YAKIMA TRAINING CENTER

Final
Cultural and Natural Resource Management Plan

2002-2006

Prepared by:
Environment and Natural Resource Division
Yakima Training Center

January 2002

Yakima Training Center

Cultural and Natural Resource

Management Plan

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Final

Cultural and Natural Resource Management Plan for Yakima Training Center

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A CD located in the pocket of this binder contains:

- Information Papers
- Lists
- Management Plans
- Maps
- Policy Statements
- Protocols

Executive Summary

Management of cultural and natural resources is an integral part of the U.S. Army's responsibilities at Yakima Training Center (YTC). Army Regulation (AR 200-3) requires that all Army installations develop a comprehensive integrated natural resource management plan to ensure proper and responsible environmental stewardship while providing for the military mission at installations. Additionally, Army Regulation (AR 200-4) requires that all Army installations develop an Integrated Cultural Resource Management Plan that integrates the entirety of the installation cultural resources program with ongoing mission activities, allowing for ready identification of potential conflicts between the installation's mission and cultural resources, and identifying actions necessary to maintain the availability of mission essential properties and acreage. The YTC Cultural and Natural Resource Management Plan (CNRMP) is designed to fulfill the requirements of these AR's and is an update of the original plan, which addressed management of these resources between 1996 - 2001. This plan employs ecosystem management concepts at the landscape scale through management of key resources, habitats, and species at multiple scales. The plan provides the means by which more meaningful and measurable resource thresholds will be developed. It introduces new project planning, assessment, and evaluation processes that strengthen the ecosystem management approach. The plan offers a flexible adaptive management approach to land management by providing opportunities for feedback to decisions and management actions through resource monitoring, along with a new emphasis on watershed assessment and project evaluations. This plan is intended to provide management direction for the next five years (2002 - 2006) and will be reviewed annually.

This plan was prepared by the YTC Environment and Natural Resources Division (ENRD) of Public Works. The document format has changed substantially from its previous version and is intended to be an electronic document with supporting material hyperlinked throughout for user convenience. Chapter 1, Environmental Management Overview, establishes the purpose for the CNRMP, states goals of the plan, and lists various environmental laws, regulations, directives, and policies related to cultural and natural resource management on the installation. It describes various levels of organizational responsibilities in management of cultural and natural resources and gives a brief overview of the environmental setting of the installation, detailing both past and current land uses. Chapter 2, Military Training Overview, presents the installation's mission and briefly describes military training strategies and general land use patterns. It introduces the concept of land use zones and describes seasonal flight restrictions developed to address possible impacts to several wildlife species. This chapter briefly discusses fire as influenced by the military training, which is a primary management concern, both on and adjacent to the installation. Chapter 3,

Management Plan Process, details concepts and procedures used in development and implementation of the CNRMP. This chapter discusses "Ecosystem Management" and defines what ecosystem management is to the Department of Defense. It states goals of ecosystem management, discusses management scale, and details the process for implementing ecosystem management on YTC. This chapter also explains "Adaptive Management" used in the CNRMP, and introduces new resource and project planning, assessment, and evaluation strategies such as the use of interdisciplinary teams, watershed analysis, and site specific project assessments. Chapter 4, Installation Resources and Management Strategies, is a thorough and detailed discussion of key cultural and natural resources by which YTC manages the landscape. It presents a brief discussion of individual resource management as the means by which ecosystem management is accomplished. After the resource description, a strategy describes what management activities will be undertaken to reach resource goals. This chapter also discusses fire in the context of resource management and provides a list of Management Action Descriptions, which are further detailed in Appendix A. Chapter 5, Budget and Implementation Strategy, provides funding requirements and implementation schedules for management actions presented in the plan. Chapter 6, References, Glossary, and Abbreviations, provides the documentation of supporting information, a glossary of terms, and defines various abbreviations used in the document. Appendices are included to provide additional detailed information in support of the CNRMP. Appendix B includes various species lists, specific resource plans, species management plans, protocols, policy statements, and Management Action Descriptions and thresholds.

This CNRMP provides management direction for cultural and natural resources on YTC for 2002 - 2006. It has been updated with the best available and most current information pertaining to resources of concern at YTC. The document was developed in concert with various land management agencies and tribal interests including U. S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, the Wanapum People and Yakama Nation. The foundation for the CNRMP is based on ecosystem management concepts and is flexible enough to be responsive to emerging issues and changing conditions. The addition of new resource and project planning, assessment, and evaluation strategies strengthens the ecosystem management approach of this plan by considering potential issues, impacts, and resource conditions at various management scales. These new strategies and this plan will enable the Army to more effectively plan and evaluate management actions, assess their effects on resources, and provide the foundation for more informed decisions regarding management of cultural and natural resources.

Chapter 1 Environmental Management Overview

Management of cultural and natural resources is an integral part of the U.S. Army's responsibilities at Yakima Training Center (YTC). Proper management of these resources is necessary for responsible environmental stewardship as well as for continued military training on the installation.

This comprehensive Cultural and Natural Resource Management Plan (CNRMP) is an update of the original plan which addressed management during 1996 - 2001. The objective of the plan is to support military use of the installation while conserving existing cultural and natural resources. The plan employs ecosystem management concepts at a landscape level and implements strategies through individual resource, species, and habitat management conducted at multiple scales.

This chapter describes the purpose and goals of the plan. It also provides an overview of laws, regulations, and policies guiding development of the plan and describes the authority and responsibilities of Army entities tasked with plan implementation. In addition, it describes the environmental setting in which the plan will be implemented and it provides a historical overview of land use practices on YTC.

1.1 Purpose

Current use of YTC places a heavy burden on the ability of the installation to sustain or improve cultural and natural resource conditions. Existing condition of these resources has been influenced by historical land uses and impacts, such as livestock grazing, homesteading, road building, fires, and past military training activities. The purpose of the CNRMP is to coalesce: (1) federal, state, and local mandates (2) military training needs, and (3) appropriate land management practices into an overall plan that allows use of these lands while conserving, protecting, and in some cases, enhancing landscape-level cultural and natural resources of the installation.

YTC, a sub-installation of Fort Lewis, is located in south central Washington State (Figure 1.1-1). The scope of this plan specifically includes all lands within the boundary of the installation. The plan considers the following resources in detail:

- Soils and geology
- Upland vegetation
- Water resources
- Riparian areas and wetlands
- Fish

- Wildlife
- Cultural Resources

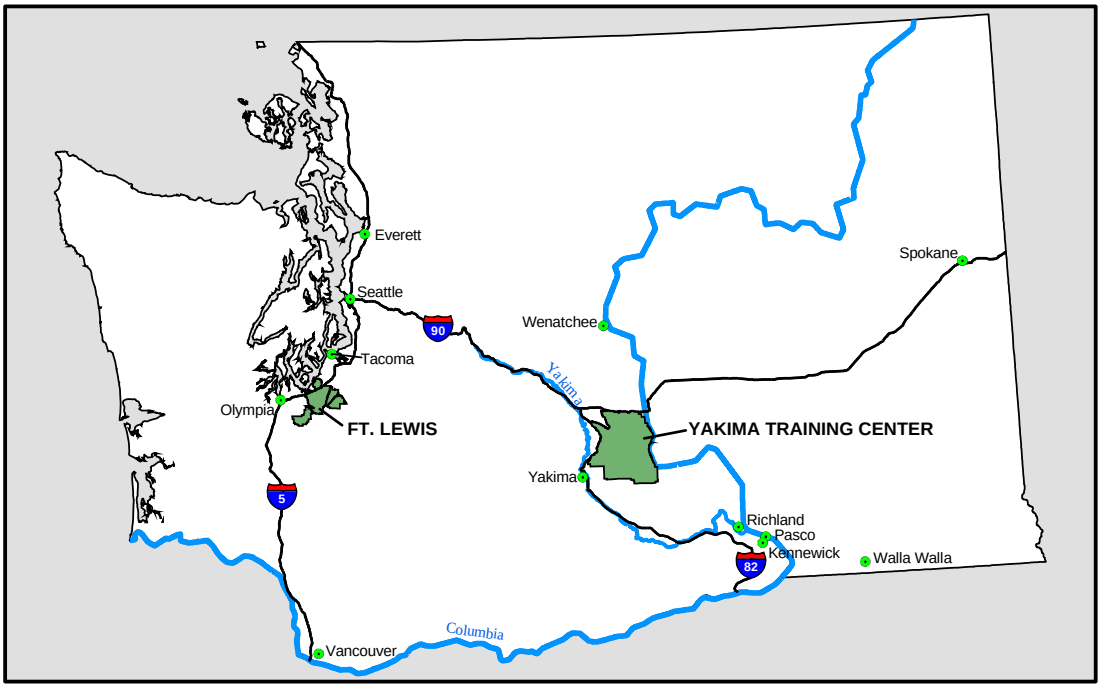


Figure 1.1-1. Location of YTC within Washington State.

The CNRMP addresses all of these resources at the landscape level. The Plan also incorporates fire management and outdoor recreational use strategies into an overall management approach. It incorporates existing environmental requirements and policies and NEPA documents. It focuses on presenting a flexible program that resource manager's implement to optimize resource conditions as the military mission continues. Management strategies are realistic within the operational context of YTC as a military training facility, measurable to allow evaluation of their effectiveness, and flexible enough to accommodate improvement.

1.2 Plan Goals

The Army set forth the following goals for the CNRMP:

- Ensure YTC's ability to support and preserve military training.
- Use a long-term, ecosystem management approach.
- Integrate resource management goals within and among watersheds.
- Promote land management flexibility by using adaptive management strategies.
- Strive to meet the cultural and natural resource goals identified in each resource area.

- Develop management strategies that mitigate military training impacts.

Resource-specific goals have been determined and are discussed in Chapter 4.

1.3 Policies

Environmental laws, regulations, directives, and policies relating to management of cultural and natural resource at YTC are listed below.

- 36 CFR Part 60: National Register of Historic Places.
- 36 CFR Part 78: Waiver of Federal Agency Responsibilities under Section 110 of the NHPA.
- 36 CFR Part 800: Protection of Historic Properties.
- American Indian Religious Freedom Act. (AIRFA) (PL 95-341), 1978 .
- Antiquities Act (PL 59-209), 1906.
- Archaeological and Historic Preservation Act (AHPA), 1974.
- Archaeological Resource Protection Act (ARPA), 1979.
- Army Regulation 200-1. Environmental Protection and Enhancement, 1997.
- Army Regulation 200-2. Environmental Effects of Army Actions, 1988.
- Army Regulation 200-3. Natural Resources – Land, Forest and Wildlife Management, 1995.
- Army Regulation 200-4. Cultural Resource Management, 1998.
- Army Regulation 200-5. Pest Management, 1999.
- Army Regulation 210-20. Master Planning for Army Installations, 1993.
- Army Regulation 350-4. Integrated Training Area Management (ITAM), 1998.
- Army Regulation 420-90. Fire and Emergency Services, 1997.
- Clean Air Act (CAA) (42 U.S.C. 7401) (PL 101-549), 1990.
- Clean Water Act (CWA), (PL 95-217), 1977.
- Department of Army, Guidance for Management of Endangered/Threatened Species, 1993.
- Department of Army, Memorandum from the Office of the Assistant Secretary of the Army, Installations, Logistics, and Environment, subject: Conservation Policy, 3 July 1995.
- Department of Army, Memorandum from the Office of the Under Secretary of Defense for Environmental Security, subject: Implementation of Ecosystem Management in the DoD, 8 August 1994.
- DoD Directive 4165.61 Intergovernmental Coordination of DoD Federal Development Programs and Activities, 1983.
- DOD Directive 4700.4 Natural Resources Management Program. 1989
- Endangered Species Act (ESA) (PL 93-205), 1973.
- Executive Order 11593: Protection and Enhancement of the Cultural Environment, 1971.
- Executive Order 11990: Protection of Wetlands (42 Fed. Reg. 26961), 1977.
- Executive Order 13175: Consultation and Coordination With Indian Tribal Governments, 2000.

- Fort Lewis Regulation 200-1. Environmental Protection and Enhancement, 2000.
- Fort Lewis Regulation 220-3. Field Organizations Fire Suppression Crew and Standby Augmentation Teams, 2000.
- Fort Lewis Regulation 350-31. Yakima Range Regulations,.1992.
- Fort Lewis Regulation 420-5. Federally Listed Endangered, Threatened, and Candidate Species, 1994.
- National Environmental Policy Act (NEPA), (PL 91-190), 1970.
- National Historic Preservation Act (NHPA) (PL 89-665 as amended), 1966.
- Native American Graves Protection and Repatriation Act (NAGPRA) (PL 101-601), 1990.
- North American Wetlands Conservation Act (P L 101-233), 1989.
- Rivers and Harbors Act (33 USC 401-413, Section 407), 1889.
- Sikes Act (PL 86-797), 1960 and (PL 105-85), 1997.
- Washington State Groundwater Standards (WAC 173-200), and Non-point Source Pollution Assessment and Management Program (implements Section 319a of CWA).
- Washington State Surface Water Standards (WAC 173-201A).
- YTC Using Unit Standard Operating Procedure (SOP), 2000.

1.4 Responsibilities

This section describes organizations and staff elements that affect, or are commonly involved with, management of cultural and natural resources at YTC.

Assistant Secretary of Army (Installations, Logistics, and Environment). Provides oversight of Army natural resource management programs including formulation, execution, and review of related policies, plans, and programs. Establishes overall program objectives and develops means of appraising program performance.

Headquarters, Forces Command (FORSCOM). Provides leadership and supervision of natural resource programs at installations under its command and jurisdiction. Assists installations with developing and implementing programs to ensure conservation stewardship, legal compliance, and protection of resources, including wetlands, threatened and endangered species, and other natural and cultural resources of special interest.

Commander, I Corps and Fort Lewis. Provides command and control over all aspects of Fort Lewis and its subinstallations. Ensures that installation training requirements and unit commander priorities are accomplished while providing proper management of the land base, including its cultural and natural resources.

Garrison Commander, Fort Lewis. Provides direct support and general support for the cultural and natural resource management program at YTC.

Commander, YTC. Provides immediate command and control over all activities at YTC. Through Fort Lewis Garrison Command, ensures that proper resources are available to manage the installation's cultural and natural resource programs. Ensures management plans and installation policies are properly coordinated with appropriate staff elements at YTC and Fort Lewis. Supervises the execution of the CNRMP to ensure that program objectives are met, applicable laws and regulations are complied with, and the training mission is accomplished.

Director, Public Works, YTC. Provides oversight of the Environment and Natural Resources Division, which administers all phases of the installation's cultural and natural resources program, using a professional staff. Serves as the installation's primary point of contact and liaison officer for issues related to cultural and natural resources. Develops programs to ensure the inventory, delineation, classification, and management of all natural resources, including wetlands, threatened and endangered species, sensitive and critical habitats, and cultural and natural resources of special interest. Administers and executes the installation's Integrated Training Area Management (ITAM) program. Plans, budgets, and executes measures required to meet objectives of the installation's CNRMP. Coordinates with local, state, and federal governmental agencies and Native American Tribes relative to the installation's cultural and natural resource program.

Director, Plans, Training, Mobilization and Security (DPTMS), YTC. Responsible for scheduling military training activities and other land uses within training areas at YTC. Rotates use of training areas when required and as mission requirements allow, to reduce overall impacts on cultural and natural resources. Manages all of the installation's recreational activities except hunting.

Staff Judge Advocate, Fort Lewis. Provides legal guidance concerning cultural and natural resource management issues at Fort Lewis and YTC. Ensures that land management and military training activities are accomplished in compliance with applicable laws and regulations.

1.5 Environmental Setting

YTC is situated in the Columbia Basin of Eastern Washington state. The area lies in the rain shadow of the Cascade Mountains and can be described as open country with sagebrush covered rolling hills and flats. Thin bands of trees and wetland shrubs occur in canyon bottoms and water courses. Rock outcrops, talus slopes, and cliffs are exposed along ridge tops, canyon walls, steep hills, and draws.

1.5.1 Climate

Climatic conditions in the vicinity of YTC are typical of the Columbia Basin. Smith (1977), describes the climate of coulee country, just northeast of YTC, as follows: Chief characteristics of the climate are its relatively low precipitation,

seasonal cycle of cool, moderately rainy and snowy winters, wet springs, hot dry summers, and warm, predominantly dry autumns. These characteristics are generalizations only; actual conditions vary among localities, seasons, and years. Typically, annual temperature is inversely related to precipitation, with peak temperatures occurring in summer months, and peak precipitation occurring in fall and winter months. Long term monitoring data from surrounding locations (Yakima, Ellensburg, and Priest Rapids) indicates the region's climate is strongly influenced by global factors. The principle influence has been the oscillation between cold (El Niño) and wet (La Niña) phases that cause major weather pattern shifts within the region.

Weather station data collected at YTC generally demonstrates that weather conditions vary by year, and spatially across the installation. Data collected at weather stations on YTC between 1984 and 2000 indicate variability across the installation with annual average precipitation ranging from a high of 9.5 in. to a low of 6.3 in. The average across YTC was 7.5 in. of precipitation, with most accumulating in the months of October through May.

YTC receives a large portion of its annual precipitation in the form of snow. While no data have been collected at YTC to monitor annual snow depth accumulations, data from monitoring stations at Yakima, Ellensburg, and Priest Rapids reflect conditions at YTC. Annual average accumulations at neighboring sites is 24.2 in. at Yakima, 28 in. at Ellensburg, and 6.7 in. at Priest Rapids.

Winds have an important role in resource condition and influence fire behavior within the region. Winds are generally northwest to southwest, but can be tracked from any direction because of pressure differences created by larger weather systems passing through the region.

1.5.2 Geology

Geologic units at YTC consist of interbedded volcanic and sedimentary rocks of the Columbia River Basalt Group. Sediments of the Ellensburg Formation are interbedded with these basalt flows. The Ellensburg Formation consists of weakly to moderately indurated conglomerates, sandstones, claystones, and siltstones, deposited by stream action as well as volcanic debris flows (Ecology and Environment, 1993). Rock crusts at YTC have been folded and faulted, creating ridges and valleys. These ridges and valleys have been further modified by the action of glaciers and flooding that has dissected existing drainages (U.S. Army, November 1990). Alluvial deposits are found in stream valleys. Wind-blown deposits of loess blanket many of the geologic units throughout YTC.

Within the Yakima Basalt Formation, a bed of diatomite crops out in the Lmuma Creek drainage (Terrain Analysis Center, December 1988). This is reported to be the largest deposit of diatomite in Washington State (U.S. Army Corps of Engineers, 1984). Three and one-half miles upstream from Priest Rapids, a gray pumicite has been mined as a source of pozzolan (a cement additive) for both

Wanapum and Priest Rapids dams. Interbedded sections of the Yakima Basalt Formation contain layers of silt or clay, some of which may be bentonitic (Terrain Analysis Center, December 1988). Deposits of petrified wood are also found within YTC.

1.5.3 Topography

Topography at YTC varies from low plains to escarpment (Terrain Analysis Center, December 1988). Five east/west ridges cross the installation. These are (from north to south): Boylston Mountains, Saddle Mountains, Manastash Ridge, Umtanum Ridge, and Yakima Ridge. The ridges form rounded hills to mountains, with slopes varying from eight to 60 percent. Steepest slopes occur along crests of ridges. Elevation variation from ridge crest to the bottom of adjacent valleys typically ranges from 500 to over 1,200 ft.

Elevations vary from about 500 ft. at the banks of the Columbia River to an elevation of 4,191 ft. along Yakima Ridge in the southeast portion of YTC (Defense Mapping Agency, 1990). Ridges generally range from 3,000 to 4,000 ft. in elevation. Elevations in stream valleys in the less rugged western portion of the installation range from about 1,500 - 2,000 ft. (U.S. Army, 1979; Ecology and Environment, 1993).

Topography tends to be more rugged in the eastern portion of YTC. Steep escarpments occur along the western end of Selah Creek, along Corral Canyon, in Alkali Canyon, and along bluffs bordering the Columbia River in the northeast portion of the installation.

1.5.4 Soils

The U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) completed a soil survey of lands within the historical boundaries of YTC in cooperation with Department of Army (USDA SCS, 1989). An additional survey was completed for the northern training areas in 1993. While 166 soils series have been identified at YTC, these series have been reduced to eight major groupings (based on soil property similarities) for management purposes. Soils at YTC formed in a variety of parent materials, including glacial outwash, loess, residuum, alluvium, and basaltic colluvium, and at several landscape positions such as ridgetops, benches, and hill slopes.

Soils at YTC are mostly shallow light silt loams. They are characteristic of arid to semiarid climates. Soils are fragile and easily eroded. In addition, there are some minor areas of bottomland or alluvial soils, primarily near the Columbia River and in the cantonment area.

1.5.5 Water Resources

YTC drains into two major basins: the Columbia River Basin east of YTC, and the Yakima River to the west. Within YTC, there are 28 sub-basins that, for the

purpose of this plan, have been consolidated into 10 watershed complexes (Figure 1.5-1).

Surface water resources at YTC include streams or creeks, springs, and ponds. Sixteen man-made sediment retention ponds are maintained for erosion control and monitoring. Four additional ponds include Greely Pond (for wildlife), Kiddy Pond (for recreation), Taylor Pond (for fire fighting), and Foster Pond (for fire fighting and training support). Major streams flowing into the Columbia River include Alkali, Corral Canyon, Hanson, Sourdough, and Johnson Creeks. Many tributaries to the Columbia River discharge via subsurface flow when stream flows are low, particularly during the summer. Lmuma Creek flows year-round into the Yakima River. Other streams that have perennial flow within YTC but become intermittent in their lower reaches include Selah, Middle, and Cold Creeks. Although streams on YTC have not been classified by the State of Washington, they are considered to be Class A (excellent) by Washington State surface water quality standards for these respective stream types. Remaining surface water drainages on YTC are intermittent and do not flow in the summer.

Groundwater at YTC is stored in four principal aquifers. Reported subsurface depths of groundwater range from 20 ft. in stream valleys to more than 200 ft. at higher elevations. Springs occasionally can be found where ridges or incised stream valleys intercept aquifers. Deeper aquifers are recharged mainly from areas west of the installation, whereas shallower aquifers are recharged primarily by precipitation falling at higher elevations on YTC. Regional groundwater flow is generally outward from higher elevations at the center of the installation, toward the Yakima and Columbia Rivers.

Since shallow groundwater supplies depend entirely on recharge within YTC, groundwater resources partially depend on soil and vegetation condition. YTC's groundwater resources support domestic supplies, fire suppression, and fish and wildlife habitat. All potable well water sources meet Safe Drinking Water Act (SDWA) standards. The well at Selah Airstrip was recently documented to have slightly elevated levels of contaminates and was repaired in accordance with Washington State Department of Health standards.

1.5.6 Upland Vegetation and Wildlife

Much of the interior, low elevation, Columbia River Basin is within the shrub-steppe zone (Daubenmire 1970). These are vegetation communities characterized by shrub-dominated overstories (often composed of several species of *Artemisia*) coupled with perennial bunchgrass understories (often dominated by species of *Pseudoroegnaria, Poa, Festuca*, and/or *Stipa*). Prior to European settlement, Eastern Washington was covered by an almost unbroken, 10.4 million acre expanse of shrub-steppe (Dobler, 1992).

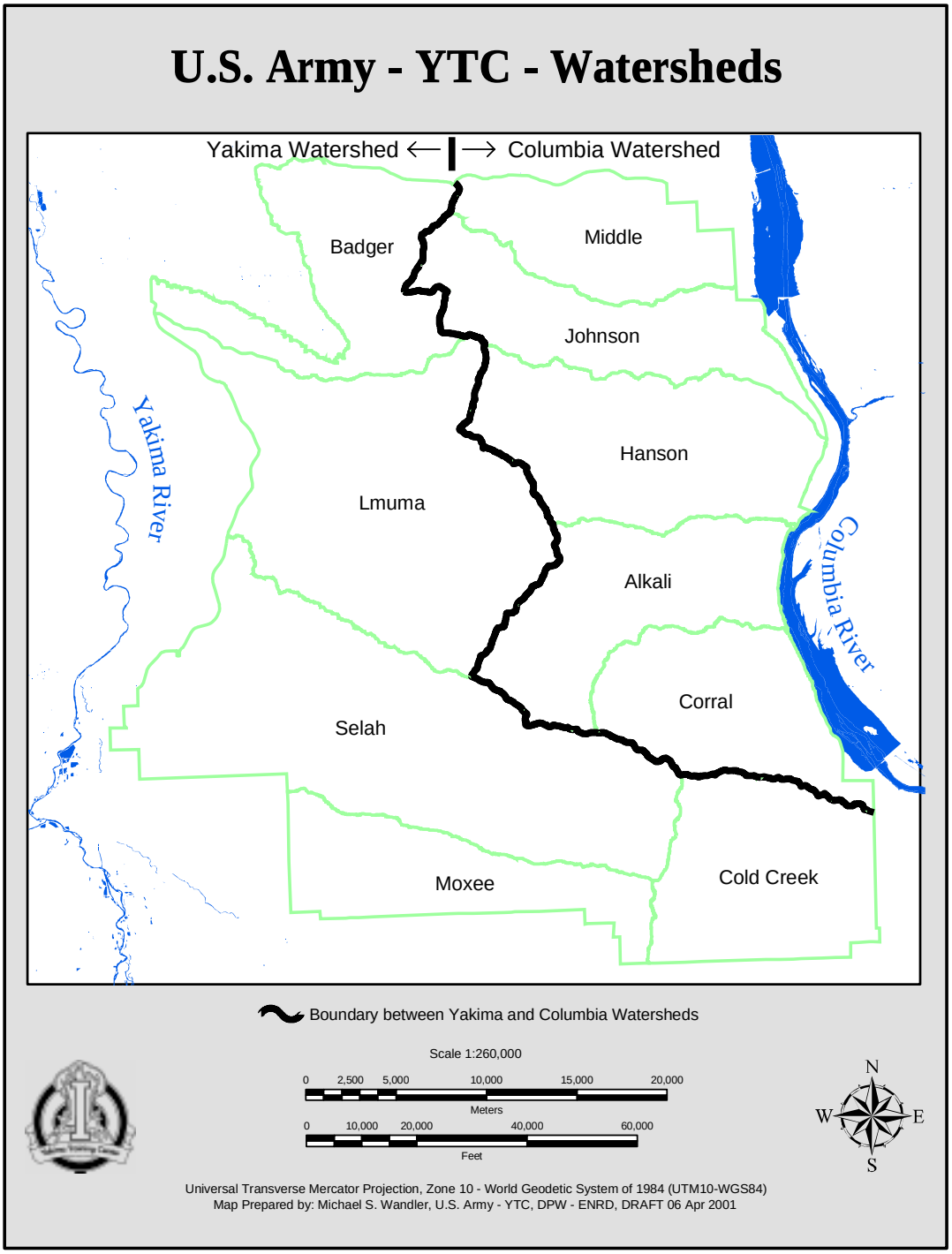


Figure 1.5-1. YTC Watershed Complexes.

Subsequent agricultural and rangeland development has reduced this to approximately 4.2 million acres. Roadways, exotic weeds, and other disturbances have fragmented much of this remaining habitat. These disturbances have greatly diminished the capacity of eastern Washington to support shrub-steppe-obligate species.

Important remnants of intact shrub-steppe in Washington are found on lands in public ownership including YTC. The installation lies within the core of the largest remaining contiguous block of shrub-steppe in Washington State. Over 241,000 acres of the installation is dominated by big sagebrush (*Artemisia tridentata*), three tip sagebrush (*Artemisia tripartita*), and stiff sagebrush (*Artemisia rigida*) plant communities. Other diverse vegetation communities occur in riparian bottoms, springs, along cliffs and rock outcrops, and on thin, shallow soils.

The installation provides habitat for over 246 wildlife species. These include 50 mammal, 174 avian, 14 reptile, and 8 amphibian species. Numerous studies have been undertaken to document species occupying YTC. Studies have investigated: western sage grouse (*centrocercus urophasianus*), neotropical migrants, long-billed curlew (*Numenius americanus*), loggerhead shrikes (*Lanius ludovicianus*), bald eagles (*Haliaeetus leucocephalus*), raptors, bats, reptiles, amphibians, small mammals, and mule deer (*Odocoileus hemionus*). These studies aid the installation by integrating species and habitat management with other resource goals.

1.6 Past Land Use

1.6.1 Historic Land Use

Archeologists generally agree that the earliest well-documented evidence of humans in the New World dates to about 13,000 years ago. However, the oldest evidence of human occupation in the interior Pacific Northwest is about 11,000 to 11,500 years old and is limited to only one archeological site and a few isolated projectile points. That single known site is 50 km. (31 miles) north of YTC in the Columbia River Valley. At that time, small bands of people used distinctive fluted projectile points to hunt now-extinct megafauna, such as mammoth and a large form of bison. Archeologists believe these people were highly mobile and focused on hunting the largest species of mammals.

The oldest known archeological sites at YTC were used between about 10,500 and 8,000 years ago. People using lancolete and large-stemmed projectile points hunted elk, bison, and pronghorn; mammoths were extinct. At least some people had settled into small seasonal (winter) communities with substantial houses constructed in excavated pits. Remains of temporary shelters have been found at other sites. Approximately six sites recorded on the eastern side of YTC date to this time. Most sites are buried under alluvial or aeolian sediments with

limited exposure. A recent geomorphological study documented the presence of now buried landforms old enough to have been used by people at this early time in Cold Creek and Lmuma complexes.

A large campsite that is more than 10,000 years old has been documented on YTC. Remains of butchered elk and bison and evidence of extensive stone tool manufacturing were found at this site, along with what may be the remains of several brush structures. This site is very unusual in that it has a number of projectile points rarely found in the Pacific Northwest. These points appear to represent the presence of people from the Northern Great Basin (southern Idaho or southern Oregon).

Sites dating between 8,000 - 6,000 years ago are more common at YTC. Most sites are recorded in eastern portions of the installation, with a few known in western complexes. Almost all of these sites are in streamside locations. Isolated projectile points that likely were used in this period are recorded on slopes and ridges in all watershed complexes, indicating broad ranging forays in opportunistic pursuit of animal and plant resources.

Sites dating between 6,000 - 3,000 years ago are found in all but one complex at YTC. Sites from this period are found throughout the landscape from streamsides to ridge crests, however long-term occupations cluster in lower valleys and along major rivers. At upland streamside sites people processed edible plants for storage, especially the roots of Bitterroot (*Lewisia redeviva*) and certain Lomatium species. This pattern of site distribution may reflect a more focused economy with people seeking targeted food resources. Another theory is that this pattern simply reflects population increase and therefore greater numbers of sites.

From about 3,000 years ago until approximately the mid-1800s, numerous sites attest to continued widespread use of uplands in all watershed complexes. Throughout this period, people occupied winter villages along the Yakima and Columbia Rivers, and followed seasonal routes to gather and return foods to their winter homes. Sites from this period indicate communal hunting occurred using surrounds or nets. First direct contact with Euroamericans dates to the early 1800s, with the appearance of fur traders. Introduced diseases that decimated native populations caused surviving populations to aggregate into fewer large villages along major rivers.

1.6.2 Other Historic Land Use

Lewis and Clark passed to the south of YTC along the Snake River and Columbia River. In the early 1800s, fur traders traveled on the Columbia River along the eastern edge of YTC between posts to the north, south and west. None of the Indian groups in the vicinity of YTC were involved in fur trade. Extensive grasslands brought ranchers to the area in the mid-1800s and Native Americans soon became cattle ranchers in their own right.

By the mid-1800s, a number of trails had been developed across YTC including an important early route that followed the streams in Cold Creek and Selah complexes and another that crossed Badger Gap. Remnants of a deeply worn trail remain in the Corral Complex heading northwest from Priest Rapids, the historical head of navigation on the Columbia River at the southeast corner of Corral complex.

Homesteading in the vicinity of YTC began in the 1880s and continued into the 1930s. Only families that managed to acquire large acreage for ranching survived, while others sold out or simply could not make a living and abandoned their holdings. Numerous homestead and ranching sites are recorded at YTC with most in Lmuma, Selah, and Moxee complexes. Ranching continued in Lmuma, Selah, Hanson, Alkali, Corral, and Cold Creek complexes until the Army acquired the land in the 1940s. A small community promoted for orchardists was developed in the Selah complex in the early 1900s. The town was abandoned when the dam established for irrigation purposes could not withstand floods.

In 1908-1909 a railroad was built across the northern portion of YTC in the Badger and Johnson complexes. Several small communities served the railroad, and several sidings or "train order stations" were maintained along the line. The route, abandoned in the 1980s, is now used as a recreational trail known as the John Wayne Trail (JWT).

From the early 1900s until the 1950s, diatomaceous earth was mined in open pit operations in the Lmuma complex. This material was used in industrial processes including the manufacture of dynamite and other products.

1.6.3 Recent Land Use

Beginning in the early 1940s and continuing into the early 1950s, the U.S. Army acquired 261,451 acres of land for the original installation. The original portion of the training center has been used for military training since its establishment in 1942 as an anti-aircraft firing range. In 1992, Congress approved acquisition of the northern expansion lands, forming the current configuration of YTC which includes 327,242 acres.

Military training activities at YTC have been diverse. Training has included infantry, tracked, and wheeled vehicles, gunnery, engineer, and parachute training. Chapter 2 describes current military training activities, many of which were conducted early in the installation's history.

A livestock grazing program existed at YTC between 1960 - 1995. Additional requirements placed upon the natural resources from training and increased resource conflicts, prompted termination of this program in December 1995.

1.7 Current Land Use

1.7.1 Military Land Use

Currently, YTC provides military training facilities and logistical support for cross-country maneuvers and operational live-fire training opportunities. Major military land uses at YTC include the cantonment area with residential, administrative, commercial, light industrial, and open space uses (1,010 acres); training areas with maneuver, impact, firing ranges, and other special uses; and the Selah Airstrip and Vagabond Army Airfield (326,438 acres). Military land use is detailed in Chapter 2.

1.7.2 Contemporary Native American Use

YTC is within the area ceded by bands and tribes of the Yakama Nation pursuant to the Treaty of 1855. Yakama tribal members continue to hunt and gather plant resources at YTC. The Wanapum People live adjacent to YTC's eastern boundary near Priest Rapids Dam and use the installation for traditional, religious, and ceremonial purposes. Restricted areas of YTC (e.g. impact areas, cantonment area, dud areas) are not open to the public. There are numerous areas of YTC where root crop plants important to Native Americans exist. Bitterroot and several species of Lomatium are especially sought. These plants are common in all complexes. Beginning in February and early March, bitterroot and lomatium are gathered with traditional digging sticks. The tender shoots of some lomatium are eaten raw and roots of bitterroot and Lomatium are cooked. Wild onion (*Allium acuminatum*) and yellow bell (*Fritillaria pudica*) are important supplementary foods, and balsamroot (*Balsamorhiza sp.*) has traditional uses. Fruits of chokecherry (*Prunus virginiana*), blue elderberry (*Sambucus cerulea*), serviceberry (*Amelanchier alnifolia*), and currants (*Ribes Cereum*) are sought in riparian areas for food where Indian hemp (*Apocynum cannabinum*) is gathered for fiber.

