daisy	LEVU	P	I	F
Leucelene ericoides	Roseheath	LEER	P	N	F
Liatris punctata	Dotted blazingstar	LIPU	P	N	F

Scientific Name	Common Name	Code	Life	Origin	Form
Lygodesmia juncea	Rush skeletonplant	LYJU	P	N	F
Microseris nutans	Nodding microseris	MINU	P	N	F
Machaeranthera bigelovii	Bigelow's tansyaster	MABI	P	N	F
Machaeranthera canescens	Hoary tansyaster	MACA2	P	N	F
Machaeranthera pinnatifida	Lady tansyaster	MAPI	P	N	F
Machaeranthera tanacetifolia	Tanseyleaf tansyaster	MATA2	A	N	F
Melampodium leucanthum	Plains blackfoot	MELE2	P	N	F
Nothocalias cuspidata	Prairie false dandelion	NOCU	P	N	F
Onopordum acanthium	Scotch thistle	ONAC	B	I	F
Oonopsis foliosa	Leafy false goldenweed	OOFO	P	N	F
[G2/S2] **Oonopsis puebloensis*	Pueblo goldenweed	OOPU	P	N	F
Packera fendleri	Fendler's ragwort	PAFE4	P	N	F
Packera neomexicana var. *mutabilis*	New Mexico groundsel	SENEM2	P	N	F
Packera tridenticulata	Threetooth ragwort	PATR7	P	N	F
[G3/S3] *Parthenium tetraneuris*	Arkansas River feverfew	PATE12	P	N	F
Pectis angustifolia	Lemon scent	PEAN	P	N	F
Picradeniopsis oppositifolia	Oppositeleaf bahia	PIOP	P	N	F
Ratibida columnifera	Upright prairie coneflower	RACO3	P	N	F
Rudbeckia laciniata var. *ampla*	Goldenglow	RULAA	P	N	F
Scorzonera laciniata	Cutleaf viper grass	SCLA6	P	I	F
Senecio flaccidus var. *douglasii*	Douglas groundsel	SEFLD	P	N	F
Senecio integerrimus	Lambstongue groundsel	SEIN2	P	N	F
Senecio spartioides	Broom groundsel	SESP3	P	N	F
Solidago canadensis	Canada goldenrod	SOCA6	P	N	F
Solidago gigantea	Giant goldenrod	SOGI	P	N	F
Solidago missouriensis	Prairie goldenrod	SOMI2	P	N	F
Solidago mollis	Velvety goldenrod	SOMO	P	N	F
Solidago nana	Baby goldenrod	SONA	P	N	F
Solidago velutina	Threenerve goldenrod	SOVE6	P	N	F
Sonchus asper	Prickly sow thistle	SOAS	A	I	F
Stephanomeria pauciflora	Brownplume wirelettuce	STPA4	P	N	F
Taraxacum officinale	Common dandelion	TAOF	P	I	F
Tetraneuris acaulis	Stemless four-nerve daisy	TEAC	P	N	F
Thelesperma filifolium	Stiff greenthread	THFI	A	N	F
Thelesperma megapotamicum	Hopi tea greenthread	THME	P	N	F
Thelesperma subnudum	Navajo tea	THSU	P	N	F
Thymophylla aurea	Manyawn pricklyleaf	THAU4	A	N	F
Townsendia exscapa	Stemless Townsend daisy	TOEX2	P	N	F
[G3/S2] *Townsendia fendleri*	Easter daisy	TOFE	P	N	F
Townsendia grandiflora	Largeflower Townsend daisy	TOGR	P	N	F
Tragopogon dubius	Yellow salsify	TRDU	P	I	F
Verbesina encelioides ssp. *encelioides*	Golden crownbeard	VEENE3	A	N	F
Virgulus ericoides	White heath aster	VIER4	P	N	F
Virgulus falcatus	White prairie aster	VIFA2	P	N	F
Virgulus fendleri	Fendler's aster	VIFE3	P	N	F
Zinnia grandiflora	Rocky Mountain zinnia	ZIGR	P	N	F

Scientific Name	Common Name	Code	Life	Origin	Form
BETULACEAE	**Birch Family**				
[G3] *Alnus incana* ssp. *tenuifolia*	Thinleaf alder	ALINT	P	N	T
BORAGINACEAE	**Borage Family**				
Cryptantha cinerea var. *jamesii*	James cryptantha	CRCIJ	P	N	F
Cryptantha crassisepala	Thicksepal cryptantha	CRCR3	A	N	F
Cryptantha minima	Little cryptantha	CRMI5	A	N	F
Cryptantha thyrsiflora	Cluster cryptantha	CRTH	P	N	F
Cynoglossum officinale	Houndstongue	CYOF	B	I	F
Hackelia floribunda	Large-flowered stickseed	HAFL2	P	N	F
Lappula marginata	Margined stickseed	LAMA9	A	N	F
Lappula redowskii	Blueburr stickseed	LARE	A	N	F
Lithospermum incisum	Narrowleaf stoneseed	LIIN2	P	N	F
Mertensia lanceolata	Lanceleaf bluebells	MELA3	P	N	F
Onosmodium bejariense var. *occidentale*	Western marbleseed	ONBEO	P	N	F
BRASSICACEAE	**Mustard Family**				
Barbarea orthoceras	American yellowrocket	BAOR	P	N	F
Barbarea vulgaris	Garden yellowrocket	BAVU	P	I	F
Camelina microcarpa	Littlepod false flax	CAMI2	A	I	F
Capsella bursa-pastoris	Shepherd's purse	CUBU2	A	I	F
Cardaria chalepensis	Lenspod whitetop	CACH42	P	N	F
Cardaria draba	Whitetop (Hoary cress)	CADR	P	N	F
Chorispora tenella	Purple mustard	CHTE2	A	I	F
Descurainia incisa	Mountain mustard	DEIN13	A	N	F
Descurainia pinnata	Western tansymustard	DEPI	P	N	F
Descurainia sophia	Herb sophia	DESO2	A	I	F
Erysimum asperum	Western wallflower	ERAS2	P	N	F
Erysimum capitatum	Sanddune wallflower	ERCA14	P	N	F
Hesperis matronalis	Dames rocket	HEMA3	P	I	F
Lepidium alyssoides	Mesa pepperwort	LEAL4	P	N	F
Lepidium densiflorum	Common pepperweed	LEDE	A	N	F
Lepidium latifolium	Broadleaved pepperweed	LELA2	P	I	F
[G3/S3] *Lesquerella calcicola*	Rocky Mountain bladderpod	LECA9	P	N	F
Lesquerella fendleri	Fendler's bladderpod	LEFE	P	N	F
Lesquerella ludoviciana	Foothill bladderpod	LELU	P	N	F
Lesquerella montana	Mountain bladderpod	LEMO3	P	N	F
Lesquerella ovalifolia	Roundleaf bladderpod	LEOV	P	N	F
Nasturtium officinale	Watercress	NAOF	P	N	F
Schoenocrambe linearifolia	Slimleaf plains mustard	SCLI12	P	N	F
Schoenocrambe linifolia	Skeleton mustard	SCLI	P	N	F
Sinapis arvensis	Charlock	SIAR4	A	I	F
Sisymbrium altissimum	Tall tumblemustard	SIAL2	A	I	F
Stanleya pinnata	Desert princesplume	STPI	P	N	F
Thlaspi arvense	Field pennycress	THAR5	A	I	F

Scientific Name	Common Name	Code	Life	Origin	Form
CACTACEAE	**Cactus Family**				
Cylindropuntia imbricata	Tree cholla	CYIM2	P	N	S
Echinocereus triglochidiatus	Claret cup	ECTR	P	N	S
Echinocereus viridiflorus	Nylon hegehog cactus	ECVI2	P	N	S
Escobaria vivipara var. *vivipara*	Spiny cactus	ESVIV	P	N	S
Opuntia macrorhiza	Twistspine prickly pear	OPMA2	P	N	S
Opuntia phaeacantha	Tulip pricklypear	OPPH	P	N	S
Opuntia polyacantha	Plains prickypear	OPPO	P	N	S
Pediocactus simpsonii var. *minor*	Ball cactus	PESIM	P	N	S
CALOCHORTACEAE	**Mariposa Family**				
Calochortus gunnisonii	Gunnison's mariposa lily	CAGU	P	N	F
CANNABACEAE	**Hops Family**				
Humulus lupulus var. *lupuloides*	Wild hops	LULUL	P	N	V
CAPPARIDACEAE	**Caper Family**				
Cleome serrulata	Rocky Mountain beeplant	CLSE	A	N	F
Polanisia dodecandra	Roughseed clammyweed	PODO3	P	N	F
CAPRIFOLIACEAE	**Honeysuckle Family**				
Lonicera morrowii	Honey-suckle	LOMO2	P	I	S
Symphoricarpos albus	White coralberry	SYAL	P	N	S
Symphoricarpos occidentalis	Western snowberry	SYOC	P	N	S
Symphoricarpos rotundifolius	Mountain snowberry	SYRO	P	N	S
CARYOPHYLLACEAE	**Pink Family**				
Saponaria officinalis	Bouncingbet	SAOF4	P	I	F
Silene dioica	Red catchfly	SIDI4	P	I	F
CHENOPODIACEAE	**Goosefoot Family**				
Atriplex argentea	Silverscale saltbush	ATAR2	A	N	F
Atriplex canescens	Fourwing saltbush	ATCA2	P	N	S
Atriplex confertifolia	Shadscale saltbush	ATCO	P	N	S
Atriplex patula	Spear saltbush	ATPA4	P	N	F
Bassia scoparia	Ironweed	BASC5	A	I	F
Chenopodium album	Lambsquarters	CHAL7	A	I	F
Chenopodium desiccatum	Aridland goosefoot	CHDE	A	N	F
Chenopodium fremontii	Fremont goosefoot	CHFR3	A	N	F
Chenopodium incanum	Mealy goosefoot	CHIN2	A	N	F
Chenopodium leptophyllum	Slimleaf goosefoot	CHLE4	A	N	F
Chenopodium simplex	Mapleleaf goosefoot	CHSI2	A	N	F
Cycloloma atriplicifolium	Winged pigweed	CYAT	N	A	F
Krascheninnikovia lanata	Winterfat	KRLA2	P	N	S
Salsola tragus	Prickly Russian thistle	SATR12	A	I	F
Salsola collina	Slender Russian-thistle	SACO8	A	I	F
Sarcobatus vermiculatus	Greasewood	SAVE4	P	N	S

Scientific Name	Common Name	Code	Life	Origin	Form
Suaeda calceoliformis	Pursh seepwee	SUCA2	P	N	F
COMMELINACEAE	**Spiderwort Family**				
[S1] *Commelina dianthifolia*	Birdbill dayflower	CODI4	P	N	F
Commelina erecta var. *angustifolia*	Whitemouth dayflower	COERA	P	N	F
Tradescantia occidentalis	Prairie spiderwort	TROC	P	N	F
CONVALLARIACEAE	**Mayflower Family**				
Maianthemum stellatum	False Solomon's seal	MAST4	P	N	F
CONVOLVULACEAE	**Morningglory Family**				
Convolvulus arvensis	Field bindweed	COAR4	P	I	F
Convolvulus equitans	Texas bindweed	COEQ	P	N	F
Evolvulus nuttallianus	Shaggy dwarf morning-glory	ENVU	P	N	F
Ipomoea leptophylla	Bush morning-glory	IPLE	P	N	F
CORNACEAE	**Dogwood Family**				
Cornus sericea ssp. *sericea*	Redosier dogwood	COSES	P	N	S
CUCURBITACEAE	**Gourd Family**				
Cucurbita foetidissima	Buffalo gourd	CUFO	P	N	F
CYPERACEAE	**Sedge Family**				
Carex duriuscula	Needleleaf sedge	CADU6	P	N	G
Carex emoryi	Emory's sedge	CAEM2	P	N	G
Carex hystericina	Bottlebrush sedge	CAHY4	P	N	G
Carex inops ssp. *heliophila*	Sun sedge	CAINH2	P	N	G
Carex occidentalis	Western sedge	CAOC2	P	N	G
Eleocharis palustris	Common spikerush	ELPA3	P	N	G
Mariscus fendlerianus	Fendlers flatsedge	CYFE2	P	N	G
Schoenoplectus lacustris ssp. *acutis*	Hardstem bullrush	SCACA	P	N	G
Schoenoplectus lacustris ssp. *creber*	Softstem bulrush	SCLAC	P	N	G
Schoenoplectus pungens	Common threesquare	SCPU10	P	N	G
Scirpus pallidus	Cloaked bulrush	SCPA8	P	N	G
DIPSACACEAE	**Teasel Family**				
Dipsacus fullonum	Fuller's teasel	DIFU2	B	I	F
Dipsacus laciniatus	Cutleaf teasel	DILA4	B	I	F
ELAEAGNACEAE	**Oleaster Family**				
Elaeagnus angustifolia	Russian-olive	ELAN	P	I	T
ERICACEAE	**Heath Family**				
Arctostaphylos uva-ursi	Bearberry	ARUV	P	N	S
EUPHORBIACEAE	**Spurge Family**				
Chamaesyce fendleri	Fendler's sandmat	CHFE3	P	N	F

Scientific Name	Common Name	Code	Life	Origin	Form
Chamaesyce glyptosperma	Ribseed sandmat	CHGL13	A	N	F
Chamaesyce missurica	Prairie sandmat	CHMI8	A	N	F
Chamaesyce serpyllifolia	Thymeleaf sandmat	CHSE6	A	N	F
Chamaesyce stictospora	Slimseed sandmat	CHST8	A	N	F
Croton texensis	Texas croton	CRTE4	A	N	F
Euphorbia dentata var. *dentata*	Toothed spurge	EUDED	A	N	F
Euphorbia esula	Leafy spurge	EUES	P	I	F
Euphorbia marginata	Snow on the Mountain	EUMA8	A	N	F
Tragia ramosa	Branched noseburn	TRRA5	P	N	F
FABACEAE	**Pea Family**				
Amorpha fruticosa	False indigo bush	AMFR	P	N	S
Astragalus bisulcatus	Two-grooved vetch	ASBI20	P	N	F
Astragalus drummondii	Drummond's milk-vetch	ASDR3	P	N	F
Astragalus laxmannii var. *robustior*	Prairie milk-vetch	ASLAR	P	N	F
Astragalus missouriensis	Missouri milkvetch	ASMI10	P	N	F
Astragalus racemosus	Alkali milk-vetch	ASRA2	P	N	F
Astragalus tenellus	Looseflower milk-vetch	ASTE5	P	N	F
Caragana arborescens	Siberian pea-shrub	CAAR18	P	I	S
Dalea aurea	Golden prairie clover	DAAU	P	N	F
Dalea candida var. *oligophylla*	White prairie clover	DACAO	P	N	F
Dalea jamesii	James' prairie clover	DAJA	P	N	F
Dalea purpurea	Purple prairie clover	DAPU5	P	N	F
Gleditsia triacanthos	Honey locust	GLTR	P	N	T
Glycyrrhiza lepidota	American licorice	GLLE3	P	N	F
Hedysarum boreale	Utah sweet vetch	HEBO	P	N	F
Hoffmannseggia drepanocarpa	Sicklepod holdback	HODR	P	N	F
Lathyrus eucosmus	Bush vetchling	LAEU	P	N	F
Lathyrus latifolius	Perennial sweetpea	LALA4	P	I	F
Medicago lupulina	Black medic	MELU	P	I	F
Medicago sativa	Alfalfa	MESA	P	I	F
Melilotus officinalis	White /Yellow sweetclover	MEOF	P	I	F
Oxytropis lambertii	Purple locoweek	OXLA3	P	N	F
Pediomelum argophyllum	Silverleaf Indian breadroot	PEAR6	P	N	F
Psoralidium tenuiflorum	Slimflower scurfpea	PSTE5	P	N	F
Robinia neomexicana	New Mexico locust	RONE	P	N	S/T
Robinia pseudoacacia	Black locust	ROPS	P	N	S/T
Thermopsis divaricarpa	Golden banner	THDI4	P	N	F
Trifolium pratense	Red clover	TRPR2	P	I	F
Sophora nuttalliana	Silky sophora	SONU	P	N	F
Vicia americana ssp. *americana*	American vetch	VIAM	P	N	F
FAGACEAE	**Oak Family**				
Quercus gambelii	Gambel's oak	QUGA	P	N	S/T
Quercus turbinella	Shrub live oak	QUTU2	P	N	S
Quercus undulata	Wavyleaf oak	QUUN	P	N	S

Scientific Name	Common Name	Code	Life	Origin	Form
FRANKENIACEAE	**Frankenia Family**				
Frankenia jamesii	James' frankenia	FRJA	P	N	S
GENTIANACEAE	**Gentian Family**				
Eustoma exaltatum ssp. *russellianum*	Showy prairie gentian	EUEXR	B	N	F
Frasera speciosa	Elkweed	FRSP	P	N	F
Gentiana affinis	Pleated gentian	GEAF	P	N	F
GERANIACEAE	**Geranium Family**				
Erodium cicutarium	Redstem stork's bill	ERCI6	A	I	F
Geranium caespitosum var. *caespitosum*	Parry geranium	GECAC3	P	N	F
Geranium richardsonii	Richardson's geranium	GERI	P	N	F
GROSSULARIACEAE	**Currant/Gooseberry Family**				
Ribes aureum	Golden currant	RIAU	P	N	S
Ribes cereum	Wax currant	RICE	P	N	S
Ribes inerme	Whitstem gooseberry	RIIN2	P	N	S
Ribes leptanthum	Trumpet gooseberry	RILE	P	N	S
HALORAGACEAE	**Water Milfoil Family**				
Myriophyllum sibiricum	Hortspike watermilfoil	MYSI	P	N	F
HELLEBORACEAE	**Hellebore Family**				
Delphinium carolinianum ssp. *virescens*	Carolina larkspur	DECAV2	P	N	F
Delphinium nuttallianum	Twolobed larkspur	DENU2	P	N	F
HYDROPHYLLACEAE	**Waterleaf Family**				
G3/S3 *Phacelia denticulata*	Rocky Mountain phacelia	PHDE2	P	N	F
HYPERICACEAE	**St. Johnswort Family**				
Hypericum perforatum	Common St. Johnswort	HYPE	P	I	F
IRIDACEAE	**Iris Family**				
Iris missouriensis	Rocky Mountain iris	IRMI	P	N	G
Sisyrinchium montanum	Strict blue-eyed grass	SIMO2	P	N	G
JUNCACEAE	**Rush Family**				
Juncus arcticus ssp. *Littoralis*	Mountain rush	JUARL	P	N	G
Juncus dudleyi	Dudley's rush	JUDU2	P	N	G
Juncus gerardii	Inland rush	JUGE	P	N	G
Juncus interior	Inland rush	JUIN2	P	N	G
Juncus nodosus	Jointed rush	JUNO2	P	N	G
Juncus torreyi	Torrey's rush	JUTO	P	N	G
JUNCAGINACEAE	**Arrowgrass Family**				
Triglochin maritima	Seaside arrowgrass	TRMA20	P	I	G

Scientific Name	Common Name	Code	Life	Origin	Form
LAMIACEAE	**Mint Family**				
Hedeoma drummondii	Drummond's false pennyroyal	HEDR	P	N	F
Lycopus americanus	American bugleweed	LYAM	P	N	F
Marrubium vulgare	Horehound	MAVU	P	I	F
Mentha arvensis	Wild mint	MEAR4	P	N	F
Monarda fistulosa ssp. *fistulosa* var. *menthifolia*	Mintleaf bergamot	MOFIM2	F	N	F
Nepeta cataria	Catnip	NECA2	P	I	F
Prunella vulgaris	Common self-heal	PRVU	P	N	F
Salvia reflexa	Lanceleaf sage	SARE3	A	N	F
Teucrium laciniatum	Lacy germander	TELA	P	N	F
LEMNACEAE	**Duckweed Family**				
Lemna minor	Common duckweed	LEMI3	A	N	F
LILIACEAE	**Lily Family**				
Leucocrinum montanum	Common starlily	LEMO4	P	N	F
LINACEAE	**Flax Family**				
Linum lewisii var. *lewisii*	Prairie flax	LILEL2	P	N	F
Linum puberulum	Plains flax	LIPU4	A	N	F
LOASACEAE	**Loasa Family**				
Mentzelia albicaulis	Whitestem blazingstar	MEAL6	A	N	F
G2/S2**Mentzelia chrysantha*	Golden blazing star	MECH	P	N	F
Mentzelia decapetala	Tenpetal blazingstar	MEDE2	P	N	F
Mentzelia multiflora var. *multiflora*	Manyflowered mentzelia	MEMUM2	P	N	F
Mentzelia nuda	Bractless blazingstar	MENUN	P	N	F
MALVACEAE	**Mallow Family**				
Alcea rose	Hollyhock	ARLO3	B	I	F
Callirhoe involucrata	Purple poppymallow	CAIN2	P	N	F
Malva neglecta	Common mallow	MANE	A	I	F
Sphaeralcea angustifolia	Copper globemallow	SPAN3	P	N	F
Sphaeralcea coccinea	Scarlett globemallow	SPCO	P	N	F
MORACEAE	**Mulberry Family**				
Morus alba	White mulberry	MOAL	P	I	T
NYCTAGINACEAE	**Four-O'Clock Family**				
Abronia fragranS	Snowball sand verbena	ABFR2	P	N	F
Mirabilis linearis	Narrowleaf four o'clock	MILI3	P	N	F
Mirabilis multiflora	Colorado four o'clock	MIMU	P	N	F
Mirabilis nyctaginea	Wild four-o'clock	MINY	P	N	F
S3 *Mirabilis oxybaphoides*	Spreading four-o'clock	MIOX	P	N	F

Scientific Name	Common Name	Code	Life	Origin	Form
[G2/S2] *Mirabilis rotundifolia*	Roundleaf four o'clock	MIRO2	P	N	F
OLEACEAE	**Olive Family**				
Fraxinus pennsylvanica	Green ash	FRPE	P	I	T
[S3] *Menodora scabra*	Rough menodora	MESC	P	N	F
ONAGRACEAE	**Evening-Primrose Family**				
Calylophus lavandulifolius	Lavenderleaf sundrops	CALA38	P	N	F
Calylophus serrulatus	Plains yellow primrose	CASE12	P	N	F
Epilobium ciliatum	Hairy willowherb	EPCI	P	N	F
Oenothera albicaulis	Whitest evening primrose	OEAL	A	N	F
Oenothera coronopifolia	Crownleaf evening primrose	OECO2	P	N	F
Oenothera curtiflora	Velvetweed	OCCU3	P	N	F
[G3/S3] *Oenothera harringtonii*	Colorado Springs evening primrose	OEHA6	P	N	F
Oenothera latifolia	Mountain evening-primrose	OELA2	P	N	F
Oenothera suffrutescens	Scarlet beeblossom	OESU3	P	N	F
Oenothera villosa	Common evening primrose	OEVI	P	N	F
ORCHIDACEAE	**Orchid Family**				
Corallorhiza wisteriana	Coral-root	COWI5	P	N	F
OROBANCHACEAE	**Broom-Rape Family**				
Aphyllon fasciculatum	Clustered broomrape	ORFA	P	N	T
PAPAVERACEAE	**Poppy Family**				
Argemone hispida	Rough prickly poppy	ARHI4	P	N	F
Argemone polyanthemos	Crested prickly poppy	ARPO2	P	N	F
PLANTAGINACEAE	**Plantain Family**				
Plantago lanceolata	Narrowleaf plantain	PLLA	P	N	F
Plantago major	Common plantain	PLMA2	P	I	F
Plantago patagonica	Wolly plantain	PLPA2	A	I	F
POACEAE	**Grass Family**				
Achnatherum hymenoides	Indian ricegrass	ACHY	P	N	G
Achnatherum robustum	Sleeplygrass	ACRO7	P	N	G
Achnatherum scribneri	Scribner needlegrass	ACSC11	P	N	G
Agropyron cristatum ssp. *cristatum*	Crested wheatgrass	AGCRC	P	I	G
Agropyron desertorum	Desert wheatgrass	ARDE2	P	N	G
Agrostis stolonifera	Creeping bentgrass	AGST2	P	I	G
Alopecurus aequalis	Shortawn foxtail	ALAE	P	N	G
Andropogon gerardii	Big bluestem	ANGE	P	N	G
Aristida divaricata	Poverty threeawn	ARDI5	P	N	G
Aristida purpurea	Purple threeawn	ARPU9	P	N	G
Avena fatua	Wild oats	AVFA	A	I	G

Scientific Name	Common Name	Code	Life	Origin	Form
Beckmannia syzigachne	American sloughgrass	BESY	P	I	G
Bothriochloa bladhii	Caucasian bluestem	BOBL	P	I	G
Bothriochloa laguroides ssp. *torreyana*	Silver beardgrass	BOLAT	P	N	G
Bouteloua curtipendula	Sideoats grama	BOCU	P	N	G
Bouteloua gracilis	Blue grama	BOGR2	P	N	G
Bouteloua hirsuta var. *hirsuta*	Hairy grama	BOHIH	P	N	G
Bouteloua simplex	Matted grama	BOSI2	A	N	G
Bromopsis inermis	Smooth brome	BRIN7	P	I	G
Bromus arvensis	Field brome	BRAR5	A	I	G
Bromus secaulinus	Rye brome	BRSE	A	I	G
Bromus tectorum	Cheatgrass	BRTE	A	I	G
Bouteloua dactyloides	Buffalograss	BODA2	P	N	G
Calamovilfa longifolia	Prairie sandreed	CALO	P	N	G
Cenchrus longispinus	Mat sandbur	CELO3	P	I	G
Chloris verticillata	Tumble windmill grass	CHVE2	P	N	G
Dactylis glomerata	Orchardgrass	DAGL	P	I	G
Distichlis spicata	Inland saltgrass	DISP	P	N	G
Echinochloa crus-galli	Barnyard grass	ECCR	A	I	G
Elymus canadensis	Canada wildrye	ELCA4	P	N	G
Elymus elymoides ssp. *brevifolius*	Squirreltail	ELELB2	P	N	G
Elymus lanceolatus	Thickspike wheatgrass	ELLA3	P	N	G
Elymus trachycaulus	Slender wheatgrass	ELTR7	P	N	G
Eragrostis cilianensis	Stinkgrass	ERCI	A	N	G
Eragrostis pilosa	Indian lovegrass	ERPI2	A	N	G
Eremopyrum triticeum	Annual wheatgrass	ERTR13	A	I	G
Erioneuron pilosum	Hairy false tridens	ERPI5	P	N	G
Festuca arundinacea	Tall fescue	FEAR3	P	I	G
Festuca pratensis	Meadow fescue	FEPR	P	I	G
Hesperostipa neomexicana	New Mexico feathergrass	HENE5	P	N	G
Hilaria jamesii	Galleta grass	HIJI	P	N	G
Hordeum jubatum ssp. *jubatum*	Foxtail barley	HOJUJ	P	N	G
Hordeum pusillum	Little barley	HOPU	A	N	G
Koeleria macrantha	Prairie Junegrass	KOMA	P	N	G
Leptochloa fusca ssp. *fascicularis*	Sprangletop	LEFUF	P	N	G
Leymus ambiguus	Colorado wild rye	LEAM	P	N	G
Leymus cinereus	Basin wild rye	LECI4	P	N	G
Lycurus setosus	Common wolftail	LYSE3	P	N	G
Monroa squarrosa	False buffalograss	MOSQ3	A	N	G
[S2] *Muhlenbergia arenacea*	Ear muhly	MUAR	P	N	G
Muhlenbergia arenicola	Sand muhly	MUAR2	P	N	G
Muhlenbergia asperifolia	Alkali muhly	MUAS	P	N	G
Muhlenbergia cuspidata	Plains muhly	MUCO3	P	N	G
Muhlenbergia montana	Mountain muhly	MUMO	P	N	G
Muhlenbergia racemosa	Green muhly	MURA	P	N	G
Muhlenbergia torreyi	Ring muhly	MUTO2	P	N	G
Muhlenbergia wrightii	Wright's muhly	MUWR	P	N	G
Nassella viridula	Green needlegrass	NAVI4	P	N	G