1.7.3 Other Uses

Nonmilitary land uses at YTC include recreational activities such as hunting, hiking, and horseback riding. These activities may take place anywhere throughout non-restricted areas of YTC, depending on scheduled training exercises and when approved by the YTC Commander.

Between 1981 - 1984, the State of Washington Parks Department acquired the railroad right-of-way now known as the John Wayne Trail (JWT). Twenty-two miles of this trail are located within, and owned and managed by the YTC. The trail is used for non-motorized types of use including hiking, trail rides, bicycling, and horseback riding.

Chapter 2 Military Training Overview

2.1 Introduction

Military training support is the primary mission of YTC. Although sometimes conflicting with the primary mission of YTC, management of cultural and natural resources on Department of Defense (DOD) lands is required by federal law as well as DOD policies, and regulations. The goal of this CNRMP is to support military use of the installation while conserving cultural and natural resources. As such, the U.S. Army will implement the CNRMP to sustain cultural and natural resources and the installation's ability to sustain the military training mission.

As a training facility, YTC provides the opportunity, facilities, and support for military units, including both active and reserve component forces, to enhance troop readiness and train for mobilization and post mobilization exercises. All branches of the armed forces and allied military units train at YTC to sustain and improve unit readiness for both wartime and contingency operations. In addition, Fort Lewis and YTC have been identified as one of the installations to be the lead in a transformation process for the Army's conversion into a more responsive, agile, and versatile force. This process will be initiated at Fort Lewis by the transformation and stand up of existing units to Interim Brigade Combat Teams (IBCT).

This chapter describes military training strategies and general military land use patterns. It also will introduce the concept of land use zones employed at YTC to minimize potential conflicts between accomplishing the military mission and managing cultural and natural resources. In addition, this chapter describes seasonal flight restrictions developed to address possible impacts to several wildlife species. It briefly discusses fire as influenced by military training on YTC, which is a primary management concern, both on and adjacent to the installation.

2.2 Training Strategy

2.2.1 General

Overall unit readiness is determined by training that takes place in each unit. Soldiers must train individual, leader, and collective tasks as members of Combat and Combined Arms Team. Using units are responsible for governing their preparedness for combat. This is accomplished through repetition of sequential and progressively more difficult drills in which units train together under simulated combat conditions.

Unit Mission Essential Task Lists (METL) identify tasks a unit must be able to complete to perform its wartime mission. Fort Lewis and YTC provide tactical units with training areas necessary to train essential tasks. This includes

accomplishing individual and crew gunnery, small arms qualification, engineer and communications training, and collective (unit) maneuver and live fire training.

Military units use YTC to train Brigade, Battalion, Company, Platoon, and Crew gunnery and maneuver. YTC is also used for air assaults, air drops (personnel and equipment), and special operations gunnery and maneuver. Units train effectively for Combat Training Center (CTC) rotations at YTC.

Availability of the Multi-Purpose Range Complex (MPRC), artillery firing points adjacent to ground maneuver corridors, the Multi-Purpose Training Range (MPTR), and other ranges provide opportunities for multiple live fire training iterations. Dominant ridgelines running east to west at YTC enable natural separation of smaller units by ridges and enable simultaneous maneuver in parallel valleys. This natural separation also allows concurrent gunnery and maneuver training, thereby maximizing unit training time.

2.2.2 Active Component Training

Below are activities military units conduct at YTC.

Gunnery. Based on current requirements, units normally conduct qualification gunnery at least twice each year. Gunnery also may occur during New Equipment Training (NET), or in preparation for a special training event.

Maneuver. Brigades, Battalions, Companies, and Platoons maneuver as individual units at least once each year. Maneuver may include tracked and wheeled vehicles, aircraft, and light infantry in either separate or combined training.

Special Operations Command Exercises. Special operations exercises, including air drops, airborne operations, air assaults, aerial gunnery, and maneuver are conducted several times a year.

2.2.3 Reserve Component/Army National Guard Training

Gunnery. Reserve units and enhanced Brigades complete gunnery training at least once each year.

Active Duty Training. Reserve units perform active duty training for two weeks annually. This normally takes place during the summer and includes both maneuver and gunnery training.

Inactive Duty Training. Reserve units perform inactive duty training two days each month, 11 months each year. Training during these time periods includes gunnery and maneuver.

Mobilization Station. YTC has been designated a war fighting center, and as such serves as a mobilization station for a significant number of critical Enhanced

Readiness Reserve and National Guard units during times of national emergency.

2.2.4 Unit Training Activities

Maneuver Training.

Practice of tactical movement and maneuver with both blank and live ammunition in a realistic environment is required to maintain unit readiness. Active and Reserve units perform offensive and defensive maneuver training at YTC. Maneuver proficiency requires commanders to integrate all available combat power, assets, and resources during field training periods to maximize use of time. Offensive and defensive maneuvers differ in the manner with which terrain is used. Offensive maneuver emphasizes use of terrain for movement and concealment while defensive maneuver uses terrain to restrict movement of attacking forces and to conceal and protect the defending forces.

Armor, Mechanized Infantry, and Interim Brigade Combat Team Gunnery.

Army units that train at YTC include Light Infantry, Mechanized Infantry, Armor and developing forces included in the IBCT transformation effort. IBCT forces utilize the same resources as other forces, and will be replaced in the future with development of other Light Armored Vehicles (LAV) types. YTC will support LAV training although specific directives are to be developed.

Armor and Mechanized Infantry Battalion gunnery consists of direct and indirect fire, and maneuver training. Each unit completes a series of gunnery exercises culminating in Crew and Platoon qualification. Exercises can be completed on the MPRC or on a variety of ranges. The opportunity to conduct Combined Arms Live Fire Exercises (CALFEX) exists in various locations at YTC.

Tank and Bradley Fighting Vehicle (BFV) gunnery training consist of a series of progressive exercises. Target arrays progress from single stationary targets at relatively close ranges to multiple moving and stationary targets at greater distances. In addition, Crews and their vehicles must fight and engage stationary and moving target arrays. LAV gunnery, and that of other systems in the IBCT Modified Table Organization and Equipment (MTOE) are anticipated to follow a similar format.

Units are able to conduct other types of live fire training at YTC. Weapons qualification for personal and Crew-served weapons also occurs during gunnery training. Currently, no aviation units requiring formal gunnery are assigned in YTC's normal area of support. Other live fire activities includes maneuver training with forces from the United Kingdom, Canada, Japanese Self Defense Ground Forces CALFEX, and Ranger/Special Forces CALFEX.

Aviation Activities.

Users of YTC airspace include all services and some allied military for training of Air Crews. Aviation operations involve flight of one or more helicopters operating in the following modes of flight:

- Nap-of-the-Earth (NOE). Flight is as close to the earth's surface as terrain and vegetation permit. Airspeeds vary. Aircraft landing gear just clears obstacles.
- Contour. A minimum altitude of 25 ft. above the highest terrain and/or vegetation, generally following the contour of obstacles at varying airspeeds.
- Low Level. A minimum altitude of 100 ft. above the highest terrain and/or vegetation. Airspeed and altitude remain constant.

River Crossing Activities.

River crossing activities consist of fixed, floating, or rafting operations. Leased land along the Columbia River supports river-crossing operations. Planning with Grant County Public Utility District (PUD), Washington State Department of Ecology (DOE), and Washington Department of Fish and Wildlife (WDFW) ensures that key training objectives are met and environmental coordination is achieved.

Engineering Activities.

Light and Heavy Engineer units train on mobility, countermobility, and survivability tasks at YTC independently in addition to supporting maneuver units as part of combined arms tactical operations.

Both Light and Heavy Engineer units dig fighting, survivability and support positions that consist of tank ditches, fighting positions, survivability positions, and road construction and repair.

2.3 Military Land Use Patterns

Twenty-six developed ranges at YTC are used for a variety of live fire training activities. A list of these ranges, including location and primary use is provided in Appendix B. Sixteen training areas, ranges, and impact areas are contained within ten watershed complexes. Use of training land is scheduled based upon historical use, current military requirements, and environmental practices and policies. As the mission continues to evolve, land use patterns at YTC may change. Land use patterns are described below by watershed complex (Figure 1.5-1).

2.3.1 Alkali Complex

The primary use of Alkali Complex is the MPRC Safety Danger Zone (SDZ). Light Infantry maneuver occurs when the SDZ is not activated. The restrictive nature of the terrain makes it an excellent training area for Light Infantry maneuver and small unit operations. Borden Springs Drop Zone is used for

personnel and equipment parachute drops. The area is also used as a support area (bivouac) for larger exercises. Intense vehicle trafficking may occur in support areas.

The Complex serves to contain non-explosive projectiles fired from the MPRC. The Alkali Creek riparian corridor, Borden and other springs are off limits to vehicle movement due to riparian, and sensitive plant and animal habitat.

2.3.2 Badger Complex

Three major uses of Badger Complex are unit maneuver training, communications sites in the Boylston Mountain area, and transportation through the area to Middle and Johnson Complexes. In addition, the complex supports Engineer activity, train-up of platoon or companies prior to participating in larger maneuver exercises, Light Infantry and scout reconnaissance activity on steeper slopes, and air defense radar and missile sites. Artillery firing positions exist in the extreme southern portion of the complex. The developed Battalion-level bivouac site located just north of Badger Gap provides for support activities, simulations training, and a shower point. The surrounding area receives heavy traffic associated with bivouac activities.

No live fire activities occur in the Badger Pocket portion of the Complex. Limited land use restrictions are associated with riparian areas, springs, and the JWT.

2.3.3 Cold Creek Complex

The primary use of Cold Creek Complex is to support activities associated with maneuver in Selah Complex. Maneuver by wheeled or tracked vehicles is difficult because of steeply sloped stream banks of north-south drainages, and deeply incised banks of Cold Creek. Light Infantry can maneuver freely.

Limited restrictions are in place associated with riparian areas and springs.

2.3.4 Corral Complex

Much of Corral Complex is available for maneuver training although a portion of it includes the MPRC SDZ. This portion is off limits when the MPRC is active. Significant portions of the complex are ideal terrain for Light Infantry training, practicing movement techniques, and small unit operations. Dismounted Infantry force-on-force maneuver training is scheduled in this area. Vehicular movement can be difficult and relatively dangerous because of steep slopes and limited road access.

Limited restrictions are in place associated with riparian areas, springs, and bald eagle roosts. Several cultural sites are also present in this complex.

2.3.5 Hanson Complex

Hanson Complex accommodates all types of maneuver, engineering, live fire, artillery, and mortar training. Although not common, river crossing operations

can be accomplished in the complex and include launching of boats and rafts conducting amphibious training without crossing the Columbia River. Steep terrain comprises more than 80 percent of Hanson Complex.

Limited restrictions are in place associated with riparian areas, springs, and bald eagle roost sites.

2.3.6 Johnson Complex

Although the southern portion of Johnson Complex consists almost entirely of steep hills with deep cuts, some areas support vehicular maneuver. The eastern end of the complex includes the Doris Support Area used for assembly and support. The northern portion of this complex contains an east-west maneuver corridor shared with Middle Complex to the north, which adjoins the Badger Complex to the west. The maneuver corridor is suitable for tanks, BFVs, and LAVs.

The presence of high voltage power lines and the JWT slightly restricts military use of this Complex, however a number of designated crossings are established to allow north/south movement. Limited restrictions are in place associated with riparian areas and springs.

2.3.7 Lmuma Complex

Lmuma Complex is the second largest on YTC, and supports the most varied use. Live fire and maneuver, mostly by mounted troops, are the principal training activities. Approximately 38 percent of the complex is impact area or developed ranges, at which weapons firing is the sole training use. Units up to Brigade size assemble, move, and engage opposing forces in training areas contained in the complex. Artillery and mortar firing points are located throughout.

Twenty-five percent of the watershed is protected for the western sage grouse. Additional restrictions are in place for sage grouse, riparian areas, and springs. Use of the complex requires enhanced fire prevention and fire fighting capabilities from training units.

2.3.8 Middle Complex

Middle Complex contains a wide, long maneuver corridor north of Middle Canyon that can accommodate Task Force level armor, mechanized infantry, or LAV maneuver. Units can conduct training in conjunction with other gunnery activities on the MPRC.

Limited restrictions are in place associated with riparian areas and springs.

2.3.9 Moxee Complex

The primary uses of Moxee Complex are maneuver and engineer training. No live fire ranges are in the complex, and limited live fire activity takes place.

Military training units use demolition in conjunction with engineer and obstacle breach training.

Maneuver use of the complex is somewhat constrained within the narrow corridor between steep southern slopes of Yakima Ridge and YTC's southern boundary. Limited restrictions are in place associated with riparian areas and sensitive plant habitat. As with all other complexes, air quality impacts are managed in accordance with YTC's Master Dust Control Plan. As conditions warrant, training activities may be modified to reduce impacts related to air quality.

2.3.10 Selah Complex

Because of its length, width, and continuity Selah Complex is desirable for all levels of maneuver training. The primary use of this complex, the largest on YTC, is to accommodate maneuver by mounted and dismounted troops, wheeled and tracked vehicles. In addition, most heavy weapons systems can be fired on ranges in this Complex. Ridgelines separating this complex from adjacent areas serve to contain various projectiles and lasers. This complex includes the Cantonment Area and a concentration of support services. Consequently, a significant amount of bivouacking occurs in the Western portion.

Use of the area is limited by permanent and/or seasonal environmental restrictions. In addition to protection of western sage grouse habitat, intense land management practices are employed to prevent or reduce erosion and noxious weed populations. Restrictions are in place for riparian areas and springs.

2.4 Land Use Zones

To aid in resource management, YTC is divided into five land use zones. These planning designations identify allowable military training activities and acceptable levels of impact to resources thereby maximizing military training opportunities, while simultaneously safeguarding resources. Land use and management activities are undertaken within the context of the zone designation. The first edition of the Zone Map was based upon both historic and projected land use patterns. Though the majority of zone designations were accurate, others were not. An example of this includes a projected requirement for a rear support area (Zone 5) near the installation's southeastern boundary which appeared on the first edition of the map but never materialized. Additionally, a portion of the sage grouse protection area (TA 14) was reconfigured, following features such as roads and ridgelines to aid in defining protection area boundaries. Finally, the area between the Cantonment Area and Range Control has, and continues to be used as a bivouac site. This was not reflected in the first map. ENRD therefore has modified the Zone Map to accurately reflect these land use patterns and resource management requirements. Should the installation's training mission or resource management requirements change in the future, modifications the zone map will be made accordingly. The following are descriptions of these land use zone designations at YTC (Figure 2.4-1).

Zone 1 (Land Bank). This zone covers 10,000 acres (3%) of YTC. It is managed for significant and sensitive natural and/or cultural resources (e.g., wetlands, riparian areas, archeological, or sacred sites). Most forms of training, including all tracked and wheeled vehicle use, digging and bivouacking are prohibited. Protection and restoration of these sites is a primary objective.

Zone 2 (Conservation). This zone is the Sage Grouse Protection Area and covers 44,320 acres (13.5%) of YTC. Most forms of training are permitted within these areas, but are highly controlled. The Sage Grouse Management Plan (Appendix B) provides a detailed description of protection and management measures that apply to these areas. Digging and bivouacking activities are not permitted within this zone. Army rest/rotation training regimes and restoration or rehabilitation activities are designed to maintain or enhance these areas.

Zone 3 (General Use). This zone covers 245,914 acres (75%) of YTC and includes the MPRC, MPTR, Cantonment Area and all the primary training and vehicle maneuver areas. With the exception of the Cantonment Area and portions of the MPRC and MPTR, all forms of training are permitted, including bivouac and digging activity, as long as surface water quality, and soil stabilization, and potential long-term habitat reservoirs are maintained.

Zone 4 (High Use). This zone covers 7,742 acres (2.4 %) of YTC. It accommodates heavy use and high-impact activities, such as Brigade Support Areas (BSAs) and gravel pits. Reclamation or remediation activities are used to ensure protection of soil and water resources.

Zone 5 (Impact Areas). This zone covers 19,126 acres (5.8%) of YTC. Included are impact and dud areas and the Selah Airstrip. Due to unexploded ordnance in impact and dud areas these sites are off limits. Due to the hazardous nature of these areas on-the-ground management of these sights is not feasible other than the protection of soil and water resources. These sites are however included in remotely sensed data collection efforts including satellite imagery and aerial photographs.

2.5 Seasonal Flight Restrictions

Designated flight corridors are used to coordinate movement of rotary aircraft throughout the installation. Portions of these corridors have seasonal restrictions due to environmental concerns for sage grouse and bald eagles.

Sage Grouse:
Aircraft are not be permitted to over-fly leks lower than 91 m (300 ft.) Above Ground Level (AGL) between 2400 - 0900 hours during the lek protection period.

Bald eagles:

A 24 hour aircraft flight restriction at the following locations:

- Hanson Creek Route - Between coordinates: GG180875 and GG280842.
    1. Minimum flight level of 300 ft. AGL.
    2. Flights must maintain a 1 km. buffer to the north and south of Hanson Creek, with traffic moving west remaining 1 km. north of Hanson Creek.
    3. The flight route will continue to support two way traffic.
- Columbia River Route - Along the Columbia River between Northing 5183000 and 5169000:
    1. The flight route will support one-way traffic. Access will be coordinated by Rattlesnake flight following facility.
    2. No minimum flight level.
    3. Flights must maintain a 1 km. buffer to the west of the railroad right-of-way along the Columbia River.

2.6 Fire

An inevitable outcome of military training is fire. Training activities such as live fire exercises, use of tracer rounds, explosive ordnance, and some aspects of maneuver training can cause fire. The result has been an increased fire frequency on YTC compared to that which naturally occurred.

As Figure 2.6-1 illustrates, fire ignition and frequency is directly related to the type and location of specific training activities. Fires start primarily on existing ranges, in the Central Impact Area, and dud areas. Between 1987 - 2000, 87,877 acres (26%) of the installation has been impacted by fire. The Central Impact and dud areas, where fires occur repeatedly, include 12,685 acres of this total. In addition, a 1996 fire that escaped from the Impact Area and MPRC burned 48,234 acres; accounting for more than half of the total acreage burned over the past 13 years. The number of acres burned annually has varied from 48,234 acres in 1996 to 2,894 in 2000.

A decline in fire ignition and spread can be attributed to enhanced fire management policy and support. Fire management measures are detailed in Chapter 4.

Figure 2.4-1. ***YTC Land Use Zones Map***

Figure 2.6-1. ***YTC Fire History Map.***

Chapter 3 Management Plan Process

3.1 Introduction

In accordance with Army Regulation 200-3, YTC developed an integrated, ecosystem-based land management plan in 1996. That plan and this update present the process and management strategies the Army follows to support the military training mission, achieve regulatory compliance, and manage resources. This management plan process is based on a landscape level ecosystem management approach that is aimed at protecting, maintaining, restoring, and enhancing essential ecosystem components, processes, and functions. Ecosystem Management (EM) recognizes the complex links between all biotic and abiotic components, functions they provide, and processes acting on these resources. Because ecosystems are so complex, management is conducted at the resource level, and at various scales within the landscape where realistic goals, thresholds, and monitoring strategies can be achieved and measured. This chapter defines EM and individual resource management, discusses appropriate management scale, and details how these concepts are used in this plan. It addresses monitoring and its role in implementing adaptive management to ensure that it is both flexible in application and responsive to emerging issues and changing conditions. This chapter also introduces new planning and assessment strategies that strengthen the ecosystem management approach of this plan by considering potential issues, impacts, and resource conditions at various management scales than was previously done. These strategies include implementing an interdisciplinary team approach in conducting both watershed and project assessments that enable YTC to more effectively plan and evaluate projects, assess their effects on natural resources, and provide the foundation for more informed decisions regarding management of cultural and natural resources.

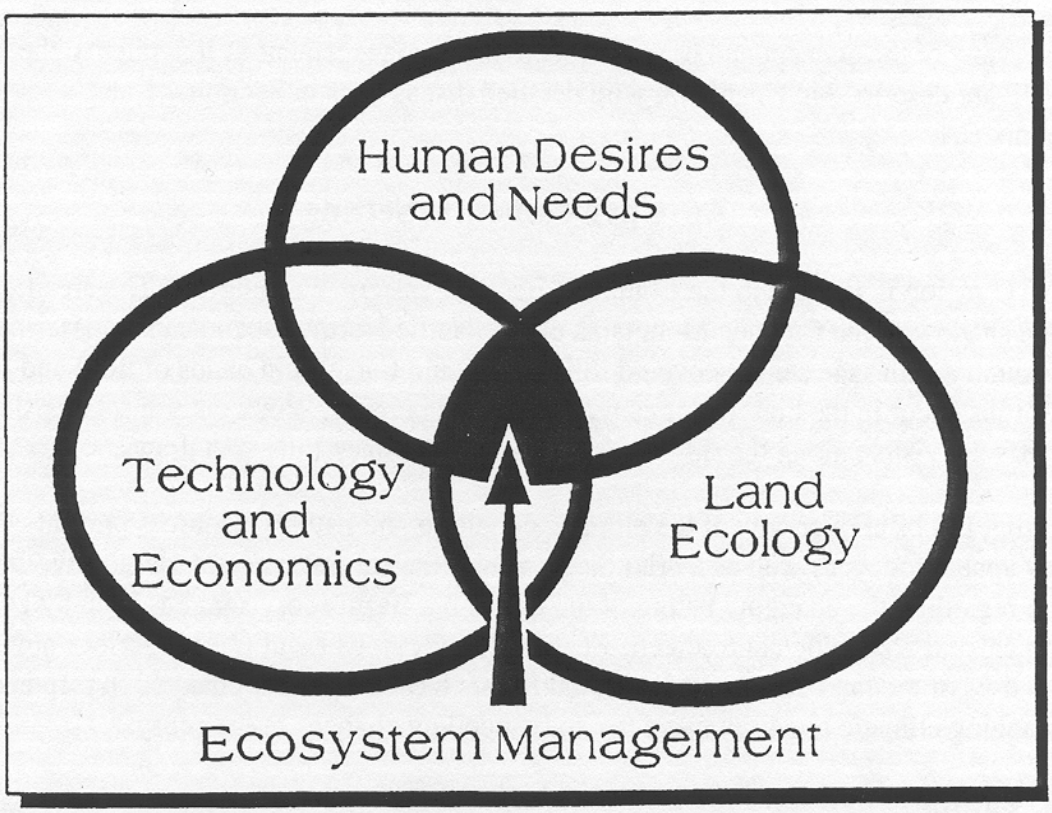
3.2 Ecosystem Management

3.2.1 Ecosystem Management Approach

On August 8, 1994, the DOD issued a memorandum calling for implementation of an ecosystem management approach for land management on all DOD lands. Ecosystem based conservation is a broad approach to natural resource management that involves identifying, protecting, and restoring complete ecosystems, including the structural components and processes they undergo, while fully incorporating social, economic, and other human concerns into planning. The general framework of ecosystem management is illustrated in Figure 3.2.1.

Ecosystem management provides a framework for land managers that promotes intact and naturally functioning ecosystems, which can by definition, support a

wide array of native species (biodiversity) and demonstrates resilience in the event of a natural or human induced disruption. The concept of ecosystem management has developed as a consequence of recognized shortcomings in



Source: Zonneveld, 1988.

Figure 3.2-1. Ecosystem Management, General Framework.

earlier conservation and land management efforts that focused narrowly on only a few elements of the natural world. In response to criticisms of single species conservation efforts, ecosystem management promotes habitat conservation and integrated planning. By improving conditions of habitats, ecosystem management provides an effective and efficient augmentation of the single species management approach. Furthermore, because ecosystem management recognizes that human activities are integral components of ecosystems, it provides the best opportunities for reconciling land use with conservation.

One key objective of this is to achieve conservation goals while eliminating or minimizing potential adverse impacts of habitat conservation efforts on military training. Ecosystem management is the focal point for management of all military lands and offers the best opportunities for sound, and informed environmental protection and natural resource management while permitting planned development and sound military operations. Ecosystem management,

is an approach that provides a sustainable, informed, and accountable basis for natural resources management at YTC.

3.2.2 Definitions and Goals of Ecosystem Management

The concept of ecosystem management provides a framework for land management that promotes conservation of communities, ecosystems, and integrated planning. The goal of ecosystem management is to restore and maintain the holistic functioning qualities of ecosystems such as the complex interrelationships among ecosystem components and processes and ecological or biological integrity. It recognizes multiple spatial and temporal scales, and emphasizes the importance of processes, rather than just organisms.
The DOD defines ecosystem management as a goal driven approach to restoring and sustaining healthy ecosystems and their functions and values using the best science available. The DOD stated goal for ecosystem management is to preserve, improve, and enhance ecosystem integrity in order to maintain and improve the sustainability and native biological diversity of terrestrial and aquatic, including marine, ecosystems while supporting human needs, including the DOD mission (DUSD[ES]/EQ-CO Memo, 08 Aug. 1994). Figure 3.2.2 diagrams the integration of ecological and sociological factors with physical and biological processes in ecosystem management.

3.2.3 Management Scale

The scale at which the manager applies EM may vary in size and complexity, depending on the needs and limitations of the manager. An important prospective to maintain is that while EM stresses landscape scales and a regional perspective for land management, resource managers can manage only their resources. Resources outside their control serve as sources of context, not objectives for management.

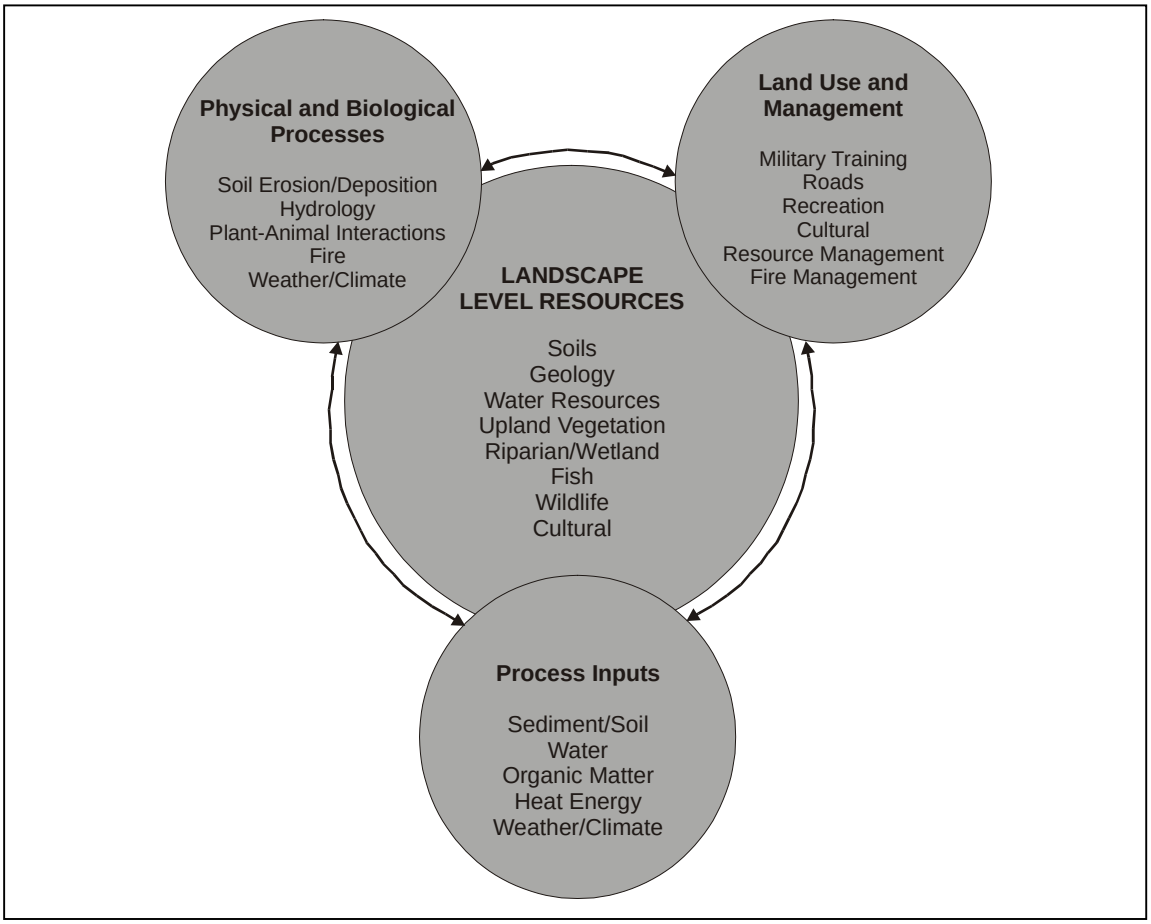
The geographic setting within which ecosystem management can be applied at YTC can be viewed within a range of scales, as follows:

- Pacific Northwest
- Columbia Basin
- Eastern Washington
- YTC and adjacent management areas (Figure 3.2-3)
- YTC boundary
- YTC watershed complexes
- Site specific (e.g. special emphasis areas, specific species, projects)

Understanding the geological, biological, and climatological context of eastern Washington and the Columbia Basin is important for land managers when clarifying resource properties, inputs, and constraints. However, these larger scale perspectives are outside YTC's control. YTC and surrounding lands comprise the regional setting that could provide natural resource linkages to Kittitas and Yakima Valleys and surrounding lands that are generally managed for agriculture or range land activities or urban development. These lands, too,

are outside the control of the Army and thus, can only be considered as potential linkages. While the Army does not have the responsibility or authority to manage

Figure 3.2-2. Factors and Processes Involved in Ecosystem Management Conceptual Framework.



these areas, it actively seeks out cooperative efforts to maintain ecological linkages with adjacent properties and interested agencies such as the USFWS and WDFW.

Lower Columbia Basin Ecosystem

YTC falls within the Lower Columbia Basin Ecosystem (LCBE) of the Columbia Plateau ecoregion. The LCBE includes all of Douglas, Lincoln, Grant, Adams, Benton, and Franklin Counties, and portions of Yakima, Klickitat, Kittitas, Spokane, Whitman, Columbia, and Walla Walla Counties. This ecoregion includes nine zonal series described by Daubenmire (Daubenmire, 1970 and 1972), with the majority of the LCBE within the *Artemisia tridentata/ Pseudoroegneria spicatum* series.

YTC and Adjacent Areas

Figure 3.2-3 shows communities and significant land use features immediately surrounding YTC. The area north of I-90 contains a patchwork of private and agency-owned land used primarily for grazing. Gingko State Park borders YTC's northeast corner. The large area beyond the Columbia River to the east is used primarily for agriculture. The south slope of Yakima Ridge, at and beyond the southern border, is used primarily for livestock grazing and agriculture. Several urban and smaller residential communities, including Yakima, Selah, Moxee City, and Terrace Heights, are located adjacent to YTC's southwest corner. I-82, the Yakima River, and private rangeland separate the western boundary of the installation from the L.T. Murray Wildlife Recreation Area. Finally, YTC borders agricultural land at its northwest corner, referred to as the Badger Pocket. This area consists of irrigated agricultural land with scattered residences and farms.

Lands Within The YTC Boundary

The CNRMP applies EM processes at YTC to the landscape defined by the YTC boundary within the context of the LCBE. Issues of regional significance (e.g. endangered species, water and air quality, and tribal issues) were considered when goals for cultural and natural resource management for the installation were developed.

YTC Watershed Complexes

To effectively manage resources at a landscape scale, ten watershed complexes have been identified. Many of the installation wide resource goals and objectives are most effectively addressed at this scale.

Site Specific

Although goals and objectives are often effectively addressed at an installation or watershed scale, implementation of management actions to meet goals and objectives are more efficiently accomplished at a finer scale.

3.2.4 Implementation of the Ecosystem Management Approach

The strategy for applying EM to YTC consists of a combined coarse, mid- and fine scale approach. The coarse scale applies to the installation as a whole, the mid-scale to watersheds and the fine-scale to specific projects, species, or resource management activities.

The EM process at YTC is diagrammed in Figure 3.2-4 and is applied at the scales outlined above. This includes identifying installation wide and watershed specific resource goals and objectives, developing thresholds for individual resources to measure their condition, and applying management actions to improve the resource. If thresholds are not met, the reason is identified and either management actions are revised or objectives evaluated to determine their validity. Throughout this process, YTC will continue to implement Best

Figure 3.2-3. ***YTC And Adjacent Management Areas.***

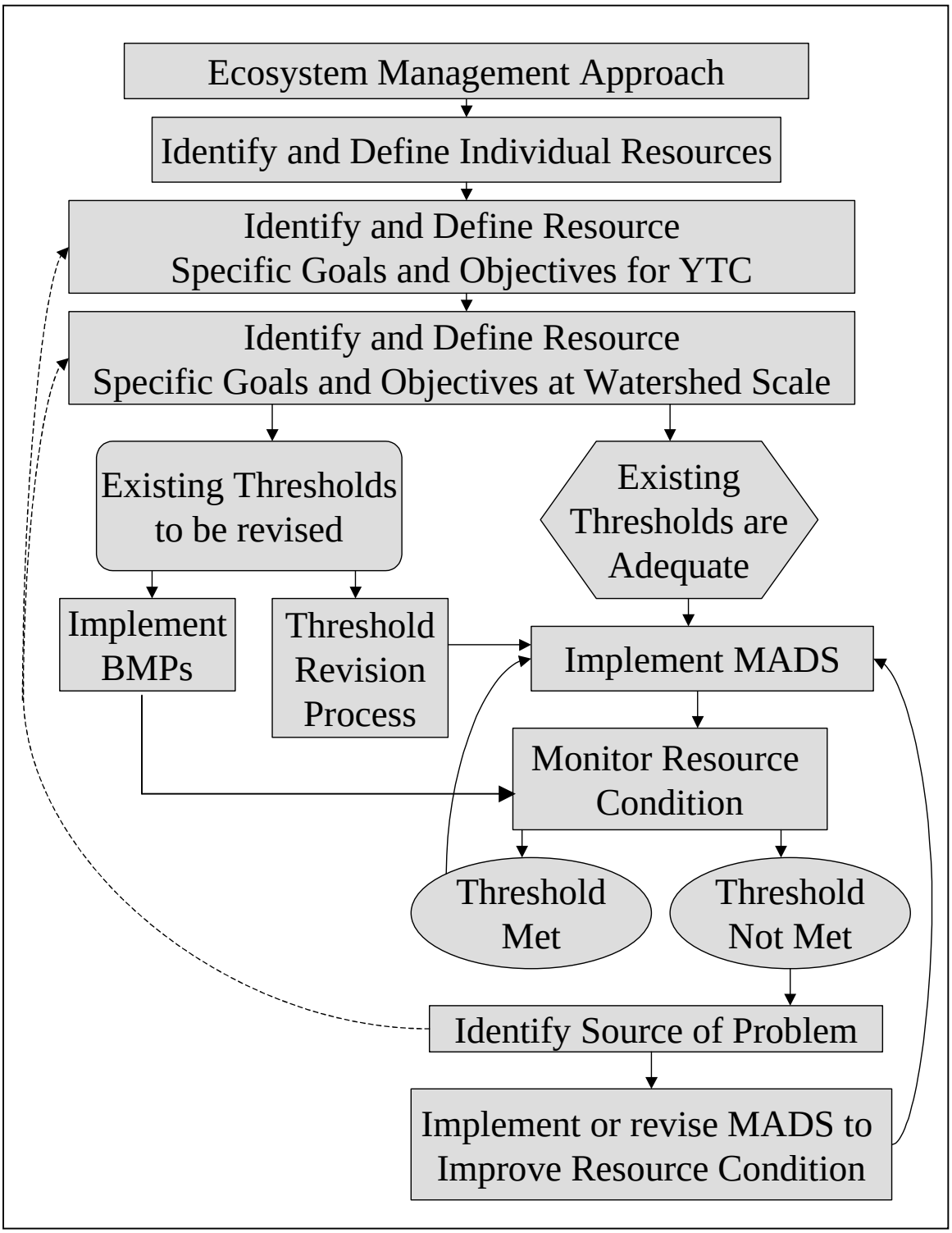


Figure 3.2-4. Management Plan Decision Flow Diagram.