Scientific Name	Common Name	Code	Life	Origin	Form
Oryzopsis pungens	Mountain ricegrass	ORPU4	P	N	G
Panicum capillare	Witchgrass	PACA6	P	N	G
Panicum obtusum	Vine mesquite	PAOB	A	N	G
Panicum virgatum	Switchgrass	PAVI2	P	N	G
Pascopyrum smithii	Western wheatgrass	PASM	P	N	G
Phalaris arundinacea	Reed canarygrass	PHAR3	P	N	G
Phleum pratense	Timothy	PHPR3	P	I	G
Phragmites australis	Common reedgrass	PHAU7	P	N	G
Piptatheropsis micrantha	Littleseed ricegrass	PIMI	P	N	G
Poa compressa	Canada bluegrass	POCO	P	N	G
Poa fendleriana	Muttongrass	POFE	P	N	G
Poa palustris	Fowl bluegrass	POPA2	P	I	G
Poa pratensis	Kentucky bluegrass	POPR	P	I	G
Poa secunda	Sandberg bluegrass	POSE	P	N	G
Polypogon monspeliensis	Annual rabbitsfoot grass	POMO5	A	I	G
Psathyrostachys juncea	Russian wild rye	PSJU3	A	I	G
Schedonnardus paniculatus	Tumblegrass	SCPA	P	N	G
Schizachyrium scoparium	Little bluestem	SCSC	P	N	G
[S2] *Scleropogon brevifolius*	Burrograss	SCBR2	P	N	G
Setaria viridis	Green foxtail	SEVI4	A	I	G
Setaria pumila ssp. *umila*	Yellow foxtail	SEPUP2	A	I	G
Sorghastrum nutans	Indiangrass	SONU2	P	N	G
Sorghum halepense	Johnsongrass	SOHA	P	I	G
Spartina gracilis	Alkali cordgrass	SPGR	P	N	G
Spartina pectinata	Prairie cordgrass	SPPE	P	N	G
Sphenopholis obtusata	Wedgegrass	SPOB	P	N	G
Sporobolus airoides	Alkali sacaton	SCAI	P	N	G
Sporobolus cryptandrus	Sand dropseed	SPCR	P	N	G
Sporobolus clandestinus	Roughdropseed	SPCL	P	N	G
Thinopyrum intermedium	Intermediate wheatgrass	THIN6	P	I	G
Thinopyrum ponticum	Tall wheatgrass	THPO7	P	I	G
Tridens muticus	Slim tridens	TRMUE	P	N	G
Triticum aestivum	Wheat	TRAE	A	I	G
Vulpia octoflora	Sixweeks fescue	VUOC	A	N	G
POLEMONIACEAE	**Phlox Family**				
Ipomopsis laxiflora	Iron ipomopsis	IPLA2	P	N	F
Ipomopsis longiflora	Flaxflowered gilia	IPLO2	A	N	F
Ipomopsis spicata	Spiked ipomopsis	IPSP	P	N	F
Linanthus pungens	Granite prickly gilia	LIPU11	P	N	F
Phlox hoodii ssp. *canescens*	Carpet phlox	PHHOC	P	N	F
POLYGONACEAE	**Knotweed Family**				
Acetosella vulgaris	Sheep sorrel	RUAC3	P	I	F
Eriogonum alatum var. *alatum*	Winged buckwheat	ERALA2	P	N	F
Eriogonum effusum	Spreading buckwheat	EREF	P	N	F

Scientific Name	Common Name	Code	Life	Origin	Form
Eriogonum lonchophyllum var. *fendlerianum*	Spearleaf buckwheat	ERLOF	P	N	F
Eriogonum jamesii	James' buckwheat	ERJA	P	N	F
Eriogonum lachnogynum	Woollycup buckwheat	ERLA3	P	N	F
Eriogonum tenellum	Tall buckwheat	ERTE9	P	N	F
Eriogonum umbellatum	Sulfur-flower eriogonum	ERUM	P	N	F
Persicaria maculata	Spotted Lady's Thumb	POPE3	A	I	F
Polygonum arenastrum	Oval-leaf Knotweed	POAR11	A	I	F
Polygonum convolvulus var. *convolvulus*	Black bindweed	POCOC2	A	I	F
Polygonum pensylvanicum	Pennslylvania smartweed	POPE2	A	N	F
Polygonum ramosissimum	Bushy knotweed	PORA3	A	N	F
Rumex altissimus	Pale dock	RUAL4	P	N	F
Rumex crispus	Curly dock	RUCR	P	I	F
Rumex maritimus	Golden dock	RUMA4	B	N	F
Rumex venosus	Wild-begonia	RUVE2	P	N	F
PORTULACACEAE	**Purslane Family**				
Portulaca oleracea	Little hogweed	POOL	A	N/I	F
POTAMOGETONACEAE	**Pondweed Family**				
Potamogeton foliosus	Leafy pondweed	POFO3	P	N	F
Potamogeton nodosus	Longleaf pondweed	PONO2	P	N	F
Potamogeton pectinatus	Sago pondweed	STPE15	P	N	F
RANUNCULACEAE	**Buttercup Family**				
Clematis hirsutissima var. *hirsutissima*	Sugarbowls	CLHIH	P	N	F
Clematis ligusticifolia	Western virgin's bower	CLLI2	P	N	F
Ranunculus cymbalaria	Alkali crowfoot	RACY	P	N	F
Ranunculus longirostris	Water crowfoot	RALO2	P	N	F
RESEDACEAE	**Mignonette Family**				
Reseda lutea	Wild mignonette	RELU	P	I	F
RHAMNACEAE	**Buckthorn Family**				
[S2] *Ceanothus herbaceus*	New Jersey tea	CEHE	P	N	S
ROSACEAE	**Rose Family**				
Agrimonia striata	Roadside agrimony	AGST	P	N	F
Cercocarpus montanus	Alderleaf mountain mahogany	CEMO2	P	N	S
Crataegus erythropoda	Cerro hawthorn	CRER	P	N	S
Crataegus succulenta	Hawthorn	CRSU5	P	I	S
Geum aleppicum	Yellow avens	GEAL3	P	I	F
Malus pumila	Paradise apple	MAPU	P	I	T
Prunus virginiana var. *melanocarpa*	Black chokecherry	PRVIM	P	N	S/T
Physocarpus monogynus	Mountain ninebark	PHMO4	P	N	S
Potentilla norvegica	Norwegian cinquefoil	PONO3	P	I	F
Potentilla paradoxa	Bushy cinquefoil	POPA15	P	N	F

Scientific Name	Common Name	Code	Life	Origin	Form
Potentilla pensylvanica	Pennsylvanica cinquefoil	POPEP5	P	N	F
Prunus americana	American plum	PRAM	P	N	S/T
Prunus persica var. *persica*	Peach	PRPEP2	P	I	T
Prunus pumila var. *besseyi*	Western sand cherry	PRPUB	P	N	S
Rosa arkansana	Arkansas rose	ROAR3	P	N	S
Rosa woodsii	Woods' rose	ROWO	P	N	S
Rubus deliciosus	Boulder raspberry	RUDE	P	N	S
Rubus idaeus var. *melanolasius*	Red raspberry	RUIDM2	P	N	S
Sanguisorba minor	Small burnet	SAMI3	P	I	F
RUBIACEAE	**Madder Family**				
Galium spp.	Bedstraw	GALIU	P	N	F
RUTACEAE	**Citrus Family**				
Ptelea trifoliata	Common hoptree	PTTR	P	N	T
SALICACEAE	**Willow Family**				
Populus angustifolia	Narrowleaf cottonwood	POAN3	P	N	T
Populus × acuminata (pro sp.) *[angustifolia × deltoides]*	Lanceleaf cottonwood	POAC5	P	N	T
Populus deltoides ssp. *monilifera*	Plains cottonwood	PODEM	P	N	T
Salix amygdaloides	Peachleaf willow	SAAM2	P	N	T
Salix exigua	Narrowleaf willow	SAEX	P	N	S
Salix fragilis	Crack willow	SAFR	P	I	T
Salix irrorata	Bluestem willow	SAIR	P	N	S
SANTALACEAE	**Sandlewood Family**				
Comandra umbellata	Bastard toadflax	COUM	P	N	F
SCROPHULARIACEAE	**Figwort Family**				
Castilleja integra	Wholeleaf Indian paintbrush	CAIN14	P	N	F
Linaria dalmatica	Dalmation toadflax	LIDA	P	I	F
Linaria genistifolia	Broomleaf toadflax	LIGE	P	I	F
Linaria vulgaris	Butter and eggs	LIVU2	P	I	F
Penstemon angustifolius	Broadbeard beard-tongue	PEAN4	P	N	F
Penstemon auriberbis	Colorado beardtongue	PEAU2	P	N	F
Penstemon barbatus ssp. *torreyi*	Torrey's penstemon	PEBAT	P	N	F
Penstemon glaber var. *brandegeei*	Brandegee's penstemon	PEGLB	P	N	F
Penstemon secundiflorus	Sidebells penstemon	PESE11	P	N	F
Penstemon versicolor	Variable-color beardtongue	PEVE9	P	N	F
[G3/S3] *Penstemon virens*	Front Range beard-tongue	PEVI3	P	N	F
Penstemon unilateralis	Oneside penstemon	PEUN	P	N	F
Pocilla biloba	Pocilla	VEBI2	A	I	F
Scrophularia lanceolata	Lanceleaf figwort	SCLA	P	N	F
Verbascum thapsus	Common mullein	VETH	P	I	F
Veronica americana	American speedwell	VEAM2	P	N	F
Veronica anagallis-aquatica	Water speedwell	VEAN2	P	I	F

Scientific Name	Common Name	Code	Life	Origin	Form
SMILACACEAE	**Simlax Family**				
[S3] *Smilax lasioneura*	Carrionflower	SMLA3	P	N	V
SOLANACEAE	**Nightshade Family**				
Chamaesaracha coniodes	Gray five eyes	CHCO	P	N	F
Chamaesaracha coronopus	Greenleaf five eyes	CHCO2	P	N	F
Physalis hederifolia var. *fendleri*	Fendler's groundcherry	PHHEF	P	N	F
Physalis virginiana	Virginia groundcherry	PHVI5	P	N	F
Quincula lobata	Chinese lantern	QULO2	P	N	F
Solanum dulcamara	Climbing nightshade	SODU	P	I	F
Solanum heterodoxum	Buffalobur	SOHE	A	N	F
Solanum rostratum	Tabacon aspero	SORO	A	N	F
Solanum triflorum	Cutleaf nightshade	SOTR	A	I	F
TAMARICACEAE	**Tamarisk Family**				
Tamarix ramosissima	Saltcedar	TARA	P	I	T
THALICTRACEAE	**Meadow Rue Family**				
Thalictrum fendleri	Fendler's meadowrue	THFE	P	N	F
TYPHACEAE	**Cattail Family**				
Typha angustifolia	Narrowleaf cattail	TYAN	P	N	G
Typha latifolia	Broadleaf cattail	TYLA	P	N	G
ULMACEAE	**Elm Family**				
Celtis laevigata var. *reticulata*	Netleaf hackberry	CELAR	P	N	T
Ulmus pumila	Siberian elm	ULPU	P	I	T
VERBENACEAE	**Vervain Family**				
Glandularia bipinnatifida	Dakota mock vervain	GLBI2	P	N	F
Verbena bracteata	Bigbract verben	VEBR	P	N	F
Verbena hastata	Blue vervain	VEHA2	P	N	F
VIOLACEAE	**Violet Family**				
Viola nuttallii	Nuttall's violet	VINU2	P	N	F
VISCACEAE	**Mistletoe Family**				
Arceuthobium vaginatum ssp. *cryptopodum*	Dwarf mistletoe	ARVAC	P	N	F
VITACEAE	**Grape Family**				
Parthenocissus quinquefolia	Virginia creeper	PAQU2	P	N	V
Parthenocissus vitacea	Woodbine	PAVI5	P	I	V
Vitis riparia	Grape	VIRI	P	N	V

Scientific Name	Common Name	Code	Life	Origin	Form
ZYGOPHYLLACEAE	**Caltrop Family**				
Kallstroemia parviflora	Warty caltrop	KAPA	A	N	F
Tribulus terrestris	Puncturevine	TRTE	A	I	F

Plant List for the Piñon Canyon Maneuver Site

FERNS & FERN ALLIES

Scientific Name	Common Name	Code	Life	Origin	Form
ATHYRIACEAE	**Ladyfern Family**				
Cystopteris fragilis	Brittle bladderfern	CYRF2	P	N	F
ASPIDACEAE	**Shieldfern Family**				
Dryopteris filix-mas	Male Fern	DRFI2	P	N	F
EQUISETACEAE	**Horsetail Family**				
Hippochaete laevigata	Smooth horsetail	EQLA	P	N	F
Hippochaete variegata	Scouringrush	EQVAV	P	N	F
SELAGINELLACEAE	**Little Club-Moss Family**				
Selaginella densa	Lesser Spikemoss	SEDE2	P	N	F
Selaginella mutica	Bluntleaf spikemoss	SEMU	P	N	F
SINOPTERIDACEAE	**Lipfern Family**				
Cheilanthes feei	Slender lipfern	CHFE	P	N	F
G3/S3 *Argyrochosma fendleri*	Fenderler's lipfern	CHFE2	P	N	F
WOODSIACEAE	**Woodsia Family**				
Woodsia oregana ssp. *cathcartiana*	Oregon cliff fern	WOORC2	P	N	F

GYMNOSPERMS

Scientific Name	Common Name	Code	Life	Origin	Form
CUPRESSACEAE	**Cypress Family**				
Juniperus monosperma	Oneseed juniper	JUMO	P	N	T
Juniperus scopulorum	Rocky Mountain juniper	JUSC2	P	N	T
PINACEAE	**Pine Family**				
Pinus edulis	Two needle pinyon	PIED	P	N	T
Pinus ponderosa	Ponderosa pine	PIPO	P	N	T

ANGIOSPERMS, FLOWERING PLANTS

Scientific Name	Common Name	Code	Life	Origin	Form
ACERACEAE	**Maple Family**				
Acer glabrum	Rocky Mountain maple	ACGL	P	N	T

Scientific Name	Common Name	Code	Life	Origin	Form
AGAVACEAE	**Agave Family**				
Yucca glauca	Soapweed yucca	YUGL	P	N	S
ALISMATACEAE	**Water-Plantain Family**				
Alisma trivale	Northern water plantain	ALTR7	P	N	F
[S1/S2] *Sagittaria spp*	Arrowhead	SAGIT	P	N	F
ALLIACEAE	**Onion Family**				
Allium cernuum	Nodding onion	ALCE2	P	N	F
Allium textile	Textile onion	ALTE	P	N	F
ALSINACEAE	**Chickweed Family**				
Eremogone hookeri	Hooker's sandwort	ERHO13	P	N	F
Paronychia sessiliflora	Creeping nailwort	PASE	P	N	F
AMARANTHACEAE	**Amaranth Family**				
Amaranthus blitoides	Mat amaranth	AMBL	A	I	F
ANACARDIACEAE	**Sumac Family**				
Rhus aromatica	Fragrant sumac	RHAR4	P	N	S
Toxicodendron rydbergii	Western poison ivy	TORY	P	N	S
APIACEAE	**Carrot Family**				
Conium maculatum	Poison hemlock	COMA2	B	I	F
Cymopterus acaulis	Plains springparsley	CYAC	P	N	F
Cymopterus montanus	Mountain springparsley	CYMO	P	N	F
Heracleum maximum	Common cowparsnip	HEMA80	P	N	F
Lomatium orientale	Northern Idaho biscuitroot	LOOR	P	N	F
Musineon divaricatum	Leafy wildparsley	MUDI	P	N	F
APOCYNACEAE	**Dogbane Family**				
Apocynum cannabinum	Indian hemp	APCA	P	N	F
ASCLEPIADACEAE	**Milkweed Family**				
Asclepias arenaria	Sand milkweed	ASAR	P	N	F
Asclepias asperula	Spider milkweed	ASAS	P	N	F
Asclepias engelmanniana	Engelmann's milkweed	ASEN	P	N	F
Asclepias incarnata	Swamp milkweed	ASIN	P	N	F
[S2] *Asclepias macrotis*	Longhood milkweed	ASMA	P	N	F
Asclepias speciosa	Showy milkweed	ASSP	P	N	F
Asclepias subverticillata	Horsetail milkweed	ASSU2	P	N	F
[G3G4/T2T3/S2*] *Asclepias uncialis ssp. unicalis*	Wheel (dwarf) milkweed	ASUNU2	P	N	F
Asclepias verticillata	Whorled milkweed	ASVE	P	N	F
Asclepias viridiflora	Green comet milkweed	ASVI	P	N	F
[S1] *Funastrum crispum*	Wavyleaf twinevine	FUCR	P	N	F

Scientific Name	Common Name	Code	Life	Origin	Form
ASTERACEAE	**Daisy or Sunflower Family**				
Acroptilon repens	Russian knapweed	ACRE3	P	I	F
Ambrosia psilostachya	Western ragweed	AMPS	P	N	F
Ambrosia trifida	Great ragweed	AMTR	A	I	F
Antennaria howellii	Howell's pussytoe	ANHO	P	N	F
Antennaria parvifolia	Small-leaf pussytoes	ANPA4	P	N	F
Arctium minus	Lesser burdock	ARMI2	P	I	F
Artemisia bigelovii	Bigelow sage	ARBI3	P	N	S
Artemisia campestris	Field sagewort	ARCAC	P	N	F
Artemisia dracunculus	Tarragon	ARDR4	P	N	F
Artemisia filifolius	Sand sagebrush	ARFI2	P	N	S
Artemisia frigida	Prairie sagewort	ARFR4	P	N	F
Artemisia ludoviciana	White sagebrush	ARLU	P	N	F
Baccharis wrightii	Wrights baccharis	BAWR	P	N	F
Brickellia brachyphylla	Plumed Brickellbush	BRBR2	P	N	F
Brickellia californica	California Brickellbush	BRCA3	P	N	S
Centaurea stoebe	Spotted knapweed	CEST8	B	I	F
Chrysothamnus nauseosus	Rubber rabbitbrush	CHNA2	P	N	S
Cirsium arvense	Canada thistle	CIAR4	P	I	F
Cirsium undulatum	Wavyleaf thistle	CIUN	P	N	F
Cirsium vulgare	Bull thistle	CIVU	P	I	F
Conyza canadensis	Canadian horseweed	COCA5	A	N	F
Coreopsis tinctoria	Golden tickseed	COTI3	A	N	F
Cyclachaena xanthifolia	Carelessweed	CYXA2	A	N	F
Dyssodia aurea	Manyawn pricklyleaf	DYAU	A	N	F
[S2] *Echinacea angustifolia*	Blacksamson echinacea	ECAN2	P	N	F
Erigeron divergen	Spreading fleabane	ERDI4	P	N	F
Erigeron pumilus	Shaggy fleabane	ERPU2	P	N	F
Erigeron subtrinervis	Threenerve fleabane	ERSU2	P	N	F
Evax prolifera	Bighead pygmycudweed	EVPR	A	N	F
Gaillardia pinnatifida	Red dome blanketflower	GAPI	P	N	F
Grindelia squarrosa	Curleycup gumweed	GRSQ	P	N	F
Gutierrezia sarothrae	Broom snakeweed	GUSA2	P	N	F
Helianthus annuus	Common sunflower	HEAN3	A	N	F
Helianthus petiolaris	Prairie sunflower	HEPE	A	N	F
Heterotheca villosa	Hairy false goldenaster	HEVI4	P	N	F
Hymenopappus filifolius	Fineleaf hymenopappus	HYI	P	N	F
Hymenopappus tenuifolius	Chalk Hill hymenopappus	HYTE2	P	N	F
Iva axillaris	Povertyweed	IVAX	P	N	F
Lactuca serriola	Prickly lettuce	LASE	P	I	F
Lactuca tatarica ssp. *Pulchella*	Blue lettuce	LATAP2	P	N	F
Leucelene ericoides	Roseheath	LEER	P	N	F
Liatris punctata	Dotted blazingstar	LIPU	P	N	F
Lygodesmia juncea	Rush skeletonplant	LYJU	P	N	F

Scientific Name	Common Name	Code	Life	Origin	Form
Machaeranthera pinnatifida	Lady tansyaster	MAPI	P	N	F
Machaeranthera tanacetifolia	Tanseyleaf tansyaster	MATA2	A	N	F
Melampodium leucanthum	Plains blackfoot	MELE2	P	N	F
Nothocalias cuspidata	Prairie false dandelion	NOCU	P	N	F
Oonopsis foliosa	Leafy false goldenweed	OOFO	P	N	F
G3G4/T2 **Oonopsis foliosa var. monocephala*	Raven Ridge false (rayless) goldenweed	OOFOM	P	N	F
Packera neomexicana var. mutabilis	New Mexico groundsel	PANEM	P	N	F
Packera pseudaurea	Falsegold groundsel	PAPS5	P	N	F
Packera tridenticulata	Threetooth ragwort	PATR7	P	N	F
S2 *Palafoxia rosea* var. *Macrolepsis*	Rosy palafox	PAROM	P	N	F
Pectis angustifolia	Lemon scent	PEAN	P	N	F
Picradeniopsis oppositifolia	Oppositeleaf bahia	PIOP	P	N	F
Ratibida columnifera	Upright prairie coneflower	RACO3	P	N	F
Ratibida tagetes	Green prairie coneflower	RATA	P	N	F
Senecio riddellii	Riddell's ragwort	SERI2	P	N	F
Solidago mollis	Velvety goldenrod	SOMO	P	N	F
Solidago multiradiata	Rocky Mountain goldenrod	SOMU	P	N	F
Solidago petiolaris	Downy ragged goldenrod	SOPE	P	N	F
Solidago velutina	Threenerve goldenrod	SOVE6	P	N	F
Stephanomeria pauciflora	Brownplume wirelettuce	STPA4	P	N	F
Taraxacum officinale	Common dandelion	TAOF	P	I	F
Tetraneuris acaulis	Stemless four-nerve daisy	TEAC	P	N	F
Thelesperma megapotamicum	Hopi tea greenthread	THME	P	N	F
Thelesperma subnudum	Navajo tea	THSU	P	N	F
Townsendia exscapa	Stemless Townsend daisy	TOEX2	P	N	F
Townsendia hookeri	Hooker's Townsend daisy	TOHO	P	N	F
Tragopogon dubius	Yellow salsify	TRDU	P	N	F
Virgulus ericoides	White heath aster	VIER4	P	I	F
Virgulus falcatus	White prairie aster	VIFA2	P	N	F
Virgulus fendleri	Fendler's aster	VIFE3	P	N	F
Zinnia grandiflora	Rocky Mountain zinnia	ZIGR	P	N	F
BORAGINACEAE	**Borage Family**				
Cryptantha bakeri	Baker's cryptantha	CRBA4	P	N	F
Cryptantha cinerea var. *jamesii*	James' cryptantha	CRCIJ	P	N	F
Cryptantha minima	Little cryptantha	CRMI5	A	N	F
Cryptantha thyrsiflora	Calcareous cryptantha	CRTH	P	N	F
Lappula marginata	Margined stickseed	LAMA9	A	I	F
Lappula occidentalis var. *occidentalis*	Flatspine stickseed	LAOCO	A	N	F
Lithospermum incisum	Narrowleaf stoneseed	LIIN2	P	N	F
Onosmodium bejariense var. *occidentale*	Western marbleseed	ONBEO	P	N	F
BRASSICACEAE	**Mustard Family**				
Arabis hirsuta	Hairy rockcress	ARHI	A	I	F

Scientific Name	Common Name	Code	Life	Origin	Form
Camelina microcarpa	Littlepod false flax	CAMI2	A	I	F
Cardaria draba	Whitetop (Hoary cress)	CADR	P	I	F
Descurainia incana	Mountain tansymustard	DEIN5	P	N	F
Descurainia incana ssp. *Incisa*	Mountain tansymustard	DEINI2	P	N	F
Descurainia pinnata	Western tansymustard	DEPI	A	I	F
Descurainia sophia	Herb sophia	DESO2	A	I	F
Draba reptans	Carolina draba	DRRE2	A	N	F
Erysimum asperum	Western wallflower	ERAS2	P	N	F
Erysimum inconspicuum	Shy wallflower	ERIN7	P	N	F
Lepiduim draba	Hoary cress	LEDR	P	I	F
Lepidium latifolium	Broadleaved pepperweed	LELA2	P	I	F
Lesquerella fendleri	Fendler's bladderpod	LEFE	P	N	F
Lesquerella ovalifolia	Roundleaf bladderpod	LEOV	P	N	F
Stanleya pinnata	Desert princesplume	STPI	P	N	F
Thelypodium wrightii ssp. *oklahomense*	Oklahoma thelypody	THWRO	P	N	F
CACTACEAE	**Catus Family**				
Cylindropuntia imbricata	Tree cholla	CYIM2	P	N	S
Echinocereus reichenbachii ssp. *perbellus*	Lace hedgehog cactus	ECREP2	P	N	S
Echinocereus viridiflorus	Nylon hegehog cactus	ECVI2	P	N	S
Escobaria vivipara var. *vivipara*	Spinystar	ECVIV	P	N	S
Opuntia macrorhiza	Twistspine prickly pear	OPMA2	P	N	S
Opuntia phaeacantha	Tulip pricklypear	OPPH	P	N	S
Opuntia polyacantha	Plains prickypear	OPPO	P	N	S
CALOCHORTACEAE	**Mariposa Family**				
Calochortus gunnisonii	Gunnison's mariposa lily	CAGU	P	N	F
CAMPANULACEAE	**BellFlower Family**				
[S2] *Lobelia cardinalis*	Cardinal flower	LOCA2	P	N	F
CAPPARIDACEAE	**Caper family**				
Cleome serrulata	Rocky Mountain beeplant	CLSE	A	N	F
Polanisia dodecandra	Redwhisker clammyweed	PODO3	P	N	F
CAPRIFOLIACEAE	**Honeysuckle Family**				
Sambucus nigra ssp. *canadensis*	American black elderberry	SANIC4	P	N	S
Symphoricarpos albus	Common snowberry	SYAL	P	N	S
Symphoricarpos occidentalis	Western snowberry	SYOC	P	N	S
Symphoricarpos oreophilus	Mountain snowberry	SYOR2	P	N	S
CHENOPODIACEAE	**Goosefoot Family**				
Atriplex argentea	Silverscale saltbush	ATAR2	A	N	F
Atriplex canescens	Fourwing saltbush	ATCA2	P	N	S

Scientific Name	Common Name	Code	Life	Origin	Form
Bassia scoparia	Burningbush	BASC5	A	I	F
Chenopodium album	Lambsquarters	CHAL7	A	I	F
Chenopodium desiccatum	Aridland goosefoot	CHDE	A	N	F
Chenopodium incanum	Mealy goosefoot	CHIN2	A	N	F
Chenopodium watsonii	Watson's goosefoot	CHWA	A	N	F
Krascheninnikovia lanata	Winterfat	KRLA2	P	N	S
Salsola tragus	Prickly Russian thistle	SART12	A	I	F
Sarcobatus vermiculatus	Greasewood	SAVE4	P	N	S
COMMELINACEAE	**Spiderwort Family**				
Tradescantia occidentalis	Prairie spiderwort	TROC	P	N	F
CONVOLVULACEAE	**Morningglory Family**				
Convolvulus arvensis	Field bindweed	COAR4	P	I	F
Evolvulus nuttallianus	Shaggy dwarf morning-glory	EVNU	P	N	F
Ipomoea leptophylla	Bush morning-glory	IPLE	P	N	F
CROSSOSOMATACEAE	**Rockflower Family**				
Glossopetalon spinescens var *planitierum*	Plains greasebush	GLSPP2	P	N	S
CUCURBITACEAE	**Gourd Family**				
Cucurbita foetidissima	Buffalo gourd	CUFO	P	N	V
CYPERACEAE	**Sedge Family**				
Carex duriuscula	Needleleaf sedge	CADU6	P	N	G
Carex gravida var. *lunelliana*	Heavy sedge	CAGRL	P	N	G
Carex lasiocarpa var. *americana*	American woollyfruit sedge	CALAA	P	N	G
[S2] *Cyperus lupulinus* ssp. *lupulinus*	Great Plains flatsedge	CYLUL	P	N	G
Cyperus schweinitzii	Schweinitz's flatsedge	CYSC3	P	N	G
Eleocharis palustris	Common spikerush	ELPA3	P	N	G
Schoenoplectus acutus var. *acutus*	Hardstem bulrush	SCACA	P	N	G
Schoenoplectus pungens	Common threesquare	SCPU10	P	N	G
ELAEAGNACEAE	**Oleaster Family**				
Elaeagnus angustifolia	Russian-olive	ELAN	P	I	T
EUPHORBIACEAE	**Spurge Family**				
Euphorbia marginata	Snow on the Mountain	EUMA8	A	N	F
Chamaesyce fendleri	Fendler's sandmat	CHFE3	P	N	F
Chamaesyce glyptosperma	Ribseed sandmat	CHGL13	A	N	F
Chamaesyce lata	Hoary sandmat	CHLA10	P	N	F
Chamaesyce missurica	Prairie sandmat	CHMI8	A	N	F
Chamaesyce stictospora	Slimseed sandmat	CHST8	A	N	F
Croton texensis	Texas croton	CRTE4	A	N	F
Euphorbia dentata var. *dentata*	Toothed spurge	EUDED	A	N	F

Scientific Name	Common Name	Code	Life	Origin	Form
Euphorbia spathulata	Warty spurge	EUSP	A	N	F
Tragia ramosa	Branched noseburn	TRRA5	P	N	F
FABACEAE	**Pea Family**				
Amorpha fruticosa	False indigo bush	AMFR	P	N	S
[S2]*Amorpha nana*	Dwarf false indigo	AMNA	P	N	S
Astragalus crassiocarpus	Groundplum milkvetch	ASCR2	P	N	F
Astragalus gracilis	Slender milkvetch	ASGR3	P	N	F
Astragalus missouriensis	Missouri milkvetch	ASMI10	P	N	F
Astragalus nuttallianus var *micranthiformis*	Turkeypeas	ASNUM2	P	N	F
Astragalus paryii	Parry's milkvetch	ASPA13	P	N	F
[S2] *Astragalus puniceus*	Trinidad milkvetch	ASPU8	P	N	F
Astragalus racemosus	Cream milkvetch	ASPU2	P	N	F
Astragalus shortianus	Short's milkvetch	ASSH3	P	N	F
Pomaria jamesii	James' holdback	POJA5	P	N	F
Dalea aurea	Golden prairie clover	DAAU	P	N	F
Dalea candida var *oligophylla*	White prairie clover	DACAO	P	N	F
Dalea enneandra	Nineanther prairie clover	DAEN	P	N	F
Dalea jamesii	James' prairie clover	DAJA	P	N	F
Dalea purpurea	Purple prairie clover	DAPU5	P	N	F
Glycyrrhiza lepidota	American licorice	GLLE3	P	N	F
Hedysarum boreale	Utah sweetvetch	HEBO	P	N	F
Hoffmannseggia drepanocarpa	Sicklepod holdback	HODR	P	N	F
Lathyrus eucosmus	Bush vetchling	LAEU	P	N	F
Lupinus pusillus	Rusty lupine	LUPU	A/B	N	F
Medicago sativa	Alfalfa	MESA	P	I	F
Melilotus officinalis	White /Yellow sweetclover	MEOF	P	I	F
Oxytropis deflexa var *sericea*	Blue nodding locoweed	OXDES	P	N	F
Oxytropis lambertii	Purple locoweed	OXLA3	P	N	F
Pediomelum hypogaeum	Subterranean Indian breadroot	PEHY4	P	N	F
Psoralidium tenuiflorum	Slimflower scurfpea	PSTE5	P	N	F
Sophora nuttalliana	Silky sophora	SONU	P	N	F
Vicia americana ssp. *Americana*	American vetch	VIAM	P	N	F
Vicia americana ssp. *Minor*	Mat vetch	VIAMM3	P	N	F
FRANKENIACEAE	**Frankenia Family**				
Frankenia jamesii	James' frankenia	FRJA	P	N	S
FUMARIACEAE	**Fumitory Family**				
Corydalis aurea	Scrambled eggs	COAU2	A	N	F
Corydalis curvisiliqua ssp. occidentalis	Curvepod fumewort	COCUO	A	N	F

Scientific Name	Common Name	Code	Life	Origin	Form
GERANIACEAE	**Geranium Family**				
Erodium cicutarium	Redstem stork's bill	ERCI6	A	I	F
GROSSULARIACEAE	**Currant or Gooseberry Family**				
Ribes aureum	Golden current	RIAU	P	N	S
Ribes cereum	Wax current	RICE	P	N	S
Ribes leptanthum	Trumpet gooseberry	RILE	P	N	S
HELLEBORACEAE	**Hellebore Family**				
Delphinium carolinianum ssp. virescens	Carolina larkspur	DECAV2	P	N	F
Delphinium wootonii	Organ Mountain larkspur	DEWO	P	N	F
HYDRANGEACEAE	**Hydrangea Family**				
Philadelphus microphyllus	Littleleaf mock orange	PHMI4	P	N	S
IRIDACEAE	**Iris family**				
Sisyrinchium montanum	Strict blue-eyed grass	SIMO2	P	N	G
JUNCACEAE	**Rush Family**				
Juncus arcticus ssp. ater	Mountain rush	JUARL	P	N	G
Juncus dudleyi	Dudley's rush	JUDU2	P	N	G
Juncus interior	Inland rush	JUIN2	P	N	G
Juncus torreyi	Torrey's rush	JUTO	P	N	G
JUNCAGINACEAE	**Arrowgrass Family**				
Triglochin maritima	Seaside arrowgrass	TRMA20	P	I	G
LAMIACEAE	**Mint Family**				
Hedeoma drummondii	Drummond's false pennyroyal	HEDR	P	N	F
Marrubium vulgare	Horehound	MAVU	P	I	F
Monarda pectinata	Pony beebalm	MOPE	P	N	F
Salvia reflexa	Lanceleaf sage	SARE3	A	N	F
Teucrium laciniatum	Lacy germander	TELA	P	N	F
LILIACEAE	**Lily Family**				
Leucocrinum montanum	Common starlily	LEMO4	P	N	F
LINACEAE	**Flax Family**				
Linum lewisii var. lewisii	Prairie flax	LILEL2	P	N	F
Linum puberulum	Plains flax	LIPU4	A	N	F
Linum rigidum var. rigidum	Stiffstem flax	LIRIR	A	N	F
LOASACEAE	**Loasa Family**				
Mentzelia albicaulis	Whitestem blazingstar	MEAL6	A	N	F
Mentzelia nuda var *nuda*	Bractless blazingstar	MUNEN	P	N	F

Scientific Name	Common Name	Code	Life	Origin	Form
Mentzelia oligosperma	Chickenthief	MEOL	P	N	F
Mentzelia rusbyi	Rusby's blazingstar	MERU	P	N	F
MALVACEAE	**Mallow Family**				
Sphaeralcea angustifolia	Copper globemallow	SPAN3	P	N	F
Sphaeralcea coccinea	Scarlett globemallow	SPCO	P	N	F
MARTYNIACEAE	**Unicorn Plant Family**				
Proboscidea louisianica	Ramshorn	PRLO	P	A	F
NYCTAGINACEAE	**Four-O'Clock Family**				
Abronia fragrans	Snowball sand verbena	ABFR2	P	N	F
Mirabilis hirsuta	Hairy-leaf fouro'clock	MIHI	P	N	F
Mirabilis linearis	Narrowleaf four o'clock	MILI3	P	N	F
Mirabilis multiflora	Colorado four o'clock	MIMU	P	N	F
G2/S2 **Mirabilis rotundifolia*	Roundleaf four o'clock	MIRO2	P	N	F
Tripterocalyx micranthus	Smallflower sandverbena	TRMI6	A	N	F
ONAGRACEAE	**Evening-Primrose Family**				
Calylophus lavandulifolius	Lavenderleaf sundrops	CALA38	P	N	F
Oenothera albicaulis	Whitest evening primrose	OEAL	A	N	F
Oenothera caespitosa	Tufted evening primrose	OECA10	P	N	F
Oenothera curtiflora	Velvetweed	OECU3	P	N	F
G3/S3 *Oenothera harringtonii*	Colorado Springs evening primrose	OEHA6	P	N	F
Oenothera suffrutescens	Scarlet beeblossom	OESU3	P	N	F
OROBANCHACEAE	**Broom-Rape Family**				
Orobanche ludoviciana ssp. multiflora	Manyflower broomrape	ORLUM	P	N	F
PAPAVERACEAE	**Poppy Family**				
Argemone hispida	Rough pricklypoppy	ARHI4	P	N	F
PLANTAGINACEAE	**Plantain Family**				
Plantago patagonica	Wolly plantain	PLPA2	A	N	F
POACEAE	**Grass Family**				
Achnatherum hymenoides	Indian ricegrass	ACHY	P	N	G
Achnatherum robustum	Sleeplygrass	ACRO7	P	N	G
Achnatherum scribneri	Scribner needlegrass	ACSC11	P	N	G
Agropyron cristatum ssp. *cristatum*	Crested wheatgrass	AGCRC	P	I	G
Agropyron desertorum	Desert wheatgrass	ARDE2	P	N	G
Andropogon gerardii	Big bluestem	ANGE	P	N	G
Agrostis stolonifera	Creeping bentgrass	AGST2	P	I	G
Alopecurus aequalis	Shortawn foxtail	ALAE	P	N	G

Scientific Name	Common Name	Code	Life	Origin	Form
Aristida purpurea	Purple threeawn	ARPU9	P	N	G
Avena fatua	Wild oats	AVFA	A	I	G
Bothriochloa laguroides ssp. torreyana	Silver beardgrass	BOLAT	P	N	G
Bothriochloa saccharoides	Silver bluestem	BOSA	P	N	G
Bouteloua curtipendula	Sideoats grama	BOCU	P	N	G
Bromopsis inermis	Smooth brome	BRIN7	P	I	G
Bromus arvensis	Field brome	BRAR5	A	I	G
Bromus tectorum	Cheatgrass	BRTE	A	I	G
Bouteloua dactyloides	Buffalograss	BODA2	P	N	G
Bouteloua eriopoda	Black grama	BOER	P	N	G
Bouteloua gracilis	Blue grama	BOGR2	P	N	G
Bouteloua hirsuta var. *hirsuta*	Hairy grama	BIHIH	P	N	G
Bouteloua simplex	Matted grama	BOSI2	A	N	G
Calamagrostis stricta	Slimstem reedgrass	CAST36	P	N	G
Dactylis glomerata	Orchardgrass	DAGL	P	I	G
Echinochloa crus-galli	Barnyard grass	ECCR	A	I	G
Elymus canadensis	Canada wildrye	ELCA4	P	N	G
Elymus elymoides	Squirreltail	ELEL5	P	N	G
Elymus lanceolatus	Thickspike wheatgrass	ELLA3	P	N	G
Erioneuron pilosum	Hairy woollygrass	ERPI5	P	N	G
Hesperostipa comata	Needle and thread	HECO26	P	N	G
Hesperostipa neomexicana	New Mexico feathergrass	HENE5	P	N	G
Hilaria jamesii	Galleta grass	HIJI	P	N	G
Hordeum jubatum ssp. *jubatum*	Foxtail barley	HOJUJ	P	N	G
Hordeum pusillum	Little barley	HOPU	A	N	G
Koeleria macrantha	Prairie junegrass	KOMA	P	N	G
Lycurus setosus	Bristly wolfstail	LYSE3	P	N	G
Monroa squarrosa	False buffalograss	MOSQ3	A	N	G
[S2] *Muhlenbergia arenacea*	Ear muhly	MUAR	P	N	G
Muhlenbergia arenicola	Sand muhly	MUAR2	P	N	G
Muhlenbergia asperifolia	Alkali muhly	MUAS	P	N	G
Muhlenbergia torreyi	Ring muhly	MUTO2	P	N	G
Nassella viridula	Green needlegrass	NAVI4	P	N	G
Panicum capillare	Witchgrass	PACA6	P	N	G
Panicum obtusum	Vine mesquite	PAOB	A	N	G
Pascopyrum smithii	Western wheatgrass	PASM	P	N	G
Phragmites australis	Common reedgrass	PHAU7	P	N	G
Piptatheropsis micrantha	Littleseed ricegrass	PIMI	P	N	G
[S2] *Poa bigelovi*	Bigelow's bluegrass	POBI	A	N	G
Poa pratensis	Kentucky bluegrass	POPR	P	I	G
Poa secunda	Sandberg bluegrass	POSE	P	N	G
Polypogon monspeliensis	Annual rabbitsfoot grass	POMO5	A	I	G
Schedonnardus paniculatus	Tumblegrass	SCPA	P	N	G
Schizachyrium scoparium	Little bluestem	SCSC	P	N	G
[S2] *Scleropogon brevifolius*	Burrograss	SCBR2	P	N	G

Scientific Name	Common Name	Code	Life	Origin	Form
Sorghastrum nutans	Indiangrass	SONU2	P	N	G
Sorghum halepense	Johnsongrass	SOHA	P	I	G
Sporobolus airoides	Alkali sacaton	SCAI	P	N	G
Sporobolus cryptandrus	Sand dropseed	SPCR	P	N	G
Sphenopholis obtusata	Prairie wedgescale	SPOB	P	N	G
Tridens muticus var. *elongatus*	Slim tridens	TRMUE	P	N	G
Vulpia octoflora	Sixweeks fescue	VUOC	A	N	G
POLEMONIACEAE	**Phlox Family**				
Gilia ophthalmoides	Eyed gilia	GIOP	A	N	F
Giliastrum acerosum	Bluebowls	GIAC4	P	N	F
Ipomopsis laxiflora	Iron ipomopsis	IPLA2	P	N	F
Ipomopsis pumila	Dwarf ipomopsis	IPPU4	A	N	F
Ipomopsis spicata	Spiked ipomopsis	IPSP	P	N	F
Phlox longifolia	Longleaf phlox	PHLO2	P	N	F
POLYGONACEAE	**Knotweed Family**				
Eriogonum annuum	Annual buckwheat	ERAN4	A	N	F
Eriogonum effusum	Spreading buckwheat	EREF	P	N	F
Eriogonum lonchophyllum var. *fendlerianum*	Pearleaf buckwheat	ERLOF	P	N	F
Eriogonum gordonii	Gordon's buckwheat	ERGO	A	N	F
Eriogonum jamesii	James' buckwheat	ERJA	P	N	F
Eriogonum lachnogynum	Woollycup buckwheat	ERLA3	P	N	F
Eriogonum tenellum	Tall buckwheat	ERTE9	P	N	F
Rumex crispus	Curly dock	RUCR	P	I	F
Rumex stenophyllus	Narrowleaf dock	RUST4	P	I	F
PORTULACACEAE	**Purslane Family**				
Portulaca oleracea	Little hogweed	POOL	A	N/I	F
Portulaca halimoides	Silkcotton purslane	POHA5	A	I	F
RANUNCULACEAE	**Buttercup Family**				
Clematis ligusticifolia	Western white clematis	CLLI2	P	N	F
ROSACEAE	**Rose Family**				
Cercocarpus montanus	Alderleaf mountain mahogany	CEMO2	P	N	S
Physocarpus monogynus	Mountain ninebark	PHMO4	P	N	S
Potentilla arguta ssp. *arguta*	Tall cinquefoil	POARA4	P	N	F
Prunus americana	American plum	PRAM	P	N	T
Prunus pensylvanica var. *pensylvanica*	Pin cherry	PRPEP	P	N	T
Prunus virginiana var. *melanocarpa*	Black chokecherry	PRVIM	P	N	T
Rosa woodsii	Woods' rose	ROWO	P	N	S
Rubus deliciosus	Delicious raspberry	RUDE	P	N	S

Scientific Name	Common Name	Code	Life	Origin	Form
RUTACEAE	**Citrus Family**				
Ptelea trifoliata	Common hoptree	PTTR	P	N	T
SALICACEAE	**Willow Family**				
Populus × acuminata (pro sp.) *[angustifolia × deltoides]*	Lanceleaf cottonwood	POAC5	P	N	T
Populus angustifolia	Narrowleaf cottonwood	POAN3	P	N	T
Populus deltoides ssp. *Monilifera*	Plains cottonwood	PODEM	P	N	T
Populus tremuloides	Quaking aspen	POTR5	P	N	T
Salix alba var. *vitellina* x *fragilis*	White willow	SAAL2	P	N	S
Salix amygdaloides	Peachleaf willow	SAAM2	P	N	S
Salix interior	Sandbar willow	SAIN3	P	N	S
SANTALACEAE	**Sandlewood Family**				
Comandra umbellata	Bastard toadflax	COUM	P	N	F
SAPINDACEAE	**Soapberry Family**				
Sapindus saponaria var. drummondii	Western soapberry	SASAD	P	N	S
SAXIFRAGACEAE					
Heuchera parvifolia	Littleleaf alumroot	HEPA	P	N	F
SCROPHULARIACEAE	**Figwort Family**				
Castilleja integra	Wholeleaf Indian paintbrush	CAIN14	P	N	F
Castilleja sessiliflora	Downy paintedcup	CASE5	P	N	F
Penstemon angustifolius var caudatus	Broadbeard beardtongue	PEANC	P	N	F
Penstemon auriberbis	Colorado beardtongue	PEAU2	P	N	F
Penstemon barbatus ssp. *Torreyi*	Torrey's penstemon	PEBAT	P	N	F
Verbascum thapsus	Common mullein	VETH	P	I	F
SOLANACEAE	**Nightshade Family**				
Chamaesaracha coniodes	Gray five eyes	CHCO	P	N	F
Chamaesaracha coronopus	Greenleaf five eyes	CHCO2	P	N	F
Lycium pallidum	Pale desert-thorn	LYPA	P	N	S
Physalis hederifolia var. *fendleri*	Fendler's groundcherry	PHHEF	P	N	F
Physalis virginiana	Virginia groundcherry	PHVI5	P	N	F
Quincula lobata	Chinese lantern	QULO2	P	N	F
Solanum americanum	American black nightshade	SOAM	A	N	F
Solanum elaeagnifolium	Silverleaf nightshade	SOEL	P	N	F
Solanum rostratum	Tabacon aspero	SORO	A	N	F
Solanum triflorum	Cutleaf nightshade	SOTR	A	N	F
TAMARICACEAE	**Tamarisk Family**				
Tamarix ramosissima	Saltcedar	TARA	P	I	T

Scientific Name	Common Name	Code	Life	Origin	Form
TYPHACEAE	**Cattail Family**				
Typha angustifolia	Narrowleaf cattail	TYAN	P	N	G
Typha latifolia	Broadleaf cattail	TYLA	P	N	G
ULMACEAE	**Elm Family**				
Celtis laevigata var. reticulata	Netleaf hackberry	CELAR	P	N	T
Ulmus pumila	Siberian elm	ULPU	P	I	T
URTICACEAE	**Nettle Family**				
Parietaria pensylvanica	Pennsylvania pellitory	PAPE5	A	N	F
VERBENACEAE	**Vervain Family**				
Glandularia bipinnatifida	Dakota mock vervain	GLBI2	P	N	F
Phyla cuneifolia	Wedgeleaf	PHCU3	P	N	F
Verbena bracteata	Bigbract verbena	VERB	P	N	F
VIOLACEAE	**Violet Family**				
Hybanthus verticillatus	Babyslippers	HYVE	P	N	F
Viola nuttallii	Nuttall's violet	VINU2	P	N	F
VITACEAE	**Grape Family**				
Parthenocissus vitacea	Woodbine	PAVI5	P	N	F
Vitis acerifolia	Mapleleaf grape	VICA2	P	N	F
VISCACEAE	**Mistletoe Family**				
Arceuthobium	Dwarf mistletoe	ARCEU	P	N	F
ZYGOPHYLLACEAE	**Caltrop Family**				
Tribulus terrestris	Puncturevine	TRTE	A	I	F

APPENDIX 7: Migratory Bird Management

Conservation actions for migratory bird management are identified in Section 4.g: Migratory Bird Management on the INRMP.

A Memorandum of Understanding (MOU) between the U.S. Department of Defense and the U.S. Fish and Wildlife Service was signed initially in 2006. This MOU is pursuant to Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds* (66 FR 3853 [January 17, 2001]) and identifies activities where cooperation between the DoD and USFWS will contribute to the conservation of migratory birds. The MOU was updated and the new version was signed in September 2014, and is set to expire in September 2019. The updated MOU is available to the public at either organization's website.

In December 2017, the Office of the Solicitor of the United States Department of the Interior issued Solicitor's Opinion M-37050, *The Migratory Bird Treaty Act Does Not Prohibit Incidental Take*, which states that the MBTA prohibition on "take" only applies to deliberate acts intended to take a migratory bird, their nests, or their eggs. A follow-up memorandum from the Deputy Assistant Secretary of Defense (Environment, Safety and Occupational Health), titled *Incidental Take of Migratory Birds* (6 February 2018; see document below), clarified that this opinion does not rescind the "military readiness rule" (50 CFR 21.15), Executive Order 13186, or the MOU with the U.S. Fish and Wildlife Service. This memorandum advised that the Military should continue to follow existing DoD guidance to minimize the incidental take of migratory birds.

The primary existing guidance regarding incidental take for non-readiness activities is contained in the 2008 Interim Guidance - *Unintentional take of Migratory Birds for Actions Other than Military Readiness Activities* (U.S. Department of the Army IMAE-CO Memorandum, 2008). Until further clarification or guidance from the DoD, Fort Carson will continue to implement this guidance and to the greatest extent practical delay activities and avoid or minimize adverse impacts on migratory birds.

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3400 DEFENSE PENTAGON
WASHINGTON, DC 20301-3400

ENERGY, INSTALLATIONS, AND ENVIRONMENT

FEB 06 2018

MEMORANDUM FOR DEPUTY ASSISTANT SECRETARY OF THE ARMY (ENVIRONMENT, SAFETY AND OCCUPATIONAL HEALTH)
DEPUTY ASSISTANT SECRETARY OF THE NAVY (ENVIRONMENT)
DEPUTY ASSISTANT SECRETARY OF THE AIR FORCE (ENVIRONMENT, SAFETY AND INFRASTRUCTURE)
DIRECTOR, DEFENSE LOGISTICS AGENCY (DSS-E)

SUBJECT: Incidental Take of Migratory Birds

On December 22, 2017, the U.S. Department of the Interior's Office of the Solicitor issued Solicitor's Opinion M-37050 issued the opinion that the Migratory Bird Treaty Act (MBTA) prohibition on the "taking" or "killing" of migratory birds applies only to deliberate acts intended to take a migratory birds, their nests, or their eggs. This opinion permanently withdraws and replaces Solicitor's Opinion M-37041 (issued January 10, 2017, and suspended pending review on February 6, 2017).

This opinion alone does not rescind the "military readiness rule" (50 C.F.R. §21.15), §315 of the Bob Stump National Defense Authorization Act for Fiscal Year 2003, Executive Order 13186, or the resulting MOU with U.S. Fish and Wildlife Service. Neither does it address the split of opinions among the five Circuit Courts of Appeal that have addressed the question of whether the MBTA criminalizes some instances of incidental take, an issue that can be resolved only by U.S. Supreme Court review or congressional action. As a consequence, we advise that until further clarification is provided, the Military Departments should continue to follow existing Department of Defense guidance designed to minimize – to the extent practicable and without diminishing the effectiveness of military readiness activities – the incidental take of migratory birds.

My point of contact is Alison Dalsimer, 571-372-6893, allyn.a.dalsimer.civ@mail.mil.