Management Practices (BMPs). As appropriate thresholds are determined and implemented, BMPs may be modified, added or eliminated.

An assumption of this approach is that actions taken to manage individual resources at multiple scales will successfully maintain the desired ecosystem processes, functions, and conditions. This requires in-depth integration of resource objectives and strategies so that goals for individual resources complement each other, rather than conflict with one another. This type of analysis can be accomplished at both the watershed and project scales to ensure an adequate level of evaluation has been conducted so that an informed decision can be made. Meeting individual resource thresholds indicates a potential for accomplishing coarse-scale goals. Implementing management actions and continued modification and improvement of strategies, based upon the outcome of monitoring efforts, is key to the adaptive management process.

3.2.4.1 Adaptive Management

In addition to implementing ongoing proven management actions, adaptive management is an approach whereby decisions and actions are treated like experiments to be tested and adopted if appropriate. Approaches to problems are monitored, feedback on effectiveness is sought and accepted, and new methodologies considered. It is an approach that allows for ecosystem change, unexpected results, learning, and adaptability in management practices.

The first CNRMP was developed to direct management efforts between 1996 – 2001. Actions undertaken during that time made great strides toward the protection and enhancement of cultural and natural resources. While some actions were done as part of mitigation measures for the YTC Expansion and Fort Lewis Stationing RODs, others were in place for the continued conservation of installation resources. Appendix B includes an Information Packet that details management activities accomplished between 1996 - 2001. Information papers include recommendations for modifications or enhancement of management and monitoring actions in the future. Recommendations and additional planning and management actions are part of the 2002 - 2006 CNRMP and are addressed in Chapter 4, the Management Action Descriptions (MADs), and as discussed below.

The Interdisciplinary Team Approach

To implement watershed and project assessments and plan monitoring efforts, an interdisciplinary team (IDT) approach will be used. This team includes professionals in the fields of plant and animal ecology, archeology, hydrology, soil science, natural resources, and Geographic Information Systems (GIS). Representation from multiple disciplines provides for adaptability, a higher level of accountability, and greater variety of possible solutions to potential problems. The IDT also brings much greater expertise to bear on possible problems and situations, providing relevant information and perspectives that can contribute to problem solving and project design.

This process helps to ensure that potential conflicts are identified in the planning and assessment stages when solutions can be developed. Over the next five

years, IDT's will accomplish assessments of YTC's ten watershed complexes. In addition, they will be used to identify and assess consequences of management actions on cultural and natural resources.

Watershed Assessment

A watershed assessment is a procedure used to characterize the human, aquatic, riparian, and terrestrial features, conditions, processes and interactions (collectively referred to as "ecosystem elements") within a watershed. It provides a systematic way to understand and organize ecosystem information. In doing so, watershed assessment enhances the ability to estimate direct, indirect, and cumulative effects of management activities and guide the type, location, and sequence of appropriate management activities within a watershed (Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis – Version 2.2, 1995). MAD 217 provides further information about development and implementation of this interdisciplinary process on YTC.

Project Assessment

Assessments will be accomplished at the project level using IDTs to identify and document direct, indirect, and cumulative impacts of management and land use activities. Examples of such projects include, road closures and upgrades, restoration, livestock trail through, and fire well development.

Project Implementation and Effectiveness Monitoring

Management actions will be implemented to meet resource goals and objectives and address key issues identified through the project assessment. Completed projects will be monitored to determine if they were correctly implemented, and effective in meeting goals, objectives, and key issues identified in the project assessment.

3.3 Environmental Review and Documentation

Implementation of some aspects of this CNRMP will require preparation of environmental documentation in accordance with the National Environmental Policy Act (NEPA), AR 200-2 (Environmental Effects of Army Actions), and Fort Lewis Regulation FL 200-1 (Environmental Protection and Enhancement). Actions such as construction of new features or facilities, or projects that result in impacts, with direct or indirect effects on environmental resources must be reviewed and documented prior to implementation.

To aid the installation in completing projects, YTC will use information provided by watershed and project assessments to dictate the level of environmental documentation required. To support activities presented in this document it is expected that a Record of Environmental Consideration (REC) will be prepared for most actions, with an Environmental Assessment accomplished for larger scale projects that exceed the scope of existing environmental documents. YTC will undertake all necessary coordination with agencies and interested parties to

ensure documents are completed in accordance with all applicable laws and regulations.

Chapter 4 Installation Resources and Management Strategies

4.1 Individual Resource Management

Chapter 3 discussed the EM approach, which achieves landscape level goals through managing resources at multiple scales. However, ecosystems are too complex, and resource managers lack an understanding of the many interrelationships that would enable them to manage all the components of ecosystems. Managers need to know what species, communities, and ecosystems occur in an area in order to focus management objectives on the most critical components of the system to facilitate management planning, analysis, and decision making. By focusing on the most critical components, managers streamline planning and clarify objectives. Managers identify landscape and ecosystem elements (compositional, structural, or functional) that are essential for conservation and management of cultural and natural resources. Individual resources within the landscape, (soils and geology, water, upland vegetation, riparian and wetland areas, fish and wildlife, cultural resources, and outdoor recreation) act, or are acted upon, by landscape-level processes and functions.

Within this context, the CNRMP uses a number of elements to accomplish individual resource management at YTC to include:

- Developing goals that represent the desired condition of a resource.
- Determining objectives (incremental steps) used to meet resource goals.
- Implementing management strategies.
- Monitoring effectiveness of management actions.
- Determining and applying thresholds to monitor whether management strategies are successfully reaching resource goals.
- Applying adaptive management.

This chapter will present the format of individual resources and management strategies discussed in this chapter followed by descriptions of each individual key resource where goals, assumptions, thresholds, and objectives are stated and management/monitoring strategies are given. This chapter also discusses fire in the context of resource management and provides a list of Management Action Descriptions, which are further detailed in Appendix A.

4.1.1 Format of Resources and Management Strategies

This section incorporates the fundamental elements listed above in describing the implementation process. An explanation of each element is given below:

Resource Goal: The resource goal is the broad overall conceptual management statement for a given resource. Each goal is based on the functions and interactions of each resource in the ecosystem. For the purpose of this document functions can indicate sustaining biotic diversity of upland, riparian and wetland communities; sustaining water and air quality, supporting fish and wildlife habitat; providing erosion control; preserving cultural resources; or sustaining human uses. The goal is the mechanism by which the sum of individual resource management achieves ecosystem management.

Resource Description: The resource description is intended to present a summary of historical conditions, a brief description of current condition, including any changes from the previous CNRMP, to identify any known trends, and to address associated issues. Management actions that were performed during the last five years are presented and are also found in the Information Papers found at Appendix B.

Implementation of Existing Best Management Practices (BMPs): This CNRMP re-defines how YTC implements ecosystem management. YTC defines management in terms of broad spatial scales, long time frames, and communities of multiple species, while continuing to uphold policies, directives, programs, and management in the short term. YTC currently implements BMPs that ensure professional stewardship, maintain options for future management actions, and implement existing Army-wide programs. These practices, as applied to each resource, are still valuable management tools and will continue to be implemented even as some new thresholds are being determined. For each resource, a brief statement of concepts is presented.

Assumptions: An assumption is a statement or series of logical statements that are taken as true, and which provide the basis for implementing BMPs or determining thresholds. Assumptions are provided to logically relate broadly stated goals to specific operational objectives and expectations.

Management and Monitoring Strategies: A list of existing programs and their associated Management Action Descriptions used to accomplish the resource goal.

Existing Thresholds: Thresholds are statements that allow evaluation of the success or failure of existing BMPs. Some thresholds from the previous CNRMP have been adopted while other new thresholds were identified for this document. A comprehensive list of thresholds is found in Appendix A.

Threshold Determination and Implementation: New thresholds may need to be determined to evaluate if resource goals are being met in response to a changing environment, legal status of resource, or management direction. The threshold determination and implementation statement provides a separation of the use of existing BMPs from development of new thresholds. In many cases,

YTC will need to understand the resource potential given ecological constraints, and then establish thresholds considering management and land use constraints. When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

Sub-element: A sub-element is a direct or indirect component of a resource goal. The use of sub-elements recognizes the complexity of ecological processes and attempts to translate broadly stated goals into measurable components.

Objective: An objective is a qualitative description of a target that directly measures the sub-element. Objectives are usually stated in terms that relate to specific measurements that can be incorporated into monitoring programs.

Threshold Statement: A threshold statement is provided for each resource sub-element to formally identify the need for a new threshold.

Threshold Determination and Implementation Strategies: A list of logical steps to determine and implement resource thresholds. The threshold determination process includes three general components needed to establish a threshold: 1) the amount or quality of an existing resource, 2) resource potential given ecological constraints only, and 3) the amount or quality of the resource desired given management, policy, and scale.

Threshold implementation includes a list of steps or plans to monitor, evaluate, and determine thresholds for a given resource. In general, once a threshold is determined, YTC will monitor the resource, compare monitoring data to the threshold, and ascertain if the threshold is being met. This process is illustrated in Figure 3.2-4.

Policies: Policies are identified in each resource area explaining the legal framework and direction that YTC operates within. Specific application of each policy to the resource is discussed. The broadest requirements and policies are presented first and geographically specific requirements last.

Management Action Descriptions: MADs describe how YTC will gather information, respond and implement corrective or preventative actions, or monitor a resource. A list of MADs is found at 4.4.

4.2 Resources

Resources and management strategies described in this section include:

- Soils and Geology
- Upland Vegetation

- Water Resources
- Riparian and Wetlands
- Fish
- Wildlife
- Cultural
- Outdoor Recreation

4.2.1 Soils and Geology

Goal

To maintain or improve soil resources that provide the basis for healthy, productive ecosystems.

Resource Description

Geologic history of this area reflects the juxtaposition of lava (basalt) deposition from fissures located to the east, the mountain-forming processes that created the Cascades, local uplift and folding, and glacial outwash and loess deposition episodes that produced the topography of the Columbia Basin Flats. Temporal and spatial overlap of these events contributed to the variety of soils found on YTC.

Geologic History of the Columbia Basin

Miocene Period. During the Miocene era between 17 million years (MY) ago and 10 MY ago, Yakima Basalts were formed through a series of lava flood flows (basalt) extruded from fissures thought to originate between present day Moscow and Lewiston, Idaho. The Cascade Mountains developed between 12 - 4 MY ago. Overlap of these two events created interbed deposits of mudflow and fluvial deposits with distinctly different geologic properties. Most prominent of these is the Ellensburg formation, comprised of pyroclastic and andesite lava materials, a well-known water bearing formation.

Folding and Uplift Period. The uplift and folding period occurred between approximately 9 MY - 1.8 MY ago and resulted in development of east-west trending ridgelines in the Columbia Basin; described as anticlines (ridges) and synclines (valleys between ridges). Anticlines that bisect YTC are Manastash, Umtanum and Yakima Ridge, and Boylston and Saddle Mountains. While these folding and uplift processes continue today, the rate of progress has slowed tremendously (Campbell, 1981). Although little uplift has occurred in the last 10,000 years, some faults associated with YTC anticlines are still active. Throughout the folding process Yakima and Columbia Rivers maintained much of their previous courses as basalt layers were uplifted.

The Pleistocene Period. This period overlapped slightly with the end of the uplift period (1.8 MY - 8,000 years ago), and was the last major influence on YTC geology and soils formation. While glaciers did not actually reach the Yakima area, climatic patterns from this period affected the geology. The Pleistocene

was a more mesic period with increased rates of water erosion and landslides. Strong prevailing Southwest winds scoured the light soils from the Cascade volcanoes and re-deposited them on the lee sides of uplifted ridges. These wind deposits (loess) comprise deep soils in valleys with other water deposits washed from adjoining north-facing slopes.

A second series of Pleistocene events influenced the geology of the eastern edge of the installation. Between 13,000 - 10,000 years ago, a lobe of ice from the Cordilleran glacier repeatedly blocked the Clark Fork River valley, creating a lake. When the ice dam broke, a volume of flood water estimated at 500 cubic mi. spilled across the Columbia Basin, and ponded behind Wallula Gap, creating a second lake with a surface elevation of approximately 350 m. (1,126 ft.). This event repeated itself 40 or more times over 3,000 - 4,000 years. Backwater deposits of granite erratics, silts, sands, and gravel are the most noticeable remaining evidence on YTC.

Recent Geologic History. Recent geologic processes at YTC are characterized by volcanic ash fall and continued loess deposition, little uplift and folding, reduced surface erosion and landslides, continued stream channel erosion, and relatively little topographical change. Important historical ash falls affecting YTC were from eruptions of Glacier Peak 12,000 years Before Present (BP), Mt. Mazama 6000 years BP, and Mt. St. Helens 3600 years BP and again in 1980.

Soil Types And Depths

Deep Soils. Loamy and cobbly loam types dominate deeper soils at YTC. These sites have the deepest soil profiles, and greatest level of soil development. These sites are also the most productive and support the dominant vegetation community of big sagebrush/blue-bunch wheatgrass *(Artemisia tridentata)*/(*Pseudoroegneria spicatum)*. Deeper soils support diverse plant communities due to their depth and fertility. These soils are capable of absorbing soil moisture better than other soils due to their texture and depth. While they typically become saturated from snowmelt in late winter and early spring, they dry quickly as water percolates through the profile.

Shallow Soils (Lithosols). These soils are generally found on south facing slopes and windswept ridges. They are less than 20 inches to bedrock with a high content of rocks and cobbles. Typical vegetation communities supported by these sites includes stiff sage/ Sandberg's bluegrass (*Artemisia rigida/Poa secunda*) and thyme buckwheat/ Sandberg's bluegrass (*Eriognum thymoides/Poa secunda*). Due to their shallow nature and high rock content, these soils have limited water-holding capacity during the late winter and early spring. For about six to eight weeks each year saturation of these soils is extreme.

Aridisols. These soils are the second most common soil order found on YTC. Aridisols are mineral soils having aridic moisture regimes that have developed

enough to no longer be classified as entisols (younger soils). Under irrigation these soils may be very productive, as evidenced by extensive agricultural development where aridisols are found throughout the Columbia Basin.

Other soils. On YTC other soils include entisols, alfisols, and aquolls. These soils form the basis for less common habitats and rare plant associations. Entisols show little or slight development due to unweatherable parent materials. Alfisols are mineral soils formed in glacial till, outwash, loess, or on bedrock that have a pedogenic accumulation of clay in the B horizon, and have sufficient water during the growing season to support growth of plants. Hydric soils are found only at wetland sites.

Important Soil Properties

Soil Chemistry. Soil acidity or alkalinity is an important characteristic that effects other resources including upland and riparian vegetation, water quality, and fisheries. Due to the arid climate, most soils are relatively alkaline, with pH values generally ranging from 6.7 - 8.5.

Soil texture. Soil texture is used to evaluate susceptibility to erosion. Three broad groups of textural classes are recognized: sandy, clayey, and loamy. Generally, sandy soils are considered coarse-textured, clayey soils are considered fine-textured, and loamy soils exhibit properties of both from moderately coarse to moderately fine. From these texture classes a gradation of 12 basic texture class names (e.g. sands, loamy sands, sandy loam, fine sandy loam, loam silt loam and clay) are derived. Loams are typically a mixture of sands, silts, and clays in approximately equal proportions. Silt loams and very cobbly loams comprise 70 percent of YTC soils. Approximately 24 percent is other soils, with less than one percent of rock, soil, and sand combinations.

Erodability Index. Erodability is a measure of soil resistance to displacement either through the effects of wind or water. Through comparison and relationship of physical and chemical properties, structure, vegetative cover, position on the landscape, and slope, an erodability index has been determined for each soil at YTC. The majority of YTCs soils are highly erodable as a result of physical properties, steep slopes, and limited vegetative cover.

Recent Erosion Status

Impacts to soil resources are chiefly attributable to military training activities. The two most important elements of land use that impact soil resources are disturbance and compaction. Disturbance is typically direct such as excavations, whereas indirect disturbance includes intensive tracking, fire, and bivouac. Other disturbances include large burn areas or deteriorated and unmaintained roads and trails. Compaction is normally associated with land use during periods of high soil moisture content.

YTC minimizes training impacts by resting over-used areas, hardening roads and assembly areas, constructing instream sediment control structures, monitoring soil moisture conditions and restricting training during periods of saturation, permitting where trainers can conduct digging activities, and revegetating disturbed areas.

Channel Erosion. Lateral stream channels continue to down cut through uplifting of soil layers. Deeply incised channels in Cold, Johnson, and to a lesser extent Hanson Creek are evidence of downcutting. Local reports, aerial photography, and survey journals indicate a significant rain-on-snow flood event occurred in the region in the early 1930s. This major runoff event, combined with early land use practices (e.g. grazing and road development) is believed to have started much of the incision in major drainages. Isolated short duration high intensity rainfall events have caused localized downcutting throughout the area including YTC.

Upland Erosion. Erosion in upland areas is a function of two processes; wind and water. Wind erosion transports and re-deposits sediments over a period of several thousand years. YTC has directed its efforts toward water and wind erosion control such as road upgrades and closures, hardening of intensively used areas, and application of dust palliatives.

Implementation of Best Management Practices

Soil erosion has a direct impact on other resources such as water quality and fish, and is an important aspect of this management plan. Several management actions have been developed to avoid, reduce or correct erosion deficiencies.

Management actions were undertaken to maintain soils in a mosaic that support resources including vegetation, water quality, wildlife, and cultural resources. The installation implements a variety of management actions to limit erosion and reach this goal.

Assumptions

- Military training impacts soils.
- Soils are necessary to support other resource management and land use requirements.
- Management prescriptions address impacts to soils.
- Modifications to management prescriptions can be made using monitoring data or as a result of changes made to other sub-elements in this plan.
- On-going management is accomplished to mitigate impacts of military training on soil resources and to meet other resource goals.

Management and Monitoring Strategies

The following is the strategy currently used for protection of soil loss.

- Minimize soil disturbance by undertaking pre-planning discussions with Using Units about balancing mission requirements with natural resources including soils. MAD 208
- Revegetate areas with appropriate native or desirable non-native grass and forb species where military training has impacted vegetation. Revegetation provides the root structure to hold soils. MAD 107, MAD 207, MAD 501
- Upgrade heavily used unimproved roads and bivouac areas to provide hardened surfaces that allow infiltration but decrease soil erosion. MAD 205, MAD 206, MAD 501
- Perform road maintenance on unimproved roads following large maneuver events to prevent water capture and confinement. MAD 205
- Install weirs and checkdams in lateral and main-stem stream channels to promote sediment deposition and limit impacts to fish, riparian areas, and off-post resources. MAD 204, MAD 501
- Rotate training areas to provide for recovery of vegetation and soils resources. MAD 201, MAD 208
- Continue to implement and revise LCTA monitoring protocols that provide soil resource data. MAD 202, MAD 501
- Continue to implement and revise water quality monitoring protocols to evaluate BMP effectiveness and needs. MAD 212
- Implement Watershed Assessment to identify issues related to soil erosion and function. MAD 217, MAD 501
- Update and implement the YTC 5 – Year ITAM Plan. ITAM supports soil resource monitoring and rehabilitation resulting from training impacts or enhancements. MAD 201, MAD 501
- Continue closures of steep roads, roads adjacent to streams, or those not maintained to reduce associated soil loss. MAD 205, MAD 207, MAD 501
- Use remote sensing information to assist in identifying areas that may require restoration or other management activities. MAD 203, MAD 501
- Continue implementing ITAM Training Requirements Integration (TRI) program that coordinates training activity between ENRD and DPTMS. MAD 208, MAD 501
- Continue Environmental Awareness for Using Units regarding awareness of training impacts to soils. MAD 209
- Continue investigation of a soil erosion model appropriate for YTC climate and soils. Success of soil erosion models to predict empirical erosion rates has been limited at other installations. MAD 216, MAD 501
- Continue to monitor wet soils and limit maneuver training when soils are saturated. MAD 211, MAD 501
- Support ongoing studies designed to understand local soil formation and degradation processes. MAD 210, MAD 501

Existing Thresholds

- Is erosion evident in areas of recent military training activity?
- As impacts arise, is reclamation of those areas initiated?

Threshold Determination and Implementation Strategies

YTC recognizes the need to determine and refine soil management thresholds. The following strategy of managing soil loss and function outlined below will be used to refine and test thresholds. Additionally, it sets forth the process for redirecting management as thresholds are tested and replace or revise thresholds as needed.

Sub-element: Soil Loss

Objective

Minimize soil loss above background levels.

Threshold Statement

A threshold will be determined that adequately describes appropriate background erosion levels and establishes thresholds for restoration based on comparison of existing background levels, given resource variability (spatial and temporal).

Assumptions

- Background levels of soil loss can be determined.
- Actual levels of soil loss can be determined.
- Limiting soil loss will limit impacts to other resources.

Threshold Determination and Implementation Strategies

- Measure actual levels of soil loss across varying spatial and temporal scales. MAD 216
- Determine appropriate threshold(s) given sampling variability and scale. MAD 216
- Measure background levels of soil loss at NRCS ponds. MAD 216
- Compare actual levels to threshold levels. MAD 216
- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.
- Actions should include identification of erosion source, understanding the mechanism of erosion and selection and implementation of appropriate BMPs to reduce soil loss to an acceptable level.

Sub-element: Soil Function

Objective

To have soils with biologic and physical functions that are supportive of other natural resource elements.

Threshold Statement

The appropriate soil function indicator(s) and threshold(s) will be determined that adequately support other resources.

Assumptions

- The appropriate indicators of soil function can be determined.
- Actual levels of soil function can be measured.
- Functioning soils provide the basis for functioning, healthy ecosystems.

Threshold Determination and Implementation Strategies

- Identify all physical and biologic properties of soils that comprise soil function. MAD 201
- Select properties that are meaningful and easily measured. MAD 201
- Determine limits of spatial and temporal scale for sampling regimes. MAD 201, MAD 501
- Establish thresholds based on a range of empirical values or from literature. MAD 201
- Monitor soil function properties at the appropriate scale to establish thresholds. MAD 201
- Monitor soil function properties at the appropriate scale to compare to thresholds. MAD 201
- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

Policies

Laws, regulations, policies, and directives specifically applicable to management of soil resources are summarized below. These policies have a direct bearing on management of soils on YTC.

- CWA
- AR 200-1
- AR 200-3
- AR 350-4
- WAC 173-201A-160§3
- YTC Using Unit SOP
- NEPA, 42 USC 4321 et seq.
- Fort Lewis Stationing ROD

Clean Water Act. The CWA specifies that non-point sources of pollution such as sediment contained in stormwater runoff from earth-disturbing activities should be controlled using BMP's, that monitoring should be performed to determine if BMP's are effective, and that additional BMP's should be implemented if

indicated by monitoring. The CWA also passes authority to states if they enact regulations that meet or exceed the level of protection afforded by federal law.

AR 200-1. This regulation sets forth guidelines for implementing land management activities (including soils). The regulation dictates that erosion from Army activity and natural causes be controlled to protect water quality and comply with applicable laws.

AR 200-3. This regulation specifies that "installation sources of dust, runoff, silt and erosion debris will be controlled to prevent damage to land, water resources, equipment, and facilities, including adjacent properties."

AR 350-4. This regulation sets forth the objectives, responsibilities, and policies for the ITAM Program. The intent of ITAM is to support sound natural resource management practices to provide stewardship of land assets while sustaining those assets to support training and other installation missions. At YTC, a primary consequence of heavy mechanized training is soil loss due to erosion and loss of soil function.

Washington Administrative Code (WAC 173-201A-160§3). This section contains language adopting the Clean Water Act BMP as the mechanism for non-point source pollution control, including sediment, in order to meet state water quality standards.

YTC Using Unit SOP. Land use restrictions related to soil moisture and use of authorized stream crossings is addressed by this SOP. The SOP also discourages sharp turns and neutral steer turns by tracked vehicles, movement of wheeled or tracked vehicles up steep slopes, and establishment of new roads. Units are strongly encouraged to use existing and improved roads, and improved Brigade Support Areas (BSAs).

NEPA, 42 USC 4321 et seq. This law requires federal agencies to consider whether actions on federal lands or federally funded projects have significant effects on the environment.

Fort Lewis Stationing ROD. This ROD prohibits maneuver training on saturated soils, in part to limit soil compaction during periods of high soil moisture. Compaction can limit plant root penetration, decrease soil resiliency and slow water infiltration.

4.2.2 Upland Vegetation

Goal

To maintain or restore upland vegetation in a diverse mosaic of plant communities in support of a range of functions.

Resource Description

YTC lies within the shrub-steppe vegetative province (Franklin and Dyrness 1973), in the Big Sagebrush/Bluebunch wheatgrass vegetative zone (Daubenmire 1970). The intricate mosaic of plant communities within this province is the result of complex soil patterns, topography, and precipitation. Adding to this complexity is the impact of land use patterns on the landscape.

Plant Communities

A comprehensive vegetation survey completed in 1999 by Salstrom and Easterly documented vegetation communities at YTC. Vegetation was delineated initially into 504 mapping units based on the distribution and abundance of dominant or indicator shrub and grass species. Mapping units are displayed on a Comprehensive Vegetation Map in Appendix B. For the purpose of this document and for an effort currently underway to determine plant community types used by sage grouse, these were consolidated by Battelle PNNL (Richland, WA) into 18 vegetation classes. Mapping units were consolidated into vegetation classes based upon similarities in cover of brush species, perennial forbs, exotic weeds, and perennial bunchgrasses. Table 4.2-1 provides class names, acreage, and percent of the installation comprised by each vegetation class. Figure 4.2-1 illustrates the distribution of vegetation classes across YTC. A general discussion of classes follows including a description of areas where they are found.

Big sagebrush/bunchgrass – ARTR/BG: The *Artemisia tridentata*/bunchgrass vegetation class consists of big sagebrush with perennial bunchgrasses in the understory consisting of either Sandberg's bluegrass (*Poa secunda*) or bluebunch wheatgrass (*Pseudoroegnaria spicata)*. In addition to big sagebrush, other scattered shrubs include spiny hopsage (*Grayia spinosa*), gray rabbitbrush (*Ericameria nauseousus* previously C*hrysothamnus nauseousus),* green rabbitbrush (*Chrysothamnus viscidiflorus*) and antelope bitterbrush (*Purshia tridentata)*. Other perennial bunchgrasses may also be present such as needle and thread grass (*Hesperostipa comata*), Cusick's bluegrass (*Poa* cusickii), bottlebrush squirreltail (*Elymus* elymoides) and Indian ricegrass (*Achnatherum hymenoides*).

The understory includes a variety of forbs, and a cryptogamic soil crust. This class occurs on gentle upland slopes with deep silt loams or loamy soils. Big sagebrush/bluebunch wheatgrass is considered the climax vegetation association in the lower Columbia Basin. Areas that support big sagebrush/Sandberg's bluegrass vegetation may occur on either somewhat shallower soils or at more xeric sites than those where the understory is dominated by bluebunch wheatgrass. This vegetation class occurs on 78,799 acres (24.2%) of the installation.

Table 4.2-1. Vegetation Classes from Sage Grouse HSI Development (Battelle PNNL 2000).

Vegetation Class Name	Code	Acres	Percent Area
Big sagebrush/bunchgrass	ARTR/BG	78,799.4	24.2
Sparse big sagebrush/bunchgrass	(ARTR)/BG	18,734.0	5.8
Big sagebrush - stiff sagebrush/bunchgrass	ARTR-ARRI/BG	35,233.0	10.8
Stiff sagebrush/bunchgrass	ARRI/BG	42,573.4	13.1
Big sagebrush - bitterbrush/bunchgrass	ARTR-PUTR/BG	14,375.6	4.4
Big sagebrush - three tip sagebrush /bunchgrass	ARTR-ARTRP/BG	14,978.0	4.6
Big sagebrush - three tip sagebrush/high bunchgrass	ARTR-ARTRP/HBG	13,543.2	4.2
Three tip sagebrush /bunchgrass	ARTRP/BG	3,382.1	1.0
Three tip sagebrush/high bunchgrass	ARTRP/HBG	17,087.1	5.2
(Big sagebrush-greasewood)/giant wildrye-saltgrass	(ARTR-SAVE)/ELCI-DIST	2,747.0	0.8
Rabbitbrush/bunchgrass	CHNA/BG	13,575.7	4.2
Goldenweed/bunchgrass	HAST/BG	8,722.2	2.7
Thyme-leaf eriogonum/bunchgrass	ERTH/BG	8,606.1	2.6
Bunchgrass	BG	30,742.3	9.4
Sandberg's bluegrass-cheatgrass	POSE-BRTE	4,093.9	1.3
Cheatgrass	BRTE	178.9	0.1
Riparian	Riparian	858.4	0.3
Disturbed, facility, developed	Disturbed	1,580.7	0.5
Impact area	Impact Area	15,985.5	4.9

Sparse (big sagebrush)/bunchgrass – (ARTR)/BG: *Artemisia tridentata*/bunchgrass is differentiated from ARTR/BG because these areas have big sagebrush cover that is patchy or less than 5% throughout the mapped polygon. This class has lower cover of perennial bunchgrasses, with the presence of cheatgrass (*Bromus tectorum*) and areas seeded with crested wheatgrass (*Agropyron cristatum*) that contain some sagebrush cover. This class has generally experienced some level of past disturbance through wildfire, training activities, or other means that decreased the total cover of big sagebrush. This class occurs on 18,734 acres (5.8%) of the installation.

Big sagebrush-stiff sagebrush/bunchgrass – ARTR-ARRI/BG: *Artemisia tridentata-Artemisia rigida*/bunchgrass describes vegetation where both big sagebrush and stiff sagebrush co-dominate the shrub layer. This class generally occurs on rockier, shallower soils, on brows of ridges, or in other areas where

soils are not uniformly deep. The bunchgrasses include bluebunch wheatgrass, Sandberg's bluegrass, and needle and thread grass. Areas where big sagebrush is present and stiff sage occurs in combination with hopsage, bitterbrush, purple sage (*Salvia dorrii*) or round-headed buckwheat (*Eriogonum sphaerocephalum*) are included. This class occurs on 35,233 acres (10.8%) of the installation.

Stiff sagebrush/bunchgrass – ARRI/BG: *Artemisia rigida*/bunchgrass occurs on rocky shallow soils. This vegetation class includes areas where stiff sage co-occurs with purple sage, thyme buckwheat (*Eriogonum thymoides*), bittterbrush, or in one case, hopsage. Cover of perennial bunchgrasses is dominated by Sandberg's bluegrass with other larger bunchgrass occurring at lower densities or in patches. This class occurs on 42,573 acres (13.1%) of the installation.

Big sagebrush-bitterbrush/bunchgrass – ARTR-PUTR/BG: *Artemisia tridentata-Purshia tridentata*/bunchgrass occurs on soils that are either shallower and stonier, contain more gravels, or are very sandy compared to deep loamy soils supporting big sagebrush-bluebunch wheatgrass associations. Soils may also be a complex patchwork that support antelope bitterbrush alternating with big sagebrush as the dominant shrub. This class may include areas where Narrow-Leaf Mock Goldenweed (*Stenotus stenophyllus*) or Douglas' Wild Buckwheat (*Eriogonum douglasii*) co-occur with bitterbrush and sagebrush. Bunchgrasses in the understory include bluebunch wheatgrass at variable densities, needle and thread grass, Sandberg's bluegrass and Thurber's Rice Grass (*Achnatherum thurberianum* (formerly *Stipa thurberiana* Thurber's needlegrass). This class occurs on 14,375 acres (4.4%) of the installation.

Big sagebrush-three tip sagebrush/bunchgrass – ARTR-ARTRP/BG: *Artemisia tridentata-Artemisia tripartita*/bunchgrass occurs on relatively deep soils usually at higher elevations or on slopes with more northerly aspects than big sagebrush/bluebunch wheatgrass. These sites are usually slightly more mesic, either as a result of higher precipitation and snow accumulation, or as a result of reduced solar insolation on north-facing slopes. The bunchgrasses are mainly bluebunch wheatgrass with occasionally bluebunch fescue (*Festuca idahoensis*) at very low densities. This class occurs on 14,978 acres (4.6%) of the installation.

Big sagebrush-three tip sagebrush/high bunchgrass – ARTR-ARTRP/HBG: *Artemisia tridentata-Artemisia tripartita*/high bunchgrass occurs on deep soils at higher elevations and on north-facing slopes. It differs from ARTR-ARTRP/BG in that the main bunchgrass is bluebunch fescue at higher densities. It is also characterized by having higher bunchgrass cover and higher forb cover. This class occurs on 13,543 acres (4.2%) of the installation.