Maureen Sullivan
Deputy Assistant Secretary of Defense
(Environment, Safety and Occupational Health)

Attachment:
None

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
US ARMY ENVIRONMENTAL COMMAND
5179 HOADLEY ROAD
ABERDEEN PROVING GROUND, MD 21010-5401

REPLY TO
ATTENTION OF

IMAE-CO

28 JUL 2008

MEMORANDUM FOR

IMCOM NORTHEAST REGION (IMNE-PWD/MR. RICHARD YATES), 5A NORTH GATE RD, FORT MONROE, VA 23651-1048
IMCOM PACIFIC REGION (IMPA-PWD/MR. AL CARROLL), H PLACE, BLDG 104, FORT SHAFTER, HI 96858-5520
IMCOM SOUTHEAST REGION (IMSE-PWD/MR. MICHAEL FRNKA), 1593 HARDEE AVE, SW, FORT MCPHERSON, GA 30330-1053
IMCOM WEST REGION (IMWE-PWD/MR. STEVE BONNEAU), 2405 STANLEY RD., BLDG 1000, FORT SAM HOUSTON, TX 78234-6106

SUBJECT: Interim Guidance – Unintentional Take of Migratory Birds for Actions Other than Military Readiness Activities

1. References:

a. National Defense Authorization Act for Fiscal Year 2003, P.L. 107-772, Section 315, "Incidental Take of Migratory Birds During Military Readiness Activities."

b. Migratory Bird Permits; Take of Migratory Birds by the Armed Forces Rule, Final Rule, 28 February 2007 (Federal Register volume 70, pages 8931-8950).

c. Memorandum of Understanding Between the US Department of Defense and the US Fish and Wildlife Service to Promote the Conservation of Migratory Birds, 29 July 2006 (Federal Register, volume 71, pages 51580 – 51585; 30 Aug 06).

2. The Migratory Bird Treaty Act (MBTA; 16 USC 703-712) prohibits the take of migratory birds without a permit or other authorization promulgated by the Department of Interior. In no circumstances will any Army Soldier, civilian employee, or contractor intentionally take a migratory bird, its active nest or egg(s) without obtaining a permit from the US Fish and Wildlife Service (USFWS).

3. In Center for Biological Diversity vs. Pirie, (191 F.Supp. 2d), the Federal District Court for the District of Columbia found that the MBTA prohibition of unpermitted take applies to both "intentional" and "unintentional" take of migratory birds even when such take occurs as a result of conducting military training and operations.

Printed on Recycled Paper

IMAE-CO 28 JUL 2008
SUBJECT: Interim Guidance – Unintentional Take of Migratory Birds for Actions Other than Military Readiness Activities

4. In reference 1a, Congress provided authorization for incidental take of migratory birds without a permit for any military readiness activity (MRA) conducted by a member of the Armed Forces. This general exemption for military readiness activities would last until the Department of Interior promulgated regulations implementing the authorization.

5. The Department of Interior promulgated implementing regulations authorizing and explaining the conditions under which members of the Armed Forces, civilian employees, and contractors performing a MRA, can unintentionally take migratory birds (reference 1b). Any MRA conducted by a Department of the Army Soldier, civilian employee, or contractor shall be carried out in accordance with the terms and conditions of reference 1b.

6. The remainder of this guidance pertains to the process for conducting non-MRAs, which is not covered by the authorization in reference 1b, with specific focus on those activities that provide direct and essential support to MRAs. No authorization or permitting process currently exists for the unintentional take of migratory birds during lawful activities that are not considered MRAs. These include routine installation operations, maintenance and construction. The USFWS will exercise prosecutorial discretion in determining whether to pursue civil or criminal penalties for Migrating Bird Treaty Act (MBTA) violations related to unpermitted, unintentional take of a migratory bird for non-MRAs. Reference 1c helps guide military installations on the conservation and management of migratory birds and their habitat.

7. An installation's Integrated Natural Resources Management Plan (INRMP) is required to address migratory bird management and conservation. In the case of military non-MRAs, an INRMP should include management practices to avoid or minimize adverse impacts on migratory birds to the greatest extent practical. Where circumstances do not permit, the INRMP needs to focus on and sufficiently address those activities that cannot be delayed until after the nesting season or modified to minimize impacts on migratory birds because of the activity's direct and essential support of MRAs or other vital military activities (i.e., range construction and maintenance which includes prescribed burning, forest manipulation, maintaining fields for target ranges, installation security and safety such as maintaining a clear perimeter or removal of hazardous trees). Installations must document and explain these activities in the INRMP by providing the information identified in 8a(1)-(7) below. Example verbiage to address non-MRA and unintentional take in the INRMP is provided in the enclosure.

IMAE-CO 28 JUL 2008
SUBJECT: Interim Guidance – Unintentional Take of Migratory Birds for Actions Other than Military Readiness Activities

8. Until the installation INRMP is updated/revised to address non-MRAs, or for non-MRAs that are outside the parameters established in the INRMP, installations will need to address and document those actions necessary to support MRAs or other mission critical activities that cannot be modified to avoid or minimize impacts on migratory birds. Provided below is guidance on addressing and implementing such non-MRAs that are likely to take migratory birds and/or their active nests (with egg(s) and/or chick(s)):

a. If the activity cannot be delayed until the end of the migratory bird nesting season, document the following information in the applicable National Environmental Policy Act (NEPA) documentation, (Environmental Assessment (EA), or Environmental Impact Statement (EIS), or a Record of Environmental Consideration with supporting documentation in the project's supporting Administrative Record if an EA or EIS will not be prepared:

(1) Activity being conducted.

(2) Purpose for the activity.

(3) Why the activity has to be conducted during the nesting season.

(4) Possible migratory birds that could be impacted by the action (with emphasis on species of concern (SOC) - go to http://dodpif.org/BCRMap.htm to identify SOCs that may occur on the installation).

(5) Project-specific conservation/management/minimization/mitigation measures, if any, being employed in and around the action area that benefit migratory birds.

(6) Conservation measures the installation implements to manage and conserve migratory bird populations, as identified in the installation's INRMP, with emphasis on the birds that will be affected by the action.

(7) The overall effect of the action on migratory bird populations affected by the action.

b. Contact the USFWS, inform them of the action, coordinate the document in 8a above, and seek comments on the proposed measures identified in 8a(5), if any. If possible, obtain the written concurrence of the USFWS on the proposed measures.

IMAE-CO 28 JUL 2008
SUBJECT: Interim Guidance – Unintentional Take of Migratory Birds for Actions Other than Military Readiness Activities

c. If active nest(s) is/are situated in a manner that could cause damage to military equipment or could be damaged by the use of such equipment (targetry equipment, communication network), explore the possibility of acquiring an intentional take permit under 50 CFR 21.41 (Depredation Permit) or 50 CFR 21.27 (Special Use Permit).

9. On an annual basis, record the installation's management efforts that benefit migratory birds. Ensure the installation is aware of the important habitats for migratory birds on the installation and the areas used by migratory bird SOCs. Provide this information to the Installation Management Command and to the State and USFWS during the installation's annual INRMP review.

10. The USFWS has enforced the MBTA with discretion, focusing on individuals or organizations that take birds with disregard for the law, particularly where no valid conservation measures have been employed. Therefore, the conservation and management efforts being implemented by the installation to benefit migratory birds, as identified in the INRMP and project-specific documentation, should be evident to the USFWS and general public.

11. The best way to protect oneself from an MBTA violation and possible litigation by a third party is by implementing conservation measures, as feasible, to ensure management of military lands are done in a manner that benefits migratory birds and by planning non-readiness activities so impacts to migratory birds are avoided, minimized, or mitigated appropriately.

12. The POC for this Command is Mr. Jay Rubinoff, (410) 436-6458, or email Jay.M.Rubinoff@us.army.mil.

Encl

MICHAEL P. O'KEEFE
Colonel, CM
Commanding

4

Management Practices for Unintentional Take of Migratory Birds for Actions Other than Military Readiness Activities

In accordance with Executive Order 13186 and the associated Memorandum of Understanding between the DoD and the US Fish and Wildlife Service (USFWS) to Promote the Conservation of Migratory Birds, (installation name) will, to the extent feasible and practical, conduct military non-readiness activities in a manner that will minimize or avoid their impacts on migratory birds, with special emphasis on migratory bird species of concern (SOC).

There are a number of non-readiness activities that provide direct and essential support for military readiness activities (MRAs) or other essential mission activities. Because of the absolute criticality of these activities in establishing the environmental conditions necessary to provide the realistic training needed to prepare or sustain the competencies of Soldiers for conflict, or maintaining the safety and security of the installation, efforts to minimize or avoid impacts on migratory birds may not be feasible.

At (installation name), Soldiers are provided training in the use of individual and heavy weaponry, tracked and wheeled vehicles, crew-served weapon's systems, involving target practice/maneuver areas/mock battlefield, to develop and/or sustain their skills to ensure battle readiness. To meet the required "battle ready" standards, Soldiers are scheduled to train on all installation land and range facilities multiple times a year. Given the number of Soldiers that will be training at (installation name) to meet these standards, the target range/maneuver areas must remain open and in ready condition throughout the year. To maintain such sites, prescribed burning/mowing of fields/select timber harvesting must occur even during periods when migratory birds are most active in the area. As such, migratory birds may be unintentionally taken as a result of these preparatory activities.

In addition, maintaining a secure border of the installation or munitions storage area requires the installation to control vegetation within ___ feet of the existing fence. The installation must also remove trees and/or other vegetation that cause a direct safety hazard, such as dead tree(s) in and around residential or administrative areas or vegetation that poses an unacceptable fire danger within these areas (identify other land management activities required to maintain or sustain other critical mission activities). Migratory birds may be unintentionally taken during implementation of these activities.

The (MRA (i.e., target range) or other mission critical activity (i.e., perimeter fence)) area provides foraging and breeding habitat for a number of migratory bird species. We've determined that the proposed maintenance activities within the area will have immediate but minimal impact on these species including the SOC known to nest in the area (see appendix, tab, or enclosure___). According to the Partners in Flight Landbird Population Estimates database, the populations of the migratory bird SOC are plentiful within the Bird Conservation Region where the installation occurs, plus other breeding

End

habitat exists on and off the installation that can be used by the species. The potential loss or unintentional "take" of active nests would be minimal and would not significantly affect these SOC. The indirect impacts of habitat loss are also not to the level that would result in a significant impact to any migratory bird species. In this ecosystem, many vegetative communities have developed in a pyrophytic environment that requires growing (nesting) season prescribed fire. These communities will not develop when the burning is conducted during the dormant season. However, because these maintenance activities will have a beneficial effect on the entire installation, the overall habitat quality will be improved, thus providing even more opportunities for successful nesting.

Although effects of the maintenance or other proposed land management activities are considered to be minimal on migratory birds, the installation still employs management/conservation efforts, to the greatest extent feasible, that will lessen the impacts on and, in many circumstances, benefit the effected species. To reduce the probability of take, the installation will, to the greatest extent possible, conduct maintenance activities (mowing, tree and/or vegetation clearing) early enough in the spring so an area is less suitable for the habitat-associated birds. Other minimization efforts, if and when possible, would be to avoid nests or remove inactive nests to discourage nesting in an area that will be impacted by readiness and non-readiness activities. For migratory bird SOC, some mitigation measures that could be considered, if feasible and practicable, are removing active nests before conducting the activity and giving the eggs and/or chicks to a licensed migratory bird rehabilitator.

The installation implements a number of management and conservation projects/efforts that benefit migratory birds, including those species that may be impacted by the military non-readiness activities discussed above. For further information and details on the installation's migratory bird program, go to section ___ of the INRMP.

In addition, the installation has established a Army Compatible Use Buffer (ACUB) to limit the effects of encroachment and maximize land inside the installation that can be used to support the installation's mission. The ACUB area is a ___ acre (woodland/grassland/mixed/etc.) parcel being managed as a natural area in perpetuity. The management and conservation practices being implemented in the area benefit migratory bird species including species of concern such as ___. For more information on this ACUB parcel and management of the site, go to ___.

APPENDIX 8: INRMP Recurring Activities

List of Projects

The various program areas within the DPW, DPTMS and the DES carry out a number of activities, many on an annual basis, that help in managing the various resources. Such activities usually do not require 'project funding', because they are done with in-house personnel, equipment etc. The recurring actions are listed and the end of each section in Chapter 4 of this INRMP. For convenience they are also listed below. All proposed recurring actions will be implemented subject to availability of funding and manpower.

Recurring actions for INRMP review and revision (Section 1.g.)

Action for INRMP review and revision	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Review of the INRMP in the first quarter of each FY with the USFWS and the CPW. Review accomplishments and anticipated projects for the current FY and FY+1.	REQ					

Recurring actions for managing species of conservation concern

Actions for species of special concern	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Continue annual (PCMS)/biennial (Fort Carson) prairie dog monitoring for colony extent and plague status. Colonies were mapped on Fort Carson in 2015, 2017, and 2019; anticipated mapping in 2021, 2023, and 2025.	BMP					
2. Continue annual monitoring of prairie dog colonies for the presence of burrowing owls and mountain plovers.	BMP					
3. Continue evaluation, at three-year intervals, of Mexican spotted owl (MSO) roost tree buffer zones for compliance with access restrictions specified in the MSO Management Plan (2016). The most recent surveys were conducted in winter 2017 – 2018, with the next round scheduled for winter 2020 – 2021.	REQ					

Actions for species of concern cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
4. Continue to inventory Army SAR populations and evaluate persistence and relationship to training annually, as scheduled around training. Fort Carson and PCMS rare plant surveys will be scheduled to occur within the next 5 years.	REQ					
5. On Fort Carson, continue Arkansas darter and southern redbelly dace population monitoring and inventory annually, as scheduled around training.	BMP					
6. Conduct baseline inventory of arthropod populations, with a focus on subphylum Hexapoda. This will allow Fort Carson staff to determine the presence and distribution of sensitive arthropod species, including those that are being considered for federal listing.	REQ					
7. Conduct baseline inventory of amphibian populations. This will allow staff to determine the presence and distribution of sensitive amphibian species. A more complete species list will also allow wildlife staff to rapidly respond to potential future ESA listings. Amphibian surveys will also allow wildlife staff to determine if invasive American bullfrogs are having a negative impact on native amphibians and determine what control measure may be necessary.	REQ					

Actions for species of concern cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
8. On Fort Carson, maintain bat gates to prevent disturbance and the spread of white-nose syndrome (WNS) from anthropogenic sources, to include annual inspections and monitoring. Monitor other bat roosting sites for disturbance and presence of WNS. Because several bat species on Fort Carson are susceptible to WNS, proactive monitoring and management will make future restrictions less likely if any of the species are listed.	BMP					
9. Continue monitoring population trends and investigating the effect of training on Colorado checkered whiptail populations as funding and staffing allow.	BMP					
10. Annually survey for and maintain inventory of raptor nests. This allows wildlife staff to respond more rapidly to projects that involve removal of trees.	BMP					
11. On PCMS, support nesting raptors by installing/maintaining raptor nesting platforms. Support cavity nesting birds by installing/ maintaining nest boxes.	BMP					
12. Continue mapping distribution of species of conservation concern, annually as encountered.	BMP					
13. Continue pesticide dusting and exploring other alternatives to prevent plague in prairie dog colonies important to nesting and wintering eagles, ferruginous hawks, and nesting burrowing owls.	BMP					

Actions for species of concern cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
14. On Fort Carson, continue to assist (by providing fish) the USFWS and CPW with translocating Arkansas darter and southern redbelly dace to additional sites to improve population stability. Identify potential additional sites for reintroductions on Fort Carson, pending IMCOM approval and conservation assurances from CPW and USFWS. By creating more stable populations of species at risk, the chance of federal listing (and thus the risk of future training restrictions) is reduced.	BMP					
15. Sustain small mammal and bird populations in woodland areas by preferentially leaving large trees with natural and bird created cavities and crevices.	BMP					
16. Create cover for sensitive species of reptiles, amphibians, and small mammals by leaving non-diseased, felled tree trunks in place during forestry operations. On Fort Carson, logs are an important component of MSO habitat and should be left in place following forestry operations in owl habitat.	BMP					
17. Create slash brush piles at sites where not increasing risk of spread of wildland fire to increase habitat availability for small mammals and reptiles.	BMP					

Recurring actions for wetlands management

Actions for wetlands management	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Ensure no-net-loss of wetland acreage on either installation.	REQ					

Actions for wetlands management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
2. Use the NEPA process to evaluate impacts on wetlands, which could result from new construction or other activities, and assist with coordination between proponent and USACE.	REQ					
3. Continue to minimize training impacts on wetlands with recommendations such as dismounted training only or driving on established crossings and roads, or avoiding steep slope traverses that affect safety and erosion.	BMP					
4. Submit quarterly Regional General Permit (RGP) reports, and review/ update the RGP on a 5-year basis.	REQ					
5. Maintain/update database of Waters of the US delineations with the USACE.	REQ					
6. Requirement for SOPs to include spill containment measures when setting up temporary refueling points and that drip pans are required under stationary vehicles.	BMP					
7. Collect reservoir-area-capacity and sediment yield data from erosion control reservoirs from 68 PCMS monitoring sites every three years.	BMP					

Recurring actions for conservation law enforcement

Actions for conservation law enforcement	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Ensure military and civilian personnel and activities are in compliance with natural, cultural and environmental laws and regulations on Fort Carson and the PCMS.	REQ					
2. Coordinate enforcement activities with other stakeholder agencies and organizations.	BMP					
3. Assist in providing education and awareness classes to various groups that use Fort Carson and the PCMS, including online classes.	BMP					

Recurring actions for fish and wildlife management

Actions for fish and wildlife management	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Integrate installation management practices, e.g., prescribed fire, revegetation, pest/invasive species management, and stormwater management, to enhance and protect biological diversity.	REQ					
2. Continue to review projects and installation activities to identify and mitigate effects on biological communities.	REQ					
3. Continue cooperative management of big game populations with CPW. Any aerial flights in the future on the installations should seek out Army aircraft as a possible fiscal savings to DPW.	BMP					

Actions for fish and wildlife management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
4. Continue baseline bat surveys on PCMS and Fort Carson.	REQ					
5. Conduct amphibian planning level surveys.	REQ					
6. Conduct planning level surveys of small mammals in a variety of habitats, including wetland and ponderosa pine vegetation communities, and in sites within MSO winter habitat.	REQ					
7. Continue developing and maintaining water resources for mitigating movements of big game species related to effects of military training.	BMP					
8. Continue CWD surveillance and require mandatory testing of harvested deer on Fort Carson. Mandatory elk harvesting on Fort Carson, as decided annually by CPW and Fort Carson. Based on annual rates of CWD prevalence, determine appropriate harvest rates with CPW.	REQ					
9. On Fort Carson, continue monitoring native fish populations.	BMP					
10. Continue to conduct avian monitoring including annual point-count surveys (Fort Carson), acoustic monitoring (PCMS), and summer and winter raptor surveys.	BMP					

Actions for fish and wildlife management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
11. Identify, burn, and monitor areas to improve forage for big game species. Due to the importance to pronghorn in winter, cholla grasslands will be excluded or burned in a mosaic pattern to preserve integrity of the resource.	BMP					
12. Continue to meet with CPW annually to discuss all hunting and coordination objectives.	BMP					
13. Conduct annual reptile surveys on PCMS and Fort Carson, as allowed by access and staffing.	BMP					
14. Complete five year (2012-2017) hunting season analysis of genetically determined susceptibility to CWD of deer harvested on FC. Base on final report, develop and apply management practices on the ground with CPW.	BMP					
15. Evaluate migration patterns of deer on Fort Carson and surrounding areas to meet deer and CWD objectives.	BMP					
16. Participate in academic partnerships and regional and national working groups to increase technical knowledge and expertise needed to develop alternative management options facilitating both military training and conservation.	BMP					

Actions for fish and wildlife management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
17. Sustain sensitive small mammal and bird populations in woodland areas by preferentially leaving large trees with natural and bird created cavities and crevices	BMP					
18. Create cover for sensitive species of reptiles, amphibians, and small mammals by leaving non- diseased, felled tree trunks in place during forestry operations. Logs are an important component of MSO habitat, and should be left in place following forestry operations in owl habitat.	BMP					
19. Create slash brush piles at sites where this action will not increase intensity spread of wildland fire. This will increase habitat availability for a variety of small mammals and reptiles.	BMP					

Recurring actions for forest management

Actions for forest management	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Manage the forests and woodlands to improve forest health through thinning, individual tree selection and sanitation salvage thinning.	REQ					
2. Restore ponderosa pine forests by thinning, removing ladder fuels, reducing crown connectivity, and then reintroducing low-intensity fires.	REQ					
3. Reduce the number of trees per acre and remove understory fuel loads to minimize the risk of catastrophic wildfire and create zones of defensible space.	REQ					

Actions for forestry management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
4. Continually survey forests for insect and disease damage, and add any data to the forestry Geographical Information System (GIS) layer.	BMP					
5. Aggressively manage against forest insect and disease pests to prevent widespread tree mortality.	BMP					
6. Ensure that a complete forest inventory is completed every ten years, and that the data is added to the forestry GIS layer.	BMP					
7. Restore native grassland habitats by reducing piñon-juniper encroachment into prairie habitats.	BMP					
8. Initiate reforestation efforts after human and natural disturbances, preferably using local seed sources.	BMP					
9. Identify and remove hazard trees annually using the USFS Hazard Tree Rating system.	BMP					
10. Continue to submit proposals to the USFS and AEC for insect and disease management projects.	BMP					
11. Work cooperatively with other Directorates and external agencies such as USFS and Colorado State University on forest management issues.	BMP					

Actions for forestry management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
12. Develop programs that generate income from the sale of forest products (such as firewood, woodchips, dimensional lumber, and fence posts), and that support standard forest management practices.	BMP					
13. Investigate potential forest product markets, including firewood, fence posts, woodchips, dimensional lumber, biomass for biofuel, and innovative use of forest and woodland tree species.	BMP					

Recurring actions for migratory bird management

Actions for migratory bird management	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Continue to review projects and installation activities to identify and mitigate conflicts with the MBTA and BGEPA.	REQ					
2. Conduct compliance-monitoring surveys at project sites and coordinate required mitigation with action proponents and/or law enforcement.	REQ					
3. Continue annual burrowing owl monitoring.	BMP					
4. Continue annual grassland and piñon-juniper bird monitoring.	BMP					
5. Continue annual mountain plover monitoring.	BMP					

Actions for migratory bird management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
6. On both FC and PCMS, begin annual monitoring for eastern black rails.	REQ					
7. Deploy wildlife escape ladders in open water tanks developed for wildlife to prevent drowning of small mammals (including bats) that fall into the tanks.	BMP					
8. Continue managing artificial cavity nests throughout the installation as mitigation for tree loss due to fire, forestry practices, and training.	BMP					
9. On PCMS, continue annual nightjar monitoring	BMP					
10. On PCMS, continue surveying for raptors nests and monitoring nest success rates.	BMP					
11. Map grasslands important to nesting birds with declining populations for input into the development of annual prescribed fire plans.	BMP					
12. Continue migratory bird outreach and education through personal contacts, Environmental Protection Officer training, and through media available on Fort Carson.	BMP					
13. Mitigate loss of owl nest sites using artificial structures. On PCMS, improve shelterbelts to replace loss of owl nesting and wintering habitat due to extensive fires. Coordinate with the DPW forester.	BMP					

Actions for migratory bird management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
14. On PCMS, mitigate loss of raptor and Chihuahuan raven nest sites by installing and maintaining artificial structures.	BMP					
15. Continue DOD Partners in Flight membership and support.	BMP					
16. Leave standing snags at a rate of 1-4 snags per acre, during forest management or post fire management for bats, small mammals, and cavity nesting birds.	BMP					
17. Assess the extent of hawk, eagle, and owl electrocutions to include identification of known sites of electrocutions of birds, identification of pole configurations and landscape features influencing pole selection, and estimating level of pole use by raptors. On Fort Carson, post-assessment recommendations to retrofit problematic utility poles will be provided to DPW operations. On PCMS post-assessment recommendations to retrofit problematic utility poles will be provided to the local electrical companies (e.g. San Isabel).	BMP					
18. Pistillate-flowered oneseed and Rocky Mountain junipers will be retained during woodland thinning operations to sustain birds wintering in piñon-juniper woodlands.	BMP					

Actions for migratory bird management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
19. Piñon pine will be retained over juniper, and old growth juniper will be retained over younger trees during woodland thinning operations.	BMP					
20. Continue investigating effects of off-road vehicle use on ground nesting birds.	BMP					

Recurring actions for the invasive species management

Actions for invasive species management	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Continue to implement the Integrated Pest Management Plan and update the plan on a 5-year cycle.	REQ					
2. Treat selected invasive species using an integrated approach (biological, chemical, cultural, physical or mechanical, and prescribed burning).	REQ					
3. Continue to work with Colorado Department of Agriculture, Colorado State University, and U.S. Department of Agriculture-APHIS to release, redistribute, and monitor biological control agents for noxious weed control.	BMP					
4. Document the size and abundance of new and existing invasive species populations. Report occurrences of new species to county and state officials.	BMP					

Actions for invasive species management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
5. Actively participate with state, county, local and other federal agencies in the management of invasive species.	BMP					
6. Monitor treated invasive plant populations to document the results and to assess for further actions.	BMP					
7. Rehabilitate areas treated for invasive species control, where necessary.	BMP					
8. Identify and implement measures in the prevention of new infestations.	BMP					
9. Continue to be involved in education and outreach efforts.	BMP					
10. Continue to work with Fort Carson CLEOs to regulate and educate on the prevention of aquatic nuisance species (ANS), for example, not allowing weed contaminated boats on our ponds; requiring all anglers to remove all plant matter from gear prior to coming in contact with ponds and streams; mandating that anglers do not dump bait buckets or live well water into any installation waterbody; and, providing signage and boat ramp monitors during high use seasons.	BMP					

Recurring actions for pest management

Actions for pest management	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Maintain and implement the IPMP on a five-year cycle, including an update in 2020.	REQ					

Actions for pest management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
2. Emphasize integrated pest management techniques to minimize the use of pesticides.	REQ					
3. Ensure pesticide applicators are fully certified.	REQ					
4. Control those plant and wildlife species that affect human health, quality of life, natural resources management (e.g. reduce ecosystem functionality, displace native species) or the military mission.	BMP					
5. Coordinate with the Fort Carson Wildlife Office, and as needed with external partners such as USFWS and CPW, for the protection of wildlife (particularly listed or sensitive species) during pesticide operations.	REQ					
6. Use chemical control as a last resort to control pests; cultural, mechanical, and biological control methods are first priority. When chemical control is required, use the least environmentally toxic pesticide. Utilize new technology, educational opportunities, and the judicious and professional use of chemicals to reduce chemical pesticide use.	BMP					
7. Conduct preventive maintenance and surveillance inspections for pests.	BMP					