Figure 4.2-1. ***Vegetation Class Distribution at YTC, taken from the Sage Grouse HSI Development (Battelle PNNL, 2000)***

Three tip sagebrush/bunchgrass – ARTRP/BG: *Artemisia tripartita*/bunchgrass occurs on deep soils, usually at more mesic higher elevations. Vegetation includes either patches of big sagebrush or very low cover of big sagebrush with understory grasses dominated by bluebunch wheatgrass. This class occurs on 3,382 acres (1.0%) of the installation.

Three tip sagebrush/high bunchgrass – ARTRP/HBG: *Artemisia tripartita*/high bunchgrass vegetation occurs at upper elevations. The main understory bunchgrass is bluebunch fescue and canopy cover with higher bunchgrass and forb cover. This class occurs on 17,087 acres (5.2%) of the installation.

(Big sagebrush-greasewood)/giant wildrye-saltgrass – (ARTR-SAVE)/ELCI-DIST: *Artemisia tridentata-Sarcobatus vermiculatus/Elymus cinereus-Distichilis spicata* occurs in low-lying drainages and seeps or in some cases alongside small streams. Vegetation includes any combination of the species and is often dominated by big sagebrush growing in association with bluebunch wheatgrass and Great Basin wildrye (*Leymus cinereus*). Great Basin wildrye is found on deep soils in more mesic sites and is often associated with seeps or springs. Greasewood is a phreatophyte and is tolerant of alkaline soils as is the associated grass species, saltgrass. This class occurs on 2,747 acres (0.8%) of the installation.

Rabbitbrush/bunchgrass – CHNA/BG: *Ericameria* (*Chrysothamnus*) *nauseosus*/bunchgrass is found on a variety of relatively deep soils usually where prior disturbance has removed big sagebrush. The bunchgrass component is either bluebunch wheatgrass or Sandberg's bluegrass, and in one case, crested wheatgrass. This class occurs on 13,575 acres (4.2%) of the installation.

Goldenweed/bunchgrass – HAST/BG: Stenotus (*Happlopappus*) *stenophyllus*/bunchgrass is found on shallow rockier soils, usually along or near the tops of ridges or hills. This cover type may contain scattered round-headed buckwheat and occasionally low densities of bitterbrush. Bluebunch wheatgrass occurs in patches or at low densities in association with Sandberg's bluegrass. This class occurs on 8,722 acres (2.7%) of the installation.

Thyme-leaf eriogonum/bunchgrass – ERTH/BG: *Eriogonum thymoides*/bunchgrass generally occurs along ridgetops and hilltops where soils are thin and rocky. This class may contain scattered or very low densities of shrubs such as stiff sagebrush, big sagebrush or occasionally bitterbrush. Douglas wild buckwheat and round-headed buckwheat may also co-occur with patchy bluebunch wheatgrass in association with Sandberg's bluegrass. This class occurs on 8,606 acres (2.6%) of the installation.

Bunchgrass – BG: Bunchgrass includes vegetation dominated by either bluebunch wheatgrass or bluebunch fescue with occassional shrubs. This type

generally occurs on deep well-drained soils that may ultimately support big sagebrush. Shrubs other than big sagebrush occur in association with bunchgrasses that were also included in this vegetation class are spiny hopsage, round-headed buckwheat, antelope bitterbrush, and purple sage. The understory of this vegetation type includes areas of bluebunch wheatgrass and bluebunch fescue or some combination of larger-statured perennial bunchgrasses. Areas where Sandberg's bluegrass is the primary perennial bunchgrass were not included. This class occurs on 30,742 acres (9.4%) of the installation.

Sandberg's bluegrass-Cheatgrass – POSE-BRTE: *Poa sandbergii/Bromus tectorum* occurs in patches, generally on loamy or silty soils with relatively recent disturbance of some kind (e.g. fire). A few patches occur on rockier soils with less than 5 percent stiff sage cover. Bluebunch wheatgrass may also be found at low densities. This class occurs on 4.093 acres (1.3%) of the installation.

Cheatgrass – BRTE: *Bromus tectorum* occurs on a very small percentage of YTC. Generally on deep soils, this class consists of high densities of cheatgrass and other weedy species with rare occurrences of any native species. Weed cover is usually close to 100 percent. This type occurs on 178 acres (0.1%) of the installation.

Riparian: This vegetation class was used to describe streamside woody vegetation and has not been differentiated by shrub or grass type. The purpose of the vegetation mapping effort was to document upland communities therefore this class may be underrepresented, and some riparian/upland interface communities may not be fully accounted for. This class occurs on 858 acres (0.3%) of the installation.

Disturbed, facility, developed: Disturbed vegetation areas are those where all vegetation has been removed and includes facilities, buildings, parking lots, and gravel pits. This type occurs on 1,580 acres (0.5%) of the installation.

Sensitive Plant Species

Selected sensitive plant species have been so designated because their populations are declining or their habitat is threatened. Sensitive plant species have been the subject of several surveys and biological assessments on YTC over the last ten years (Downs et al., 1992, Bottorff and Swanson, 1993, Salstrom et al., 1995 and 1999).

Past efforts indicate the presence of 20 plant species at YTC that are federal or state species of concern (state sensitive and above). A list of YTC's sensitive plant species is located in Table 4.2-2. Figure 4.2-2 illustrates sensitive plant locations at YTC. The map depicts documented populations but is not all-inclusive, as surveys for sensitive plants are ongoing.

Upland Vegetation Community Diversity

Two studies recently undertaken at YTC have been used to aid the installation in identifying areas of interest for maintaining upland vegetation community diversity. As part of a biodiversity study completed by The Nature Conservancy (TNC) in 1999, eight areas were identified because of their unique biological communities. In 2001, Salstrom and Easterly completed a review of vegetation mapping data, sensitive plant survey data, and areas proposed by TNC for the purpose of delineating areas for maintaining upland vegetation community diversity. The result was the delineation of 14 areas designated for the plan as unique vegetation communities that consist of unique biological communities that enhance biodiversity of the YTC landscape. Figure 4.2-3 depicts unique vegetation communities.

Table 4.2-2. YTC Sensitive Plants.

Scientific Name	Code	Common name	Federal status[1]	State status[2]
Astragalus columbianus	ASCO	Columbia milkvetch	S	TH
Astragalus misellus var. pauper	ASMI	pauper milk-vetch		SE
Camissonia pygmaea	CAPY	dwarf desert primrose		TH
Camissonia scapoidea	CASC	naked-stem evening primrose		SE
Carex hystricina	CAHY	porcupine sedge		SE
Collomia macrocalyx	COMA	bristle-flowered collomia		SE
Cryptantha leucophaea	CRLE	gray cryptantha	S	SE
Cryptantha rostellata	CRRO	beaked cryptantha		SE
Cyperus bipartitus	CYBI	shining flatsedge		SE
Eatonella nivea	EANI	white eatonella	S	TH
Eleocharis rostellata	ELRO	beaked spike-rush		SE
Epipactis gigantea	EPGI	giant helleborine		SE
Erigeron basalticus	ERBA	basalt daisy	C	TH
Lobelia kalmii	LOKA	Kalm's lobelia		EN
Lomatium tuberosum	LOTU	Hoover's desert-parsley	S	TH
Mimulus suksdorfii	MISU	Suksdorf's monkeyflower		SE
Minuartia nuttallii ssp. Fragilis	MINU	Nuttall's sandwort		SE
Nicotiana attenuata	NIAT	coyote tobacco		SE
Oenothera cespitosa var. cespitosa	OECE	desert rockrose		SE
Tauschia hooveri	TAHO	Hoover's tauschia	S	TH

Notes: [1]S = species of concern, C = candidate

[2]SE = sensitive, TH = threatened, EN = endangered

Figure 4.2-2. ***YTC Sensitive Plant Species.***

Figure 4.2-3. ***Unique Vegetation Communities.***

The descriptions of these unique biological communities follow:

Borden Springs

This spring and surrounding habitat is regionally important because it provides habitat for several species of rare plants including giant helleborine *(Epipactis gigantea),* porcupine sedge *(Carex hystricina),* shining flatsedge *(Cyperus bipertitus),* beaked spike-rush (*Eleocharis rostellata*), gray cryptantha (*Cryptantha leucophaea*), and the only known Washington State population of Kalm's lobelia (*Lobelia kalmii*).

Middle Canyon

This relatively isolated canyon supports a rich assemblage of plants and birds. The canyon facilitates east west connectivity and has an array of habitats, including lithosols, sites dominated by big sagebrush (*Artemisia tridentata)* and/or three tip sagebrush (*A. tripartita*), cliffs, rock scree, riparian, and outcrops of Vantage interbed. The area includes upper tributaries that support a rich assemblage of species, many of which are distinct from one another, some with rare species such as Suksdorf's Monkeyflower (*Mimulus suksdorfii*), and other species not known to occur elsewhere on the installation including hesperochiron (*Hesperochiron californica*). An important, diverse assemblage of species occurs on north and east facing slopes that contain good quality plant communities, with patches of high microbiotic crust coverage, particularly on north aspects.

Near the canyon mouth and to the south are extensive areas of gravel and sand deposits. The area includes occurrences of the following rare plant species: Sucksdorf's monkeyflower (*Mimulus suksdorfii*)*,* white eatonella (*Eatonella nivia*)*,* gray cryptantha (*Cryptantha leucophaea*), beaked cryptantha (*Cryptantha rostellata*), dwarf desert primrose (*Camissonia pygmaea*)*,* naked-stem evening primrose (*Camissonia scapoidea*), and desert rockrose (*Oenothera cespitosa*)*.*

North slope Umtanum Ridge (Central and East)

Community types in this area are typical for shrub-steppe occurring on north aspects and include cliffs, riparian areas, springs, and lithosols. Higher effective moisture on the north aspect has facilitated recovery from historic disturbances, and the area within the MPRC SDZ has not been grazed by livestock since 1987, eight years before most grazing was terminated across YTC. Much of the area burned in 1996, but scattered big sagebrush is still present and will likely serve as a seed source.

High quality three-tip sagebrush/idaho fescue (*A. tripartita/Festuca idahoensis*) occurs within the area, including stable and healthy assemblages on north slopes adjoining the Central Impact Area. Several upper tributaries to Alkali Canyon support springs and riparian areas that are floristically diverse and different from one another. Rare plants within the area include large occurrences of Hoover's desert parsely (*Lomatium tuberosum*), Columbia milkvetch *(Astragalus columbianus),* bristle-flowered collomia *(Collomia macrocalyx),* and Suksdorf's

monkeyflower. High songbird and raptor diversity has been documented in this area by TNC (Stepniewski 1998).

Selah Canyon

This area provides abundant cliff and talus habitat with extensive riparian habitat for plants, birds, and mammals. It is important for three taxa of rare plants including basalt daisy (*Erigeron basalticus*), Hoover's desert parsley and pauper milk-vetch (*Astragalus misellus* var. pauper).

Saddle Mountain (East) and Sentinel Gap

Lithosols, cliffs, outcrops of interbedded materials, and Pleistocene flood gravels interspersed throughout the area provide a unique juxtaposition of vegetation communities. This area includes extensive, important occurrences of Columbia milkvetch and Hoover's desert parsley. Other rare plant species include Nuttall's sandwort (*Minuartia nuttallii* var. *fragilis*), dwarf desert primrose, bristle-flowered collomia, and beaked cryptantha.

South slopes support big sagebrush/bluebunch wheatgrass (*A. tridentata /Pseudoroegnaria spicatum)* with gray rabbitbrush (*Grayia spinosa*) and stiff sagebrush (*Artemisia rigida)*, which grade to lithosols containing stiff sagebrush and sandberg's bluegrass (*A. rigida/Poa secunda*). Portions of this area with significant spiny hopsage (*Grayia spinosa*) may support communities different in composition from those historically present.

Hanson Creek

Hanson Creek is an important riparian corridor of extensive stands of mature big sagebrush (*Artemisia tridentata*), with spiny hopsage and three-tip sage. A large population of Columbia milkvetch occurs in this area.

Cold Creek Divide

Plant communities here are resilient to past disturbance and are in relatively good condition. This area includes a predominantly south-facing landscape on Umtanum Ridge that is relatively lush, reflecting the higher rainfall of the area. Although portions were historically disturbed, moist conditions contribute to the high resiliency and associated biodiversity, uncommon for south aspects. Diversity of the site is enhanced by gentle but complex topography. The polygon includes Yakima Ridge, which contributes to north-south connectivity. Several springs in the area will improve as they recover from past effects of livestock grazing. Umtanum ridge has complex assemblages of lithosol types, some of which are in good condition.

Southwest Yakima Ridge

This area support lithosols that are unusually diverse at YTC, perhaps reflecting unique geological composition of the ridge. Included is a large, vigorous occurrence of Hoover's tauschia (*Tauschia hooveri*) and Henderson's rice grass (*Achnatherum hendersonii*). The area supports antelope bitterbrush (*Purshia*

tridentata), Douglas sulferflower *(Eriogonum douglasii),* Hedgehog cactus *(Pediocactus simpsonii),* and purple sage (*Salvia dorrii*), all of which contribute to biodiversity and complexity of the site. In addition, three-tip sage occurs on a south aspect in an unusual occurrence.

North Slope Saddle Mountain

This area includes a continuum from wet (west) to dry (east) sites. North aspects and high elevation south slopes have been resilient to past disturbances due to relatively high effective moisture that maintains the good condition of native vegetation, especially to the west. The area supports unusual plant community assemblages on shallow soils with high effective moisture. The ridge includes high quality lithosols that are susceptible to damage from training, particularly under saturated conditions. Secondary drainages on south slopes provide an array of diverse habitats in close proximity enhancing biodiveristy. All of the area is dominated by native species and will continue to recover and improve in condition without livestock grazing and other disturbances.

Cairn Hope Peak East

This area supports high quality big sagebrush/bluebunch wheatgrass habitat and a small population of Columbia Milkvetch. The area provides important connectivity to adjacent habitat off YTC.

Lmuma Creek and West Boundary

This area provides diverse topographic complexity with significant riparian habitat. Two rare plant species Suksdorf's monkeyflower, and coyote tobacco (*Nicotiana attenuata*) occur here. It's proximity to the installation boundary provides connectivity to adjacent lands.

North Boylston Mountain

North Boylston Mountain supports a mosaic of low elevation vegetation communities within gentle topography. Upper elevations of Boylston Mountain include a mixture of plant communities spanning from lithosols to three tip sagebrush/Idaho fescue. It is in moderate condition, having the capacity for improvement if left undisturbed. The area includes communities with Idaho fescue and landscape dominated by big sagebrush.

Knuckles

This area supports a large occurrence of Hoover's tauschia and an unusual plant community dominated by flufleaf lomatium (*Lomatium grayii*). Widespread clumpy occurrences of bitterbrush enhance the diversity of the area. The area contains unusual soils distinct from those surrounding it.

Boylston Tauschia hooveri (TAHO) Site

This area supports a large population of Hoover's tauschia and extensive lithosols, portions of which are in good condition. Pauper milkvetch also occurs in the area.

Land Use Effects on Upland Vegetation

Past and ongoing training continues to affect upland vegetation, including cryptogamic crusts. Vehicle and foot traffic has compacted soils and crusts, and removed or disturbed vegetation. The result, in some cases, has been reduced species diversity, changes in wildlife habitat values, and soil loss. When noxious weed seed sources are present, they have invaded disturbed areas and compete with native plants.

Increased fire frequency is inherent to military training. This continues a cycle of reverting vegetation communities to early seral stages. Fire can leave large expanses of reduced vegetative cover, which can reduce habitat values, increase potential for water and wind erosion, and make areas vulnerable to noxious weed invasion.

Noxious weeds represent a significant threat to YTC's ecological integrity. Approximately 60,000 acres of the installation is infested with various species of knapweed (*Centaurea sp*.), including diffuse (*C. diffusa*.), spotted (*C. maculosa*), and Russian (*C. Repens*). The YTC Noxious Weed Control Plan found at Appendix B has been implemented to control the spread these species. This effort includes introduction of biotic controls, application of herbicides, implementation of vehicle wash policy, and revegetation. Biological agents released at YTC include *Urophora affinis, U. quadrifasciata, Sphenoptera jugoslavica, Metzneria paucipunctelia* and *Larinus minutus.* Additionally, Russian thistle (*Salsola kali*), Koshia (*Koshia scoparia*), Russian olive (*Elaegnus angustifolia),* Scotch thistle (*Onopordum acanthum*), and purple loosestrife (*Ammania robusta*) are also present.

Impact reduction techniques have included rest rotation of training areas, road upgrades, and closures of poorly located or poor condition roads; hardening of BSA's; and revegetation and rehabilitation of sites using native and desirable non-native grass, forb and shrub species. Upland revegetation is accomplished using rangeland drills, tub and hand spreaders. In the Sage Grouse Protection Area (Zone 2) native species are used (Appendix B). In Zones 3 and 4 either native or desirable non-native species are used (Appendix B). Upland revegetation and sagebrush restoration sites were identified through post-training satellite imagery, aerial photography, and field reconnaissance. In 1997, approximately 893 acres were seeded with grasses and forbs, 1,150 acres in 1998, and 966 acres in 1999. Due to reduced training impacts, 669 acres were seeded in 2000. Sagebrush restoration began with seeding 900 pounds in 1997. Sagebrush seedling plantings have included 149,250 in 1998, 50,000 in 1999, and 128,514 in 2000.

In the past anecdotal observations by YTC staff were used to monitor revegetation. However, this did not provide the level of detail necessary to determine if installation upland vegetation and habitat goals were being met. As noted in this plan, a monitoring protocol currently under development will be

implemented to gather detailed information on the installation's upland revegetation efforts. As quantitative data are gathered, mitigation will be modified.

As part of the noxious weed control and rehabilitation measures, the MPRC Bivouac Area was hardened in 1996, the Rear Unit Bivouac Area (RUBA) in 1997, and in 2000 the Boylston, 15th Engineers, and Exit 11 BSAs were hardened. Approximately 275 mile of roads were upgraded between 1996 and 2000 to stabilize road beds and reduce erosion. Concurrently, approximately 390 stream crossings have been improved through placement of culverts and fords, and approximately 14 miles of roads have been realigned.

Implementation of Best Management Practices

Management actions have been implemented to maintain or restore upland vegetation in a diverse mosaic of plant communities in support of a range of functions. The following strategy is currently used by YTC for maintenance and enhancement of upland vegetation.

Best management practices on YTC include noxious weed control, erosion control, Siber staking, reseeding and replanting shrubs, grasses, and forbs, and research to improve efforts in erosion control, upland revegetation and rehabilitation, and noxious weed control.

Assumptions

- Military training impacts upland vegetation resources.
- Desirable upland vegetation communities are necessary to support other resource management and land use requirements.
- Management prescriptions address land use impacts.
- Modifications to management prescriptions can be made using information gathered during monitoring data or as a result of changes made to other sub-elements in this plan.
- On-going upland vegetation management maintains or improves upland resources to meet other resource goals.

Management and Monitoring Strategies

- Continue to implement and revise LCTA monitoring protocols to provide additional data including vegetative structure and composition. MAD 202, MAD 501
- Implement Watershed Assessment to identify erosion problems and prioritize vegetative restoration and maintenance needs. MAD 217, MAD 501
- Update and implement the YTC 5 – Year Integrated Training Area Maintenance Plan. ITAM projects support training area access improvements, upland seeding of areas impacted by training, hardening of repetitively used roads, and stream crossing management for erosion control. MAD 201, MAD 501

- Use remote sensing information to assist with planning and evaluating training damage and upland restoration activities. Remote sensing is used to detect problem areas more efficiently. MAD 203, MAD 501
- Restore upland vegetation in areas impacted by military training and land use practices. Restoration is a priority for erosion control, habitat protection and maintenance of lands for military training. MAD 207, MAD 107, MAD 501
- Continue closing and rehabilitating redundant or incorrectly placed roads. MAD 205, MAD 207, MAD 501
- Continue necessary road upgrades with a focus of improving existing roads. Upgrading established roads reduces impacts that result from pioneering of unauthorized roads. MAD 205, MAD 207, MAD 501
- Develop and implement a Sensitive Plant Management Plan (SPMP). MAD 112, MAD 501
- Monitor designated sensitive plant populations and unique plant communities. MAD 113, MAD 501
- Maintain and update the Siber Stake program to protect sensitive vegetation communities. MAD 111, MAD 501
- Support ongoing research designed to develop improved plant materials for reclamation and restoration purposes. MAD 210
- Continue fire suppression and management actions according to the YTC Wildland Fire Management Plan in order to minimize impacts to upland vegetation communities. MAD 214, MAD 218, MAD 501
- Continue implementation of the YTC Noxious Weed Control Plan that includes cultural, biological and chemical control techniques. Continue to minimize spread of noxious weeds by implementing the vehicle wash policy. MAD 215, MAD 501
- Continue to implement the ITAM TRI program that coordinates training activity between ENRD and DPTMS. Coordination helps minimize repetitive impacts to the environment. MAD 208, MAD 501
- Continue EA training for using units about regarding awareness of how training impacts upland vegetation communities. MAD 209
- Coordinate and direct livestock trail-through operations to minimize impacts to upland vegetation communities. MAD 213, MAD 501

Existing Thresholds

- Is site restoration, when required, accomplished using native plants?
- Have restoration activities been successful?

Threshold Determination and Implementation Strategies

YTC recognizes the need to determine additional upland vegetation management thresholds. The complexity of upland vegetation communities warrants separation of interrelated resource components in order to manage the resource within different vegetation communities. Identifying separate objectives for resource components allows YTC to determine and implement specific thresholds and management strategies for different vegetation communities. A

strategy of managing distribution, quantity, composition, and structure of upland vegetation will be used to develop, refine, and test thresholds.

Sub-element: Distribution and Quantity of Upland Vegetation

Objective

To have upland vegetation in the amounts and distribution that provide for a range of functions.

Threshold Statement

A threshold will be determined that addresses the distribution and quantity of upland plant communities needed to support a range of functions.

Assumptions

- There is some amount and distribution pattern of upland vegetation needed for a range of functions.
- The distribution of upland vegetation can be identified and measured.
- The desired range of functions can be identified and defined.

Threshold Determination and Implementation Strategies

- Identify amount and distribution pattern of vegetation needed to provide a range of functions. MAD 202, MAD 501
- Identify and define the desired range of functions. MAD 202, MAD 217
- Determine a threshold of distribution and quantity of upland vegetation needed to support a range of functions. MAD 202, MAD 501
- Inventory and monitor the amount, distribution, structure, and quantity of upland vegetation to ascertain current status and trends in order to establish appropriate thresholds. MAD 201, MAD 501
- Develop an evaluation process for determining success of restoration and maintenance efforts. MAD 207, MAD 501
- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

Sub-element: Upland Vegetation Composition

Objective

To have upland vegetation in a composition that provides for a range of functions.

Threshold Statement

A threshold will be determined that answers the question, “Do all upland communities have the vegetative compositions needed to support a range of functions?”

Assumptions

- There are compositions of upland vegetation needed for a range of functions.
- Upland vegetation compositions can be identified and measured.
- The desired range of functions can be identified and defined.

Threshold Determination and Implementation Strategies

- Identify the vegetative composition needed to provide for a range of functions. MAD 202, MAD 501
- Identify and define the desired range of functions. MAD 202, MAD 217
- Determine a threshold composition of vegetation needed to provide a range of functions. MAD 202
- Inventorying and monitoring the composition of upland vegetation will ascertain current status and trends relative to appropriate thresholds. MAD 202, MAD 501
- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

Sub-element: Upland Vegetation Structure

Objective

To have upland vegetation structures that provide for a range of functions.

Threshold Statement

A threshold will be determined that answers the question, “Do all upland vegetation communities have the structure needed to support a range of functions?”

Assumptions

- Upland vegetation structure is needed to support a range of functions.
- Upland vegetation structure can be identified and measured.
- The desired range of functions can be identified and defined.

Threshold Determination and Implementation Strategies

- Identify amounts of vegetation structure needed to provide for range of functions. MAD 202, MAD 501
- Identify and define the desired range of functions. MAD 202, MAD 217
- Develop a threshold that addresses potential structure and desired range of functions. MAD 202, MAD 501
- Inventorying and monitoring the structure of upland vegetation will ascertain current status and trends relative to appropriate thresholds. MAD 202, MAD 501

- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

Policies

Laws, regulations, policies, and directives specifically applicable to management of upland vegetation resources are summarized below. These policies have a direct bearing on management of upland vegetation at YTC.

- AR 200-3, 1995. Natural Resources – Land, Forest and Wildlife Management.
- AR 200-5, 1999. Pest Management
- DOD.) Directive 4700.4. Natural Resources Management Program.
- Endangered Species Act (16 USC 1531-1544).
- FL 200-1, 2000. Environmental Protection and Enhancement.
- FL 420-5, 1998. Procedures for the Protection of State and Federally Listed Threatened, Endangered and Candidate Species, Species of Concern and Designated Critical Habitat.
- ROD requirement and mitigation measures from the YTC Expansion and Fort Lewis Stationing EIS's (required by NEPA, 42 USC 4321 1969).
- YTC Using Unit SOP (2000).

AR 200-3. This regulation prescribes current Army policies, procedures, and standards for conservation, management, and restoration of land and renewable natural resources therein consistent with and in support of the military mission and in consonance with national policies. The scope includes the conservation, management and use of soils, vegetation, water resources, rangelands, fish and wildlife species.

AR 200-5. This regulation implements DOD policies to protect health, property, and natural resources from damage by insects, weeds, and other species in ways that promote training and readiness and minimum risks to the environment.

DOD Directive 4700.4. This directive requires military units to conserve and manage natural landscapes, fish and wildlife, and protected species. It directs the Army to review its natural resource management plan every five years, to manage DOD lands to support military activities while improving land and water quality; and to monitor and assess land condition, soil capability, and erosion status information for use in decision making.

The Endangered Species Act (ESA) (1973). This law requires federal agencies to carry out programs for the conservation of endangered and threatened species. The Act states that an inventory of endangered and threatened species and their habitats shall be conducted, programs for monitoring species status shall be developed and implemented, and potential actions that impact species

and their habitats, including training and land management, must comply with this law.

FL Regulation 200-1. This regulation prescribes policies and procedures for conservation, protection, and enhancement of the environment at Fort Lewis, its sub-installations and supported facilities.

FL Regulation 420-5. This regulation sets forth policies and procedures for protection of endangered, threatened and/or candidate species, and habitat components necessary to support their persistence on Fort Lewis and sub-installations.

YTC Expansion and Fort Lewis Stationing RODs. This document requires rehabilitation of up to 2,000 acres/year through planting of native or introduced seed and plants, revegetation to assist soil stabilization, road closures and improvements, and management of training activities to avoid wet soil conditions.

YTC Using Unit SOP. This SOP presents the policies, procedures, and management measures enacted for protection of cultural and natural resources on the installation. Included is the requirement to use established roads during periods of high soil moisture, the requirement to acquire dig permits, fill ruts and excavations, and measures to minimize use of steep slopes and neutral steer turns.

4.2.3 Water Resources

Goal

Meet State of Washington surface water quality standards (WAC 173-201A-030), promote sustained survival of aquatic macro-invertebrate communities, and support water quality management efforts in the Yakima and Columbia River Basins.

Resource Description

Surface Water

YTC surface water resources are contained within 28 sub-watersheds that are grouped into 10 watershed complexes for this plan (Figure 1.5-1). Streams within the Middle, Johnson, Hanson, Alkali, and Corral complexes flow to the Columbia River. Moxee, Selah, Lmuma, Badger, and Cold Creek flow to the Yakima River.

Surface water resources include intermittent, ephemeral, and perennial streams, approximately 204 springs, 19 artificial ponds for sediment retention, fire suppression, habitat, and recreation (Figure 4.2-4). Lmuma, Hanson, Alkali, Johnson, Corral, Sourdough, and Selah Creeks contain perennial flow for much

***Figure 4.2-4**. YTC Streams, Ponds and Springs.*

of their length. However, water often flows below the surface through coarse gravel prior to discharging into the Yakima and Columbia Rivers. Remaining stream channels at YTC are ephemeral or intermittent, flowing for a short period of time in Spring or immediately following a large storm event. Hydrologic conditions vary annually depending on seasonal snowpack and runoff characteristics. Rain falling on snow or frozen ground may result in flashy runoff events with minimum water retention within complexes. Gradual melting of snow creates more consistent spring flows and recharges shallow aquifers resulting in higher, more consistent summer base flows. Several years of drought conditions can cause perennial streams to become intermittent or ephemeral in certain reaches. When shallow aquifers are recharged temporarily, intermittent reaches or ephemeral reaches may return to a perennial condition.

Land use activities that degrade upland and riparian resources can have an affect on surface water resources. An increase in the amount of bare ground and non-native upland species can reduce the quantity of water held within upland areas and increase overland flow. This can increase discharge of peak flows and decrease the duration of flood flows. Historic land use activities, military training, and disturbance have resulted in degradation of many streams at YTC. For example, channel incision causes discontinuity between the channel and flood plain. As incision continues, flow becomes more concentrated and due to decreased upland and bank storage capacity increased degradation results. This process can effectively lower the water table and impacts the presence and composition of riparian vegetation.
Ending of grazing at YTC, combined with riparian protection, plantings and stream restoration activities, have had a positive effect on condition of riparian areas on YTC. Anecdotal observations indicate a rise in the water table and an associated increase in spring and stream flow. As riparian areas continue to improve, flows will become less flashy and base flows will increase.

Surface Water Quality. Although not classified by the State of Washington, under this plan primary streams at YTC are considered class A streams and managed for (excellent) water quality according to provisions of Washington State regulations (WAC 173-201). The primary water quality concern at YTC is introduction of fine sediment into streams and discharge to the Yakima and Columbia Rivers. Discharge of fine sediment is most likely following high, short duration flow event, typically rain falling on snow or frozen ground. Sources of fine sediment include degraded upland areas, improperly designed and located roads, degraded channels resulting from mass wasting, and natural erosion processes.

To date conclusions based on analyzed data indicate that sediment loads from YTC contribute a small fraction of total sediment loads in the Columbia and Yakima systems. However, the effect of timing and extent of discharge is not known. High discharges of solids from YTC may occur over very short time

periods (36 - 48 hours). Peak sediment discharge is often associated with occurrences of rain-on-snow events over frozen ground. Runoff events can occur from November through February; with spring events usually occurring earlier at YTC than Cascade Mountain events. Infrequent runoff events have been monitored resulting in sporadic data that is difficult to interpret. Due to high variability in dryland hydrology and weather, it will be difficult to determine whether changes in water quality are due to management practices or natural processes associated with dryland hydrology. YTC has installed remote water quality monitoring stations, two in Selah Creek, one in Middle Canyon, and one in Sagebrush Canyon. Low runoff during the past two years has limited runoff events and subsequent sample collection.

Surface Water Quality Improvements. Within the past five years improvements in road structure, road closure and realignments, and channel crossings has been completed. Nearly 300 miles of existing roads have been resurfaced with crushed rock (Figure 4.2-5). Approximately 14 miles of roads were re-routed away from stream channels and areas with a high potential for erosion. Approximately 14 miles of deteriorated or poorly located roads were closed to vehicle traffic and rehabilitated. In addition 390 stream channel crossings have been improved with culverts and fords, with 11 miles planned for closure and rehabilitation during 2001. Along with these improvements, riparian and upland restoration programs contribute to minimizing the quantity of fine sediment reaching YTC streams and subsequently transported to the Columbia and Yakima Rivers.

Surface Water Use. Surface water resources on YTC are used for recreation, fire protection, fish and wildlife, and erosion control. The Kiddy pond, located in the cantonment area is used for recreation. Taylor Pond and Foster Pond are used for fire suppression. Greely and Coffin Ponds are for wildlife use. Ponds along Whipple Creek, North Fork Lmuma Creek, and 12 sedimentation ponds located across the installation are for erosion control, capturing fine sediments during large runoff events (Figure 4.2-4). Currently four developed springs provide water for fire suppression at various locations. As fire suppression wells are developed, use of the four springs for fire suppression will be abandoned. Well and fire suppression water resources are illustrated at Figure 4.2-6.

Groundwater

Extensive folding of sedimentary and basalt layers described in Section 4.2.1 created a complex groundwater system with variable hydraulic properties, depths to water, and flow directions. Groundwater in the vicinity of YTC occurs within four principal aquifers: surficial sedimentary units (principally Ellensburg Formation), Saddle Mountains Basalt, Wanapum Basalt, and Grande Ronde Basalt (Ecology and Environment, 1993). Aquifers are not present everywhere across the installation; the occurrence and movement of groundwater at a given location depends upon rock type, geologic structure, and topography.

***Figure 4.2-5**. YTC Roads Map.*

Figure 4.2-6. ***Well and Fire Suppression Resources***

Groundwater is found in gravel layers within surficial sedimentary formations typically confined by overlying finer-grained materials. In sequences of basalt, groundwater is predominantly found within weathered, more fractured contact zones and interbedded layers of sediment between basalt flows. Reported depths to groundwater at YTC range from 100 to >200 feet in higher elevations to <20 feet near the Yakima River and tributary stream valleys. Groundwater-fed springs occur where stream valleys are incised to depths that intercept aquifers.

The process of groundwater aquifer recharge differs between depths. Section 1.5.5 outlines the mechanisms involved. Shallow aquifers beneath YTC largely recharge from precipitation (rain and snow) falling directly within the boundary of the installation. Deeper basalt aquifers recharge over broader areas, particularly to the west of YTC. Water-level elevation maps for aquifers in this area indicate regional groundwater flow from recharge areas in the center part of YTC toward the Yakima River, and the Columbia River on the east (Lane and Whiteman, 1989). Local groundwater recharge (direct infiltration) from precipitation occurs at higher elevations along anticline ridges where basalt flow layers are exposed or covered with a thin mantel of unconsolidated material (Foxworthy, 1962).

Because the shallow groundwater supply is entirely dependent on recharge within YTC, groundwater resources partially depend on the condition of soils and vegetation. Watershed features that retard runoff and promote absorption of water into the soil enhance infiltration of precipitation. Impacts that adversely affect infiltration and the quantity of groundwater include soil compaction, reduction or loss of vegetation, and concentration of flow (e.g., along improperly designed or constructed roads); all of which occur as a consequence of training (off-road vehicle use, fire, and bivouacking). Other land use activities such as livestock grazing have affected soils and vegetation in the same way. Groundwater resources are thus directly linked to the condition of soils and vegetation at YTC, and in turn support domestic supplies, fire suppression, and fish and wildlife habitat.

Ground Water Quality. Recent groundwater assessments in range areas of YTC have included installation of monitoring wells at the Range 14 Unexploded Munitions Treatment Unit (UMTU), and the recently closed sanitary landfill. Monitoring has found no contamination of groundwater at these sites. However, Picloram (Tordon), a restricted-use pesticide, was present at trace levels (1.2 - 5.1 ppb) in the Selah Airstrip Well. The maximum contaminant level (MCL) for drinking water for this chemical is 200 ppb. Continued monitoring is scheduled to track Picloram levels in this well. Suspected sources include knapweed aerial spray control efforts in 1987, and residual chemical treatments applied in the late 1970s prior to paving the airstrip. In 1999, the sanitary seal on this well was repaired to prevent further contamination.

Monitoring wells installed in the cantonment area found subsurface contamination near the old fire training pit located up-gradient of the Central

Vehicle Washrack on the northeast edge of the cantonment area. The contaminant found was No. 6 heating oil. Discovery of this product is consistent with past use of this area, since No. 6 heating oil was used to conduct fire fighting training. When this shallow monitoring well was installed, no groundwater or contaminants were found; however, subsequent monitoring (approximately six months later), found that the No. 6 oil had leached in. Potable water wells in the Cantonment Area have also been monitored for past contamination. Recent monitoring found trace levels (2 ppb), below the MCL drinking water standard of 5 ppb, of tetrachlorothane in Marie's Well which was closed in 2000. Additionally, Yakima County Health District sampled 11-offsite potable water wells down-gradient from YTC in 1995. Testing results do not show any evidence of contamination.

Ground Water Use. Surficial sedimentary formations yield water to wells and springs at rates suitable for domestic and limited irrigation use. Deeper wells penetrating basalt aquifers at YTC are capable of yielding 200 - 600 gallons per minute (gpm) or more. Potable water supplies at YTC are obtained from 14 wells, and non-potable water for fire suppression is currently obtained from nine additional wells and four springs (Figure 4.2-6). Storage tanks, ranging in capacity from 500 - 375,000 gallons, provide a total potable water storage capacity of approximately 568,000 gallons to support training activities and fire protection outside the cantonment area. Storage from non-potable wells for fire suppression alone ranges from 12,500 - 20,000 gallons with total storage capacity of approximately 209,000 gallons to support fire suppression and construction activities.

Summer demand for water at YTC averages approximately 200,000 gallons per day. Approximately three-fourths of this water comes from the cantonment area system. Estimated peak daily demand, measured in 1992 as measured during the 81st Brigade's two-week summer camp, can reach approximately 215,000 gallons per day in the cantonment area. Water used by troops during training exercises may be drawn from the cantonment area system and hauled to the field or from training area wells. Although current water supply capacity is adequate, YTC may need additional wells in range areas to provide better distribution of water for fire suppression. If water yield and quality are acceptable, one or more wells may be developed for drinking water use. Deep aquifer water supplies are adequate for any foreseeable needs at YTC.

Aquifer Recharge. Critical aquifer recharge areas and relationships between surface topography and location of particular aquifers and springs have not been defined within YTC. However, basalt formations serve as primary groundwater sources in the area. These are composed of multiple individual basalt flows. Porous and vesicular tops act as aquifers capable of yielding significant quantities of water. Interbeds within these flows can also provide groundwater to springs and wells. Springs occur on sides of ridges below areas of infiltration where flow tops, interbeds, faults, fractures, and jointing intersect the land

surface. For springs on basalt slopes, recharge areas are ridge crests and rubble slopes. Indications suggest that some disturbance in these recharge areas could enhance recharge by breaking up surface crusts and loosening exposed rock. In addition to interbeds, other features may promote groundwater recharge. The source of groundwater for a number of springs at YTC may be associated with upward leakage from a deeper confined aquifer along structural features such as a fault. Faulting can also cause springs by creating a subsurface blockage or dam groundwater flow. A common example of this is where shallow groundwater collects behind a dam or depression formed by faulting, such as a faulted syncline. Dammed groundwater rises through sediments until the water level reaches land surface and appears as a spring.

Implementation of Best Management Practices

Management actions have been implemented to improve surface water quality in perennial, intermittent, and ephemeral streams. Surface water quality monitoring has occurred in Selah, Middle, and Sagebrush Canyon Creeks at locations in Figure 4.2-7. Best Management Practices undertaken to improve surface water quality include, improving roads and stream channel crossings, closing unnecessary roads, riparian restoration, and upland revegetation and rehabilitation.

Assumptions

- Military training can impact surface water resources.
- Desirable surface water quality standards are necessary to support other resource management and land use requirements.
- Current management strategies minimize training impacts to surface water resources.

Management and Monitoring Strategies

- Fielding additional remote water monitoring stations. MAD 212, MAD 501
- Continue monitoring surface water quality to determine turbidity, temperature, and dissolved oxygen. MAD 212
- Conduct watershed assessments to determine sources of sediment input to surface waters and develop strategies to limit sediment input. MAD 217, MAD 501
- Continue improving secondary roads and stream channel crossings to help restore the function of riparian areas. MAD 205, MAD 501
- Continue closure of unnecessary roads that are sources of fine sediment. MAD 205, MAD 207, MAD 501
- Continue Siber Staking program to protect riparian areas and springs. MAD 111, MAD 501
- Continue Environmental Awareness training given to using units regarding surface water quality concerns and training procedures to follow to reduce impacts to surface water resources. MAD 209

Figure 4.2-7. ***Location of Surface Water Quality Monitoring Stations.***

- Continue implementing upland and riparian revegetation and rehabilitation program to limit soil entrainment and movement downslope. MAD 102, MAD 107, MAD 110, MAD 207, MAD 501

Existing Thresholds

- Does YTC water quality meet or exceed WAC 173-201A-030 Washington State Water Quality Standards?
- Are stream crossing sites (e.g., fords and culverts) properly designed, constructed, utilized, and maintained?
- Are hardened bivouac sites properly located, constructed, utilized and maintained?
- Does YTC have a current hazardous spill control and contingency plan and the capability of implementing the plan when required?
- Do military units comply with the requirement that prohibits bivouacking and vehicle maneuvers within 100 - 60 m., respectively, of a riparian area?
- Do military units comply with the requirement that prohibits vehicle refueling and maintenance activities within 200 m. of a riparian area?
- Are appropriate spill prevention measures and contingency plans in place and can they be enacted during river crossing exercises on the Columbia River?
- Is off-road vehicle training suspended when soil moisture conditions exceed established limits?
- Does YTC participate with other entities regarding Yakima and Columbia River Basin water quality?
- Are roads properly located, designed, constructed and maintained?
- Are sediment control specifications in construction contracts being followed?
- Are sediment control specifications in construction contracts effective?
- Are instream erosion control structures (gabions and weirs) achieving the desired results?

Sub-element: Meet State of Washington Surface Water Quality standards, Washington Administrative Code (WAC) 173-201A-030

Objective

Consistent with existing thresholds for water quality, YTC will ensure turbidity does not exceed five Nephelometric Turbidity Units (NTU) over background turbidity when background is 50 NTU or less or have more than a 10 percent increase in turbidity when background is more than 50 NTU. Ensure dissolved oxygen will be maintained at a minimum of 8 mg/L and maximum water temperature does not exceed 18º C as a result of human activities.

Threshold Statement

Does YTC surface water quality meet or exceed State of Washington Surface Water Quality standards (WAC 173-201A-030) for turbidity, dissolved oxygen, and temperature?

Assumptions

- WAC 173-201A-030 Washington State Water Quality Standards are appropriate for YTC watersheds.
- Data can be collected to determine water quality.
- If water quality thresholds are exceeded actions can be taken to improve the resource.

Threshold Determination and Implementation Strategies

- Determine baseline levels of turbidity, dissolved oxygen, and temperature for YTC watersheds during base and high flow events. MAD 212
- Monitor streams and compare YTC water quality to Washington State Standards. MAD 212
- When water quality thresholds are not met, implement actions to regain specified standards. MAD 102, MAD 204
- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

Sub-element: Aquatic Macroinvertebrate Communities

Objective

Identify and monitor aquatic macroinvertebrate communities present in YTC watersheds that are indicators of water quality conditions.

Threshold Statement

A threshold will be determined that defines the relationship between aquatic macroinvertebrates and water quality of streams existing at YTC.

Assumptions

- Aquatic macroinvertebrate communities are appropriate indicators of water quality conditions.
- Communities of aquatic macroinvertebrates can be identified and monitored.

Threshold Determination and Implementation Strategies

- Determine the aquatic macroinvertebrates communities that should exist based on the characteristics of YTC streams. MAD 101, MAD 114, MAD 212, MAD 501
- Identify the presence and distribution of aquatic macroinvertebrate communities on YTC. Compare existing communities with desired communities. MAD 101, MAD 114, MAD 212, MAD 501
- If the existing communities are not present determine if water quality is the factor influencing the communities. MAD 101, MAD 114, MAD 212

- If water quality is determined to be the influencing factor take appropriate actions to improve water quality. MAD 217
- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

Sub-element: Support other water quality management efforts in the Yakima and Columbia River Basins.

Objective

Support and cooperate with regional water quality organizations involved in management of water quality in the Yakima and Columbia River Basins.

Threshold Statement

A threshold will be determined that answers the question; Does YTC participate with other interested parties concerned with Yakima and Columbia Basin water quality management issues?

Assumptions

- Fostering relationships throughout the Columbia River Basin will help YTC manage water resources.
- Coordination and information exchange is effective in achieving water quality standards.

Threshold Determination and Implementation Strategies

- If a need is identified, take action to support cooperative regional water quality efforts through exchange of information and maintenance of YTC surface water quality. MAD 212
- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

Policies

Laws, regulations, policies, and directives specifically applicable to management of water resources are summarized below.

- YTC Expansion ROD (1991).
- Fort Lewis Stationing ROD (1994).
- Clean Water Act
- Washington State Surface Water Standards (WAC 173-201A).
- Washington State Groundwater Standards (WAC 173-200).
- Washington State Hydraulic Code (RCW 75.20.100-160).
- Endangered Species Act (16 USC 1531-1544).

YTC Expansion ROD. This document prescribes specific mitigation actions to protect water resources. These include hardening of stream crossings, relocating roads outside Foster and Johnson Creeks, limiting access and use of riparian corridors and associated buffers, and suspended solids monitoring.

Fort Lewis Stationing ROD. This document prescribes specific mitigation actions to protect water resources. These include hardening of stream crossings, relocation of roads outside riparian corridors, establishment of buffers, and suspended solids monitoring.

Clean Water Act. As a 1977 amendment to the Federal Water Pollution Control Act of 1972, this act sets the basic structure for regulating discharges of pollutants to United States waters. The law gave EPA the authority to set effluent standards and set water quality standards for all contaminants in surface waters. The State of Washington complies with the CWA by implementing Washington State Surface Water Standards (WAC 173-201A) and Groundwater Standards (WAC 173-200).

The CWA mandates compliance with state, local, and federal water quality standards and discharge restrictions, with an overall goal of maintaining water quality for all uses. YTC streams are not specifically monitored or classified by the State of Washington, but are managed for water quality standards meeting or exceeding Class A streams (WAC 173-201A). Washington surface water quality standards include an anti-degradation policy to protect all existing beneficial water uses and provide special protection for high-quality waters. The policy also encourages evaluation and use of less degrading or non-degrading alternatives and sets aside outstanding waters from receiving any. In compliance with section 303(d) of the CWA each state must identify polluted waters and submit the list to the Environmental Protection Agency. No waters within YTC are included, but the Yakima and Columbia River's are cited as impaired due to water quality. The CWA requires the state to establish Total Maximum Daily Loads (TMDL) for each pollutant affecting impaired waters. The TMDL consists of a watershed based management plan to improve impaired waters to meet CWA and Washington State water quality standards. The plan for certain pollutants in the Yakima River will be completed in 2001, with all TMDL's completed by 2012. It is unlikely that YTC waters will be directly addressed in the Yakima River Plan, because discharge of pollutants from YTC is minimal. However, the plan may address temperature, sediment, and quantity of flow for YTC streams.

Section 404 of the CWA requires a permit for discharge of dredged and fill material into U.S waters. Actions regulated under this policy include channel crossing installation, bank protection, and instream grade control structures such as rock or gabion weirs placed within "waters of the U.S.". The primary purpose of section 404 is to minimize impacts to wetland resources.

Washington State Hydraulic Code (RCW 75.20.100-160). The Washington State Hydraulic Code requires any individual, organization, or government agency conducting construction activities in or near state waters to conduct the activity according to guidelines specified by a permit issued by WDFW. The permit is called a Hydraulic Project Approval and specifies actions to minimize impacts to fish and wildlife habitat.

Endangered Species Act (ESA) (1973). Recent listings by the National Marine Fisheries Service (NMFS) of Yakima and Columbia River salmon and steelhead under the ESA will affect management of waters within the Yakima and Columbia River watersheds. According to 4(d) rulings many activities conducted on YTC require coordination with NMFS to ensure that listed species are not jeopardized by YTC actions.

4.2.4 Riparian and Wetland

Goal

To provide ecologically healthy and functioning riparian and wetland areas on YTC.

Resource Description

Riparian and wetland systems associated with ponds, springs, perennial, and intermittent streams are critical elements of the shrub-steppe ecosystem. The term "riparian" in this document, is defined as: "…the area adjacent to streams that is influenced by perennial or intermittent water and contains elements of both aquatic and terrestrial ecosystems mutually influencing each other" (Thomas, et al., 1979). Riparian areas include the entire extent of the flood plain and those wetlands directly connected to streams. Wetlands are defined as " those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (U.S. Army, Environmental Laboratory, 1987). For the purposes of this plan, riparian and wetland resources will be referred to as riparian unless identified otherwise.

In arid areas, wetlands and associated riparian areas provide important ecological functions for fish and wildlife, sensitive plant species habitat, water quality, and natural erosion control. Although they comprise only a small proportion of the arid landscape, riparian areas are used by wildlife disproportionately more than other habitat. Riparian and wetland systems in arid and semi-arid lands are characterized by higher productivity and greater habitat and species diversity compared to adjacent uplands (Thomas, et al., 1979; Platts and Raleigh, 1984). Because water is an important limiting factor, plant and animal life depends on this resource, especially during dry times of the year. Aquatic and riparian areas are very dynamic systems experiencing a variety of changes at different spatial and temporal scales.

Past and on-going human related activities (domestic livestock grazing, military training, and road construction), as well as natural events, such as floods, drought, and fire can influence the distribution, quantity, composition, structure, and function of riparian habitats. These activities and events have often times resulted in degraded riparian resources on YTC. It is these factors and their resultant effects that are of issue with management of riparian resources. Natural disturbances, such as floods, drought, wildfire, and wildlife browsing can decrease the distribution, amount, and condition of riparian and wetland resources at YTC. Flooding can substantially alter channel morphology. Drought conditions can affect the distribution and survival of riparian vegetation. Wildfire can eliminate existing riparian vegetation or alter its structure to the point where it is susceptible to invasion by non-desirable species or other degrading factors. Wildlife browsing by deer, elk, porcupine, and beaver can also affect quantity, distribution, and condition of riparian vegetation. Such natural disturbance events that occur within the natural range of variability are important for maintaining ecosystem function. For example, development of cottonwood seedlings requires exposed mineral soil on stream banks and point bars that erode during flooding (Prichard, 1993). It is when the frequency, rate, timing, duration, or intensity of these natural disturbance factors change that undesirable effects occur to the quantity, distribution, composition, structure, and function of riparian areas. In addition, even natural disturbance factors acting within their natural range of variability can have a negative influence on riparian areas if degraded in their current state. Human-related disturbances include domestic livestock grazing, military training, road construction/use, stream crossings, and human caused fires. Domestic livestock grazing can degrade and alter the distribution and amount of riparian vegetation, cause stream bank erosion, and reduce water quality. Military training involving off-road vehicle use can affect riparian areas in much of the same way. Vehicle use within riparian areas can reduce existing vegetation, disturb unstable and highly erodeable soils, and impact site-specific hydrologic patterns. Poor road and stream crossing design, construction, and maintenance can impact riparian resources by decreasing riparian vegetation and channeling streams thereby contributing to fine sediment loads. An increase in fire frequency within and adjacent to riparian areas can significantly increase sediment inputs and bed-load transport, as well as creating areas susceptible to invasion by non-desirable species. Although impacts occur, riparian areas have evolved resiliency to cope with a variety of changes at different spatial and temporal scales. However, the time required and pathway to recovery for a riparian area is dependent on the degree of degradation and its current condition.

Management actions within the last five years include an installation wide riparian assessment (1999) that determined the current condition of 15 selected streams at YTC and validated earlier assumptions and general observations related to past impacts and degraded riparian conditions. A base-line of riparian conditions were established to monitor the pace and direction of recovery occurring

following the cessation of domestic livestock grazing in 1995 (refer to Riparian Assessment Information Paper in Appendix B). Other past riparian and wetland area management actions include extensive protection (Siber Staking) and restoration efforts aimed at maintaining and enhancing existing riparian areas (Refer to Siber Staking and Riparian Restoration Information Papers in Appendix B).

Current riparian and wetland distribution, quantity, composition, structure, stable channel conditions. An assumption, used during the first CNRMP, primarily based on past observations and anecdotal information, was that existing quantity and quality of riparian and wetland resources at YTC were significantly below ecological potential and did not meet desired management conditions of ecologically healthy and functioning riparian areas. Riparian and wetland resources were in some cases functioning poorly or not functioning at all in terms of providing for fish and wildlife habitat, sensitive plant habitat, water quality, and natural erosion control. Riparian and wetland areas were believed to be limited to known springs and perennial water-bodies, and their potential for recovery was unknown. Unstable channel conditions, decreased quantity and distribution, and alteration of species composition and structure of riparian vegetation was observed.

The riparian assessment conducted on 15 mainstem drainages (Figure 4.2-4), from 1996 - 1998 validated original observations. Additionally it provided a baseline of conditions to compare against in the future and identified the need for specific thresholds to be developed that can be applied at a more refined and meaningful scale. In addition, these efforts identified the need to continue assessments for the purpose of evaluating trends in recovery of riparian and wetland resources.

Distribution and Quantity of Riparian Areas. A total of 204 springs occur at YTC (Figure 4.2-4). Several ponds occur on the installation and are maintained for recreation, wildlife, fire fighting, and erosion control. These water bodies are described in 4.2.3. Most have, or have the potential to develop associated riparian and wetland areas.

At YTC, riparian areas and wetlands occur along portions of perennial or intermittent streams. As defined in Prichard (1993), perennial streams flow continuously and are generally associated with a locally occurring water table. Intermittent streams typically flow seasonally, receiving water from springs or from surface sources, such as snowmelt or precipitation. Ephemeral streams flow only in direct response to precipitation, with the channel being above the water table at all times (Prichard, 1993). As a result, ephemeral streams are not likely to support extensive riparian communities. Stream flow at YTC varies among watershed complexes and among streams within watershed complexes. As a result, potential structure and composition of riparian systems varies considerably. Where streams flow intermittently or are confined to steep, narrow,

or incised channels, adjacent upland vegetation occurs up to the stream edge. With increasing water, and decreased disturbance, riparian and wetland plant communities exhibit greater extent and diversity.

Streams having perennial flow along portions of their length are few at YTC. Intermittent and ephemeral streams lacking the ability to support extensive riparian and wetland habitats primarily dominate the drainage network. Streams exhibiting long reaches of perennial flow are lower Selah, Johnson, Alkali, and Cold Creek. Reaches of lower Lmuma and lower Hanson Creek exhibit shorter perennial stream reaches. Perennial stream reaches are absent in Badger, Corral, Middle, and Moxee Complexes. Many intermittent and ephemeral streams at YTC experience limited flows that are typically related to storm events or snowmelt.

All springs and main-stem drainages have been designated to occur within Zone 1. Although this designation includes areas containing selected cultural sites, bald eagle roosts, and selected raptor nest sites, riparian areas dominate the land area within this zone. Among watershed complexes, the land area in Zone 1 is greatest in Selah Complex, followed by Alkali, Corral, and Lmumma Complexes (Figure 4.2-8).

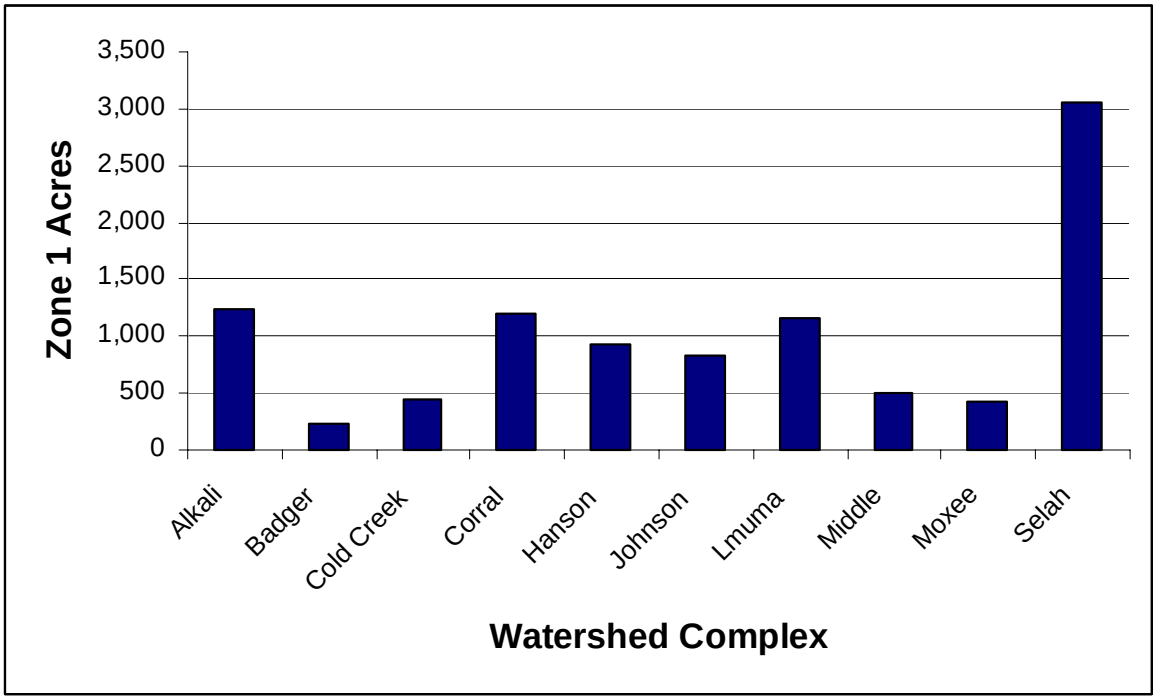
Composition. During the initial assessment riparian plant species composition was found to vary across YTC. Although existing native riparian vegetation and natural regeneration of desired native species was evident, extensive colonization by non-native and/or undesirable weedy plant species was documented in response to cessation of livestock grazing. This occurred in every watershed on YTC. However, due to the sampling design the extent of riparian areas with non-native and/or undesirable weedy species were not determined. Current species composition, extent of non-native and/or undesirable plant species, and occurrence and rate of natural regeneration of desirable native plant species will be considered for future riparian assessments.

Several sensitive plant species occur within riparian areas. Five are obligate wetland species and include shining flatsedge (*Cyperus bipartitus)*, Kalm's lobelia (*Lobelia kalmii)*, porcupine sedge *(Carex hystricina)*, beaked spikerush *(Eleocharis rostellatat)*, and giant helleborine *(Epipactis gigantean)*. See Table 4.2-2 for the status of these species.
Plants of cultural importance occur within riparian areas at YTC. Of these, many are shrubs that produce berries used for a variety of purposes. Species include: serviceberry *(Almelanchier alnifolia)*, black hawthorne (*Crategus douglasii)*, choke cherry *(Prunus virginiana*)*,* golden currant (*Ribes aureum)*, white squaw currant (*Ribes cereum)*, and blue elderberry *(Sambucus cerulea).*

Structure. During the initial assessment the structure of riparian vegetation communities was found to vary across YTC. Early seral conditions, lacking woody shrubs and trees, however, dominated most riparian areas. It is the

structure found in later seral stages, that adds diversity to riparian functions (roost sites, nest sites, woody recruitment into streams and shade). The extent of large diameter trees providing potential Lewis woodpecker habitat was assessed. Hanson, Cold, and Foster Creek contained the greatest extent of large diameter trees with lesser amounts found in Lmuma, Middle, No-name, and Selah Creek.

Figure 4.2-8. Zone 1 Areas by Complex.



Stable Channel Conditions. Lastly, during the initial assessment channel conditions were found to vary across the installation due a variety of natural and human-related disturbance factors. All or portions of many stream channels were confined or entrenched, had multiple non-functional ratings, and poor bank stability, making them susceptible to erosion. Stream channels in these conditions provide poor environments for establishment and maintenance of riparian plant communities; thus reducing potential for wildlife, fish, sensitive plant species habitat, erosion control, and water quality.

Implementation of Best Management Practices

A variety of management actions have been implemented by ENRD to maintain or restore ecologically healthy and functioning riparian areas. The following is the strategy currently used.

Assumptions

- Military training can impact riparian area resources.

- Desirable riparian communities are necessary to support other resource management and land use requirements.
- Current management strategies minimize land use impacts.
- Modifications to management strategies can be made using information gathered during monitoring or as a result of changes made to other sub-elements in this plan.
- On-going riparian area management is designed to maintain or improve riparian resources.

Management and Monitoring Strategies

- Revise and implement Riparian Assessment to better monitor the quantity and quality of riparian areas. MAD 101, MAD 501
- Implement Watershed Assessment Program to more accurately identify the potential for riparian areas within watersheds. MAD 217, MAD 501
- Revise and implement Spring Assessment to better monitor the quantity and quality of riparian areas associated with springs. MAD 103, MAD 501
- Continue Bald Eagle Habitat Restoration to provide future winter roost habitat within riparian areas. MAD 110, MAD 501
- Continue Integrated Training Area Management (ITAM) Plan updates. MAD 201, MAD 501
- Continue LRAM – Instream Erosion Control and Crossing Feature program. MAD 204, MAD 501
- Continue road closure program. MAD 205, MAD 207, MAD 501
- Use remotely sensed data to assist in planning riparian restoration activities. MAD 203, MAD 501
- Restore riparian vegetation in areas impacted by military training and past livestock grazing. MAD 102, MAD 104, MAD 110, MAD 501
- Continue Siber Stake program to protect riparian vegetation communities. MAD 111, MAD 501
- Implement fire suppression and management actions within the YTC Fire Management Plan that minimize impacts to riparian vegetation communities. MAD 214, MAD 218, MAD 501
- Implement IPMP that includes cultural, biological, and chemical control techniques. MAD 215, MAD 501
- Continue implementation of the ITAM TRI program that coordinates training activity between ENRD and DPTMS. MAD 208, MAD 501
- Continue EA training of using units regarding awareness of riparian area issues and training procedures to follow to reduce impacts to riparian communities. MAD 209
- Coordinate livestock trail through to avoid impacts to riparian communities. MAD 213, MAD 501

Existing Thresholds

- Are all legal requirements being met?

- Do using units comply with bivouac and vehicle maneuver restrictions associated with riparian areas?
- Are management activities protecting, maintaining, and enhancing riparian corridor vegetation, and promoting recruitment of large woody debris?
- Are Siber Stake protection areas being complied with?
- Are known noxious weeds and undesirable plant species properly controlled using integrated pest management practices?
- Has the completed riparian assessment validated original assumptions regarding riparian conditions?
- Did the completed riparian assessment (1999) establish a baseline condition to measure future amounts and conditions of riparian vegetation?
- Are additional riparian assessment efforts being conducted to address new management issues and monitor against baseline conditions?

Threshold Determination and Implementation Strategies

YTC recognizes the need to determine and refine riparian area management thresholds. The following strategy of managing hydrology and the distribution, quantity, composition, and structure of riparian vegetation will be used to develop, refine, and test thresholds. Additionally it sets forth the process for re-directing management activities as thresholds are tested.

Sub-element: Hydrology

Objective

To establish channel conditions that are representative of ecologically healthy and functioning riparian areas.

Threshold Statement

A threshold will be determined that answers the question, “Do stable channel conditions that provide for ecologically healthy and functioning riparian areas exist?”

Assumptions

- Stable channel conditions are needed for ecologically healthy and functioning riparian areas.
- Stable channel conditions are needed to establish appropriate riparian vegetation composition, structure, quantity, and distribution.
- Stable channel conditions can be defined, measured, and assessed for various reaches within a watershed.

Threshold Determination and Implementation Strategies

- Determine stable channel conditions that are required for ecologically healthy and functioning riparian areas associated with reaches within watersheds. MAD 101, MAD 103, MAD 217

- Inventory and monitor channel conditions and analyze against threshold. MAD 101, MAD 501
- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

Sub-element: Distribution and Quantity of Riparian Vegetation

Objective

To have riparian vegetation in the quantity and distribution that provides for ecologically healthy and functioning riparian areas.

Threshold Statement

A threshold will be determined to answer the question "Does riparian vegetation exist in the proper quantity and distribution to provide healthy and functioning riparian areas?"

Assumptions

- There is a minimum quantity and distribution pattern of vegetation needed to provide for ecologically healthy and functioning riparian areas.
- Existing quantity and distribution of riparian vegetation can be measured.
- Potential quantity and distribution of riparian vegetation can be identified and measured.
- Healthy functioning riparian areas can be defined and identified.

Threshold Determination and Implementation Strategies

- Identify the minimum quantity and distribution of riparian vegetation required for healthy, functional riparian areas. MAD 101, MAD 103, MAD 217, MAD 501
- Identify the potential quantity and distribution of riparian vegetation. MAD 101, MAD 103, MAD 217, MAD 501
- Determine a threshold that addresses the desired future condition of riparian vegetation quantity and distribution. MAD 101, MAD 103, MAD 217, MAD 501
- Inventory and monitor the quantity and distribution of riparian vegetation and analyze against threshold. MAD 101, MAD 501
- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

Sub-element: Vegetation Composition

Objective

To have riparian areas consisting of the appropriate native plant species composition that provides ecologically healthy and functioning riparian areas.

Threshold Statement

A threshold will be determined to answer the question "Do riparian plant communities consist of the appropriate native plant species composition based on site potential?"

Assumptions

- Riparian areas with appropriate native plant species composition infer ecologically healthy and functioning riparian areas.
- Appropriate native plant species composition can be defined for a range of riparian conditions (perennial, intermittent, and ephemeral) and scales (stream reaches, and watersheds) on YTC.
- Riparian plant species composition can be measured.

Threshold Determination and Implementation Strategies

- Determine appropriate native plant species composition across the range of riparian conditions and their composition potential at YTC. MAD 101, MAD 103, MAD 217, MAD 501
- Determine a threshold that addresses the desired native plant species composition for a range of riparian conditions and their composition potential. MAD 101, MAD 103, MAD 217, MAD 501
- Inventory and monitor plant species composition and analyze against threshold. MAD 101, MAD 103, MAD 501
- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

<u>Sub-element: Vegetation Structure</u>

Objective

To have appropriate vegetation structure that provides ecologically healthy and functioning riparian areas.

Threshold Statement

A threshold will be determined to answer the question "Do riparian plant communities contain the vegetation structure needed to provide ecologically healthy and functioning riparian areas?"

Assumptions

- Certain vegetation structures are required for certain riparian functions.

- Vegetation structure depends on vegetation composition and site potential.
- Vegetation structure that provides for riparian functions can be determined.
- Vegetation structure can be measured.

Threshold Determination and Implementation Strategies

- Determine appropriate vegetation structures required to provide riparian functions at YTC. MAD 101, MAD 103, MAD 217
- Determine site conditions that have potential to develop vegetation structure. MAD 101, MAD 103, MAD 217, MAD 501
- Determine a threshold that addresses the vegetation structures needed to provide for a variety of riparian functions at YTC. MAD 101, MAD 103, MAD 217
- Inventory and monitor vegetation structure and analyze against threshold. MAD 101, MAD 103, MAD 501
- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

Policies

The laws, regulations, policies, and directives that are specific to managing riparian and wetland resources are listed and summarized below:

- Clean Water Act.
- Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A)
- AR 200-3
- YTC Expansion ROD (1991)
- Fort Lewis Stationing ROD (1994)
- YTC Using Unit SOP (2000)

Clean Water Act. This act is detailed in the water resources section 4.2.3. Compliance with standards set forth by CWA supports objectives of riparian and wetland resource hydrology, species composition, and distributions.

AR 200-3. This Army Regulation (Section 6-7 Habitat Management) directs habitat management efforts to conserve and enhance existing flora and fauna consistent with the Army goal to conserve, protect, and sustain biological diversity. It states that management actions will be directed toward maintaining healthy ecosystems and restoring degraded ecosystems. Primary consideration is given to management of indigenous listed, proposed, and candidate species habitats. In addition, areas that are either environmentally sensitive or of special concern are covered under this regulation. Riparian and wetland areas at YTC can be considered both listed species (salmon) habitat and environmentally sensitive areas.

YTC Expansion and Fort Lewis Stationing RODs. Both RODs identified mitigation measures for riparian areas and wetlands, which included such things as construction of hardened stream crossings, installation of culverts, protection of sensitive riparian and wetlands, and non-renewal of grazing leases.

YTC Using Unit SOP (2000). This local land use policy and guidance document contains specific requirements to protect riparian and wetland resources during training activities at YTC.

4.2.5 Fish

Goal

To provide an ecologically healthy and functioning native fishery.

Resource Description

The term fisheries refers to fish species present in a water system, their relative abundance, potential abundance, habitat, and condition of the system. Past management of fish resources has involved limited population monitoring, riparian and wetland assessments, riparian restoration efforts, and land management activities associated with stream crossings, water erosion control structure improvements, and sediment improvements. Soil management, erosion control, and riparian restoration and assessment are described in 4.2.1, 4.2.3, and 4.2.4.

Past fish monitoring at YTC was limited due to the limited fisheries resource present. An inventory was conducted in expansion area streams in 1988, and in Hanson Creek in 1991. Fish were inventoried in Alkali, Johnson, and Lmuma Creeks in 1993. All perennial streams on YTC were surveyed for fish in 1994, and two were surveyed in 1999. As part of the current CNRMP, monitoring efforts involving scheduled surveys of streams across YTC are planned. Increased efforts are warranted due to recovery of fish habitat, and designation of critical habitat for three salmonid species at YTC.