Actions for pest management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
8. Ensure pest management personnel receive adequate formal, as well as on-the-job, training to achieve required pest management certification and to operate at the most efficient level.	BMP					
9. Procure, maintain, and properly store adequate supplies of pesticides and pesticide dispersal equipment.	BMP					
10. Implement a safety program that provides for the safety and well-being of all pest management personnel.	BMP					
11. Work with other installations in the region to include the Fort Carson pest management program within the Front Range Ecoregional Management Team.	BMP					
12. Participate in Directorate and Garrison level working groups to ensure pest management activities are represented and are in agreement with Fort Carson goals and objectives.	BMP					

Recurring actions for Geographic Information Systems (GIS) management

Actions for GIS management	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Ensure that data meets published Army GIS standards.	REQ					
2. Provide maps and spatial analyses to support natural resources management, as well as other missions.	BMP					

Actions for GIS management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
3. Work cooperatively with all GIS users to share GIS data and products.	BMP					
4. Maintain up-to-date software and data.	BMP					

Recurring actions for outdoor recreation

Actions for outdoor recreation	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Manage Sikes Act permit sales and iSportman Recreation Management Service by maintaining the iSportman website and hunter check-in kiosks at both FC and PCMS.	BMP					
2. Continue management of recreational fishing on Fort Carson, to include stocking fish, improving fish habitat, and managing irrigation water to maximize angling opportunities.	BMP					
3. On Fort Carson, maintain public access areas (Bird Farm, Wildlife Demonstration Area, and fishing reservoirs).	BMP					
4. Continue annual meetings with CPW to share an annual comprehensive recreation report that includes permit sales, hunter check-in, and harvest data; and to discuss license numbers and other issues related to recreation.	BMP					
5. Continue consulting with the state and DPTMS to resolve hunter access restrictions during big game seasons.	BMP					

Actions for outdoor recreation cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
6. Continue to provide and assist with the free Colorado State Wounded Warrior hunting tags.	BMP					
7. Review and prioritize projects for habitat management, improvement, and restoration needs on FC and the PCMS for funding with permit proceeds per DoDI 4715.03.	BMP					
8. Develop a recreational fisheries management plan with stocking information and creel surveys every two to three years.	BMP					

Recurring actions for Wildlife Aircraft Strike Hazard (WASH)

Actions for Wildlife Aircraft Strike Hazard (WASH)	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. On Fort Carson and PCMS, evaluate and manage WASH hazards, such as prairie dogs, at BAAF and downrange aircraft landing sites to reduce the probability of a strike.	REQ					
2. Conduct pre-treatment surveys for burrowing owl prior to lethal control of prairie dogs.	REQ					
3. Consult with the USFWS regarding migratory bird depredation permits and eagles as related to airfield operations.	REQ					
4. Maintain grass heights at the airfield between 6” and 12” to reduce the attractiveness of the airfield to wildlife.	BMP					
5. Participate in the BAAF WASH Working Group.	BMP					

Actions for Wildlife Aircraft Strike Hazard (WASH) cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
6. Continue participation in the National Military Fish and Wildlife Association WASH working group.	BMP					
7. Conduct small mammal trapping to determine if population densities are likely to increase the number of raptors hunting at or near the airfield. Increased seasonal raptor activity would be filed as a Notice to Airmen (NOTAM) for pilot briefings.	BMP					
8. Continue to perform quarterly inspection of boundary fence for evidence of mammal encroachment and identify sites for repair.	BMP					
9. Consult with CPW regarding big game issues related to airfield operations.	REQ					

Recurring actions for wildland fire management

Actions for the wildland fire management	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Request annual funding to replace PPE, to maintain/replace equipment, and for annual training.	REQ					
2. Assist fire department personnel in suppressing wildfires.	REQ					
3. Annually assist Fort Carson Fire and Emergency Services in preparing and implementing the Prescribed Fire Burn Plan covering both Fort Carson and the PCMS.	REQ					
4. Ensure Prescribed Fire Smoke Plan and Burn Permits are in compliance with the INRMP, Land Use Plans, Army Wildland Policy Guidance, and CDPHE requirements.	REQ					

Actions for wildland fire management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
5. Suppress wildfires in Mexican spotted owl (MSO) habitat. Prescribe burn a buffer zone between Booth Mountain and training ranges to keep military mission-related fires from entering MSO habitat.	REQ					
6. Ensure soil, flora and faunal resources, and endangered species habitat enhancement and protection are considered during fire management activities.	REQ					
7. Use prescribed burning to support the Forestry and Invasive Species Management Programs.	REQ					
8. Coordinate with cultural resource and natural resource personnel during wildfires and prior to conducting prescribed burns.	REQ					
9. Describe fire use benefits in education and outreach programs such as the Environmental Protection Officer (EPO) training, and Earth and Arbor Day Events for local schools.	REQ					
10. Maintain and improve approximately 72 miles of firebreaks on Fort Carson.	REQ					
11. On active firing ranges create a minimum of a 300-foot wide strip of burned area along all perimeters, where feasible, that will be sufficient to contain any unintentional starts and therefore, assist in maintaining planned training schedules.	REQ					

Actions for wildland fire management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
12. Implement other fuel reduction techniques beyond prescribed fire (as appropriate), to include mastication, limbing, forest thinning, mowing, and herbicides, in coordination with the installation forester.	REQ					
13. Assist the ITAM program in maintaining Range and Training Land Assessment (RTLA) Land Management Objectives, and utilize RTLA data in monitoring the effects of prescribed fires on the landscape.	REQ					

Recurring actions for training of personnel

Actions for training of personnel	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. For government employees, include in their Individual Development Plans refresher training needed to fulfill job requirements (e.g., enforcement, GIS, NEPA, endangered species documentation/consultation, firefighter, pesticide application) and ensure that they are trained.	REQ					
2. Provide funding for personnel to attend annual workshops or professional conferences.	BMP					
3. Encourage personnel to join and be active in professional societies and cooperative groups.	BMP					

Recurring action for floodplains management

Action for floodplain management	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Review, via the NEPA process, all projects proposed for the Fort Carson main post area for impacts to floodplains and risks to life and property; propose mitigation measures for any such risks.	REQ					

Recurring action for mineral resources

Action for mineral resources	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Continue working with Congress to withdraw certain lands within Fort Carson and the PCMS from public availability for mining.	REQ					

Recurring actions for urban forest management

Actions for urban forest management	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Prevent damage or loss of valuable resources from insects, disease, wind, construction, and/or neglect.	REQ					
2. Provide technical advice to the grounds maintenance contractor to ensure all turfgrass and landscaped areas are properly maintained.	BMP					
3. Provide guidance on how to select, plant and maintain trees and shrubs on Fort Carson main post and the PCMS cantonment area to enhance aesthetics and provide benefits, such as visual barriers, windbreaks, decreased heating costs, reduced soil erosion, and safety enhancements.	BMP					

Actions for urban forest management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
4. Provide guidance on proper pruning of shrubs and trees and remove dead plants as an essential objective for the long-term health of trees and shrubs on the installation and to ensure the safety of people and structures.	BMP					
5. Annually participate in Arbor Day celebrations and meet standards established by the National Arbor Day Foundation to achieve recognition as a 'Tree City USA".	BMP					
6. Work with contractors and other directorates to include improved urban forestry requirements in solicitations for new contracts.	BMP					
7. Provide ongoing support in the implementation of the Xeriscape Master Plan.	BMP					
8. Encourage implementation of practices listed in the 1994 White House Memorandum on federal landscaped grounds.	REQ					
9. Complete and maintain an Urban Forest Management Plan for Fort Carson by December of 2020.	REQ					

Recurring actions for water rights management

Actions for water rights management	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Monitor stream flow diversions.	REQ					
2. Repair and maintain all water right infrastructures, including ditches, reservoirs, and wells.	REQ					

Actions for water rights management cont.	Req or BMP	FY20	FY21	FY22	FY23	FY24
3. Utilize water per decrees.	REQ					
4. Send monthly water use reports to the State District Water Commissioner.	REQ					
5. Send USGS quarterly gauge reports to the State.	REQ					
6. Send monthly well reports to Colorado Water Protective Development Association (CWPDA).	REQ					
7. Maintain approximately 35 wells at the PCMS.	BMP					

Recurring actions for Integrated Training Area Management (ITAM)

Actions for Integrated Training Area Management	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Provide training to military units and civilians to understand safety hazards, as well as, cultural and environmental resource issues.	BMP					
2. Develop and implement safety, maneuver access projects, and provide erosion control measures and structures to mitigate maneuver impacts within the training areas.	BMP					
3. Monitor and assess maneuver impacts on the condition of soils, vegetation, and watersheds.	BMP					
4. Develop and provide map products, as well as, provide documentation and information for the Range Operations Sustainable Range Program and military customers.	BMP					

Actions for Integrated Training Area Management	Req or BMP	FY20	FY21	FY22	FY23	FY24
5. Update and maintain databases on downrange training facilities, structures, and resources.	BMP					

Recurring actions for bald and golden eagle management

Actions for bald and golden eagle management	Req or BMP	FY20	FY21	FY22	FY23	FY24
1. Continue to review project proposals for potential conflicts with the BGEPA and identify permits, documents, collaboration, and recommend mitigation to avoid violations. Consultation with USFWS law enforcement and permit office may be required to ensure actions are adequately mitigated.	REQ					
2. Continue to conduct compliance-monitoring surveys at project sites and coordinate required mitigation with action proponents and/or law enforcement.	REQ					
3. Continue to conduct annual eagle eyrie surveys. Identify and map active eyries and provide locations to Range Control and Butts Army Airfield for protecting occupied sites. Active eyries will be protected with a buffer zone from January through the fledging season, generally in July.	REQ					
4. Continue assessment of risk of electrocution of hawks, eagles, and owls to include identification and mitigation of high-risk poles.	REQ					

APPENDIX 9: ITAM / LRAM Best Management Practices

ITAM/LRAM BMPs for Fort Carson and the PCMS
Updated January 2019

LRAM projects have to adhere to NEPA.
Including CWA Compliance:

- CWA Permits
- Wetlands Permits (putting fill in a wetland)
- SWPPP, NPDES, Storm-water Permits (as required)

Directorate of Public Works (DPW) will prepare the Record of Environmental Consideration (REC) for the proponent. In instances where the REC is prepared by DPW, the proponent will have to communicate to DPW the anticipated project impacts and Area of Potential Effect (APE). The REC will be reviewed by DPW subject matter experts. State Historical Preservation Officer (SHPO) Section 106 Survey and survey concurrence are reviewed during the DPW process. These processes are usually completed prior to contractor proposal request.

Dig Permits are Work Requests via BOID and the Operations and Maintenance Division and/or Range Control (depending upon the location of the dig), and are staffed through the normal NEPA process, which takes about seven to ten business days.

LRAM maintenance activities are routine preventative actions conducted to keep training areas and training area assets safe and usable. Maintenance is work required to preserve site conditions so that the site can be used effectively for its designated purpose. These maintenance activities also require a Work Request via BOID.

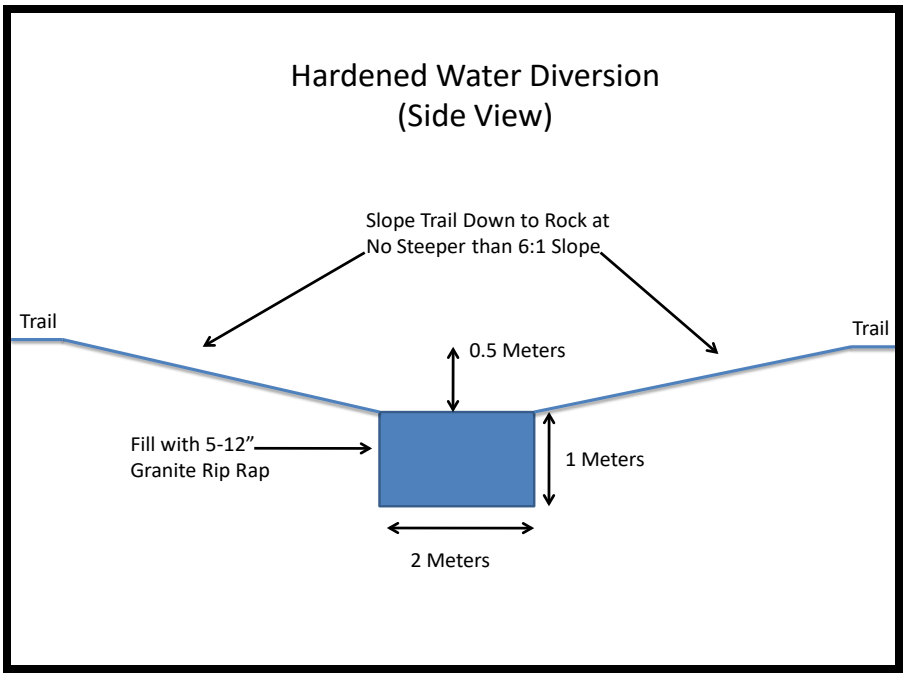
Repair entails fixing/restoring damaged training area assets in support of training events. Repair is usually not routine and it follows training events.

Reconfiguration entails changing existing landscape conditions to support particular training events. Reconfiguration can entail construction activities. Construction/reconfiguration involves expanding, altering existing assets or creating new training area assets.

BMP Index

- BMP's used in our LRAM program are, but not limited to:
- Armored Water Diversion Bars
- Bank Sloping
- Broadcast Seeding
- Critical Area Seeding (drill seeding 2x rate)
- Drill Seeding
- Elevated Maneuver Trail Enhancement
- Geo-textile Fabric
- Head Cut Remediation
- Low Water Crossing
- New Elevated Maneuver Trails
- Rock Check Dams
- Seibert Stake Markers
- Rock Ripping
- Trail Crowning
- Trail In-Sloping
- Water Bar

Armored Water Diversion Bars



On trails with a steep drop off on one side, the use of a water bar may lead to head cuts developing in the trail itself. In order to prevent this while still diverting the water from the trail we have developed the Armored Water Diversion. An Armored Water Diversion consists of a two meter wide by one meter deep excavation. This excavation is filled with 5-12" granite rip rap. This line of rip rap will be embedded half a meter into the trail. This will allow for a swale to be constructed around the rip rap assuring that any water flowing down the trail finds its way to the rip rap thus preventing linear erosion across the trail. The swale will have sides no steeper than 6:1 to allow for easy vehicular passage along the trail.

<u>Rip Rap Specification</u>**:**

Any rip rap used on an LRAM project will consist of dense, hard, durable stone, angular in shape and resistant to weathering. Optimal rock will be of granite origin with 100 percent surface fracture. Rounded stone or boulders will not be accepted as rip rap material. The stone shall have a specific gravity of at least 2.5. Each piece shall have its greatest dimension not greater than three times its least dimension. Rip rap will be clean crushed rock and cleared of fines.

If the specified 5-12 inch rip rap is not available, then California Department of Transportation (CDOT) standard D50 stone size of 6 inches may be used. Details of this stone size range is specified in CDOT table 506-2E. If the specified 3" minus inch rip rap is not available, 1-3 inch may be used. However a sample of the 1-3 inch must be approved by the LRAM program prior to installation.

Deviations from This Standard Design:

Armored Water Diversion 1

	Length	Rip Rap Width	Rip Rap Depth	Total Rip Rap	Swale Slope	Total Excavation
Unit	Feet	Feet	Feet	Tons	Ratio	Cubic Yard
Qty.		6.6	3.3			

Armored Water Diversion 2

	Length	Rip Rap Width	Rip Rap Depth	Total Rip Rap	Swale Slope	Total Excavation
Unit	Feet	Feet	Feet	Tons	Ratio	Cubic Yard
Qty.		6.6	3.3			

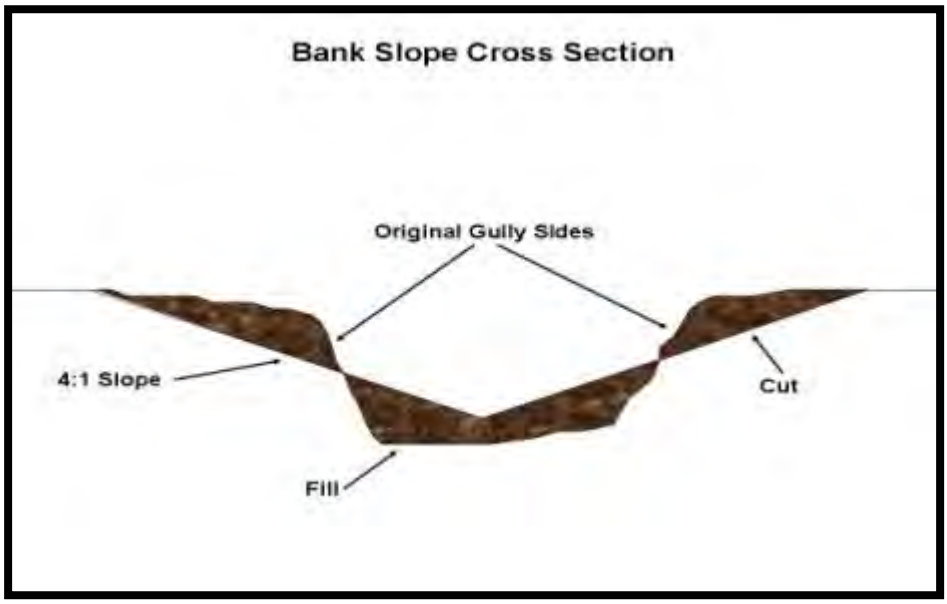
Armored Water Diversion 3

	Length	Rip Rap Width	Rip Rap Depth	Total Rip Rap	Swale Slope	Total Excavation
Unit	Feet	Feet	Feet	Tons	Ratio	Cubic Yard
Qty.		6.6	3.3			

Armored Water Diversion Totals

	Total Rip Rap	Total Excavation
Unit	Tons	Cubic Yard
Qty.		

Bank Sloping



Bank sloping is used to eliminate safety hazards and increase maneuverability in areas hampered by deep, sheer walled gullies.

Prior to further excavation, any top soil and its current vegetation (up to 6 inches deep) will be removed and stockpiled for later reapplication. All efforts should be made to avoid disturbing any trees that may be located at the site. Any tumbleweed or other noxious vegetation present at the project site will be collected prior to excavation and stockpiled adjacent to the site in the location least likely to hamper the maneuverability of the area.

This noxious vegetation should be left in piles no larger than four feet in diameter and four feet in height. If multiple stockpiles are necessary, they will be created so as to allow easy vehicular maneuver around each pile. This vegetation will not be reapplied to the site. The location of these piles should be coordinated with the LRAM program prior to placement.

The sheer sides will be cut to a slope no steeper than 4:1. This slope allows for safe military vehicle maneuver. The material cut from the gully walls will be pushed into the channel and smoothed. After smoothing, no ridges greater than eight to ten inches in height will be present. When possible, construction will be completed so that any such ridges remaining will follow the natural contours of the site.

After the channel is completely reshaped, the stockpiled topsoil will be reapplied in an even layer across the disturbed surface. All disturbed areas will be seeded with the Fort Carson Critical Area Seed Mix as described in the seeding section of this document.

Deviations from This Standard Design:

Bank Sloping Excavation

Reach	Length (ft.)	Width(ft)	Depth (ft.)	Excavation (Yd^3)
1				
2				
3				
4				
5				
6				
7				
8				

Bank Sloping Location

Reach	Start Location		End Location	
1	**E** 5	**N** 42	**E** 5	**N** 42
2	**E** 5	**N** 42	**E** 5	**N** 42
3	**E** 5	**N** 42	**E** 5	**N** 42
4	**E** 5	**N** 42	**E** 5	**N** 42
5	**E** 5	**N** 42	**E** 5	**N** 42

Broadcast Seeding

Broadcast seeding requires the use of a broadcast seeder to seed a site. Fort Carson Military Reservation and Piñon Canyon Maneuver Site each have their own specially tailored broadcast seed mix.

Broadcast seeding requires seedbed preparation. Depending upon the age and degree of disturbance, the site may require additional grading to level ruts or harrowing to knock down weeds. Sites may also require crimp mulching with weed free straw or hay after seeding. This will be specified for each site. Broadcast seeding may occur on slopes greater than 3:1 or especially rocky sites but should not be attempted on windy days.

The window for seeding extends from November to April. Sites should not be seeded during the growing season. Sites should be harrowed before AND after broadcast seeding. To minimize erosion, all seeding machinery will follow paths along the natural contours of the site when possible.

If a substitution to the standard mix is to be made, the LRAM program must be notified in writing.

Seed Mix and Substitutions

Fort Carson Military Reservation Broadcast Seed Mix

Common Name	*Scientific Name*	lbs. PLS/ac
Barton Western Wheat Grass	*Agropyron smithii*	4.0
Vaughn Sideoats Grama	*Bouteloa curtipendula*	3.0
Alkali Sacaton	*Sporobolus airoides*	0.2
Sand Dropseed	*Sporobolus cryptandrus*	0.4
Ladak Alfalfa	*Medicago sativa*	1.0
Blue Grama	*Bouteloua gracilis*	1.0
Pryor Slender Wheatgrass	*Elymus trachycaulus*	4.0
	Total:	**13.6**

Piñon Canyon Maneuver Site Broadcast Seed Mix

Common Name	*Scientific Name*	lbs. PLS/ac
Barton Western Wheat Grass	*Agropyron smithii*	3.0
Vaughn Sideoats Grama	*Bouteloa curtipendula*	3.5
Alkali Sacaton	*Sporobolus airoides*	0.2
Sand Dropseed	*Sporobolus cryptandrus*	0.5
Ladak Alfalfa	*Medicago sativa*	1.0
Blue Grama	*Bouteloua gracilis*	1.0
	Total:	**9.2**

When the Vaughn cultivar of Side Oats Grama (*Bouteloua curtipendula*) is not available the El Reno cultivar or Pastura Little Bluestem (*Schizachyrium scoparium*) shall be substituted at the same PLS/Acre.

When the Barton cultivar of Western Wheatgrass (*Agropyron smithii*) is not available, the Ariba cultivar may be used at the same seeding rate.

When the Pryor cultivar of Slender Wheatgrass (*Agropyron trachycaulum*) is not available, then the San Luis cultivar may be substituted at the same seeding rate.

Either the Pastura or Cimarron cultivar of Little Bluestem (Schizachyrium scoparium) may be used.

Critical Area Seeding

Critical Area Seeding is the process of seeding freshly disturbed soil with twice the normal rangeland seeding application rate of Pounds of Live Seed (PLS) per acre. Fort Carson and Piñon Canyon Maneuver Site each have their own specially tailored seed mix described below.

At each specified site, the seed bed will be prepped for seeding. This is usually accomplished by disking the bare soil. This soil will then be drill seeded with the appropriate seed mix and crimp mulched. Crimp mulching consists of spreading appropriate straw on the site and securing it with a crimping disc. Crimp mulching is used to maintain soil moisture and reduce erosion until seed germination.

The site must be crimp mulched with Colorado certified weed free straw. Documentation proving this status must be provided to the LRAM Coordinator prior to seeding. A second copy must be kept on site for the duration of the seeding effort.

Seeding during dry periods in the growing months (May-November) will require watering of the site. Dry periods are defined as a lack of substantial moisture for two weeks prior to seeding and no significant (50% or greater) chance of moisture for the week following seeding. If this is the case, water must be applied to the site prior to crimp mulching. The water should be applied in a uniform fashion, assuring all seed has equal access to supplied moisture. Enough water shall be applied to the site to assure substantially enhanced seed germination without flooding or pooling. The site should be given time (at least one day) for soil to absorb moisture before crimp mulching so as to prevent moisture from locking into the mulch instead of the soil.

Seeding of this task will occur within one month of the completion of any dirt work on site. This timeframe may only be extended with the prior approval of the LRAM program.

All seeding machinery will follow paths along the natural contours of the site when possible. This will minimize erosion along any ridges left behind by the seeding process.

If a substitution to the standard mix is to be made, the LRAM program must be notified of the change in writing.

<u>Deviations from This Standard Design:</u>

Seeding Quantities Required

Mix	Area to be Seeded	Unit
Fort Carson		Acres
Piñon Canyon		Acres

Fort Carson Critical Area Seed Mix

Common Name	*Scientific Name*	PLS/AC
Barton Western Wheat Grass	*Agropyron smithii*	4.0
Vaughn Sideoats Grama	*Bouteloa curtipendula*	3.0
Alkali Sacaton	*Sporobolus airoides*	0.2
Sand Dropseed	*Sporobolus cryptandrus*	0.4
Ladak Alfalfa	*Medicago sativa*	1.0
Blue Grama	*Bouteloua gracilis*	1.0
Pryor Slender Wheatgrass	*Elymus trachycaulus*	4.0
Little Bluestem	*Schizachyrium scoparium*	0.4
	Total:	**14.0**

Piñon Canyon Critical Area Seed Mix

Common Name	*Scientific Name*	PLS/AC
Barton Western Wheat Grass	*Agropyron smithii*	4.0
Vaughn Sideoats Grama	*Bouteloa curtipendula*	3.0
Alkali Sacaton	*Sporobolus airoides*	0.2
Sand Dropseed	*Sporobolus cryptandrus*	0.4
Ladak Alfalfa	*Medicago sativa*	1.0
Blue Grama	*Bouteloua gracilis*	1.0
	Total:	**9.6**

Seed Mix Substitutions**:**

When the Vaughn cultivar of Side Oats Grama (*Bouteloua curtipendula*) is not available the El Reno cultivar or Pastura Little Bluestem (*Schizachyrium scoparium*) shall be substituted at the same PLS/Acre.

When the Barton cultivar of Western Wheatgrass (*Agropyron smithii*) is not available, the Ariba cultivar may be used at the same seeding rate.

When the Pryor cultivar of Slender Wheatgrass (*Agropyron trachycaulum*) is not available, then the San Luis cultivar may be substituted at the same seeding rate.

Either the Pastura or Cimarron cultivar of Little Bluestem (*Schizachyrium scoparium*) may be used.

Drill Seeding

Drill seeding requires the use of a rangeland or no till drill to seed a site. It is the default seeding method. Fort Carson Military Reservation and Piñon Canyon Maneuver Site each have their own specially tailored drill seed mix.

Drill seeding does not require seedbed preparation. However, depending upon the age and degree of disturbance, the site may require grading to level ruts or harrowing to knock down weeds. Sites may also require crimp mulching with weed free straw or hay after seeding. This will be specified for each site. Drill seeding is not viable on slopes greater than 3:1 or especially rocky sites.

The window for seeding extends from November to April. Sites should not be seeded during the growing season. Seeds should be planted ¼ to ½ inch deep with rows spaced 7-12 inches. To minimize erosion, all seeding machinery will follow paths along the natural contours of the site when possible.

If a substitution to the standard mix is to be made, the LRAM program must be notified of the change in writing.

Seed Mix and Substitutions

Fort Carson Military Reservation Drill Seed Mix

Common Name	*Scientific Name*	lbs PLS/ac
Barton Western Wheat Grass	*Agropyron smithii*	2.0
Vaughn Sideoats Grama	*Bouteloa curtipendula*	1.5
Alkali Sacaton	*Sporobolus airoides*	0.1
Sand Dropseed	*Sporobolus cryptandrus*	0.2
Ladak Alfalfa	*Medicago sativa*	0.5
Blue Grama	*Bouteloua gracilis*	0.5
Pryor Slender Wheatgrass	*Elymus trachycaulus*	2.0
	Total:	6.8

Piñon Canyon Maneuver Site Drill Seed Mix

Common Name	*Scientific Name*	lbs PLS/ac
Barton Western Wheat Grass	*Agropyron smithii*	1.5
Vaughn Sideoats Grama	*Bouteloa curtipendula*	1.75
Alkali Sacaton	*Sporobolus airoides*	0.1
Sand Dropseed	*Sporobolus cryptandrus*	0..25
Ladak Alfalfa	*Medicago sativa*	0.5
Blue Grama	*Bouteloua gracilis*	0.5
	Total:	**4.6**

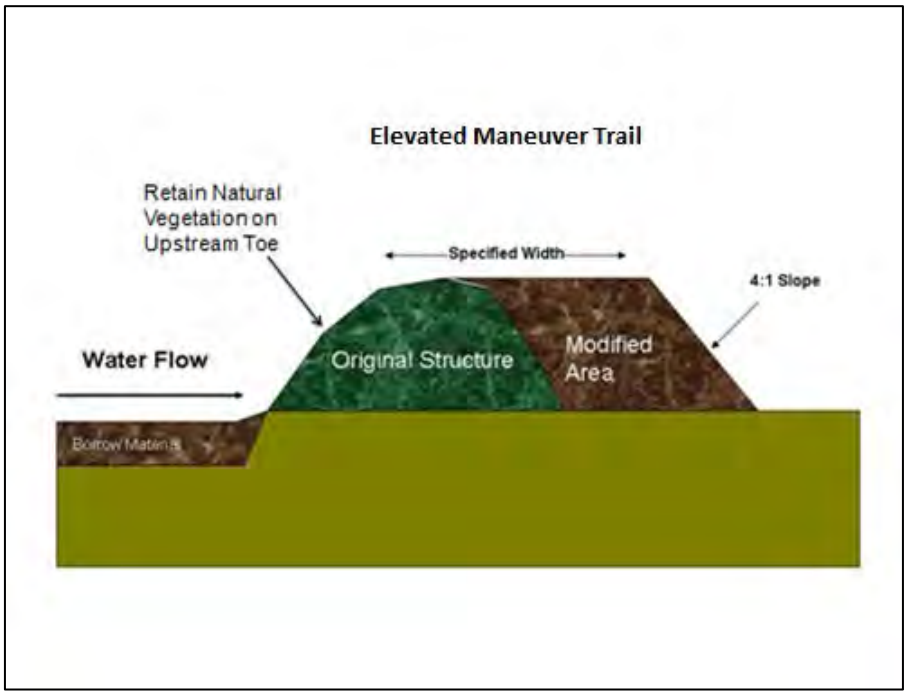
When the Vaughn cultivar of Side Oats Grama (*Bouteloua curtipendula*) is not available the El Reno cultivar or Pastura Little Bluestem (*Schizachyrium scoparium*) shall be substituted at the same PLS/Acre.

When the Barton cultivar of Western Wheatgrass (*Agropyron smithii*) is not available, the Ariba cultivar may be used at the same seeding rate.

When the Pryor cultivar of Slender Wheatgrass (*Agropyron trachycaulum*) is not available, then the San Luis cultivar may be substituted at the same seeding rate.

Either the Pastura or Cimarron cultivar of Little Bluestem (Schizachyrium scoparium) may be used.

Elevated Maneuver Trail Enhancement



Site Preparation**:**

The borrow area, the top surface, and the downstream toe of the elevated maneuver trail to be enhanced will be stripped of all vegetation and topsoil. The established vegetation on the upstream toe of the embankment will be left as intact as possible. The removed topsoil will be stockpiled and later reapplied to the finished structure to promote the establishment of vegetation.

Any noxious vegetation such as tumbleweed or tamarisk on site will be removed and stockpiled in piles no larger than four feet high and four feet wide with ample maneuver space between piles. Tamarisk that is near the work site and removable within the scope of the project should be removed as well. This will assist with the perpetual effort to decrease Tamarisk populations at both Fort Carson and the PCMS. Any Tamarisk removed from the site should be placed on ground high enough above the water line to prevent the plant from rooting again. These piles will be created in the locations least likely to hamper the maneuverability of the area. This noxious vegetation will not be reapplied to the site.

Fill Placement:

The borrow area for this elevated maneuver trail enhancement project will be current sediment basin. The excavations of the borrow area will not compromise the foundation of the current maneuver trail. To the greatest extent possible, excavation of the borrow area will follow the natural contours of the site to minimize erosion. Fill material will be excavated from the borrow area and laid on the erosion control structure in continuous horizontal layers in twelve inch lifts and compacted after each application. This compaction will be accomplished by extra runs of the wheeled tractor belly scraper at half normal speed with paddles locked unless otherwise negotiated. Appropriate soil moisture will be assured as specified below.

Fill material will not contain tumbleweed, topsoil, brush, snow, ice, frozen material, or any other perishable material. Rock particles larger than 12 inches in diameter shall be removed prior to compaction of the fill material. The distribution of fill throughout the embankment structure shall be essentially uniform. Upon placement, the fill material used shall be free from lenses, pockets, streaks, or layers of material substantially different in moisture, texture, or content.

If the surface of any layer becomes too hard and/or smooth for proper bonding with adjacent layers it shall be scarified parallel to the axis of the fill to a depth of no less than two inches before subsequent layers are placed. If necessary for proper bonding, the topmost layer will be moistened with a water truck prior to placement of the subsequent layer of fill.

The top surface of the embankment shall be crowned with approximately 3 percent slope drainage to ensure effective drainage. The overall structure will have a cross-sectional slope no steeper than 4:1. This may require bank sloping gully walls if present.

The downstream toe of the maneuver trail embankment will be a continuous 4:1 slope to the existing contours. This means that if there is a gully present on site, then the downstream toe will consist of one continuous 4:1 slope from embankment crest to gully bottom, with adjacent continuous slopes from maneuver trail crest to gully crest. This will provide vehicular access into the gully to allow for cover and concealment during military exercises. The upstream toe of the maneuver trail is also to be one continuous slope from maneuver trail crest to basin bottom.

Maximum Basin Capacity**:**

The capacity of the newly carved basin is never to exceed two acre-feet. If a contractor feels that the maneuver trail embankment cannot be enhanced as otherwise specified without exceeding the two acre-feet maximum in basin capacity, this is to be identified before the contract is awarded and will be negotiated as necessary. If this concern is not identified prior to contract award and the basin exceeds two acre-feet in capacity, a culvert must be installed at the two acre-feet level at the contractor's expense as specified in the next section.

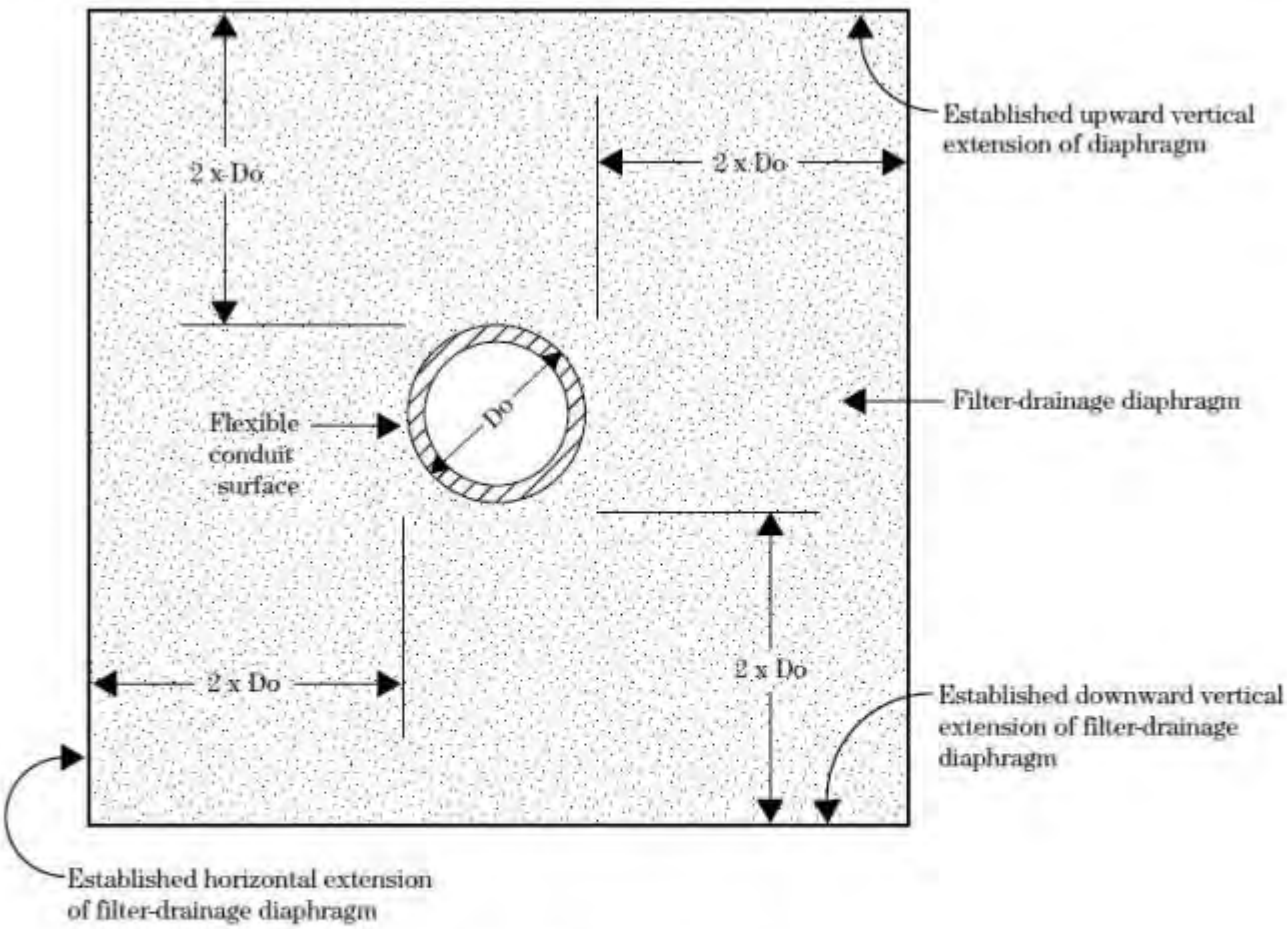
Culvert:

If specified, an 18" diameter Corrugated Metal Pipe (CMP) culvert will be installed in the maneuver trail embankment. If this culvert is installed, the earth fill around the CMP will be backfilled in six inch lifts to provide ample compaction. The culvert will be installed at a height in the maneuver trail's profile that will allow no more than two acre-feet of water to collect in the basin and which will also prevent water gathering to a depth of greater than four feet. If a culvert is necessary, the quantity of fill to be removed and then replaced from the structure of the current maneuver trail embankment will be specified below. The downstream outlet of the culvert will be armored with 16 tons of 5-12 inch granite rip rap arranged in a surface pad of appropriate shape to minimize point erosion from the culvert outflow. The culvert will be installed in the embankment's profile in such a way as to allow it to drain freely.

Filter Diaphragm:

Whenever a culvert is specified, a filter diaphragm must be installed to protect the structure. This diaphragm will consist of fine washed concrete sand that meets the requirement of ASTM C 33. Any sand used will be "self-healing" i.e. it will be able to adjust and fill in cracks that may form in the surrounding earth fill. The diaphragm will be constructed according to the following diagrams. In the first diagram, "Do"

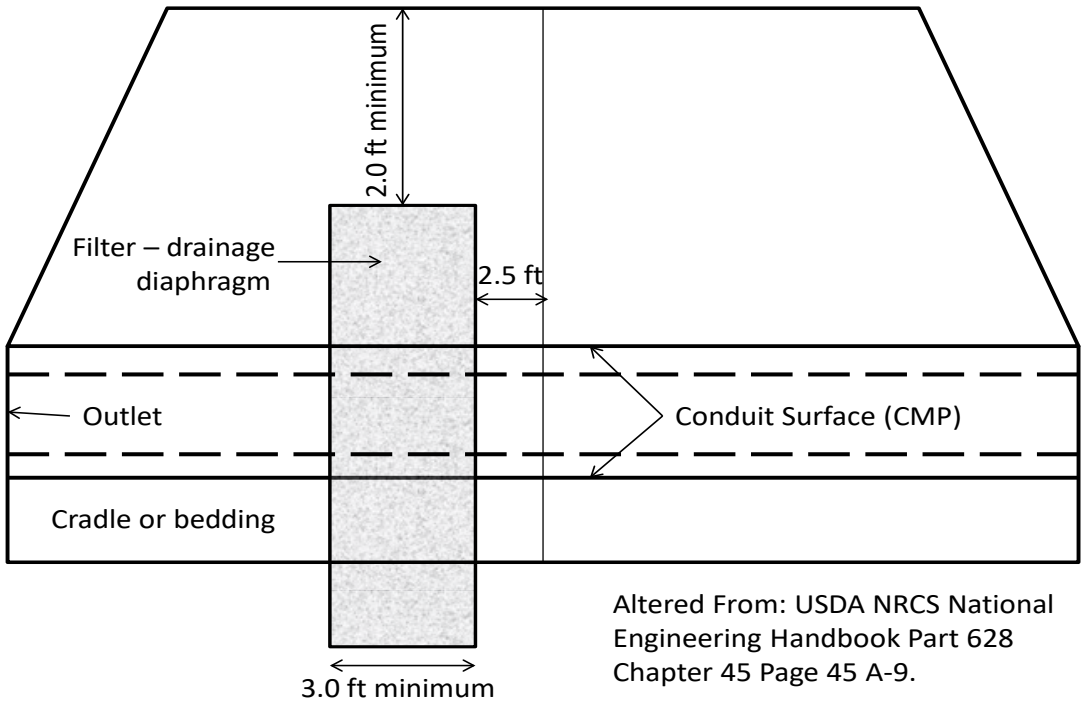
will always equal 18 inches. Thus the collar will be 90 inches (7.5 feet) wide, 90 inches (7.5 feet) tall and 36 inches (3 feet) thick. This collar will be located parallel to the center line of the embankment, on the outlet side of the key trench, and perpendicular to the CMP. If the culvert must be skewed to allow for proper drainage, the diaphragm will be located parallel to the center line of the embankment, on the outlet side of the key trench. The diaphragm will be located a minimum of 2 feet below the surface of the embankment. It will also not penetrate any bedrock surface below the embankment.



Cross section

Source: USDA NRCS National Engineering Handbook Part 628 Chapter 45 page 45A-8

Profile



Altered From: USDA NRCS National Engineering Handbook Part 628 Chapter 45 Page 45 A-9.

Rip Rap Specification**:**

Any rip rap used on an LRAM project will consist of dense, hard, durable stone, angular in shape and resistant to weathering. Optimal rock will be of granite origin with 100 percent surface fracture. Rounded stone or boulders will not be accepted as rip rap material. The stone shall have a specific gravity of at least 2.5. Each piece shall have its greatest dimension not greater than three times its least dimension. Rip rap will be clean crushed rock and cleared of fines.

If the specified 5-12 inch rip rap is not available, then CDOT standard D50 stone size of 6 inches may be used. Details of this stone size range is specified in CDOT table 506-2E. If the specified 3” minus inch rip rap is not available, 1-3 inch may be used. However a sample of the 1-3 inch must be approved by the LRAM program prior to installation.

Deviations from This Standard Design:

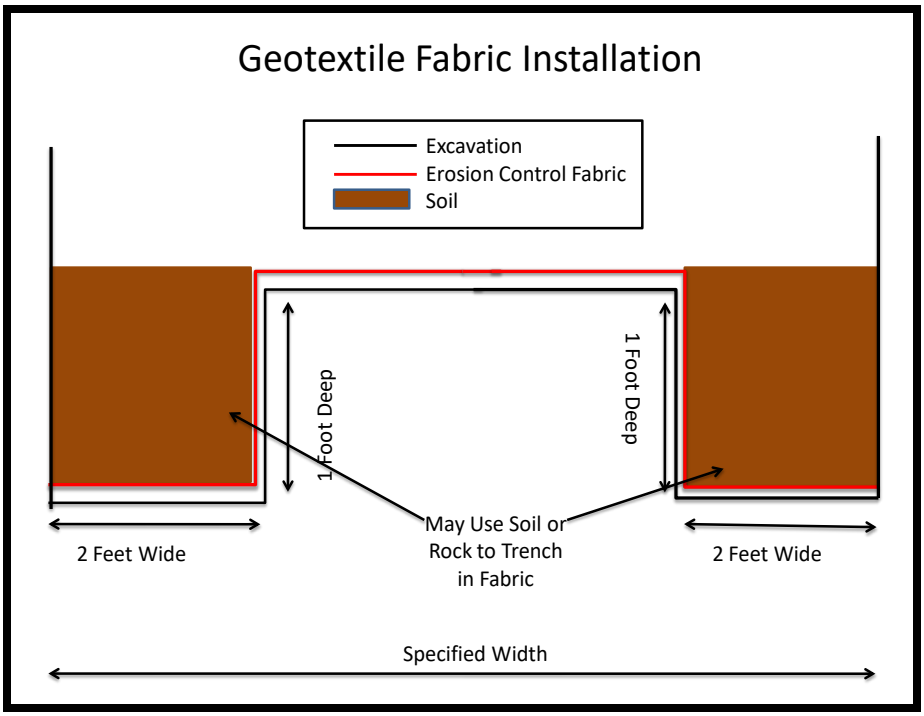
Embankment 1 Quantities Required

	Length (ft.)	Width (ft.)	Height (ft.)	Total Excavation (Yd^3)
Key Trench		5	4	
Embankment				
Overflow				

Embankment 1 Specifications

Culvert To Be Installed?	
Armor Culvert Outlet?	
Overflow Natural or Artificial?	
Overflow To Be Rock Armored?	
Area to be Seeded:	

Geo-textile Fabric



Several types of LRAM projects call for geo-textile fabric to be placed underneath granite rip rap. This is to prevent hydraulic undercutting in projects such as hardened crossings, gully fills, and head-cut remediation projects.

The fabric used will be a quality, monofilament, woven geo-textile with a high percent open area. The fabric used is to meet and not exceed the following requirements:

Property	Test Method	Min. Avg. Roll Value (English)	Min. Avg. Roll Value (Metric)
Tensile Strength	ASTM D-4632	120 lb.	0.533 kN
Tensile Elongation	ASTM D-4632	50%	50%
Puncture Strength	ASTM D-4633	65 lb.	0.289 kN
Trapezoid Tear	ASTM D-4633	50 lb.	0.222 kN
UV Resistance	ASTM D-4655	70% @500 hr.	70% @ 500 hr.
AOS	ASTM D-4751	70 US Sieve	0.212 mm
Permittivity	ASTM D-4491	1.8 sec-1	1.8 sec-1
Water Flow Rate	ASTM D-4491	120 gal/min/ft^2	4885 l/min/m^2

Head Cut Remediation

A head cut is the intersection of an active gully and a trail. These locations are remedied in one of two ways.

The first method is to fill the head cut with material from a specified location. This fill will be accomplished according to the specifications in the fill site section of this document.

The second method, used for larger head cuts, is to bank slope all three walls of the head cut itself according to the specifications in the bank sloping section of this document. This bank sloped area will then be armored with a layer of geotextile fabric installed as specified in the geotextile fabric section of this document and then covered with a surface layer of 5-12 inch granite rip rap.

Rip Rap Specification**:**

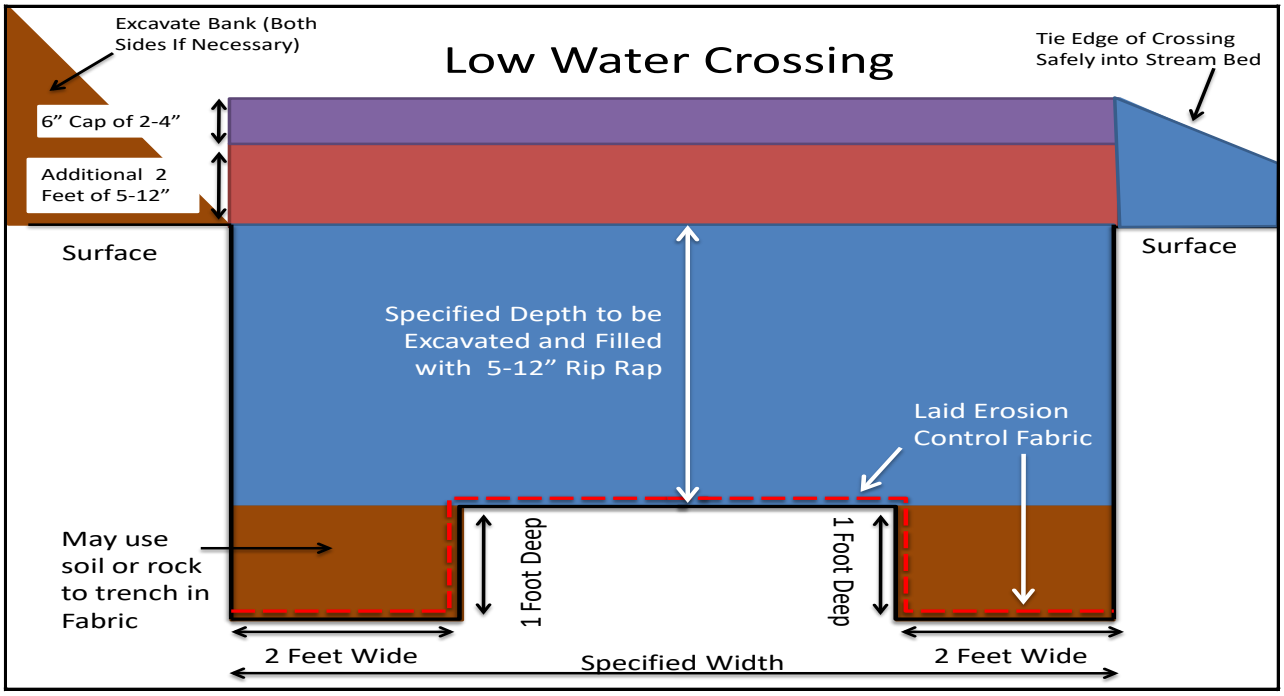
Any rip rap used on an LRAM project will consist of dense, hard, durable stone, angular in shape and resistant to weathering. Optimal rock will be of granite origin with 100 percent surface fracture. Rounded stone or boulders will not be accepted as rip rap material. The stone shall have a specific gravity of at least 2.5. Each piece shall have its greatest dimension not greater than three times its least dimension. Rip rap will be clean crushed rock and cleared of fines. If the specified 5-12 inch rip rap is not available, then CDOT standard D50 stone size of 6 inches may be used. Details of this stone size range is specified in their table 506-2E.

Deviations from This Standard Design:

Remediation Method to be Used

Material	Amount	Unit
HC Excavations	0.0	Yd^3
5-12” Rip Rap	0.0	Tons
Geo-textile	0.0	Yd^2

Low Water Crossing



A low-water crossing is placed where trails intersect with wet or potentially wet areas. This allows vehicles to cross drainages successfully and with a minimum of damage to the area.

The area to be converted into a low water crossing will be excavated to a depth of 2 feet and lined with geo-textile fabric to prevent hydraulic undercutting. Please see the Geo-textile Fabric section for details. This excavation will then be filled with 5-12 inch diameter granite rip rap. Once surface grade has been reached, an additional 2 feet of 5-12 inch granite rip rap will be placed over the area of the crossing to act as an erosion control feature. Thus a total of 4 feet of 5-12" rip rap will be placed on site. This rip rap layer will taper on both edges to tie into the stream bed at a 45 degree angle. There should never be a sharp angle on a LRAM project. Thus it is imperative that the edges of the hardened low water crossing do not drop off abruptly. They should tie into the stream bed at a gradual angle of 45 degrees or more.

The 5-12" rip rap will then be covered with 2-4" granite rip rap in a layer six inches deep. This layer provides a smoother ride for vehicles using the crossing. The 2-4" rip rap will be centered parallel to the line of the crossing and perpendicular to the line of the stream bed.

Rip Rap Specification:
Any rip rap used on an LRAM project will consist of dense, hard, durable stone, angular in shape and resistant to weathering. Optimal rock will be of granite origin with 100 percent surface fracture. Rounded stone or boulders will not be accepted as rip rap material. The stone shall have a specific gravity of at least 2.5. Each piece shall have its greatest dimension not greater than three times its least dimension. Rip rap will be clean crushed rock and cleared of fines.

Deviations from This Standard Design:

First Low Water Crossing (Location: E5 N42)

	Length	Width	Depth	Total Excavation	5-12” Rip Rap	3” Minus Rip Rap
Unit	Feet	Feet	Feet	Cubic Yards	Tons	Tons
Qty.						

Second Low Water Crossing (Location: E5 N42)

	Length	Width	Depth	Total Excavation	5-12” Rip Rap	3” Minus Rip Rap
Unit	Feet	Feet	Feet	Cubic Yards	Tons	Tons
Qty.						

Third Low Water Crossing (Location: E5 N42)

	Length	Width	Depth	Total Excavation	5-12” Rip Rap	3” Minus Rip Rap
Unit	Feet	Feet	Feet	Cubic Yards	Tons	Tons
Qty.						