Current fisheries exist in both perennial and non-perennial streams. YTC has six streams with perennial flow, four of which support fish populations (Johnson, Hanson, Alkali, and Lmuma Creeks), and two that do not (Cold and Selah Creeks). Two of 14 intermittent streams (Middle and Corral) seasonally support fish populations (Table 4.2.3). Fish species found in YTC stream inventories have included the threespine stickleback (*Gasterosteus aculaties*), mountain sucker (*Catostomus platyrhynchus*), longnose dace (*Rhinichthys cataractae*), rainbow trout (*Oncorhynchus mykiss*) and its anadromous form, steelhead, Fall chinook fry (*O. tshawytscha*), coho salmon (*O. Kistuch*), brown trout (*Salmo trutta*) chiselmouth (*Acrocheilus alutaceus*), prickly sculpin (*Cottus asper*), largescale sucker (*C. macrocheilus*), redside shiner (*Richardsonius balteatus*), and the non-native Eastern brook trout (*Salvelinus fontinalis*).

Creek Name	Perennial Flow	Watershed Complex	Fish Present	Species Present
Alkali	Yes	Alkali	Yes	Rainbow trout, Fall chinook fry, Eastern brook trout
Badger	No	Badger	No	
Whipple	No	Badger	No	
Johnston	No	Badger	No	
Cold Creek	Yes	Cold Creek	No	
Dry	No	Alkali	No	
Corral	No	Corral	Yes	Fall chinook fry
Cow	No	Corral	No	
Sourdough	No	Corral	No	
Hanson	Yes	Hanson	Yes	Coho salmon, Eastern brook trout, Fall chinook fry
Cottonwood	No	Hanson	No	
Johnson	Yes	Johnson	Yes	Rainbow trout, chinook salmon, cottids, chiselmouth, possibly steelhead, threespine stickleback, prickly sculpin, largescale sucker, redside shiner
Foster	No	Johnson	No	
Lmuma	Yes	Lmuma	Yes	Rainbow trout, mountain sucker, longnose dace
N. Fork Lmuma	No	Lmuma	No	
Middle	No	Middle	Yes	Rainbow trout
Selah	Yes	Selah	No	
Burbank	No	Selah	No	
Pomona	No	Selah	No	

Table 4.2-3. Known Fish Presence at Yakima Training Center.

YTC has several fish species of interest. Mountain sucker are an indicator of water quality and a State Candidate Species. Upper Columbia steelhead and Upper Columbia Spring Chinook are federally listed as endangered, while Middle Columbia Steelhead are federally listed as threatened. YTC streams are designated by the NMFS as critical habitat for these salmonids. Presence of these species effects resource management at YTC. In accordance with AR 200-3, YTC will develop a Salmonid Endangered Species Management Plan (SEMP). The purpose of which is to aid in maintaining or increasing populations and habitats of endangered salmonids at YTC, and to aid in avoiding negative impacts to these species.

Past levels of military training, fire, and livestock grazing have impacted fish and their habitat at YTC. Land use activities have accelerated erosion and stream sedimentation, influenced invasion of noxious weeds, influenced stream flow and temperature, and limited development of coarse woody debris (CWD) and other

vegetative structure. These factors act as compounding influences on the quality and quantity of fish habitat. For example, noxious weeds that invade riparian areas and form monocultures of tap-rooted plants are less able to hold soil than fibrous root systems of native plants. Also, severe degradation of most streams at YTC may be partially attributed to higher peak flows and lower base flows, in part a result of the above activities. Activities that promote channel incision and bank erosion may affect shifts in volume and timing of surface and sub-surface water flow. Historic evidence from Johnson Creek indicates higher base flow existed prior to these activities (Sullivan 1994). And, as an effect of reduced native vegetation cover and stream degradation, water temperatures are speculated to have risen throughout riparian areas at YTC. Reduced vegetative cover and shade along streams will promote increased water temperatures. Likewise, with fewer riparian trees than occurred historically, CWD is limited in many riparian areas. The lack of CWD and other vegetative structure may be limiting pool creation, sediment trapping, and structural complexity of several streams. Recent beaver activity in Johnson and Hanson Creeks demonstrates recruitment of CWD in these streams. These compounding factors have played a significant role in the occurrence, distribution, and abundance of fisheries at YTC.

Land management and restoration efforts have improved fish habitat in several streams across YTC. The riparian assessment completed during 1996 - 1999 indicated that riparian areas benefited from Siber Staking and ending of livestock grazing. Current livestock trail through activities are intensively managed to restrict crossings to specific areas and prohibit feeding and watering in riparian areas. Fish habitat has been protected through road improvements near riparian areas, hardening of stream crossings, fish passage improvements at crossings, and riparian plantings. These actions are described in soil, water, and riparian and wetland resource sections.

Implementation of Best Management Practices

Fisheries management on YTC is directed at maintaining or increasing populations of native fish species and their habitats. This is accomplished through a variety of direct and indirect actions, ranging from fish population and habitat monitoring to upland vegetation management.

Assumptions

- Military training has the potential to impact fishery resources.
- Appropriate strategies can be developed that accomplish fisheries objectives.
- Other resource management activities influence fisheries, and can be used as management tools to maintain or improve fisheries.

Management and Monitoring Strategies

- Continue to survey presence and abundance of fish populations at YTC for the purpose of monitoring population trends and their response to

management actions. Relative abundance is an indicator of habitat condition and availability. MAD 114, MAD 501

- Develop a Salmonid Endangered Species Management Plan, as required by Army Regulation 200-3. The plan will direct the protection, maintenance, and enhancement of salmonids and their habitat at YTC. MAD 122, MAD 501
- Continue monitoring of fish habitat within streams and riparian areas through the Comprehensive Riparian Assessment and surface water quality monitoring. MAD 101, MAD 212, MAD 501
- Continue to use LCTA to monitor uplands that have the potential to influence fisheries throughout YTC. MAD 202, MAD 501
- Develop Watershed Assessments to guide resource decisions that influence fish populations and habitats on YTC. MAD 217, MAD 501
- Continue to restrict vehicle movement through riparian areas through the Siber Stake Program. MAD 111, MAD 501
- Continue to maintain or improve fish habitat through riparian area restoration and maintenance. MAD 102, MAD 110, MAD 204, MAD 501
- Continue to upgrade substandard roads and close roads that cannot be brought up to standard to protect fish habitat from sedimentation and other road related problems. MAD 205, MAD 207, MAD 501
- Continue to use integrated pest management practices to reduce sedimentation of streams, enhance plant diversity, and provide for better ecological functions and noxious weed control. MAD 215, MAD 501
- Continue to maintain or improve fish habitat through upland re-vegetation and restoration. MAD 107, MAD 207, MAD 501

Existing Thresholds

- Are habitat conditions improving in streams historically suitable for fish?
- Is fish passage unrestricted and available where historical occurrence is probable and re-establishment practicable?
- Are passages through fords, culverts, and other man-made obstacles unimpeded, when sufficient stream flow is available?

Threshold Determination and Implementation Strategies

YTC recognizes the need to determine fisheries management thresholds. The following strategy of managing species and their habitat will be used to develop, refine, and test thresholds.

Sub-element: Species

Objective

To have appropriate species that represent healthy fisheries.

Threshold Statement

A threshold will be developed that addresses appropriate abundance and distributions of native species that represent healthy fisheries.

Assumptions

- Appropriate species abundance can be determined that represent healthy fisheries.
- Appropriate distributions of species can be determined that represent healthy fisheries.

Threshold Determination and Implementation Strategies

- Determine appropriate aquatic species and distributions that represent healthy fisheries. MAD 114, MAD 501
- Identify desired species and their distributions in each watershed. MAD 114, MAD 217, MAD 501
- Develop a threshold that addresses distribution and abundance of appropriate species. MAD 114, MAD 501
- Identify and monitor current species abundance and distribution and analyze results of monitoring against the threshold. MAD 114, MAD 212, MAD 501
- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

Sub-element: Habitat

Objective

To have appropriate habitat that supports healthy fisheries.

Threshold Statement

A threshold will be developed that addresses appropriate habitats and their distributions for appropriate fishes.

Assumptions

- Appropriate habitats can be determined for selected species.
- If appropriate habitats exist, the system has the capacity to support appropriate fisheries.

Threshold Determination and Implementation Strategies

- Determine habitat requirements of selected species. MAD 114
- Identify desired habitats of selected fishes. MAD 114, MAD 501
- Develop a threshold that addresses distribution and quantity of habitat for selected species. MAD 114
- Identify and monitor current habitat conditions and distributions and analyze monitoring results against the threshold. MAD 114, MAD 501
- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing

of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

Policies

The laws, regulations, policies, and directives specific to managing fish resources are listed and summarized below.

- Endangered Species Act (16 USC 1531-1544).
- AR 200-3
- Clean Water Act.
- Washington State Surface Water Standards (WAC 173-201A).
- Washington State Hydraulic Code (RCW 75.20.100-160).
- YTC Using Unit SOP (2000).

The Endangered Species Act (1973). The ESA is intended to recover populations and habitats of species in danger of extinction, or threatened with becoming endangered of extinction. Upper Columbia River Spring-run Chinook salmon and steel head were listed as endangered on 24, March 1999 and 18, August 1997, respectively. The Middle Columbia steelhead was listed as threatened on 25, March 1999. YTC was designated as critical habitat for all three species on 16, February 2000, thus requiring that YTC actions be compliant with section 7 consultations. Section 9 of the ESA prohibits individuals and groups from unauthorized import, export or take of any listed species or Evolutionarily Significant Units of species. All three species were covered under the 4D ruling of 10, July 2000, which lists specific actions known to impact endangered species, and actions exempt from these rules. While government agencies are exempt from section 9 take prohibitions and 4D rules they are subject to consultation requirements pursuant to Section 7 of ESA, Section 9 and 4D guide preparation for consultation with USFWS or NMFS, as required of government agencies under section 7 of the ESA.

AR 200-3. Chapter 6 section 1 states that “the Fish and Wildlife Program will provide for the management of fish and wildlife populations and their habitats…. Emphasis will be placed on the maintenance and restoration of indigenous fish and wildlife species, particularly federally listed species protected under the Endangered Species Act”. Sections 6-4(a) (Fish and Wildlife Cooperative plan), and 6-6(a) require endangered species management through creation and implementation of an ESMP, as described in chapter 11.

Clean Water Act. As a 1977 amendment to the Federal Water Pollution Control Act of 1972, this act sets the basic structure for regulating discharges of pollutants to United States waters. The law delegated authority to the EPA to set effluent and water quality standards for all contaminants in surface waters. The State of Washington complies with the CWA by implementing Washington State Surface Water Standards (WAC 173-201A) and Groundwater Standards (WAC 173-200).

The CWA mandates compliance with state, local, and federal water quality standards and discharge restrictions, with an overall goal of maintaining water quality for all uses. YTC streams are not specifically monitored or classified by the State of Washington, but are managed for water quality standards meeting or exceeding Class A streams (WAC 173-201A). Washington surface water quality standards include an anti-degradation policy to protect all existing beneficial water uses and provide special protection for high-quality waters. The policy also encourages evaluation and use of less degrading or non-degrading alternatives and sets aside outstanding waters from receiving any. In compliance with section 303(d) of the CWA each state must identify polluted waters and submit the list to the Environmental Protection Agency. No waters within YTC are included, but the Yakima and Columbia River's are cited as impaired due to water quality. The CWA requires the state to establish Total Maximum Daily Loads for each pollutant affecting impaired waters. The TMDL consists of a watershed based management plan to improve impaired waters to meet CWA and Washington State water quality standards. The plan for certain pollutants in the Yakima River will be completed in 2001, with all TMDL's completed by 2012. It is unlikely that YTC waters will be directly addressed in the Yakima River Plan, because discharge of pollutants from YTC is minimal. However, the plan may address temperature, sediment, and quantity of flow for YTC streams.

Washington State Hydraulic Code (RCW 75.20.100-160). The Washington State Hydraulic Code requires any individual, organization, or government agency conducting construction activities in or near state waters to conduct the activity according to guidelines specified by a permit issued by WDFW. The permit is called a Hydraulic Project Approval and specifies actions to minimize impacts to fish and wildlife habitat.

YTC Using Unit SOP 2000. The SOP places several restrictions on activities that can impact fisheries. Units are required to comply with Siber Staking restrictions, avoid maneuvering vehicles in stream channels, cross streams at right angles, and comply with YTC Zone restrictions. Other policies are described in section 4.2.4.

4.2.6 Wildlife

Goal

Provide self-sustaining wildlife populations.

Resource Description

Wildlife resources consist of all native and desirable non-native vertebrate and invertebrate species (including mammals, birds, reptiles, amphibians, and insects) and their habitats. Management strategies for fish, aquatic insect species, and their habitats are described in Section 4.2.5. During 1996 - 2000,

YTC employed a strategy whereby wildlife resources were managed via a select set of wildlife Species of Concern (Figure 4.2-9). Management actions involved

1996 CNRMP	2001 CNRMP
Shrub-steppe representatives: Western sage grouse Loggerhead shrikes Sage thrasher Sage sparrow Burrowing owl Merriam's shrew Riparian Representatives: Bald eagle Lewis's woodpecker Swainson's hawk Cliff and Draw Representatives: Golden eagle Ferruginous hawk Prairie falcon	Selected Wildlife: Bald eagle Western sage grouse Passerine and upland game birds Raptors Big game Selected Habitats: Shrub-steppe uplands Riparian areas Rare and sensitive areas

Figure 4.2-9. Approaches Used To Manage Wildlife Resources At Yakima Training Center For The 1996 And 2001 CNRMP.

collecting baseline biological information, conducting surveys for detecting presence and range of populations, and developing overall strategies for managing wildlife resources. As a result, YTC has identified a process by which wildlife can be more efficiently managed, and strategies better directed to address Department of the Army issues, goals, and objectives. This process, detailed below and the implementation of best management practices, involves managing five selected wildlife species or groups and three selected habitats. Selected species and habitats are threatened or endangered, sensitive, native to shrub-steppe communities, or desirable non-native. Following is a description of common and selected habitat and wildlife resources.

Wildlife Habitats

The landscape of YTC is characteristic of shrub-steppe regions of the LCBE. For the purpose of describing wildlife resources, general vegetation communities are comprised of 18 vegetation classes, which include shrub-steppe uplands and riparian areas (Figure 4.2-1). Shrub-steppe uplands account for over 95 percent of land cover at YTC. Uplands provide life requisites for the majority of wildlife species that permanently or seasonally inhabit YTC. Cliff and talus slope habitats support small amounts of vegetation but provide shade, cover, and rearing sites. These habitats are least abundant on YTC, comprising approximately 1,341 acres, primarily along the Columbia River and Selah Canyon. Associated with waterbodies and springs are riparian communities, which provide habitat for a wide variety of wildlife species that partially or entirely

depend on these areas to meet life requisites. These habitats provide water as well as riparian vegetation needed for cover, forage, and rearing sites. Throughout upland and riparian communities are areas comprised of sensitive vegetation. Sensitive areas may be important riparian corridors, plants sensitive to disturbance, or rare plant populations. Rare and sensitive plant populations are those that are irregularly distributed across the landscape, unique to YTC, or occupy specialized or limited habitats.

The extent of contiguous high quality shrub-steppe communities, intact riparian areas, and number of areas comprised of rare and sensitive vegetation is important in maintaining biodiversity at YTC. Biodiversity, or ecosystem diversity refers to the variety and variability among organisms and their environments. A 1999 study of the role of YTC in preserving biodiversity of the LCBE concluded that management of wildlife resources, in association with other resource areas, can effect landscape processes and biodiversity. In managing for all native and desirable non-native wildlife species and habitats, and fostering cooperative management among neighboring natural resource agencies, YTC will work toward the objective of preserving biodiversity at the installation, as directed by the Department of the Army.

Selected Habitats. Wildlife use habitats according to their specific requirements. Uplands provide cover and forage for a number of mammals, reptiles, and birds. Permanently wet habitats are used year-round by several species of birds, frogs, and turtles, while all riparian areas are used by raptors, game birds, songbirds, snakes, bats, and many species of large and small mammals. To address habitat requirements for all native and desirable non-native wildlife species, three selected habitats will be managed: shrub-steppe uplands, riparian areas, and sensitive areas. Upland vegetation and sensitive plant communities are described in further detail in Section 4.2.2. Riparian communities are described further in Section 4.2.4.

Wildlife Species

Wildlife at YTC may be resident or migratory. A total of 246 wildlife species either occur at YTC or are expected to occur based on known ranges and habitat preferences (Terrestrial vertebrate species list, Appendix B). Fifty mammal, 174 avian, 14 reptile, and 8 amphibian species have been identified (Department of the Army, 1994). Thirty-six mammal species are permanent residents at YTC, five occur seasonally or peripherally, and nine have not been documented. Of avian species identified, up to 74 percent breed at YTC. Neotropical migrants comprise 40 percent of avian species, whereas 48 percent are short-distance migrants, and 12 percent are non-migratory. Of 22 expected reptile and amphibian species, 15 are considered permanent, whereas 17 are undocumented. Following is a brief discussion of common wildlife species found at YTC and the habitats they inhabit.

Mammals. Five small mammals represent 98 percent of all species identified during 1990 LCTA small mammal monitoring. These species are deer mice (*Peromyscus maniculatus*), sagebrush voles (*Lemmiscus curtatus*), Great Basin pocket mice (*Perognathus parvus*), least chipmunks (*Eutamias minimus*), and northern pocket gophers (*Thomomys talpoides*). Other small and medium sized mammals include black-tailed jackrabbits (*Lepus californicus*), Townsend's ground squirrels (*Spermophilus townsendii*), and Merriam's shrews (*Sorex merriami*). Cliffs and talus slopes are used by bushy-tailed woodrats (*Neotoma cinerea*) among other species.

Six species of mammals are typically found in riparian habitats. These species are raccoons (*Procyon lotor*), porcupines (*Erethizon dorsatum*), mink (*Mustela vison*), muskrats (*Ondatra zibethicus*), beaver (*Castor canadensis*), and montane voles (*Microtus montanus*). Several common mammals use a combination of upland and riparian habitats. Mule deer (*Odocoileus hemionus*) and elk (*Cervus elaphus*) use uplands and riparian habitat for forage, water, and cover. Coyotes (*Canis latrans*) primarily use shrub habitats for hunting small mammals. Western small-footed bats (M*yotis ciliolabrium*), little brown bats (*Myotis lucifugus*), big brown bats (*Eptesicus fuscus*), and fringed myotis (*Myotis thysanodes*), roost on cliffs and talus slopes and feed along riparian drainages.

Birds. The most common species documented in uplands during 1997 - 1999 included horned larks (*Eremophila leucophrys*), western meadowlarks (*Sturnella neglecta*), Brewer’s sparrows (*Spizella breweri*), vesper sparrows (*Pooecetes gramineus*), and sage thrashers (*Oreoscoptes montanus*). Other year-round inhabitants of shrub-steppe habitats include western sage grouse, golden eagles (*Aquila chrysaetos*), prairie falcons (*Falco mexicanus*), common ravens (*Corvus corax*), and rock wrens (*Salpinctes obsoletus*). Summer residents include sage sparrows (*Amphispiza belli*), sage thrashers, and burrowing owls (*Speotyto cunicularia*). Winter residents include rough-legged hawks (*Buteo lagopus*) and rosy finches (*Leucosticte arctoa*).

Common birds that inhabit riparian habitats include red-winged blackbirds (*Agelaius phoeniceus*), Bullock’s orioles (*Icterus galbula*), American robins (*Turdus migratorius*), and brown-headed cowbirds (*Molothrus ater*). Several common birds use a combination of upland and riparian areas as habitats. Species include Brewer’s blackbirds (*Euphagus cyanocephalus*), cliff swallows (*Hirundo pyrrhonata*), Swainson's hawks (*Buteo swainsoni*), and Wilson’s warblers (*Wilsonia pusilla*). Common winter residents of this type are Northern shrikes (*Lanius excubitor*) and bald eagles.

Reptiles and Amphibians. Of 22 species of reptiles and amphibians potentially occurring at YTC, five typically inhabit sagebrush, cliff, and talus slope habitats. These include side-blotched lizards (*Uta stansburiana*), sagebrush lizards (*Sceloporus graciosus*), western fence lizards (*Sceloporus occidentalis*), and striped whipsnakes (*Masticophis taeniatus taeniatus*). Common in riparian

habitats are Pacific treefrogs (*Hyla regilla*), long-toed salamanders (*Ambystoma macrodactylum*), and painted turtles (*Chrysemys picta*). Others reptiles, such as short-horned lizards (*Phrynosoma douglassii*), gopher snakes (*Pituophis melanoleucus*), and western rattlesnakes (*Crotalus viridis*) are distributed throughout the landscape.

Selected Wildlife. ENRD recognizes that in addition to managing selected habitats, managing selected wildlife is needed in order to balance management of ecosystem diversity with the needs of select species. In the 1996 CNRMP, ENRD managed wildlife species of concern identified in the Fort Lewis Stationing ROD Biological Assessment (Figure 4.2-9). Changes since 1993 in federal listing actions (see Terrestrial vertebrate species list, Appendix B), state conservation concern, and their concern to the Army warrant reevaluation. To manage populations of all native and desirable non-native wildlife, five selected wildlife species or groups will be targeted. These are:

- Bald eagles
- Western sage grouse
- Passerine and upland game birds
- Raptors
- Big game

Other wildlife species will be managed through selected habitats. A description of selected wildlife follows.

Bald eagles. This species is currently designated as federally threatened in the lower 48 contiguous United States. Bald eagles are a winter resident (November to April) at YTC. They forage along the Columbia River at the installation's eastern boundary, and roost at four sites along Hanson Creek. Peak abundance occurs in February. Specific management direction for this species at YTC is included in the 1997 Bald Eagle ESMP, found at Appendix B.

Western sage grouse. The Columbia Basin population of western sage grouse is designated by the USFWS as a candidate for listing as threatened under the ESA. Concern exists because of significant reduction in species range resulting from habitat conversion for development and agriculture, intensive grazing, and fire. Western sage grouse are linked throughout the year to healthy shrub-steppe habitat complexes for food, cover, and breeding (Eberhardt and Hofmann, 1991). YTC supports one of two populations in Washington, and the only population on federally owned land in the state. Annual surveys for leks (communal mating grounds), and lek counts have been conducted to monitor trends and assess population status. Ten leks have been active since 1999. As of 2001, the ten year population average is 289 birds (SD=75.0). Since 1999 the population has averaged 332 birds (SD=77.7). Starting in 1989 radio telemetry research and population monitoring has shown that adult use and nesting and brood rearing occurs primarily south of Umtanum ridge in proximity to leks. Opportunistic sightings and past telemetry locations suggest sage grouse occupy

the Northern Expansion Area in limited numbers. Assessments of nesting and brood rearing habitat have identified existing habitat components and levels at YTC.

Research and monitoring has lead to current management and protection of western sage grouse. A sage grouse management plan for the period 1998 - 2003 details management of this species at YTC. As detailed in the plan all active leks, nesting, and early brood rearing areas illustrated in Figure 4.2-10 receive seasonal protection. Updates to the sage grouse management plan will consider additional biological data gathered during recent studies on the installation. Revised management strategies will include modifications to sagebrush restoration activities. Information on sage grouse research results and management actions is presented in a Sage Grouse Information paper in Appendix B. YTC is currently working with WDFW, USFWS, and others to develop a regional sage grouse conservation plan for the state of Washington. As part of this regional recovery effort the installation is working with the Yakama Nation on a sage grouse reintroduction project to transplant sage grouse to their historic range at the Yakama Nation.

Passerine and upland game birds. Eleven of 40 (28%) Washington state bird species of concern use habitats within the shrub-steppe ecosystem (WDFW 1999). Avian species, including those of concern to WDFW and USFWS are managed under passerine and upland game bird management. During 1995 - 2000, management has involved mitigating training impacts, studies of species and habitats, and monitoring avian populations and their habitats.

During 1997 - 1999, ENRD staff surveyed major habitat associations for all avian species encountered at points along four driving transects and four riparian walking transects. 19,619 individuals from 95 species were observed during driving surveys. 2,230 individuals from 77 species were observed during walking surveys. Research studies have investigated habitat requirements and relative abundance of sage sparrows, sage thrashers, and loggerhead shrikes, as well as diversity of populations and habitats across YTC. Due to minimal long term monitoring information, it is unclear at this time if thresholds necessary to maintain avian populations and habitats are being met. Monitoring will continue to ascertain population trends, habitat use, and impacts to these resources.

Raptors. Burrowing owls, ferruginous hawks, golden eagles, prairie falcons, Swainson's hawks, peregrine falcons, and bald eagles have experienced marked population declines throughout their range in recent years. Raptor management at YTC has been focused towards these species because of concern for their populations and because they provide an effective means of monitoring raptor populations. Bald eagles are managed separately from other raptors. Peregrine falcons have been observed migrating along the Columbia River, but rarely within YTC. Observations are incidental and without pattern or consistency. Raptors were monitored during 1993 - 1996, at which time 19 species were observed.

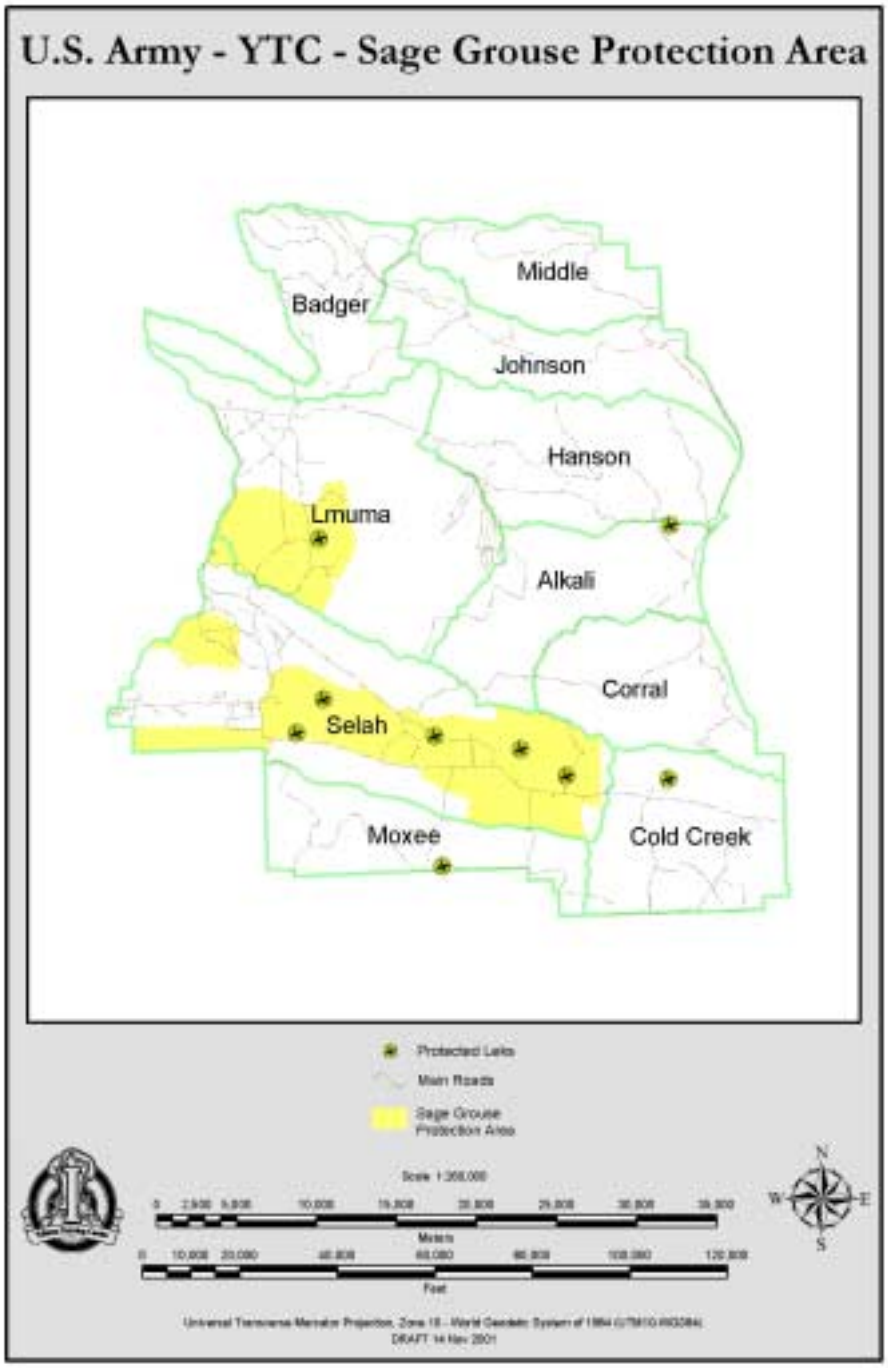


Figure 4.2-10. Sage Grouse Protection Area, Yakima Training Center.

Swainson's hawk populations remained relatively stable during 1993 - 1996. Twenty active Swainson's hawk nests were observed during past breeding surveys. Swainson's hawks, a state candidate species, prefer to nest in trees, which might be a limiting factor on YTC. Fewer prairie falcons were observed nesting than Swainson's hawks, although nests tended to be successful. Prairie falcons nest on or around cliffs or steep rock outcroppings, a habitat well represented at YTC. Still fewer golden eagles and burrowing owl nests were observed, although nesting success appeared to remain comparable during 1993 - 1996. Golden eagles, a state candidate species, reside on YTC in resident and migrant status. At least eight active burrowing owls nests were located during past surveys. Burrowing owls are underground nesters, dependent on badgers (*Taxidea taxus*) and other digging mammals to provide adequate tunnels and holes for nest sites. Ferruginous hawks, a state threatened species, have been extremely rare since 1993. Although a formal inventory has located multiple historic nest sites, since 1993 ferruginous hawks have not been documented nesting at YTC and opportunistic sightings have been rare. Raptor management at YTC is summarized in Appendix B.

Big game. Mule deer and elk are big game wildlife at YTC. The population estimate of mule deer is 825 animals, as of January 2001. They are found across YTC riparian and upland habitats. As of 2001 the elk population was approximately 50 animals. Elk populations are tenuous because elk move freely off YTC. Elk range along draws with good forage in proximity to agricultural fields adjacent to the installation boundary. California bighorn sheep (*Ovis canadensis*), classified as a federal candidate species, wander onto YTC and are infrequently observed by YTC staff. Resident bighorns are found immediately west of YTC within Yakima Canyon and along bluffs within the Yakima River drainage (WDFW unpublished information, Department of the Army 1993).

Other wildlife managed through selected habitats. Species accounts, biological requirements, and descriptions of surveys conducted for other wildlife resources are detailed in the ENRD Technical Library, the Fort Lewis Stationing ROD, information papers in Appendix B, and the 1996 CNRMP.

Implementation of Best Management Practices

For the 1996 CNRMP, wildlife "species of concern" were used to manage all native and desirable non-native wildlife and habitats. In light of acquired biological information and changes in policies and directives during 1996 - 2000, YTC will modify its management to use "selected wildlife and habitats" to represent all native and desirable non-native wildlife and habitats. Selected wildlife and habitats are threatened or endangered, sensitive, or native to shrub-steppe communities (Figure 4.2-9).

Management of wildlife resources has and will continue to involve fostering cooperative relationships with neighboring federal and state agencies in order to promote wildlife biodiversity of the LCBE. YTC will work with WDFW in support

of their efforts to monitor small and medium mammal populations. In the future YTC may consider readjusting efforts to shift emphasis from monitoring raptors to designated small and medium mammal species.

Assumptions

- Military training and other land uses impact many wildlife resources.
- Wildlife resources can be represented by a select number of species and habitats, which if properly managed, can be used to make inferences about all populations and their habitats.
- Monitoring wildlife populations and their habitats is necessary to develop appropriate management strategies.
- Restoration and protection strategies can be developed that effect wildlife resource levels.
- Wildlife resources can be maintained at appropriate levels through a combination of monitoring, protection, and restoration.

Management and Monitoring Strategies

- Continue riparian corridor assessment and conduct restoration activities as needed. MAD 101, MAD 102, MAD 501
- Continue seep and spring assessment and conduct restoration activities as needed. MAD 103, MAD 104, MAD 501
- Continue to implement Sage Grouse Management Plan to include revisions of protection and monitoring strategies. MAD 105, MAD 106, MAD 501
- Continue to restore sagebrush uplands following protocol as determined by post-training impact assessments. MAD 107, MAD 501
- Continue to implement the sage grouse re-introduction study. MAD 123
- Continue to implement Bald Eagle Management Plan to include compliance with federal regulations, protection, monitoring of birds and their habitat, and habitat restoration. MAD 108, MAD 109, MAD 110, MAD 501
- Continue to protect riparian corridors, rare and sensitive areas, and selected uplands. MAD 111, MAD 501
- Develop a Sensitive Plant Management Plan to protect and monitor populations identified across YTC. MAD 112, MAD 113, MAD 501
- Continue to survey nesting success of raptors and census passerine and upland game birds as a means of monitoring population trend and habitat use. MAD 115, MAD 118, MAD 501
- Continue to support hunting and recreational use through established programs. In addition, continue to conduct aerial surveys for big game species as a means of monitoring populations. MAD 116, MAD 117, MAD 401, MAD 501
- Implement training impact analysis and research projects as a means of monitoring shrub steppe uplands. MAD 120, MAD 501
- Complete timely updates to wildlife sightings database as an additional means of documenting species presence and habitat use across YTC. MAD 119, MAD 501

- Implement the Natural Resource Law Enforcement Program to include coordinated efforts with state and federal agencies. MAD 404
- Further develop training impact protocols that incorporate LCTA plot sampling and change detection monitoring. MAD 202, MAD 203, MAD 501
- Implement a study of big game and upland game bird predators leading to the development of surveys to monitor predator populations. MAD 121, MAD 501
- Implement the sage grouse re-introduction project on the Yakama Nation. MAD 123

Existing Thresholds

- Are all legal requirements being met?
- Is YTC complying with the Sage Grouse Management Plan?
- Is YTC complying with the Bald Eagle Management Plan?
- Are Using Units following environmental training standards as detailed during EA briefings?
- Have existing wildlife population and habitat surveys, censuses, and studies been conducted as scheduled, and are additional efforts needed?
- Have restoration and protection activities been conducted that maintain or enhance wildlife habitat, and are additional efforts needed?
- Do harvest management strategies promote healthy and sustainable game populations?

Threshold Determination and Implementation Strategies

The following strategy of managing selected wildlife and habitats will be used to develop, refine, and test thresholds for wildlife management.

Objective

Manage selected wildlife and habitats that represent native and desirable non-native wildlife and habitats at YTC.

Threshold Statement

Thresholds will determine if all selected wildlife and habitats were managed to represent all native and desirable non-native wildlife.

Assumptions

- Appropriate populations and habitats of all native and desirable non-native wildlife can be determined.
- Existing populations and habitats of all native and desirable non-native wildlife can be measured.
- Selected wildlife and habitats represent all native and desirable non-native wildlife and habitats.
- Population and habitat parameters that are thresholds can be determined for selected wildlife and habitats.
- Population and habitat parameters can be measured against thresholds.

Threshold Determination and Implementation Strategies

- Determine appropriate populations and habitats of wildlife. MAD 106, MAD 109, MAD 115, MAD 116, MAD 118, MAD 119, MAD 501
- Identify selected wildlife and habitats that represent populations and habitats of wildlife. MAD 106, MAD 109, MAD 115, MAD 116, MAD 118, MAD 119, MAD 501
- Determine population and habitat parameters that are thresholds for selected wildlife and habitats. MAD 101, MAD 103, MAD 105, MAD 106, MAD 108, MAD 109, MAD 112, MAD 113, MAD 115, MAD 116, MAD 118, MAD 119, MAD 120, MAD 121, MAD 122, MAD 202, MAD 203, MAD 501
- Inventory and monitor selected wildlife and habitats to ascertain current status with respect to appropriate thresholds. MAD 101, MAD 103, MAD 106, MAD 109, MAD 112, MAD 115, MAD 116, MAD 118, MAD 120, MAD 501
- When thresholds are not met an interdisciplinary approach will be used to determine a) the need to implement other management actions, b) continuing of management because resource is on a trajectory toward meeting resource goals, or c) a reevaluation of the threshold.

Policies

The following laws, regulations, policies, and directives apply to managing wildlife resources:

- Endangered Species Act (16 USC 1531-1544).
- AR 200-3
- National Environmental Policy Act (1969).
- Fort Lewis Regulation 420-5
- Sikes Act, 16 USC 670 (1976).
- YTC Using Unit SOP (2000).
- Fort Lewis Stationing ROD (1994).
- YTC Expansion ROD (1993).
- DOD Memorandum, Biodiversity Initiative (1994).
- YTC Sage Grouse Management Plan (1998).
- YTC Bald Eagle Management Plan (1997).

The Endangered Species Act (1973). Sections of the ESA that apply to fish resources would also apply to wildlife resources. See Section 4.2.5.

AR 200-3. One goal of AR 200-3 is to systematically conserve biological diversity on Army lands within the context of its mission. Technical requirements to implement programs aimed at this goal come from Memorandums of Understanding (MOUs), and conservation agreements. Additionally, this regulation supports wildlife resource management similarly to fish resources and is outlined in Section 4.2.5 and requires the development of ESMPs for listed and candidate species.

Fort Lewis Regulation 420-5. This regulation directs the protection of endangered, threatened, and candidate species and habitat components necessary to support their continued existence. This regulation supports section 7 (c) of the ESA and reference 3b of the Sikes Act. It requires that YTC consult with USFWS in the planning process to ensure that activities, including training, do not adversely affect listed species and critical habitat. Management plans are required for all listed species and critical habitats occurring at YTC. Specific procedures are detailed for the protection of the following species and their habitats at YTC:

- Bald eagles
- Ferruginous hawks
- Sage grouse
- Long-billed curlew
- *Astragalus columbianus*
- *Lomatium tuberosum*
- *Erigeron basalticus*

Sikes Act, 16 USC 670 (1976). This act requires the Department of the Army to provide for the conservation and rehabilitation of natural resources on military installations. The program at YTC is to be managed under an integrated natural resource management plan and accomplished in cooperation with USFWS and WDFW. Specific wildlife resources identified within this act include conserving migratory game birds (sec. 670b) and providing recreation opportunities (sec. 670c.) to the public.

YTC Using Unit SOP (2000). Specific policies protecting wildlife resources during training operations are covered under section VI. These include:

- Compliance with IPMP regulations, including washing vehicles before leaving YTC.
- Compliance with sensitive species protection measures.
- Compliance with Siber Stake and off-limits restrictions.
- Prohibiting disturbances of wildlife that include harassment, handling, or capture, and unnecessary disturbance to critical habitat.

National Environmental Policy Act (1969). This law requires that federal actions having significant effects on resources be evaluated to disclose their effects. BA's of impacts to wildlife resources are included within EISs.

YTC Expansion ROD (1991) and Fort Lewis Stationing ROD (1994). Requirements for the protection of wildlife resources include:

- Use LCTA and remote sensing to monitor habitat conditions.
- Non-renewal of livestock grazing leases.
- Rehabilitate springs.
- Comply with the Sage Grouse Conservation Agreement.
- Protect and restore bald eagle wintering habitat.

- Protect ferruginous hawk sites.
- Avoid and protect habitats used by threatened and endangered species.
- Study candidate species and develop management strategies.

DOD Memorandum, Biodiversity Initiative (1994). This memorandum contains principles and guidelines to implement ecosystem management and conserve biodiversity of lands. This memorandum states that an ecosystem approach to management will maintain and improve sustainability and diversity of ecosystems while supporting sustainable economies and communities.

YTC Sage Grouse Management Plan (1998). This directs management for sage grouse and their habitat at YTC during 1998-2003. It details current species information, conservation goals, management prescriptions, monitoring information, and threats facing sage grouse at YTC. Conservation measures in this plan are:

- Direct protection, such as lek protection during nesting and brood rearing.
- Protection and restoration of designated nesting and brood rearing habitat.
- Scheduling and restrictions of military training and land management.
- EA training for military personnel.
- Rangeland fire prevention.
- Control and restriction of excavations and bivouacking.
- Non-renewal of livestock grazing leases.
- Noxious weed control.

YTC Bald Eagle Management Plan (1997). This directs management of bald eagles and their habitat at YTC during 1997 - 2001. It details current species information conservation goals, management prescriptions, monitoring information, and threats facing bald eagles at YTC. Conservation measures included are:

- Minimize eagle interactions with military training through seasonal ground and air traffic restrictions.
- Protect existing habitat, perches, and roost trees.
- Provide future roost sites through riparian tree plantings.
- Monitor bald eagle populations.
- Survey potential habitat and map species distribution patterns.

4.2.7 Cultural Resources

Goal

Identify and properly manage historic properties, archeological sites and traditional cultural resources.

Resource Description

YTC has a long history of occupation and use by Native Americans. The treaty of 1855 identifies the area within YTC as part of the ceded lands of the bands

and tribes of the Yakamas. Currently the Wanapum People occupy a village located along the Columbia River adjacent to the installation's southeastern boundary while the Yakama Reservation is located 17 miles south of YTC. Both Native Peoples continue to use the installation for traditional cultural practices. Policies are in place to address access and safety and are further described in MAD's 305 and 306.

Ongoing consultation includes both formal government-to-government consultation between the Fort Lewis Commanding General and Tribal leaders and informal consultation between Fort Lewis and YTC staff and Native People and their staffs.

Cultural resource management on YTC also involves identification, evaluation, and protection of archeological sites and traditional use areas and resources. Broad-scale and project-specific inventory surveys are used to identify cultural sites. Cultural sites are evaluated using criteria for listing in the National Register of Historic Places. Sites meeting these criteria are protected, primarily with Siber Stakes to prohibit vehicular traffic and other ground-disturbing activities.

Management actions undertaken within the last five years included protection of 46 archeological sites, evaluation of 275 miles of road upgrades and realignments, assessment of instream erosion control and crossing feature improvements, BSA upgrades, and other construction projects. Dig requests from troop units undergo cultural review and coordination. To date, 211,331 acres of the primary maneuver corridors (306,343 acres) have been surveyed for cultural resources Figure 4.2-11. 450 archaeological sites were found in surveys between 1996 - 2000. Over 1000 archaeological sites are now recorded at YTC. Of this total, 215 sites are protected and approximately 175 sites await evaluation. Excavation has been completed at one prehistoric archaeological site. Data analysis of this 10,000 year-old site is ongoing. Refer to Cultural Resource Information Paper in Appendix B for more detailed information.

Management actions continuing over the next five years include survey and inventory of cultural sites on remaining acres of YTC, evaluation and testing of archeological sites, rehabilitation (sorting and repackaging) of cultural material and records to archival standards, and continued review of graphite smoke impacts on radiocarbon aging of archaeological sites and geomorphological features.

In addition to actions directly related to the identification and protection of cultural resources, other land management activities continue to positively affect and protect cultural resources. Activities such as erosion control, restoration, habitat protection, Siber Staking and environmental awareness training all contribute to sustaining and protecting cultural resources on the installation.

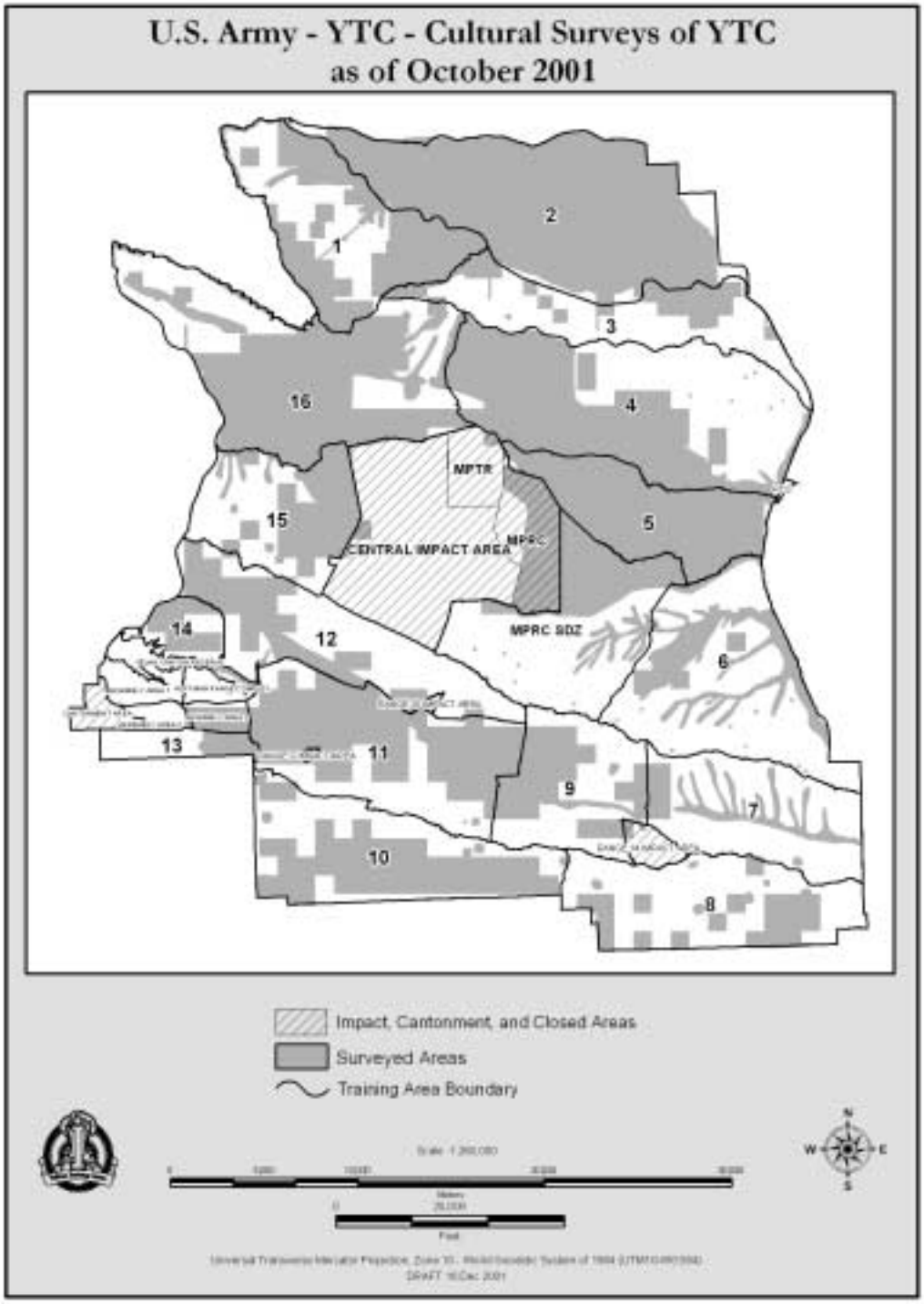


Figure 4.2-11. Cultural Resource Survey Areas of YTC.

Resource Condition. Monitoring activities over the last two years indicate that protective measures for archeological sites work very effectively. Siber Stakes and EA training are particularly effective in preventing damage to protected sites.

Historic and traditional properties are successfully managed to avoid adverse effects and to provide access for traditional uses. Productive root crop areas are identified and access for traditional uses are coordinated with the Yakama Nation and Wanapum People.

Implementation of Best Management Practices

The Army strives to manage and cultural resources from damage by Army activities and other land use practices. An aggressive strategy has been implemented to conduct cultural surveys and evaluate all known cultural resources at YTC. All construction and excavation activities are preceded by a cultural resource review and followed by compliance evaluation.

Inventory, evaluation and protection of cultural resources continue under established protocols. Survey of the remaining acres is scheduled over the next five years. As cultural sites are evaluated, those that are deemed significant in accordance with NRHP standards will be protected with Siber Stakes.

Evaluation of ground-disturbing activities for potential impacts to cultural resources will continue. Construction actions are reviewed for possible impacts to cultural resources. Impacts are avoided or minimized by redesign or mitigation.

Monitoring cultural resource sites will continue, as will monitoring of planned ground disturbing activities and unplanned actions that may affect cultural resources (e.g., erosion and fire). Site monitoring and stabilization plans for will be developed for designated cultural resource sites.

Assumptions

- Military training has the potential to affect cultural resources**.**
- Cultural resources can be identified through pedestrian survey.
- Significant cultural resources can be protected or effects can be negated or mitigated.
- Impacts to traditional resources can be avoided and resources managed to provide sustained yields.
- Training and traditional uses can be compatible.

Management and Monitoring Strategies

- Continue cultural resource identification and evaluation. MAD 301, MAD 302, MAD 307, MAD 501
- Develop and implement site monitoring and stabilization plans for designated cultural resource sites. MAD 309, MAD 310

- Continue to manage cultural and traditional resources in a proactive manner. MAD 111, MAD 112, MAD 301, MAD 303, MAD 304
- Continue to accommodate access for traditional uses. MAD 305, MAD 306, MAD 308, MAD 501

Existing Thresholds

- Has the Army considered the effects of its actions on historic properties?
- Has the Army identified, recorded and marked cultural resources?
- Are excavations by parties other than the Army or its agents conducted under an Archaeological Resources Protection Act (ARPA) permit?
- Has the Army adequately reviewed known destruction of archeological resources or protected these resources from such destruction, including vandalism?
- Are traditional use opportunities at or near historic levels? Do reductions in opportunities occur only when required to sustain the viability of focal resources?
- Have significant cultural resources in need of management been identified?

Sub-element: Section 106 Compliance

Objective

Identify, evaluate and manage cultural resources in accordance with legal requirements.

Threshold Statement

Has the Army considered the effects of its actions on historic properties?

Assumptions

- The Army will review each land use action and assess need for consultation.
- The Army will protect cultural resources that are significant or that have not yet been evaluated.

Threshold Determination and Implementation Strategies

- Follow Compliance Monitoring protocol. MAD 301, MAD 501
- Survey for cultural resources in areas of undertakings not exempted from review. MAD 102, MAD 104, MAD 204, MAD 205, MAD 206, MAD 207, MAD 215, MAD 301, MAD 302, MAD 501
- Evaluate cultural resources that cannot be avoided or protected. MAD 301
- Avoid or protect historic properties, or mitigate or negate impacts to historic properties through data recovery. MAD 301, MAD 303, MAD 304, MAD 305, MAD 306, MAD 308, MAD 501
- Coordinate efforts with the Washington State Historic Preservation Officer, affected tribes, and interested parties. MAD 301

Sub-element: Cultural Resources Inventory

Objective

Complete pedestrian inventory survey of all available lands at YTC to locate and record cultural resources.

Threshold Statement

Has the Army identified and recorded cultural resources?

Assumptions

- All unrestricted areas will be inventoried for cultural resources.
- Inventory surveys will result in discovery of most cultural resources.

Threshold Determination and Implementation Strategies

- Follow status of Cultural Resource Inventory Monitoring Protocol. MAD 302
- Complete pedestrian surveys of designated areas. MAD 301, MAD 302, MAD 307, MAD 501
- Complete Installation Cultural Resource Inventory Form or update for all cultural resources located during survey. MAD 302, MAD 501
- Accurately locate cultural resource sites and place permanent markers at each archeological site. MAD 302, MAD 501

Sub-element: Compliance with ARPA Permits

Objective

Identify instances in which ARPA permits are required and facilitate process.

Threshold

Are excavations by parties other than the Army or its agents conducted with an ARPA permit?

Assumptions

The Army will ensure that all excavations at archeological sites not for the Army are accomplished under valid permits.

Threshold Determination and Implementation Strategies

- Follow Protective Management Monitoring protocol. MAD 303
- Implement timely reviews and recommendations for each permit application. MAD 303

Sub-element: Compliance with Archeological Resources Protection Act - Vandalism

Objective

Prevent unauthorized destruction or damage to archeological resources.

Threshold

Has the Army adequately reviewed known destruction of archeological resources or taken reasonable steps to protect these resources from such destruction, including vandalism?

Assumptions

The Army will prevent non-reviewed destruction or damage to archeological sites within reasonable limits of protection measures.

Threshold Determination and Implementation Strategies

- Follow Preventive Management Monitoring protocol. MAD 304.
- Assist authorities with investigations and prosecuting violations. MAD 111, MAD 304, MAD 308, MAD 404

Sub-element: Facilitate Native American Access for Yakama Nation Members and Wanapum People

Objective

Accommodate Yakama and Wanapum use of traditional resources at YTC.

Threshold

Are traditional use opportunities at or near historic levels? Do reductions in opportunities occur only when required to sustain the viability of focal resources?

Assumptions

- The Yakama retain treaty rights to access YTC for traditional uses.
- The Wanapum have established rights to access YTC for traditional uses.

Threshold Determination and Implementation Strategies

- Follow Traditional Uses Monitoring Protocol. MAD 305, MAD 306
- Promote healthy and sustained traditional resource availability. MAD 305, MAD 306, MAD 308,
- Provide reasonable access for traditional uses. MAD 305, MAD 306, MAD 501

Sub-element: Section 110 Compliance

Objective

Assess importance of all known cultural resources at YTC.

Threshold

Have significant cultural resources in need of management been identified?

Assumptions

- Cultural resource inventory surveys will identify most cultural resources.
- Certain cultural resources are significant and should be managed.

Threshold Determination and Implementation Strategies

- Follow status of Cultural Resource Inventory Monitoring protocol. MAD 307
- Ascertain significance of cultural resources. MAD 302, MAD 307
- Evaluate cultural resources for significance using National Register of Historic Places criteria. MAD 307

Policies

The following statutes require inventory and management of cultural resources at YTC:

- National Environmental Policy Act (NEPA), 42 USC 4321 et seq.;
- National Historic Preservation Act, as amended (NHPA), 16 USC 470 et seq.;
- Archaeological Resources Protection Act (ARPA), 16 USC 470 et seq.;
- Native American Graves Protection and Repatriation Act (NAGPRA), 25 USC 3001 et seq.;
- The American Indian Religious Freedom Act (AIRFA), 42 USC 1996 et seq.

National Environmental Policy Act (NEPA), 42 USC 4321 et seq. This law requires federal agencies to consider whether actions that are on federal lands or are federally funded will have a significant effect on the environment, including cultural resources.

National Historic Preservation Act, as amended (NHPA), 16 USC 470 et seq. This act created the National Register of Historic Places; requires that effects of any federal agency actions on National Register eligible properties be accounted for and review of such actions be undertaken; it also directs responsibility for federally owned historic properties, their identification, and protection from inadvertent damage.

Archaeological Resources Protection Act (ARPA), 16 USC 470 et seq. This act directs procedures for permitting archeological excavations on federal lands and establishes civil and criminal penalties for violations.

Native American Graves Protection and Repatriation Act (NAGPRA), 25 USC 3001 et seq. This act requires federal agencies to inventory and account for Native American human remains and associated objects.

The American Indian Religious Freedom Act (AIRFA), 42 USC 1996 et seq. This act provides for Native American Access for religious cultural rights and practices.

AR 200-4 Cultural Resource Management This regulation prescribes Army policies for meeting cultural resources compliance and management requirements. The regulation includes NHPA, AIRFA, EO 13007, NAGPRA, ARPA, 36 CFR 39 and other policies and policies affecting cultural resources. This is to ensure that Army installations make informed decisions regarding

cultural resources in compliance with public laws, in support of the military mission, and consistent with sound principles of cultural resource management.

The following are additional laws and regulations.

- 32 CFR Part 229, Protection of Archeological Resources: Uniform Regulations
- 36 CFR Part 60, National Register of Historic Places
- 36 CFR part 63, Determinations of Eligibility for Inclusion in the National Register of Historic Places
- 36 CFR Part 68, The Secretary of the Interior's Standards for Historic Preservation Projects
- 36 CFR Part 79, Curation of Federally Owned and Administered Archaeological Collections
- 36 CFR Part 800, Protection of Historic and Cultural Properties
- Executive Order 13007, Indian Sacred Sites
- Executive Order 13084, Consultation and Coordination with Indian Tribal Governments
- White House Memorandum dated 29 April 1994, Government-to-Government Relations with Native American Tribal Governments
- DOD American Indian and Alaska native Policy

4.2.8 Outdoor Recreation

Goal

Provide outdoor recreational opportunities without compromising public safety, negatively impacting natural resources, or interfering with military training.

Resource Description

Outdoor recreation involves three major management facets; management of the John Wayne Trail, overseeing sport hunting in compliance with WDFW regulations, and facilitating non-consumptive recreational use. Activities involving harvest of plant and animal resources by Yakama and Wanapum people for traditional use is managed under cultural resources (4.2.7). Recreational activities occur throughout the year on unrestricted areas of YTC and are subject to restrictions due to military training and resource protection. The YTC Outdoor Recreation Policy Statement (Appendix B) serves as the primary document containing guidelines and regulations for outdoor recreation at YTC. The most common recreational activities permitted on the installation are described below. Recreation activities do not vary significantly by watershed, with the exception of use of the JWT, located in the northern portion of the installation.

As a corridor managed in compatibility with Washington State Parks regulations, a 22-mi. section of the JWT bisects Badger and Johnson watershed complexes on an abandoned railroad bed. The route is owned by the Department of Army and serves to connect a cross-state trail for horseback riding, bicycling, and

hiking that runs 110 mi. from North Bend, Washington through YTC to the Columbia River. Figure 4.2-12 shows the JWT and access points on YTC located at the Kittitas or Doris Trailheads. ENRD acts as custodian of the YTC corridor by ensuring that trail use is compatible with military training, land use activities, and management of other resources. The YTC portion of the trail is open daily from dawn to dusk, unless temporarily closed due to training. Groups greater than 20 individuals must coordinate trail use in advance with ENRD. Motorized vehicle use is prohibited except by emergency vehicles. Additional information on JWT management is found in the John Wayne Trail Policy Statement in Appendix B.

Hunting is a popular recreational activity at YTC and is intensively managed by YTC in coordination with WDFW, ENRD and DPTMS. Management during the last five years has involved regulating use and access across YTC, and monitoring harvest of game. Access and use is controlled by the Operations Center and complies with land use restrictions set forth in the YTC Outdoor Recreation Policy Statement. Hunting is allowed on most areas of YTC although access to some portions may be restricted for safety reasons (Figure 4.2-12). Deer and elk harvest is managed through a permit process while harvest of other species, including upland game birds, is managed under statewide regulations. Hunting seasons, numbers of tags available, and bag limits are established by WDFW in coordination with installation staff. Falconry is permitted in many areas of YTC. Falconers must follow state law as well as regulations set forth in the YTC Outdoor Recreation Policy Statement. Fishing opportunities for young anglers are available at the Kiddy Fishing Pond in the Cantonment Area. The pond is stocked twice annually by WDFW. All recreational users must access YTC through the main gate and provide Operations Center personnel with the proper documentation. A detailed list of hunting guidelines and regulations is found in the YTC Outdoor Recreation Policy Statement at Appendix B.

Other outdoor recreation opportunities include various non-consumptive uses. Wildlife viewing, mountain biking, horseback riding, hiking, and wildflower viewing are common examples. These activities are permitted in unrestricted areas of YTC. ENRD facilitates these activities by disseminating maps and information to the public and briefing Operations Center personnel of outdoor recreation policies.

Past management actions have been directed to reduce recreational use conflicts with natural or cultural resources or military training. Actions include disseminating information through an orientation video, maps, and information pamphlets; coordinating use of the installation with the public and special user groups; and implementing safety and recreational use policies set forth in the Outdoor Recreation Policy Statement. Conflicts are reduced by limiting or regulating public access in proximity to training activities and in areas with specific resource issues. Examples of strategies to reduce conflicts with training include limiting vehicle access to existing roads, prohibiting overnight camping

and fires, and requiring user groups (e.g. endurance horseback riders) to coordinate in advance with ENRD. Examples of strategies to reduce conflicts with cultural and natural resources include limiting public viewing of sage grouse leks to ENRD-organized tours, enacting protection measures for sage grouse nesting and brood rearing, and enacting sensitive area protection measures.

Implementation of existing Best Management Practices (BMP's)

Sub-element: Public Safety

Objective

Develop public safety information for public dissemination.

Assumptions

- Outdoor recreation can be managed without compromising public safety.
- Existing programs and policies provide for public safety.

Management and Monitoring Strategies

- Maintain existing policies and programs that provide for public safety (i.e. Outdoor Recreation Policy Statement, John Wayne Trail Policy Statement, controlled and coordinated access, etc.). MAD 117, MAD 401, MAD 402, MAD 403, MAD 404, MAD 501
- Identify and resolve safety issues through coordination with DPTMS. MAD 117, MAD 401

Existing Threshold

- Has YTC developed and disseminated public safety information to the public?

Has the number of recreation related violations remained at historic levels or decreased?

Sub-element: Other Resources

Objective

Manage recreation without negatively impacting natural resources.

Assumptions

- Impacts to natural resources can be identified and managed.

Existing programs and policies reduce impacts to other resources.

Figure 4.2-12. ***YTC Recreation Map.***

Management and Monitoring Strategies

- Maintain existing programs and policies that do not negatively impact other resources. MAD 117, MAD 401, MAD 402, MAD 403, MAD 404
- Resolve issues or conflicts through coordination with DPTMS and user groups. MAD 117, MAD 401, MAD 402, MAD 403, MAD 404
- Identify impacts to resources through wildlife population monitoring. MAD 106, MAD 109, MAD 115, MAD 116, MAD 118, MAD 119

Existing Threshold

- Have natural or cultural resources been negatively impacted by recreation?
- Has the number of recreation related violations remained at historic levels or decreased?
- Are other resource goals adequately protected under historic levels of law enforcement?

Sub-element: Training Conflicts

Objective

Coordinate recreation in a manner that does not interfere with military training.

Assumptions

- Outdoor Recreation can be compatible with military training.
- Existing programs and policies provide recreation opportunities without interfering with military training.
- Conflicts with military training can be identified and managed.

Management and Monitoring Strategies

- Maintain existing programs and policies that provide for outdoor recreation without interfering with military training. MAD 117, MAD 401, MAD 402, MAD 403, MAD 404
- Resolve issues or conflicts through scheduling and coordination with DPTMS and user groups. MAD 401, MAD 402, MAD 403

Existing Threshold

Has recreation interfered with military training?

Policies

- Army Regulation 200-3
- Endangered Species Act (ESA)
- YTC Outdoor Recreation Policy Statement
- John Wayne Trail Policy Statement

Army Regulation 200-3. This regulation states “whenever practicable, Army lands with suitable natural resources will be managed to allow for outdoor

recreational opportunities." Installations are required to allow public access when compatible with the military mission, natural resource management, and public safety.

Endangered Species Act (ESA). Under the ESA, YTC is responsible to eliminate and prohibit recreational activities that take protected species.

YTC Outdoor Recreation Policy Statement. This policy statement, revised annually, provides guidelines and regulations that pertain to hunting and other recreational use of the installation.

John Wayne Trail Policy Statement. This policy statement, revised as needed, sets forth all regulations for the use of the JWT at YTC.

4.3 Fire Management

Although not managed as an individual resource, YTC has developed a strategy for managing the effects of fire at YTC. The strategy involves implementing a planning process that involves risk assessment, prevention, maintaining facilities and resources to suppress fire, enacting restrictions on training to reduce fire risks, and supporting recovery and post fire restoration programs.

Fire is an integral part of the shrub-steppe ecosystem, and serves as a disturbance factor under which communities have evolved at historic levels (~ 450 ha. fire/10 year period at YTC, L. Cadwell 2001, PNNL, pers. comm). However, over the past 100 years a significant increase in fire frequency compounded by other factors such as invasion of flammable non-native species, has caused major shifts in plant communities. The result has been a reduction in size and density of late seral stage native vegetation communities with increases in communities susceptible to fire. This has impacted soil retention, water quality, wildlife, and habitat, and training readiness.

A marked decline in fire ignition and spread at YTC since 1996 is attributed to enhancements of fire management policy and support. These enhancements include:

- Development and Implementation of a Fire Management Plan
- Implementation of annual Pre-Burn Plans
- Enhanced weather data collection
- Implementation of the Fire Risk Assessment
- Pyrotechnic restrictions during periods of high fire danger
- Wildland Fire Fighting Training
- Enhancement of Fire Suppression Support Teams
- Upgrade of firebreak system and roads to contain fires
- Development of fire dip ponds and fire fighting wells
- Enhanced troop education

- Remote sensing, fire history monitoring, and related GIS data layer maintenance

Fire Management Plan. YTC has developed and implemented a fire management plan that incorporates safety, resource management, and training requirements. It provides a strategy for annual pre-suppression and suppression, and implementation of a Fire Risk Assessment. This assessment is included in the YTC Wildland Fire Management Plan located at Appendix B. The Fire Management Planning MAD details plan maintenance and revision (MAD 214), and implementation of the Plan is outlined at MAD 218.

YTC Pre-Burn Plan. Fire monitoring demonstrates that fires historically reoccur in impact and dud areas, and portions of the most intensively used gunnery ranges. To control periodic man-made fire, personnel from Range Control, the Fire Department, and ENRD annually develop a plan to undertake controlled burns on designated ranges to reduce potential fire ignition and spread while military training is being conducted. The plan development is presented in the Fire Management Planning MAD with implementation presented in the Fire Management Suppression and Pre-suppression Management Action Description MAD 214, MAD 218.

Enhanced Weather Data Collection. YTC has installed and operates ten electronic weather stations to collect ambient weather data such as temperature, wind, fuel moisture, and relative humidity. Data are updated hourly from each station through cellular data connections. The daily adjective fire danger rating (i.e. low, medium, high, and extreme) is calculated using these data and is automatically posted to the YTC, ENRD web page in the mid-afternoon to reflect fire conditions at peak solar intensity. This information is used by Range Control and Fire Department personnel to implement the Fire Risk Assessment, set daily fire danger rating, and monitor conditions during fire fighting activities and throughout the day. Weather data collection and dissemination are presented in the Meteorological Services and Monitoring MAD 211.

Fire Risk Assessment. This assessment is completed by Range Control personnel to evaluate risks associated with various training activities during the fire danger season. It is used to determine whether live fire activities or use of pyrotechnic devices creates an unreasonable fire risk. When the risk becomes to great, military training is curtailed or postponed until the risk of uncontrolled fire is reduced. The assessment determines three components: current environmental conditions, type of training being conducted, and personnel/availability of presuppression or suppression measures. This fire risk assessment and supporting information are presented in the Fire Management Suppression and Pre-suppression MAD 218.

Pyrotechnics Restrictions. If the Fire Risk Assessment indicates specific risk of fire ignition is exceeded, other measures to reduce risk that can include

termination of use of incendiary devices are implemented. Fire Management Suppression and Pre-suppression MAD 218.

Wildland Fire Fighter Training. YTC Fire Department personnel and other YTC staff members are red-card certified having received special training in fighting wildland fire. Fire Management Suppression and Pre-suppression MAD 218.

Fire Suppression Teams. While military units are using ranges, they are required to designate suppression teams responsible for extinguishing ignited fires. These teams are supported by YTC Fire Department personnel as required. Training and fielding of these teams is addressed in the Fire Management Suppression and Pre-suppression MAD 218.

Firebreak Maintenance. YTC annually maintains over 240 miles of firebreaks to aid in compartmentalizing fires. In addition, enhancement of the road network has added approximately 300 miles of roads that act as fire breaks. Development and maintenance of firebreaks and roads are addressed in the Fire Management Suppression and Pre-suppression (MAD 218), and the LRAM – Secondary Road Upgrade and Maintenance MAD 205.

Fire Wells and Dip Ponds. Two dip ponds located on the installation provide water for aircraft involved in fire fighting (Figure 4.2.4). In addition, 22 wells (potable and non-potable) equipped with fast-fill capabilities are located throughout YTC (Figure 4.2-6). Development and maintenance of these wells and dip ponds is addressed in the Fire Management Suppression and Pre-suppression MAD 218.

Enhanced Troop Education. YTC emphasizes fire prevention and control during Environmental Awareness Briefings, and in the YTC Using Unit SOP. Fire management is addressed during the daily range briefings at Range Control. ITAM – EA Training MAD 209.

Remote Sensing and Fire History Monitoring. YTC uses remote sensing to record location and size of fires. This information is used to develop fire break maintenance plans, pre-burn plans, and updates to the Fire Management Plan. Data aids in managing training activities and pre-suppression and suppression support to reduce potential fire impacts. Remote Sensing and Change Detection MAD 203.

4.4 Management Action Descriptions

Management Action Descriptions are listed below. A detailed description of each is found at Appendix A.