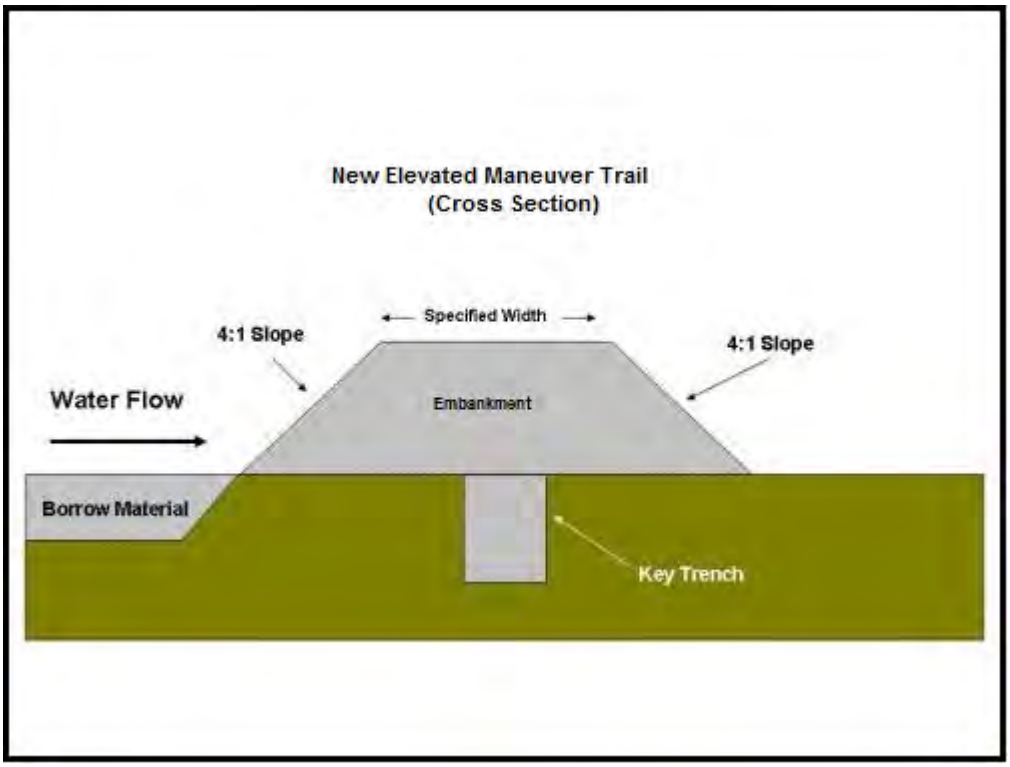
Fourth Low Water Crossing (Location: E5 N42)

	Length	Width	Depth	Total Excavation	5-12” Rip Rap	3” Minus Rip Rap
Unit	Feet	Feet	Feet	Cubic Yards	Tons	Tons
Qty.						

Low Water Crossing Totals

	Total Excavation	5-12” Rip Rap	3” Minus Rip Rap
Unit	Cubic Yards	Tons	Tons
Qty.			

New Elevated Maneuver Trail



Key Trench and Foundation Preparation**:**

Both foundation sites and borrow areas of new elevated maneuver trails will be stripped of all vegetation and topsoil. This removed topsoil will be stockpiled and later reapplied to the finished structure to promote the establishment of vegetation. Any noxious vegetation on site will be removed and stockpiled in piles no larger than four feet high and four feet wide with plenty of maneuver space between piles. These piles will be created in the locations least likely to hamper the maneuverability of the area. This noxious vegetation will not be reapplied to the site.

A core or key trench will be dug in the center of the future trail embankment site. This trench will run the length of the embankment and key into undisturbed soil on either end of the embankment. This trench will be five feet wide and four feet deep unless otherwise specified. To provide ample compaction, fill material in the key trench will be placed in six inch lifts and compacted after every lift. This compaction will be accomplished with extra runs of the wheeled tractor belly scraper with the paddles locked, unless otherwise coordinated. The surface material of the foundation and key trench shall be compacted and bonded with the first layer of earth fill for the above ground structure of the embankment.

Fill Placement**:**

Fill material will not be placed until construction of a key trench and proper foundation preparation steps have been taken and inspected. The borrow area for the embankment will be on the upstream side of the

future structure. The excavations of the borrow area will not compromise the embankment's foundations. The excavation of this borrow area will form the sediment basin of the embankment. Fill material will be excavated from the borrow area and laid on the erosion control structure in continuous horizontal layers in twelve inch lifts and compacted after each application. This compaction will be accomplished by extra runs of the scraper at half normal speed with paddles locked unless otherwise negotiated. Appropriate soil moisture will be assured as specified below.

Fill material will not contain tumbleweed, topsoil, brush, any other perishable material, snow, ice, or frozen material. Rock particles larger than 12 inches in diameter shall be removed prior to compaction of the fill material. The distribution of fill throughout the embankment structure shall be essentially uniform. The fill material used shall be free from lenses, pockets, streaks, or layers of material substantially different in moisture, texture, or content.

If the surface of any layer becomes too hard and/or smooth for proper bonding with adjacent layers it shall be scarified parallel to the axis of the fill to a depth of no less than two inches before subsequent layers are placed. If necessary for proper bonding, the topmost layer will be moistened with a water truck prior to placement of the subsequent layer of fill.

The top surface of the embankment shall be crowned with approximately 3 percent slope drainage to ensure effective drainage. The overall structure will have a cross-sectional slope no steeper than 4:1. This may require bank sloping gully walls if present.

Culvert:

If specified, an 18" diameter Corrugated Metal Pipe (CMP) culvert will be installed in the new elevated maneuver trail. If this culvert is installed, the earth fill around the CMP will be backfilled in six inch lifts to provide ample compaction. The culvert will be installed at a height in the embankment's profile that will allow no more than two acre-feet of water to collect in the basin of the embankment and which will also prevent water gathering to a depth of greater than four feet. The downstream outlet of the culvert will be armored with 5-12 inch granite rip rap. This will minimize erosion at the culvert outlet.

Rip Rap Specification**:**

Any rip rap used on an LRAM project will consist of dense, hard, durable stone, angular in shape and resistant to weathering. Optimal rock will be of granite origin with 100 percent surface fracture. Rounded stone or boulders will not be accepted as rip rap material. The stone shall have a specific gravity of at least 2.5. Each piece shall have its greatest dimension not greater than three times its least dimension. Rip rap will be clean crushed rock and cleared of fines. If the specified 5-12 inch rip rap is not available, then CDOT standard D50 stone size of 6 inches may be used. Details of this stone size range is specified in their table 506-2E.

Overflows**:**

The embankment will be constructed to maintain the surface of the embankment at a height of four feet above the overflow. Overflows will be one of two types as specified in below. The preferable choice is a natural overflow; which, is one incorporated into a large, relatively level, naturally vegetated area. If this is the case, all effort must be made to disturb the vegetation located in the future overflow as little as possible.

If such a large vegetated area is not available to incorporate into the overflow, an artificial overflow may need to be cut from the surrounding earth. In some cases, the cut overflow will require rock armoring with 5-12 inch rip rap. Where the crown of the embankment intersects the overflow, an additional six inch deep cap of 3” minus inch rip rap will be installed. This will allow for smooth vehicular crossing of the overflow. The type of overflow to be constructed on this embankment will be specified below.

Moisture Content Requirements and Water Truck Contingencies**:**

The moisture content of the fill material shall be maintained within the limits required to provide ample fill compaction in the new embankment structure, prevent bulking or dilation of material while being hauled or compacted, prevent adherence of the fill material to tracks and treads of construction equipment and ensure the crushing and blending of soil clods and aggregations into a reasonably homogenous mass.

The moisture content of the fill material will be considered adequate to provide ample compaction when it passes the “hand test.” This method is a very basic, informal, field measurement of soil moisture. It begins by grabbing a handful of soil and squeezing it in the palm of the hand. If the soil on a site is powdery when squeezed and does not retain shape when released, then the soil is too dry. If it is moldable but it shatters when dropped from waste height, the soil is still too dry. If the soil retains its shape and only breaks into a few pieces when dropped, the soil is of the right moisture content for ample compaction. If the soil leaves traces on the fingers and stays in one piece when dropped from height, then it is too moist for compaction.

If fill material for a given embankment becomes too dry to satisfy these conditions a water truck may be necessary. If a water truck is needed, as much advance notice as possible must be provided to the LRAM program in order to initiate mobilization of funds to cover this contingency.

When used, water from the truck will be sprinkled on fill material in the borrow area before application to the dams surface. If necessary, uniform moisture content of the fill material will be attained by disking.

If fill material for a given embankment becomes too moist to satisfy the necessary conditions, the project may have to be temporarily abandoned to allow for natural drying of the fill material.

Rock Check Dams

Rock check dams are used to control water in a drainage that has lost its natural protection from erosion. Rock check dams reduce erosion by slowing the flow of water through a channel and trapping sediment traveling in the channel.

Rock check dams should be built in a weir shape with the center of the embankment1.5 feet lower than the edges. This will force water over the center of the dam rather than around the edges.

The spacing of the dams will be specified, but should alterations to this spacing become necessary, the new spacing will not exceed the NRCS guidelines outlined in the table below.

If specified, a scour protection apron will be built on the downstream side of each dam. These aprons will be a layer of 5-12” granite rip rap the width of the channel and with a length equivalent to the height of the check dam. This layer will be embedded four inches into the ground to prevent transport of the rip rap in times of high flow.

Each dam will be 4 feet wide and 3 feet high (above ground). The base of the dam should be keyed into the channel bottom to an additional depth of 2 feet. Each end of the dam should be keyed into the channel side to a depth of 4 feet.

Each individual rock check dam will be constructed so the above ground rip rap will be free of dirt (or other “fines”), brush, or any other material. The rock check dams will be constructed from 5-12” granite rip rap.

Rip Rap Specification:

Any rip rap used on an LRAM project will consist of dense, hard, durable stone, angular in shape and resistant to weathering. Optimal rock will be of granite origin with 100 percent surface fracture. Rounded stone or boulders will not be accepted as rip rap material. The stone shall have a specific gravity of at least 2.5. Each piece shall have its greatest dimension not greater than three times its least dimension. Rip rap will be clean crushed rock and cleared of fines. If the specified 5-12 inch rip rap is not available, then CDOT standard D50 stone size of 6 inches may be used. Details of this stone size range is specified in their table 506-2E.

Deviations from This Standard Design:

Rock Check Dams Reach 1

	Dam Length (channel width)	Width of Dam	Height of Dam	No. Dams	Excavation/ Dam	Rip Rap/ Dam	Total Excavation	Total Rip Rap	Scour Apron	Spacing	Channel Length
Unit	Feet	Feet	Feet	Dams	Yd^3	Tons	Yd^3	Tons	Build?	Ft. Apart	Feet
Qty.		4	3								

Rock Check Dams Reach 2

	Dam Length (channel width)	Width of Dam	Height of Dam	No. Dams	Excavation/ Dam	Rip Rap/ Dam	Total Excavation	Total Rip Rap	Scour Apron	Spacing	Channel Length
Unit	Feet	Feet	Feet	Dams	Yd^3	Tons	Yd^3	Tons	Build?	Ft. Apart	Feet
Qty.		4	3								

Totals for All Reaches

	No. Dams	Total Excavation	Total 5-12” Rip Rap
Unit	Dams	Yd^3	Tons
Qty.			

NRCS Rock Check Dams Spacing Guidelines

Rock Check Dam Spacing (feet) for Various Dam Heights			
Channel Slope (%)	Rock Check Dam Spacing (feet)		
	1 ft. High Dam	2 ft. High Dam	3 ft. High Dam
< 2	100	200	300
2 - 5	40	80	120
5 - 10	20	40	60
10 - 15	13	25	40
15 - 20	10	20	30
> 20	not recommended		

Source: http://www.wy.nrcs.usda.gov/technical/ewpfactsheets/rockcheck.html

Seibert Stake Markers

Seibert markers consist of a 2-inch diameter, Schedule 40 polyvinyl chloride (PVC) pipe, approximately 16 inches in length, wrapped in multicolor, high intensity prismatic sheeting, that is affixed to a 6-foot, heavy-duty, studded, steel fence T-post.

In areas of high visibility, such as shortgrass prairie, the Seibert markers shall be placed no more than 10 meters apart. In areas where vegetation obscures visibility, such as piñon-juniper woodlands, the Seibert markers shall be placed no more than 5 meters apart.

To the extent possible, the T-post should be driven at least 18 inches into the ground, or until the anchor plate has been covered, with a minimum of 4 feet visible above the ground. Posts will be pounded into the ground using a handheld T-post driver or pneumatic pounder. No holes will be dug. If the subsurface cobbles or bedrock prohibit placement of the T-post to the required depth, the anchor plate should be removed from the T-post, and using a hammer drill, an 18-inch hole shall be drilled that is slightly larger than the diameter of the T-post. Then, use cement grout or mortar to secure the T-post in the drilled hole. Alternatively, the T-posts can be anchored into 4-inch by 4-inch cement post supports in areas where driving the T-post into the ground is impossible.

The Seibert topper will then be affixed to the top of each T-post, with yellow end at the top and white end on the bottom. It will be placed against two sides of the T-post; only the white portion of the marker will contact the T-post. The black strip of the Seibert marker must face toward the inside of the area being marked. One Standard American Engineering (SAE) size #48 stainless steel, worm clamp with a hex head screw will be used to attach the topper to the T-post. Then, one self-drilling screw (SAE size #10 x ¾-inch with hex washer head) will be drilled into the topper above the clamp in an effort to prevent the PVC pipe from sliding down the T-post (Figure 6-1).

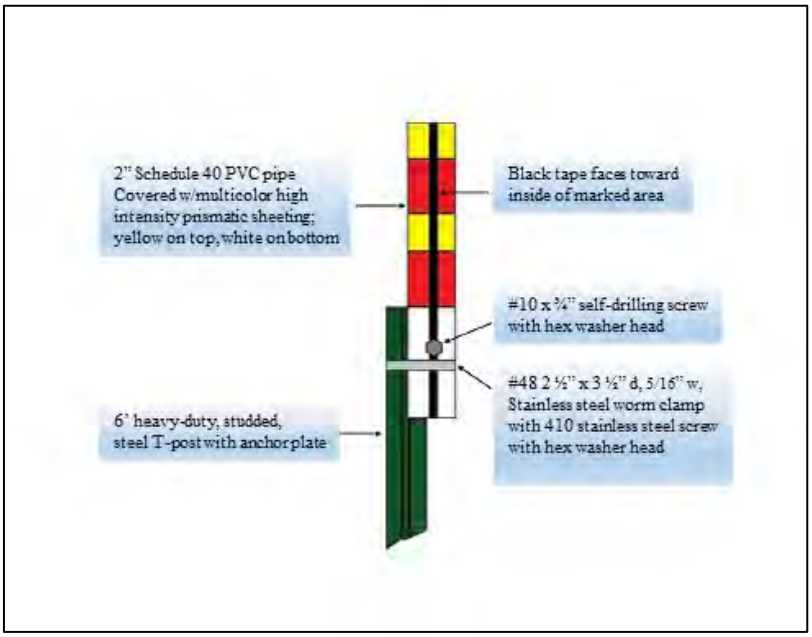


Figure 1. How a Seibert marker shall be assembled.

Color Tape	Width of Tape	Length of Tape	# Strips/Stake
White Reflective	3 inches	7 inches	2*
Red Reflective	3 inches	7 inches	2
Yellow Reflective	2 inches	7 inches	2
Black	1 inch	16 inches	1**

**Two white strips are adjacent to one another at the bottom of PVC pipe.*
***Black strip is placed along the entire length of the PVC pipe on the back side.*

Table 1. Reflective tape specifications for steel post Seibert Stakes.

Delineating Protected Site Boundaries in Drop Zones

Due to the safety hazard that T-posts pose to Soldiers parachuting into a drop zone, protected sites located within 1000 feet from the drop zone boundary shall be delineated by using Carsonite Seibert Stake markers no more than 10 meters apart.

Carsonite utility markers are a six-foot flexible post, comprised of a fiberglass-reinforced composite material. These posts have the ability to flex without breaking when struck by an object or person, but remain rigid enough to be manually driven into the ground. The back side of the Carsonite post from the top down 18" will be painted with a flat black enamel spray paint. The Carsonite Seibert Stake will be topped with Schedule 40 polyvinyl chloride (PVC) pipe, approximately 8 inches in length. For site protection purposes, the same multicolored, high intensity prismatic sheeting used for the Seibert markers will be affixed to white-colored Carsonite utility markers. To the extent possible, the Carsonite utility marker should be driven at least 18 inches, using a specialized utility marker driver. As with the Seibert steel post markers, the black band shall face the inside of the area to be marked.

Front

Back

Figure 2. Front and Back view of a Carsonite Seibert Stake.

Color Tape	Width of Tape	Length of Tape	# Strips/Stake
White Reflective	4 inches	7 inches	1
Red Reflective	3 inches	7 inches	3*
Yellow Reflective	2 inches	7 inches	3*

*Two strips on Carsonite post and 1 on the PVC pipe top.

Table 2. Reflective tape specifications for Carsonite Seibert Stakes.

Rock Ripping

In the course of construction, it may be necessary to excavate subsurface or exposed rock layers. When this occurs the rock will be ripped where possible. A site visit prior to contracting of this task is critical to assure agreement on the scope and possibility of a ripping operation. If rock cannot be excavated with readily available equipment, a geologic test must be conducted to determine the type and engineering properties of rock at the site. Equipment able to remove the identified rock must be supplied and utilized in the ripping operation. Should this occur, documentation of the test performed, its results, and the equipment chosen for rock removal must be supplied to the LRAM program.

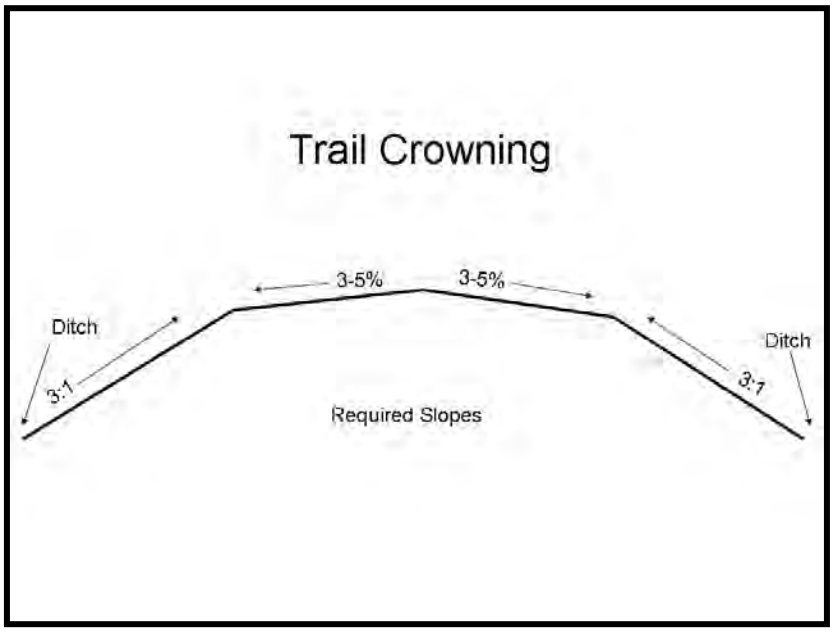
The estimated volume of rock to be excavated is specified below. This estimate is based on exposed surface rock. Muck remaining from these excavations (including that from over-break) will be stockpiled on the site in piles no larger than 6 feet in diameter or height unless requested by the LRAM program. The location of these piles needs to be coordinated with the LRAM program prior to placement.

Rock to be excavated during trail rehabilitation projects will be excavated to a depth of 2 feet below current surface level and the width of the current trail. The length of trail to be rehabilitated will be listed in that section of this document.

Deviations from This Standard Design**:**

Expected Hardness of Rock (Soft, Medium, Hard)	
Estimated Volume of Rock to be Removed	

Trail Crowning



When trails begin to channel water they often become eroded to the point of impassability. When this occurs they require rehabilitation, and one method for this is trail crowning.

Trail crowning will consist of a three part solution. (I) Ditches will be cut on both sides of the trail to channel water that was previously travelling down the trail itself. These ditches will be diverted from the trail at logical locations, preferably into well-vegetated, flat, open areas. (II) Rock check dams will be installed in these channels to slow the water in its channel and decrease its erosive potential. (III) The trail itself will be crowned to the specification found in the above diagram. The final cross-sectional shape of the trail will be a smooth arc. This will force any water on the trail to flow into the controlled ditches.

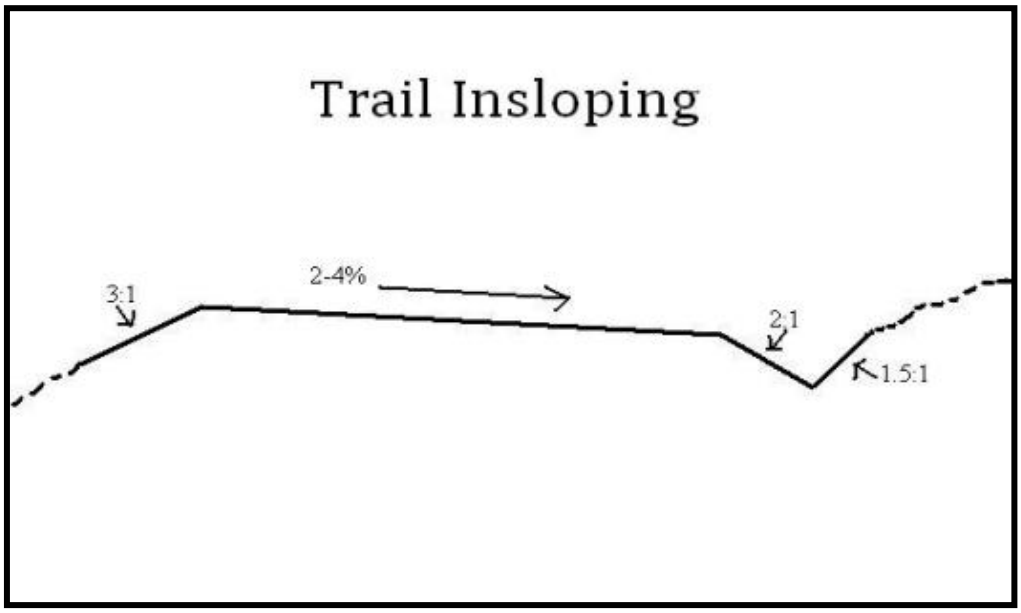
In some cases, water bars will be used to divert water off of a trail into a well vegetated stable area. If these are necessary, see the water bar section included in this document for specifications.

<u>Deviations from This Standard Design:</u>

Trail Rehabilitation Quantities Required

Work Type	Quantity	Unit
Ditch Excavation		Yd^3
Trail Crowning		Yd^3
Water Bars		Water Bars
Rock Check Dams		Rock Check Dams

Trail In-Sloping



When trails begin to channel water they often become eroded to the point of impassability. When this occurs they require rehabilitation, and one method for this is trail in-sloping.

Trail in-sloping will consist of a four part solution. (I) A ditch will be cut on the uphill side of the trail to channel water that was previously travelling down the trail itself. This ditch will be diverted from the trail at logical locations, preferably into well-vegetated, flat, open areas. (II) Rock check dams will be installed in this channel to slow the water in its channel and decrease its erosive potential. These will be installed according to the specifications in the rock check dam section of this document. (III) The trail itself will be sloped into the ditch at a grade of 2 to 4 percent as found in the above diagram. (IV) The downhill edge of the trail will be raised at a 3:1 slope from the undisturbed surroundings. This will assure proper drainage off the surface of the trail.

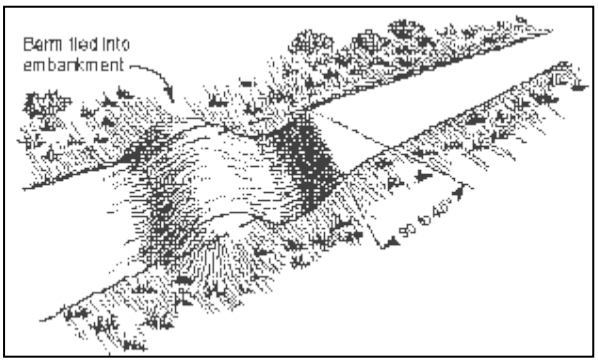
In some cases, water bars will be used to divert water off the trail into well vegetated stable areas. If these are necessary, see the water bar section included in this document for specifications.

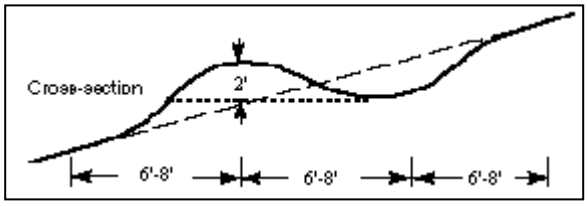
Deviations from This Standard Design**:**

Trail Rehabilitation Quantities Required

Work Type	Quantity	Unit
Ditch Excavation		Yd^3
Trail In-sloping		Yd^3
Water Bars		Water Bars
Rock Check Dams		Rock Check Dams

Water Bar





A water bar is a berm constructed on a trail in order to divert water flow off of the trail itself. The water should be diverted into a flat well vegetated area or into a channel with erosion control measures in place. The location of each water bar will be specified with flagging and/or grids. If these are not apparent, please consult the LRAM Coordinator prior to water bar placement.

The final cross-sectional shape should be a smoothly rounded mound downhill from a smoothly rounded trough. Both the mound and trough will have no steeper than a 3:1 (33%) slope. This trough will be a shallow trench running the length of the water bar on the uphill side. These tandem structures should be constructed at a 90 to 45 degree angle to the trail; thus forcing any water traveling down the trail into stable, down-hill, off-trail locations. Both the berm and trench portions of the water bar should be tied into the surrounding landscape both uphill and downhill of the trail.

These water bars will be constructed to have equal proportions of cut and fill. The total volume of the excavated trench will be equivalent to the total volume of the constructed berm.

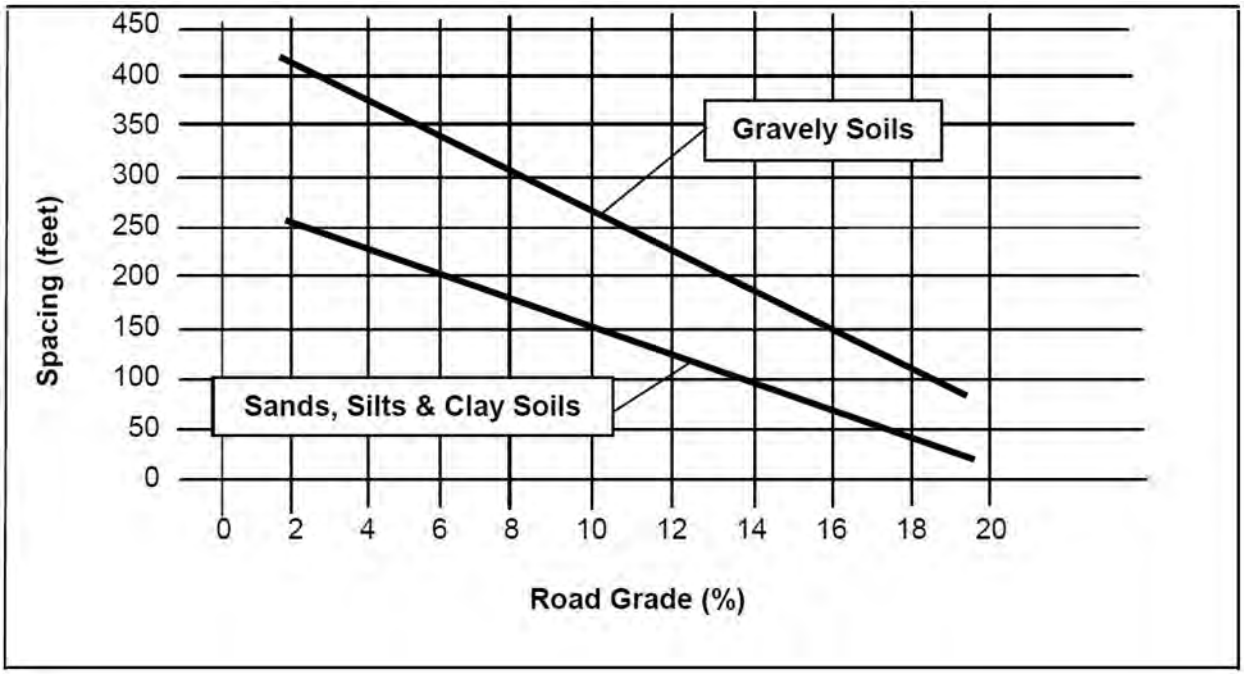
It is important that the water bar is constructed so that it will not retain water. This is accomplished by assuring there is a minimum of a 1:50 (2%) cross drainage grade with the upslope side tied into the hillside. The surface of the drainage trench must be smooth enough to allow water to exit along this cross drainage grade without accumulating in the trench itself.

<u>Deviations from This Standard Design:</u>

Water Bar Quick Reference

Length	Width	Berm Height	Trench Depth	Total Fill Moved	Location
		2	2		E 5
Feet	Feet	Feet	Feet	Cubic Yards	N 42

Recommend Spacing of Relief Culverts and Water Bars Based on Soil Types



Source: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_026142.pdf

APPENDIX 10: LRAM Project List for FYs 2019 and 2020

Integrated Training Area Management (ITAM) proposes to accomplish the following Land Rehabilitation and Maintenance (LRAM) projects at Fort Carson and the PCMS in FY 2019 and 2020. These are typical of LRAM projects implemented annually. For additional detail regarding design and specifications of LRAM standard projects, please see ITAM/LRAM Best Management Practices (updated January 2019) in Appendix 9. (Please note: All proposed recurring actions will be implemented subject to availability of funding and manpower.)

Task 14-502 **Priority - Medium**
PCMS TA 2 Low Water Crossing and Trail Rehabilitation

Project Description
A trail in TA 2 requires maintenance and rehabilitation. The trail will be crowned with two low water crossings and three water bars installed. The remediation will stop erosion occurring during rain events, will eliminate trail duplication, and will allow ease of travel across the terrain.

WGS84 UTM Grid Location

Description	Easting	Northing
North Low Water Crossing	580354	4152030
Trail Crowning	580251	4151596
Water Bar	580236	4151546
South Low Water Crossing	580218	4151410
Water Bar	580207	4151408
Water Bar	580197	4151350

Task 13-504 **Priority - Medium**
PCMS TA 7 Low Water Crossing

Project Description
A low water crossing (approximately 4,645 meters south of MSR 2) will be installed on a maneuver trail in TA 7 to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Low Water Crossing	587362	4143775

Task 12-118 **Priority – Medium**
Fort Carson TA 20 Low Water Crossings

Project Description
Two trails in TA 20 need low water crossings (one approx. 1420m W of MSR 9, and the second 1300m NW of Tank Trail D) to support sustainable and safe maneuver training conditions. The trails shown above will have a crossing in the shape of a trapezoid to cover both trails and narrowing to the single trail.

WGS84 UTM Grid Location

Description	Easting	Northing
Low Water Crossing 1	509950	4272997
Low Water Crossing 2	510169	4272170

Task 12-116 **Priority – Medium**
Fort Carson TA 10 Low Water Crossings

Project Description
Four low water crossings (over 30m east of Tank Trail C) will be installed in TA 10 where the trail crosses the creek bottom to support sustainable and safe maneuver training conditions. There are three sites, but one of the sites will have a double crossing with approximately 25 meters of trail in between the low areas.
Low water crossing 2 will also have a small bank slope area that runs into the creek at the same point. The area will be sloped 4:1 and have check dams installed to prevent further erosion.

WGS84 UTM Grid Location

Description	Easting	Northing
Low Water Crossing 1	517016	4279694
Low Water Crossing 2	516845	4279792
Low Water (Double) Crossing 3	516584	4279854

Task 12-115 **Priority - Medium**
Fort Carson TA 10 & 11 Low Water Crossings

Project Description
Two low water crossings (approx. 20m west and 250m east of Tank Trail Charlie) will be installed to support sustainable and safe maneuver training conditions. Both of these locations have been previously marked with NATO crossing signs, keeping the direction of travel away from Limited Use areas along the creek channel.

WGS84 UTM Grid Location

Description	**Easting**	**Northing**
Low Water Crossing 1	517219	4279525
Low Water Crossing 2	517528	4279433

Task 12- 114 **Priority - Medium**
Fort Carson TA 11 Low Water Crossings

Project Description
Two low water crossings (approx. 950 east of Tank Trail C) will be installed in TA 11 on maneuver trails that cross a stream bed to support sustainable and safe maneuver training conditions. Both areas have been previously armored with rip rap, but with improper installation practices. The trail is heavily used, and the mediation will increase maneuverability during wet periods.

WGS84 UTM Grid Location

Description	Easting	Northing
Low Water Crossing 1	518239	4279256
Low Water Crossing 2	518339	4278940

Task 12-106 **Priority – Medium**
Fort Carson TA 9 Low Water Crossing & Headcut Remediation

Project Description
Two separate projects, one in TA 9 and one in TA 10, will make up this task to support sustainable and safe maneuver training conditions. The above photo shows a trail (approx. 1270m E of Tank Trail D) where the low water crossing needs to be installed with some bank sloping. The other project will consist of filling a head cut (approx. 136m W of Tank Trail D) next to a trail in the same drainage (Little Fountain Creek) just west of this proposed site in TA 9. These two projects are combined due to small size and close proximity to each other.

WGS84 UTM Grid Location

Description	Easting	Northing
Head Cut	514989	4279433
Hard Low Water Crossing	515992	4279806

Task 16-115 **Priority – Medium**
Fort Carson TA 7 Low Water Crossing

Project Description
A large gully in TA 14 (~345 meters south of MSR 6) will be bank sloped to support sustainable and safe maneuver training conditions. An erosion control dam is already constructed above the area.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	518160	4277362

Task 13-505 **Priority –Medium**
PCMS DAM #231 Enhancement

Project Description
PCMS Dam #231 will be enhanced to a width of 25 feet and a culvert will be placed in the dam at a maximum height of four feet. This will increase maneuverability in the area and will also eliminate the safety hazard of steep dam sides. The entire dam and basin area will be sloped to a 4:1 ratio.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	583138	4148630

Task 15-120 **Priority – Medium**
Fort Carson TA 14 North Bank Slope

Project Description
A large, deep gully in TA 14 (115 meters south of MSR 6 and east of the Sand Canyon Bypass) will be bank-sloped to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	517407	4277481

Task 13-504 **Priority – Medium**
PCMS TA 7 Low Water Crossing

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	587362	4143775

Task 19-516 **Priority - Medium**
PCMS New Elevated Maneuver Trail 3

Project Description
An Elevated Maneuver Trail (EMT) will be constructed (approx. 1405m SSE of MSR 1) in Training Area 7, at PCMS, to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Spillway	585655	4150287
Toe	585596	4150270

Task 19-599 **Priority - High**
PCMS Cultural Protection Measures

Project Description
In high use areas where cultural resources need to be protected, Seibert stakes (T-Posts) are placed around the area to prevent maneuver vehicles from encroaching on the site. For safety, Carsonite markers will be used in Drop Zones and their Safety Buffers to prevent bodily injury to soldiers jumping out of aircraft.

Task 19-515 **Priority – Medium**
PCMS TA 7 Elevated Maneuver Trail 2

Project Description
An Elevated Maneuver Trail (EMT) is to be constructed (approx. 1895m SE of MSR 1) in Training Area 7, at Piñon Canyon Maneuver Site, to support sustainable and safe maneuver training conditions. The trail will be rerouted across the top of the EMT, and the trail will be graveled through the spillway area and across for a length of 85 meters.

WGS84 UTM Grid Location

Description	Easting	Northing
Spillway	585264	4150017
Toe	585315	4149965

Task 19-514 **Priority - Medium**
PCMS TA 7 New Elevated Maneuver Trail

Project Description
An Elevated Maneuver Trail (EMT) is needed (approx. 1993m SE MSR 1), at Piñon Canyon Maneuver Site in Training Area 7, to support sustainable and safe maneuver training conditions. The existing trail will be rerouted across the top of the dam, where a gravel base will be added. The gravel will be extended through the spillway (additional 10 meters) as armoring.

WGS84 UTM Grid Location

Description	Easting	Northing
Toe	583698	4148950
Spillway	583624	4148955

Task 19-513 **Priority - Medium**
PCMS TA 7 Low Water Crossing

Project Description
A trail in Training Area 7 at Piñon Canyon Maneuver Site is in need of a low water crossing (LWC) (approx. 1211m SE MSR 1) to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	582836	4149480

Task 19-512 **Priority – Medium**
PCMS TA 7 Low Water Crossing

Project Description
In Training Area 7, a low water crossing (LWC) will be constructed (approx. 2610m SE MSR 1) to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	584739	4149012

Task 19-511 **Priority - Medium**
PCMS TA 7 Low Water Crossing 1

Project Description
At PCMS in Training Area 7, a low water crossing (LWC) is needed (approx. 2527m SE MSR 1) to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	584626	4149009

Task 19-510 **Priority – Medium**
PCMS TA 10 Elevated Maneuver Trail Rehabilitation and Bank Slope

Project Description
A large Elevated Maneuver Trail within the Red Rocks Drainage (approx. 3368m NNE MSR 1) of TA 10 is in need of repair after a breach, to support sustainable and safe maneuver training conditions. For this repair, the breach will be used for the placement of a culvert. A head cut is upstream from the dam, and is in need of bank sloping. Below the dam, a gulley will be bank sloped for a length of 66 feet (20 meters).

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	599727	4158878

Task 19-509 Priority -Medium
PCMS TA 10 New Elevated Maneuver Trail, Bank Slope, Armoring

Project Description
A head cut and gulley have formed in TA 10 in the Red Rocks drainage (approx. 3105m NNW MSR 1). The head cut will be bank-sloped (BS) and the major problem areas armored with 5-12" rip rap and an Elevated Maneuver Trail (EMT) installed to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Spillway	599088	4158435
Toe	599086	4158474

Task 19-508 Priority - Medium
PCMS TA 10 New Elevated Maneuver Trail and Bank Slope

Project Description
A new Elevated Maneuver Trail (EMT) with Bank Sloping (BS) will be constructed (approx. 3594m NNW of MSR 1) in TA 10 at PCMS to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	598879	4158910

Task 19-507 Priority - Medium
PCMS TA 10 Low Water Crossing

Project Description
A trail in TA 10 at PCMS is in need of a Low Water Crossing (LWC) to support sustainable and safe maneuver training conditions. The LWC will be constructed (approx. 95m W of MSR 1A) for a length of 112 feet and a width of 16.5 feet.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	603631	4159461

Task 19-506 Priority - Medium
Fort Carson TA 10 New Elevated Maneuver Trail and Bank Sloping

Project Description
A new elevated maneuver trail will be constructed in TA 10 (approximately 2,330 meters west of MSR 1A) to improve maneuvering area access and safety and to help prevent sediment created from adjacent training activities from entering downstream. Also, a scarp about 250 feet downstream of the trail construction will be bank sloped to prevent further erosion and allow for safe training.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	601412	4159782

Task 19-505 **Priority - Medium**
Fort Carson TA 10 Elevated Maneuver Trail

Project Description
A new Elevated Maneuver Trail (EMT) will be constructed (approx. 3400m west of MSR 1A) in TA 10 to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	600298	4159657

Task 19-504 **Priority - Medium**
PCMS TA 10 New Elevated Maneuver Trail

Project Description
A new Elevated Maneuver Trail (EMT) will be constructed (approx. 3203 NW of MSR 1) in TA 10 to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	600102	4159446

Task 19-503 **Priority - Medium**
PCMS TA 10 New Elevated Maneuver Trail

Project Description
A new Elevated Maneuver Trail (EMT) will be constructed (approx. 3506 N of MSR 1) in TA 10 to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	600011	4159078

Task 19-502 **Priority - Medium**
PCMS TA 10 Elevated Maneuver Trail

Project Description
A new Elevated Maneuver Trail (approx. 3,600m N of MSR 1) will be constructed in TA 10 to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	599541	4158978

Task 19-501 **Priority - Medium**
PCMS TA 10 Elevated Maneuver Trail and Bank Slope

Project Description
A new Elevated Maneuver Trail (EMT) will be constructed in TA 10 (approximately 3,600 meters north of MSR 1) with Bank Sloping (BS) to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	599099	4158978

Task 19-114 **Priority - Medium**
Fort Carson TA 7 New Elevated Maneuver Trail

Project Description
An Elevated Maneuver Trail (EMT) is needed (approx. 1993m SE MSR 1), at Piñon Canyon Maneuver Site in Training Area 7, to support sustainable and safe maneuver training conditions. The existing trail will be rerouted across the top of the dam, where a gravel base will be added. The gravel will be extended through the spillway (additional 10 meters) as armoring.

WGS84 UTM Grid Location

Description	Easting	Northing
Toe	583698	4148950
Spillway	583624	4148955

Task 19-113 **Priority - High**
Fort Carson TA 31 Elevated Maneuver Trail

Project Description

WGS84 UTM Grid Location

Description	Easting	Northing
Start of Gully	508690	4263247
Overflow	508752	4263257

Task 19-112 **Priority - Medium**
Fort Carson TA 31 Trail Armoring, Head Cut Repair, and Bank Sloping

Project Description
In Training Area 31 at Fort Carson, the area (approximately 241 meters northeast of MSR 8/11) near an existing elevated maneuver trail (EMT) is in need of repair to support sustainable and safe maneuver training conditions. Upstream of the EMT, a head cut has formed that will be bank sloped and armored. Just above this head cut, there are some signs of erosion. This area will be armored for a length of 20 feet. Below the start of the head cut, a gully has formed. This will be bank sloped and require check dams. Where this gully meets the EMT, a low water crossing will be constructed, and the trail over the EMT will be resurfaced with 4 inches of compacted gravel. Additional signs of erosion are found immediately downstream of the EMT. This area will be armored and one side of a gully will be bank sloped, while the other will require additional armoring. Two check dams will be added. Further downstream, an additional bank slope (two-sided) will be constructed.

WGS84 UTM Grid Location

Description	Easting	Northing
Existing EMT	509100	4263211
Upstream Head Cut	509161	4263057
Downstream Head Cut Armoring (2 Areas)	509128	4263113

Task 19-111 **Priority - Medium**
Fort Carson TA 25 Head Cut and Bank Slope

Project Description
A head cut, as well as a subsequent gully has developed in Training Area 25 (approximately 115 meters northwest of MSR 11) at Fort Carson. To mitigate any negative impact on training and safety, the head cut will be armored and the gully will be bank sloped.

WGS84 UTM Grid Location

Description	Easting	Northing
Head Cut	508409	4268549
Start of Bank Slope	508408	4268543

Task 19-110 **Priority - Medium**
Fort Carson TA 25 Elevated Maneuver Trail and Head Cut

Project Description
A head cut has formed near an Elevated Maneuver Trail (EMT) in Training Area 25 (approximately 706 meters west of MSR 11) at Fort Carson, and is in need of repair to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	509011	4269855

Task 19-109 **Priority - Medium**
Fort Carson TA 24 Trail Rehabilitation, Low Water Crossing, and Gravel Pad

Project Description
At Fort Carson, a maneuver trail in Training Area 24 is in need of repair to support sustainable and safe maneuver training conditions. The trail will be crowned, ditches will be added, and three water bars (over 310m NE of MSR 11) added to divert water off of the path. A low water crossing will be placed (approx. 670m NE of MSR 11) along the trail in the lowest point to provide a safe crossing during and after precipitation events. The bare ground area, just off (Approx. 65m NE) of MSR 11, will be graveled due to its continuous use during training.

WGS84 UTM Grid Location

Description	Easting	Northing
Graveled Pad	509770	4269842
Low Water Crossing	509328	4270237
Water Bar 1	509549	4269954
Water Bar 2	509372	4270171
Water Bar 3	509273	4270275

Task 19-108 **Priority - Medium**
Fort Carson TA 24 Bank Sloping and Check Dams

Project Description
An area in Training Area 21 (approximately 214 southeast of Tank Trail D) is in need of bank sloping, after developing a large gully. This has become hazardous to training. The area just above the gully will require three additional check dams, starting 75 meters uphill from the start of the bank slope and spaced 75 meters apart.

WGS84 UTM Grid Location

Description	Easting	Northing
Start Bank Slope	509930	4269521

Task 20-150 **Priority - Low**
Fort Carson TA 31 Maneuver Impact Reseed

Project Description
Training Area (TA) 31 requires reseeding projects to repair dig sites and maneuver impacts. The sites total 34 acres and should all be drill seeded with the Fort Carson Military Reservation Drill Seed Mix. See the attached BMP information for seeding specifics.

Task 20-151 **Priority - Low**
Fort Carson TA 40 Maneuver Impact Reseed

Project Description
Training Area (TA) 40 requires reseeding projects to repair dig sites and maneuver impacts. The 3 sites total 12.5 acres and should all be drill seeded with the Fort Carson Military Reservation Drill Seed Mix. Two of the sites totaling 3.5 acres are dig sites and crimp mulching should follow seeding. See the attached BMP information for seeding specifics.

Task 19-107 **Priority - Medium**
Fort Carson TA 21 Multiple Elevated Maneuver Trail Drainage Projects

Project Description
Various existing elevated maneuver trails are in need of repairs or culvert additions in Training Area 21 (approximately 12 to 780 meters east of Tank Trail D depending on location of elevated trail) at Fort Carson Military Reservation. The rip rap in the spillway of the most eastern elevated trail has washed down from the original spillway. This will be removed geo-textile fabric installed, and riprap placed back into the spillway area. A 2' culvert will be placed through the EMT at 18" above the basin floor. Just east of this site a check dam needs to be repaired with geo-textile fabric, and a head cut armored. Additionally, the next elevated trail to the west will require a culvert. Upstream to this elevated trail, another elevated trail will require a culvert placement as well as a head cut repair. The most western elevated trail will require a culvert as well as an excavation of the basin (including brush removal). A head cut has also formed in the spillway and will be repaired and geo-textile placed under the armor.

WGS84 UTM Grid Location

Description	Easting	Northing	
EMT 1	512052	4271069	Spillway Repair
EMT 2	511690	4271253	Culvert
EMT 3	511369	4271181	Culvert, Head Cut
EMT 4	511180	4271169	Culvert, Basin Excavation

Task 19-106 **Priority - Medium**
Fort Carson TA 21 New Elevated Maneuver Trail and Bank Slope

Project Description
In Training Area 21 (approximately 102 meters south of Tank Trail D), a gulley has formed that has become hazardous and has impeded training in the area. An elevated maneuver trail will be constructed and boulders will be placed around the borders of the gully above the trail, for a total perimeter of about 350 meters. Boulders will be spaced 10 meters apart, and Seibert stakes will be placed between boulders in the future. The erosion that has formed downstream of where the elevated trail will be constructed will be bank sloped for a length of 177 feet. Additionally, two head cuts upstream will be armored to prevent further erosion. As well, the trail directly south of the gully will be excavated and rehabilitated to allow for a more passable route.

WGS84 UTM Grid Location

Description	Easting	Northing
Toe	510516	4270442
Spillway	510487	4270415
Head Cut 1	510574	4270393
Head Cut 2	510676	4270381

Task 20-152 **Priority - Low**
TA 30 Maneuver Impact Reseed

Project Description
Training Area (TA) 31 requires reseeding projects to repair dig sites and maneuver impacts. The sites total 34 acres and should all be drill seeded with the Fort Carson Military Reservation Drill Seed Mix. See the attached BMP information for seeding specifics.

Task 20-153 **Priority - Low**
Fort Carson TA 20 Maneuver Impact Reseed

Project Description
Training Area (TA) 20 requires a reseeding project to repair a dig site. The site is 0.9 acres and should be drill seeded with the Fort Carson Military Reservation Critical Seed Mix. The site may be rocky at the North end. See the attached BMP information for seeding specifics.

Task 20-154 **Priority - Low**
Fort Carson TA 43 Maneuver Impact Reseed

Project Description
Training Area (TA) 43 contains a 27.6 acre site designated as Limited Use since 1999. Degradation due to maneuver impacts resulted in a loss of desirable native species and abundance of weeds. Even with rest, it has not yet recovered. It requires a reseeding project and should be drill seeded with the Fort Carson Military Reservation Drill Seed Mix. It will require a harrow to knock down weeds. See the attached BMP information for seeding specifics.

Task 20-155 **Priority - Low**
Fort Carson TA 53 Maneuver Impact Reseed

Project Description
Training Area (TA) 53 requires reseeding projects to repair maneuver impacts. The site is 5.4 acres and has erosion issues occurring. It should all be drill seeded with the Fort Carson Military Reservation Critical Seed Mix followed by crimp mulching See the attached BMP information for seeding specifics.

Task 19-105 **Priority - Medium**
Fort Carson TA 24 Low Water Crossing

Project Description
A low water crossing will be constructed on a trail in Training Area 24 (approximately 478 meters northwest of MSR 11) to allow for crossing during and after high precipitation events. Along the trail to the south, a small area will be excavated to allow for proper drainage off the trail.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	510373	4271317

Task 19-104 **Priority - Medium**
Fort Carson TA 24 Trail Rehabilitation

Project Description
A trail in Training Area 24 has formed a gully in the adjacent ditch (approximately 546 meters north of MSR 11) and is in need of repair so driving and maneuvering can occur safely. This trail will be in-sloped, and check dams will be included in the ditch to slow water and capture sediment. The trail junction at the base will be armored to prevent a hazardous crossing.

WGS84 UTM Grid Location

Description	Easting	Northing
Reach 1	510067	4270940
Reach 2	510058	4271020
Reach 3	510051	4271070
Reach 4	510048	4271109

Task 19-103 **Priority - Medium**
Fort Carson TA 40 Low Water Crossing

Project Description
A low water crossing will be constructed in TA 40 (approximately 25 meters south of Tank Trail D) at Fort Carson on a trail where water collects during precipitation events and hinders training.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	508031	4263373

Task 18-514 **Priority - Medium**
PCMS TA 7 Trail Rehabilitation

Project Description
The Gutierrez Trail in Training Area 7 (approximately 3,340 meters north of MSR 2) is in need of rehabilitation to support sustainable and safe maneuver training conditions. The trail will be crowned for a total length of approximately 3.1 kilometers (1.9 miles), and eight water bars will be implemented (46 feet in length) ensuring water flow off of the trail.

WGS84 UTM Grid Location

Description	Easting	Northing
Beginning of Trail	581969	4143950
End of Trail	581084	4141058

Task 18-512 **Priority - Medium**
PCMS TA 10 Elevated Maneuver Trail and Bank Slope

Project Description
An elevated maneuver trail (approx. 3620m north of MSR 1) will be constructed in TA 10 to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	599465	4157916

Task 18-511 **Priority - Medium**
PCMS TA 10 Elevated Maneuver Trail and Head Cut Rehabilitation

Project Description
An elevated maneuver trail (approx. 2700m NNW of MSR 1) will be constructed in TA 10 to support sustainable and safe maneuver training conditions. A large head-cut upstream is in need of armoring and proper bank-sloping to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Elevated Maneuver Trail	599006	4158045
Headcut	598871	4158072

Task 18-510 **Priority - Medium**
PCMS TA 10 New Elevated Maneuver Trail

Project Description
A gully has formed in Training Area 10, in the Upper Red Rock Canyon watershed. A new Elevated Maneuver Trail (approximately 2,520 meters north of MSR 1) will be constructed to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	598951	4157814

Task 18-509 **Priority - Medium**
PCMS TA 7 Elevated Maneuver Trail #452 Rehabilitation

Project Description
PCMS Elevated Maneuver Trail in Training Area 7 (approximately 4,060 meters north of MSR 2) requires rehabilitation to support sustainable and safe maneuver training conditions. A wing on the southern side (toe) will be implemented to prevent overflow into the gully below.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	579677	4144406

Task 18-508 **Priority - Medium**
PCMS TA 7 Elevated Maneuver Trail #450 Rehabilitation

Project Description
PCMS TA 7 has an Elevated Maneuver Trail (approximately 5,100 meters south of MSR 1) that requires rehabilitation to support sustainable and safe maneuver training conditions. The dam will be enhanced to include an 83.5 foot culvert. Within the basin, there is also a grouping of tamarisk trees in need of removal.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	579825	4145398

Task 18-507 **Priority - Medium**
PCMS TA 7 Elevated Maneuver Trail #449 Rehabilitation and Tree Removal

Project Description
PCMS Training Area 7 has an Elevated Maneuver Trail (approximately 4,685 meters south of MSR 1) that requires rehabilitation to support sustainable and safe maneuver training conditions. The dam will be enhanced to include a culvert, 116 feet in length. The basin also includes a grouping of tamarisk that will need to be removed and piled during this enhancement project. The spillway will be armored with 5-12” rip rap.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	579729	4145806

Task 18-506 **Priority - Medium**
PCMS TA 1 Elevated Maneuver Trail

Project Description
An elevated maneuver trail (approx. 850m N of MSR 1) will be constructed in TA 1 to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	579060	4151155

Task 18-505 **Priority - Medium**
PCMS TA 1 Elevated Maneuver Trail

Project Description
An elevated maneuver trail (approx. 125m east of a MSR 1) will be constructed in TA 1 to support sustainable and safe maneuver training conditions.

WGS84 UTM Grid Location

Description	Easting	Northing
Center of Mass	578813	4151264

This page intentionally left blank.