101 Riparian Assessment
102 Riparian Restoration

103 Springs Assessment
104 Spring Restoration
105 Sage Grouse Management Plan (SGMP)
106 Sage Grouse Monitoring
107 Sagebrush Restoration
108 Bald Eagle Management Plan (BEMP)
109 Bald Eagle Population Monitoring
110 Bald Eagle Habitat Restoration
111 Siber Stake Program
112 Sensitive Plant Management Plan (SPMP)
113 Sensitive Plant Monitoring
114 Fish Population Monitoring
115 Raptor Population Monitoring
116 Aerial Big Game Surveys
117 Hunting Management Program
118 Loggerhead Shrike, Passerine and Game Bird Population Monitoring
119 Wildlife Sightings Database
120 Training Impact Analysis
121 Predator Study
122 Salmonid Endangered Species Management Plan (SESMP)
123 Sage Grouse Reintroduction Project
201 Five-Year Integrated Training Area Management (ITAM) Plan
202 Land Condition Trend Analysis (LCTA)
203 Remote Sensing And Change Detection Monitoring
204 LRAM – In-stream Erosion Control And Crossing Features
205 LRAM – Secondary Road Upgrade And Maintenance
206 LRAM – Brigade Support Area (BSA) Upgrade And Maintenance
207 LRAM – Upland Revegetation And Rehabilitation
208 ITAM – Training Requirements Integration (TRI)
209 ITAM – Environmental Awareness (EA) Training
210 Support of Ongoing Natural Resource Related Study Projects
211 Meteorological Services and Monitoring
212 Surface Water Quality Monitoring
213 Livestock Trail-Through
214 Fire Management Planning
215 Noxious Weed Control
216 Erosion Modeling
217 Watershed Assessment
218 Fire Management Suppression and Pre-suppression
301 Section 106 Compliance
302 Survey for Cultural Resources
303 Archeological Resources Protection Act Compliance – Permits
304 Archeological Resources Protection Act Compliance – Vandalism
305 Native American Access – Yakama Indian Nation Members
306 Native American Access – Wanapum People
307 Resource Evaluations

308 Native American Graves Protection and Repatriation Action
309 Cultural Resource Site Monitoring
310 Cultural Resource Site Stabilization
401 Recreational User Support
402 Group Activity Support
403 John Wayne Trail (JWT)
404 Natural Resource Law Enforcement

Chapter 5 Budget and Implementation Strategy

Chapter 4 and the accompanying Management Action Descriptions (Appendix A) present various management actions with proposed timeframes and budget requirements for each line item in the plan. The purpose of this chapter is to coalesce requirements into a central planning and budget matrix. Tables 5-1.1 and 5-1.2 provide a five-year implementation schedule of MADs. The Budget Matrices (Table 5-1.1 and Table 5-1.2) illustrate annual and five-year costs associated with plan implementation. Because the plan is adaptive in nature, MAD's and consequently these Implementation and Budget matrices, may change during the five-year life of this plan. Changes in management and monitoring strategies may indicate a need to modify management actions which could impact scheduling and budget requirements.

In accordance with AR 200-3 the plan will be evaluated annually and revised every five years. The implementation of BMP's and threshold determination strategies will continue during execution of this plan with the goal of having all thresholds determined by October 2006.

Table 5-1.1. ECAP Budget Implementation Matrix.

			ECAP Program					
MAD	Management Actions	EPR Number	FY02	FY03	FY04	FY05	FY06	Five – Year Total
	Riparian Management							
101	Riparian Assessment	YKFC94S005						
		YKFC96F008						
102	Riparian Restoration	YKFC94S005						
103	Spring Assessment	YKFC94S005						
104	Spring Restoration	YKFC94S005						
	Program Totals							
	Sage Grouse Management							
105	Sage Grouse Management Plan	YKFC94S008						
106	Sage Grouse Monitoring	YKFC94S008						
107	Sagebrush Restoration	YKFC94S008						
120	Training Impact Analysis and Research Projects	YKFC94S008						

MAD	Management Actions	EPR Number	ECAP Program FY02	FY03	FY04	FY05	FY06	Five – Year Total
123	Yakama Nation Reintroduction Project	YKFC99F001						
	Program Totals							
	Bald Eagle Management							
108	Bald Eagle Management Plan	YKFC94S026						
109	Bald Eagle Monitoring	YKFC94S026						
110	Bald Eagle Habitat Restoration	YKFC94S026						
	Program Totals							
	Sensitive Area Management							
111	Siber Staking	YKFC94S027						
		YKFC96F008						
	Program Totals							
	General Wildlife Management Operations							
112	Sensitive Plant Management Plan	YKFC96F009						
113	Sensitive Plant Monitoring	YKFC96F009						
115	Raptor Population Monitoring	YKFC96F009						
118	Loggerhead Shrike, Passerine, Game Bird Monitoring	YKFC96F009						
119	Wildlife Sightings Database	YKFC96F009						
121	Predator Study	YKFC96F009						
	Program Totals							
	Game Species and Outdoor Recreation							
116	Aerial Big Game Surveys	YKFC01F002						
117	Hunting (check station)	YKFC01F002						

			ECAP Program					
MAD	Management Actions	EPR Number	FY02	FY03	FY04	FY05	FY06	Five – Year Total
401	Recreational User Support	YKFC01F002						
402	Recreational Group Activity Support	YKFC01F002						
403	John Wayne Trail	YKFC01F002						
	Program Totals							
	Fisheries Management							
114	Fish Population Monitoring	YKFC01F001						
122	Salmonid Endangered Species Management Plan	YKFC01F001						
	Program Totals							
	Land Management							
204	LRAM Instream Erosion Control and Crossing Features	YKFC96F018						
205	Secondary Road Upgrade and Maintenance	YKFC96F020						
206	Brigade Support Area Upgrade and Maintenance	YKFC96F019						
210	Ongoing Natural Resource Related Study Projects	YKFC92S006						
		YKFC94S028						
212	Surface Water Quality Monitoring	YKFC93S023						
214	Fire Management Planning	YKFC97S001						
215	Noxious Weed Control	YKFC92S006						
		YKFC92S006						
216	Erosion Modeling	YKFC94S028						
217	Watershed Assessment							
		YKFC96F008						
218	Fire Suppression and Presuppression	YKFC97S001						
		YKFC97S001						
		YKFC92S004						

MAD	Management Actions	EPR Number	ECAP Program FY02	FY03	FY04	FY05	FY06	Five – Year Total
		YKFC02F001						
	Program Totals							
	Cultural Resources							
301	Section 106 Compliance	YKFC95S005						
		YKFC94S046						
302	Survey for Cultural Resources	YKFC00F005						
303	ARPA Compliance Permits	n/a						
304	ARPA Compliance - Vandalism	FTL96S013						
305	Native American Access - Yakama Nation Members	n/a						
306	Native American Access - Wanapum People	n/a						
307	Section 110 - Resource Evaluation	YKFC94S045						
308	NAGPRA	n/a						
	Program Totals							
	Natural Resource Law Enforcement							
404	Natural Resource Law Enforcement	YKFC00S001						
	Program Totals							
	Administrative Support							
501	Geographic Information System Management	YKFC01F003						
501	Geographic Information System Management	YKFC96F008						
	Conservation GS Salaries	YKFC93S001						
	GSA Vehicle Support	YKFC99F001						
	Admin. Program Support	YKFC96S001						
	Program Totals							

			ECAP Program					
MAD	Management Actions	EPR Number	FY02	FY03	FY04	FY05	FY06	Five – Year Total
			FY02	**FY03**	**FY04**	**FY05**	**FY06**	**Five – Year Total**
	Total ECAP Programs							

Table 5-1.2. ITAM Budget Implementation Matrix.

			ITAM Program					
MAD	Management Actions	EPR Number	FY02	FY03	FY04	FY05	FY06	Five - Year Total
	ITAM Program							
201	Five-Year ITAM Plan	YKFC000000						
202	Land Condition Trend Analysis	YKFC000000						
203	Remote Sensing and Change Detection Monitoring	YKFC000000						
204	LRAM - Instream Erosion Control and Crossing Features	YKFC000000						
205	Secondary Road Upgrade and Maintenance	YKFC000000						
206	Brigade Support Area Upgrade and Maintenance	YKFC000000						
207	Upland Revegetation and Rehabilitation	YKFC000000						
208	ITAM - Training Requirements Integration	YKFC000000						
209	ITAM - Environmental Awareness Training	YKFC000000						
210	Ongoing Natural Resource Related Study Projects	YKFC000000						
211	Meteorological Services and Monitoring	YKFC000000						
501	Geographic Information System Management	YKFC000000						
	Program Totals							

	FY02	FY03	FY04	FY05	FY06	Five-Year Total
Total ITAM Funding Requirements						

Chapter 6 References, Glossary and Abbreviations

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6.2 Glossary and Abbreviations

A-Horizon - Refers to a layer of soil that is an accumulation of partially decomposed organic matter mixed with a larger amount of mineral soils. Occurs at the surface or below an entirely organic surface layer.

AC - Active Component.

ACE - Armored combat excavator.

Adaptive Management - The process of implementing policy decisions as scientifically driven management experiments that test predictions and assumptions in management plans, and using the resulting information to improve the plans.

AGL - Above ground level.

AIRFA – American Indian Religious Freedom Act

Alkali - A soluble salt obtained from ashes of plants and consisting largely of potassium or sodium carbonate.

Alkaline - Relating to or having the properties of an alkali, i.e., having a pH greater than 7.

Alluvial - Relating to, composed of, or found in alluvium.

Alluvium - Clay, silt, sand, gravel, or similar detritus material deposited by running water.

Amphibian - Any member of the class Amphibia, a class of cold-blooded vertebrates which includes the caecilians, frogs, toads, and salamanders. Larvae are aquatic and breathe by gills; adults breathe by lungs.

Anadromous - A fish, such as the salmon, that ascends fresh water streams from the sea to spawn.

Anthropogenic - Man caused influences or factors, such as vehicle impacts, or noise from aircraft.

Anticline - An arch of stratified rock in which the layers bend downward in opposite directions from the crest.

Aquifer - A layer of rock which can hold and conduct water.

AR – Army Regulation

ARPA - Archaeological and Historic Preservation Act

AT - Annual training.

ATV - All-terrain vehicle.

AVLBs - Armored Vehicle Launched Bridges.

AVLMs - Armored Vehicle Launched MICLICs.

AVN - Aviation.

BA – Biological Assessment.

B-Horizon - The mineral soil layer found under organic or mixed organic-mineral layers.

Bank Full Flow - Flow of water in a stream's ordinary channel. Additional flow would result in the stream overflowing into an adjacent floodplain.

Bare Root Propagation - Technique by which juvenile plants with bare roots are planted directly into a site.

Basalt - A dark gray to black dense to find-grained igneous rock that consists of basic plagioclase, augite, and usually magnetite.

Basin - An entire area drained by a given steam and its tributaries.

Battalion - Ground-force unit composed of a headquarters and two or more companies or similar units. 500-1,000 soldiers.

BDE - Brigade.

Bed Stabilization - The process of stream bed movement where bed material is moved downstream at the same rate it is replaced. The vertical profile of the stream remains stable, neither cutting down nor building up.

Bedload - Coarser bed and bank material (sediments) that is transported by a stream by rolling it along the bottom. The material does not become physically suspended in the water column.

Bench - A long narrow flat area of land breaking up the continuity of the slope.

Bentonite - An absorptive and colloidal clay.

Best Management Practice - Refers to a practice, method of construction, or physical device constructed to prevent a pollutant, such as sediment, from entering adjacent waterways.

BFV - Bradley Fighting Vehicle.

Biodiversity - The variety of life and its processes including the variety in genes, species, ecosystems, and the ecological and evolutionary processes that dynamically connect everything (adapted from Noss and Cooperrider, 1994).

Biomass - The dry weight of living matter, including stored food, present in a species population and expressed as a given area or volume of the habitat.

Biotic Diversity - See biodiversity.

Bivouac - Military encampment made with tents or improved shelters.

Blacklining - Purposefully burning a road, trail, or firebreak to enhance or widen an existing firebreak.

BLM - Bureau of Land Management.

BMP - Best management practice.

BP - Baseline periodic (referring to surface water monitoring).

Brigade - A military organization normally consisting of three combat battalions and combat support units.

Brood Habitat - Necessary habitat that provides young with their needs.

Brood - 1. To incubate eggs or cover the young for warmth. 2. The young of birds.

Brooding - To warm, protect, or cover (young) with the wings or body. To sit upon (eggs) to hatch, the act of rearing young, as a bird.

Brush Mattress - A device constructed by laying or weaving layers of brush (usually willows) along an exposed stream bank or slope.

BSA – Brigade Support Area

C-Horizon - A subsurface soil layer of like or unlike material from which the soil was formed or is presumed to have formed. Lacks properties of A and B horizons, but includes materials in various stages of weathering.

CAA - Clean Air Act (of 1963).

CALFEX - Combined Arms Live Fire Exercises.

Canopy - The uppermost branching and spreading layer of vegetation.

Carrying Capacity - The maximum population (organisms or people) that a given area of habitat type can sustain, without inducing a downward trend in the organisms's own population or the quality of the habitat.

CEV - Combat Engineer Vehicle.

Check Dam - A small structure used in open drainages to retard the flow of water in order to decrease runoff velocity, minimize channel scour, and promote sediment deposition.

Clay Loam - A loam containing 20 to 30 percent clay.

Climax Community
The assemblage of species that establishes itself in a given area over time barring disturbance events such as fires.

CNRMP - Cultural and Natural Resources Management Plan.

Coarse Filter - Refers to making planning decisions involving an appropriate classification of ecosystems across the landscape. Planning is at the stand, successional stage, ecosystem or similar size unit.

Cobbly Loam - A mixture of loam and cobble (rounded rock of alluvial 2-10" diameter).

Colluvium - Soil material, rock fragments, or both moved by creep, slide or local wash and deposited at the base of steep slopes.

Company - A subdivision of a regiment, battle group, or a battalion consisting of 80-200 soldiers.

CONUS - Continental United States.

Core Habitat - The portion of a territory that is used by a species which provides the necessary life requisites --- water, cover, and food.

Corps - A military unit of ground combat forces consisting of two or more divisions and other troops.

Corridor - A route that allows movement of wildlife individuals or species from one region or place to another.

CP – Command Post

CPX - Command post exercise.

Crew - Soldiers who operate a single combat vehicle or weapon.

Cribwall - A retaining wall formed by weaving structural members such as railroad ties.

Critical Habitat - An area that is essential to the survival of a species on the YTC. Use of this term in this document does not denote the US Fish and Wildlife Service's legal definition.

Crown Cover - The area of ground covered by a plant's canopy which has been projected vertically downward.

Cryptogamic - Pertaining to an assemblage of plant species (primarily mosses and lichens) whose mode of reproduction is strictly non-seed bearing (i.e., reproduction by spores of gametes other than seeds) and which forms a ground cover (crust) in the sagebrush steppe ecoregion.

CTC - Combat Training Center.

Culvert - A drain running under a road or embankment.

CWA - Clean Water Act.

CWD – Course Woody Debris.

DA - Department of the Army.

DEM - Digital elevation model.

Detention Structure - A structure built across a drainage to retain sediment during runoff event (sediment retention pond).

DFC - Desired future condition.

Dissolved Oxygen - A measure of the amount of oxygen dissolved in water.

Disturbance Regime - The sum of the types and frequency of events (such as flood and/or fire) which disturb and change the numbers and composition of animal and plant species in a given area.

DNR - Department of Natural Resources.

DOD - Department of Defense.

DOE – Department of Ecology.

Dominance - Designating or relating to the species that is most typical of a habitat and that may determine the presence and type of other species.

DPTMS – Directorate of Plans, Training, Mobilization and Safety

DPW - Directorate of Public Works.

Duripan - A cemented layer under developed soil horizons. The layer normally consists of silica or calcium carbonate or both.

EA – Environmental Awareness.

Ecological Type - In a species having a wide geographical distribution, a subgroup which has developed specific adaptations to local conditions such as temperature, light, and humidity.

Ecosystem - A dynamic complex of plant, animal, fungal, and microorganism communities and their associated non-living environment interacting as an ecological unit.

Ecosystem Integrity - The wholeness or completeness of the ecosystem. It refers to the presence and functioning of ecological components and processes. There is no direct measure of integrity, but it may be suggested by indicators.

Ecosystem Management - Landscape level natural resource management that integrates and balances ecological factors, sociological factors such as human use of the land, management tools available to managers, and economic factors such as available management funds.

Edaphic - Related to, or determined by conditions of the soil. Pertaining to soil as it relates to living organisms.

EM - Ecosystem management.

Endangered - Federal endangered: a species in danger of extinction throughout all or a significant portion of its range. State endangered: same as above but species is native to that state and endangered within a significant range within that state.

ENRD - Environmental and Natural Resources Division.

Ephemeral - A stream that flows only in response to precipitation events.

Erosion - Natural processes, as weathering or gravity, by which material is moved on the earth's surface.

Escarpment - A steep slope or long cliff resulting from erosion or faulting and separating two relatively level areas of different elevations.

ESMP – Endangered Species Management Plan.

Estuarine - Pertaining to the mouth of a river valley where freshwater mixes with seawater.

ESU – Evolutionary Significant Unit.

EXEVAL – External Evaluation.

Extirpate - To destroy or exterminate, often a localized or isolated population.

Eyrie - Variation of aerie, a nest of a predatory bird, such as an eagle or falcon, built on a high place, usually refers to a cliff nest.

Falconry - The use of domesticated raptors to hunt small game or upland birds.

Fascines - Bundles of sticks bound together for use in streambank erosion control.

Fault - A break in the continuity of a rock formation caused by a shifting or dislodging of the earth's crust, in which adjacent surfaces are differentially displaced parallel to the plant or fracture.

Fauna - 1. The assemblage of animal species in a given area. 2. A list and scientific description of all animal species in a given area.

Federal Candidate - A species that is a candidate for listing as threatened or endangered under the Endangered Species Act.

FEIS - Final Environmental Impact Statement.

Fine Filter - Refers to making land management decisions based on the needs of individual species or guilds.

Firebreak - A strip of cleared land used to stop the spread of fire.

Floodplain - The area of a river valley adjacent to the channel which is covered by water during high flow (run-off) events.

Flora - 1. The assemblage of plant species in a given area. 2. A list and scientific description of all plant species in a given area.

Flume - An artificial channel or chute for a stream of water.

Fluvial - Fluvial Geomorphology is the study of river channel forms (fluvial forms) and processes. Fluvial Deposits are the sediments deposited as a result of river or stream channel processes.

Forb - Annual and non-woody perennial plant species.

Ford - A shallow place in a body of water, as a stream, used for crossing.

FORSCOM - Forces Command.

Fragile Soil - Soil that is easily fractured or dislodged.

FTX - Field training exercise.

Fuel Load - Volume of combustible material on the surface in a given area.

Fuel Stick Moisture - A measure of ambient moisture (humidity) made by weighing standardized wooden sticks that rapidly absorb or release air moisture.

FY – Fiscal Year (1 October through 30 September).

Gabion - Large, single- or multi-celled rectangular wire mesh boxes that are filled with rock and wired together to form a protective structure. Gabions are generally used at YTC to construct drop structures in streams that retain bedload and reduce channel slope.

Geomorphic - Of or relating to the form of the earth, or its solid surface features.

Germination - Sprout; to begin to grow.

GIS - Geographic Information System.

GPM (gpm) - Gallons per minute.

GG - Golf-Golf - The alphabetical 100,000 meter Grid SQUARE designator which is within the Alphanumeric (10T) Grid ZONE Designation in the Universal Transverse Mercator map system.

Gully - A channel or miniature valley cut in the earth by concentrated water runoff but through which water commonly flows only during and immediately after a storm or snow melt event.

Habitat Diversity - The pattern of habitats and species assemblages across a land area of thousands to tens of thousands of acres.

Habitat Linkages - Habitats that are functionally connected by the movement of organisms, material, or energy.

Habitat Patches - A non-linear surface area differing in appearance from its surroundings, typically a small (less than 50 acres) portion of the landscape; small patches the size of an individual tree canopy are frequently called gaps.

HSI - Habitat Suitability Index

Habitat Type - 1. All areas that support, or can support, the same primary vegetative climax. 2. The expression, through the plants present, of the sum of environmental factors that influence the nature of the climax.

Hardened Crossing - A type of ford where a hard surface, such as concrete, has been placed to prevent traffic from eroding the ford site.

Headwall Erosion - Erosion that occurs when water acts on the relatively soft material surrounding a hardened culvert, structure entrance, or upstream of streambank erosion.

Herbivory - The consumption of portions of a plant without killing it.

Hybrid - 1. Offspring whose parents are of differing species. 2. Rock formed by the assimilation to two magmas.

Hydrograph - A graph of stream discharge versus time.

Hydrophitic - Plant species that are adapted to living in aquatic or wetland habitats.

Hydroseeding - Method of seeding using a high pressure pump to dispense seed mixed with a moisture medium and sometimes fertilizer.

IBCT – Interim Brigade Combat Team

Igneous - Formed by solidification from a molten or partially molten state.

IPM - Integrated Pest Management.

Indurated - A rock material that has been hardened by the application of heat or pressure or by the introduction of a cementing material.

Infiltration - Permeation of a liquid into a substance by passing through its interstices or pores, i.e., water into soil.

INRMP - Integrated Natural Resources Management Plan.

Insloped - A road surface that tilts into the slope which it crosses. Such roads require a side ditch to collect both slope and road runoff water.

Integrated Pest Management - A method of pest management (plants, animals) that considers all possible means of control, then uses the least environmentally harmful method or combination of methods to achieve a reduction in the pest species.

ITAM - Integrated Training Area Management.

Interbedded - Having beds or layers lying between other beds or layers.

Intermittent - A stream that flows only at certain times of the year but is not dependent on storm events.

Introduced Species - Non-native species (plant or animal) that evolved in a geographically disjunct area and were translocated anthropologically to a new area in which they thrive.

Invasive Weeds - Weeds with a tendency to spread at a rapid rate such that native plants are excluded from the area.

JWT – John Wayne Trail

Keystone Species - Also called indicator species. A species which can be used to indicate the health of an ecosystem because their welfare is presumed to indicate the welfare of other species. Managing for these species can positively impact other species in the ecosystem.

Landscape - A heterogeneous land area composed of a cluster of interacting ecosystems that are repeated in similar form throughout. An ecologically delineated area of sufficient size to be able to contain viable populations of nearly all of the endemic species for the area, with the exception of a few megafauna.

Landscape Ecology -The study of the interrelationships of organisms with one another and with the environment on a landscape scale.

LAV – Light Armored Vehicle.

LCBE – Lower Columbia Basin Ecosystem.

LCTA - Land Condition Trend Analysis.

Leader Training Programs (LTPs) - A program to train battalion commanders and their staff prior to rotations at National Training Centers (NTCs).

Lek - A site where birds (primarily grouse) traditionally gather for mating display and courtship.

Linkage - The functional connection of two land areas through the movement of organisms, material, or energy.

Listed - 1. Any species of fish, wildlife, or plant which has been determined to be endangered or threatened under Section Four of the Endangered Species Act. 2. Any species which has been determined to be endangered, threatened, sensitive, or monitored by the Washington State Department of Fish and Wildlife.

Lithic - Of or relating to stone.

Lithosol - A group of shallow soils lacking well-defined layers and composed of partially weathered fragments of rock.

Litter - Dead plant parts on top of soil layer.

Live Stakes - The stems and/or branches of live hardwood plant species pushed into wet soil for propagation.

Loam - Soil consisting chiefly of sand, clay, silt and organic matter.

Loess - Fine grained material, dominantly of silt sized particles, deposited by wind.

LP - Long-term periodic (referring to surface water monitoring).

LRAM - Land Rehabilitation and Maintenance.

LTP – Leader Training Program.

LWD - Large woody debris.

Macroinvertebrates - An invertebrate possessing sufficient size as to be seen with the ‘naked’ eye.

MAD - Management Action Description.

MCL - Maximum Contaminant Level.

Metamorphic - Characteristic of rock masses altered in texture, composition, or structure by great heat or pressure.

METL - Mission Essential Task List.

MICLIC – Mine Clearing Line Charge.

Microclimate - A local, rather uniform climate of a specific place or habitat, compared with the climate of the entire area of which it is a part.

MILES - Multi Integrated Laser Engagement System.

Mitigation - Mitigation includes 1) avoiding an impact altogether by not taking a certain action or parts of an action; 2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; 3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; 4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; 5) compensating for the impact by replacing or providing substitute resources of environments.

MOA - Memorandum of Agreement.

MOPM - Mine Emplacement Kit.

Morphology - The study of the shape and form of an object (i.e., landform).

Mosaic - The intermingling of plant communities and their successional stages so as to give the impression of an interwoven design.

MOU – Memorandum of Understanding.

MP - Military Police.

MPH – Miles Per Hour.

MPRC - Multi-Purpose Range Complex.

MPTR - Multi-Purpose Training Range.

MTOE - Modified Table Organization and Equipment.

MY – Million Years.

NAGPRA - Native American Graves Protection and Repatriation Act.

Native - A plant or animal species whose genetic lineage can be traced to the area of interest (i.e., the assemblage of plants occurring on YTC prior to European settlement).

Natural Range of Variability - The historic range of ecosystem conditions with which the endemic species of a region evolved.

Natural Vegetation - The assemblage of plant species native to a given area.

NET – New Equipment Training.

NEPA – National Environmental Policy Act.

NFDRS - National Fire Danger Rating System.

NHPA - National Historic Preservation Act.

Niche - 1. The unique role or way of life of a plant or animal species. 2. The unique arrangement of food, water, and cover that meets the requirements of a particular species.

NMFS – National Marine Fisheries Service.

NOE - Nap of the Earth.

Non-Native - Species (animal or plant) whose genetic lineage was derived in a geographically separate from the area of interest (i.e., any species that has been introduced to YTC since European settlement).

Noxious Weed - Any plant which, when established, is highly destructive, competitive, or difficult to control by cultural or chemical practices.

NRCS - Natural Resource Conservation Service.

NTU - Nephelometric Turbidity Units.

NVG - Night vision goggles.

Obligate - Species (animal or plant) whose biologic requirements are tied to a certain environmental parameter, such as wet soil. In reference to wetland plants: plants that occur almost always (>99% probability) under natural conditions in wetlands.

ORV - Off-road vehicle.

Outsloped - A road surface that tilts away from the slope which it crosses. Upslope and road runoff drains across these roads in a sheet, reducing erosion and eliminating the need for drainage ditch maintenance.

Outwash - Mainly sandy or coarse textured material of glaciofluvial origin.

Overland Flow - Unconfined water flowing over the ground surface toward a channel.

Overstory - The aggregated uppermost layer of an assemblage of plant species canopies.

Palustrine - Being, living, or thriving in a fresh water marsh.

Palustrine Emergent - Wetland characterized by a mix of rushes, cattails, sedges, grasses, and forbs and dominated by rushes, cattails, sedges, saltgrass, rabbitsfoot grass, mint, stinging nettle, and teasel.

Palustrine Forested - Wetland dominated by tree species that exceed 20 feet in height and form a distinct mainstem (i.e., cottonwood).

Palustrine Scrub/Shrub - Wetland characterized by shrubs or short trees less than 20 feet in height that usually have multiple stems in clumps and dominated by willow, but may also include chokecherry, Wood's rose, red-osier dogwood, and, to a lesser extent, bitterbrush.

Passerine - All perching birds including songbirds.

Pedestaling - The effect created by erosion around the base of a plant, such that the plant's roots retain soil and the surrounding soil is washed away, placing the plant on a pedestal.

Pedogenic – To produce, or develop soil.

Perch - A bar, pole, or limb of a tree upon which a bird will sit or roost.

Perennial - A stream that has water in it throughout the year.

pH - A term used to describe the acidity or alkalinity of a system on a scale of 0-14. Below 7 is acid, 7 is neutral, and above 7 is alkaline.

Pioneering Species - An animal or plant species that establishes itself in a previously barren environment.

Platoon - A military unit consisting of two or more squads or sections and a headquarters (15-50 soldiers).

Pleistocene - An epoch of the geologic time during the Quaternary period, also known as the Ice Age. The Pleistocene epoch precedes the recent period.

Pool - A body of water in a stream contained by a blockage.

Potential Habitat - An assemblage of vegetation which will likely be present through succession or by management practices.

Potential Natural Vegetation - The theoretical climax vegetation community that would occupy an area if left undisturbed by humans.

ppb – part per billion.

Prescribed Burn - Skillful application of fire to natural fuels under conditions of weather, fuel moisture, soil moisture, etc. to allow confinement of the fire to a predetermined area while producing the intensity of heat and rate of spread required to accomplish certain planned benefits.

Productivity - A measure of the amount of biomass produced during the growing season.

Propagule - A structure such as a seed, cutting, or spore that causes a plant to continue growing or increase by sexual or asexual reproduction.

Proposed for Listing - A fish, wildlife or plant species that is proposed in the Federal Register to be listed as endangered or threatened under the Endangered Species Act.

PUD – Public Utility District.

Pumicite - A rock froth, formed when expanding gasses in liquid lava generate extreme pressures prior to and during lava solidification.

PW – Public Works

Pyrotechnics - Ammunition containing chemicals for producing smoke or light, as for signaling, illuminating, or screening.

Race - An intraspecific taxonomic group of organisms such as a subspecies.

Raptor - General classification for predatory birds which include hawk, owl, falcon, and eagle families.

RCW - Revised Code of Washington.

RE - Rare event (referring to surface water monitoring).

Recharge Area - A zone where aquifers or streams gain water from unsaturated adjacent zones.

Reclaim - To restore the ecological function of a severely disturbed landscape employing native or non-native plant species.

Rehabilitation - To restore the ecological function of a severely disturbed landscape employing native plant species.

Relative Humidity - The ratio of the amount of water vapor in the air at a specific temperature to the maximum capacity of the air at that temperature.

Remediate - Process in which an environmentally destructive agent is removed or obviated.

Residuum - Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Restoration - The process in which a severely disturbed area is restored to original ecological function (or near original condition) using the identical assemblage of native species which were present originally.

Rhizome - A root-like usually horizontal stem growing under or along the ground that sends out roots from its lower surface and leaves or shoots from its upper shoots.

Riffle - A shallows across a stream bed over which water flows swiftly and is broken into waves by submerged objects.

Rill - A small gully. A rill is generally less than 1 foot deep and can be obliterated by ordinary tillage.

Riparian - The area adjacent to streams that is influenced by perennial or intermittent water and contains elements of both aquatic and terrestrial ecosystems mutually influencing each other. Riparian habitat includes the entire extent of the floodplain and those areas of wetlands that are directly connected to streams.

Riparian Buffer - A strip of land which functions to exclude activities that may be harmful to the biologic functioning of an associated riparian area. This area extends at least 50 meters from the edge of the riparian area by regulation on YTC.

Riparian Corridor - A passageway between riparian areas in which associated riparian animal species can safely migrate.

Riprap - A loose assemblage of broken stones erected in water or on soft ground. Used to reduce erosion, usually along stream banks.

Riverine - Of or pertaining to a stream or river.

ROD - Record of Decision.

Ruderal - Growing in land with a poor capacity to support vegetative cover or in waste.

RUSLE - Revised Universal Soil Loss Equation.

Sanctuary Pools - Pools of water within creeks or streams that are large enough, deep enough, and with sufficient cover to maintain trout through the driest periods.

Sandy Loam - A loam soil containing a large sand component.

SDWA – Safe Drinking Water Act.

SDZ - Safety danger zone.

Sedimentary - Relating to rocks formed from sediment or from fragments of other rocks deposited in water.

Sedimentation - The act or process of depositing sediment.

SEE – Small Emplacement Excavator.

Seed Bed - A plot of soil for germinating seeds, sometimes cultivated or otherwise disturbed.

Sensitive Species - Any wildlife species native to the state that is vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range without cooperative management or removal of threats.

Seral - Plant species that predominate in disturbed landscapes for varying lengths of time, but which are eventually replaced by climax species.

Sheet Erosion - The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall or runoff water.

Shrub-Steppe - A region of the intermountain west whose vegetation is dominated by shrubs and bunchgrasses.

Siber Stake - Multicolored markers used on the YTC to identify environmentally or culturally sensitive areas such as riparian areas. Motorized vehicle travel within siber staked areas is prohibited.

Site Potential - The ability of a given range site to produce a dominant vegetation of a given height.

Slips - Soil mass that moves downslope when loaded, excavated, or wet.

Soil Moisture - Moisture that is within the layer of soil that is suitable for the growth of plants.

Soil Series - Group of soil profiles with somewhat similar profile characteristics such as the kind, thickness, arrangement, and properties of soil horizons.

SPMP – Sensitive Plant Management Plan.

Spawning - The deposition of eggs by aquatic animals, such as fish.

Species Diversity - A measure of the number of species within a defined area and the variation in abundance of those species.

Species of Concern - An unofficial status for a species of conservation concern under the ESA, but for which USFWS does not have sufficient information to support proposals to list it as endangered or threatened. Given additional information regarding biological vulnerability, a species would be assigned the status of Candidate for listing as endangered or threatened.

Spring - Any discharge of deep-seated underground water to the land surface.

Squad - The smallest unit of military organization, consisting of 8-10 soldiers.

Staging Area - An area where troops and equipment are assembled and readied for transportation to and from the field of operation.

State Candidate - Wildlife species that are under review by the Washington State Department of Fish and Wildlife for possible listing as endangered, threatened, or sensitive.

State Monitor Species - Wildlife species native to the state that 1) were once classified as endangered, threatened or sensitive; 2) require habitat that is limited at some point in their life cycle; 3) are indicators of environmental quality; 4)

require further study to determine population status; 5) may be competing with and impacting other species of concern; and 6) have significant popular appeal.

Stony Loam - A loam soil intermixed with stones.

Substrate - A surface on which a plant or animal grows or is attached.

Subwatershed - A portion of a watershed that contains a distinct drainage, but does not make up the entire watershed.

Surficial - Occurring on the surface or occurring on the earth's surface.

Suspended Solids - The fraction of sediment and organic matter that is carried suspended in a body of water.

Syncline - A low trough-like area in bedrock, in which rocks incline together from opposite sides.

T - Tolerable soil loss.

T-Value - Tolerance value (when discussing soil series data).

Talus - A sloping mass of debris located at the base of a cliff.

TCE - Tetrachloroethane.

Threatened - Federal threatened - a species likely to become endangered within the foreseeable future. State threatened - same as above but native to that state and threatened within that state.

TMDL - Total maximum daily load.

TNC – The Nature Conservancy.

Tracer - Ammunition containing a chemical substance that causes a projectile to trail smoke or fire so as to make its path visible.

Tracked Vehicle - An armored vehicle that is propelled by steel tracks.

TRI – Training Requirements Integration.

TSS - Total suspended solids.

Tubeling - Plants propagated from seed and allowed to grow and advance developmentally in plastic (or paper-based) tubes prior to transplanting.

Turbidity - The property water due to sediments that causes light to be scattered and absorbed, rather than transmitted directly through a sample.

TVIM - Tracked Vehicle Impact Modeling.

UMTU – Unexploded Munitions Treatment Unit.

Understory - The herbaceous and shrub vegetation under a brushwood or tree canopy.

Ungulate - Refers to hoofed mammals, typically herbivores.

Upland - Landscapes located at topographically higher positions than wetlands/riparian areas and characterized by soils which exhibit strong seasonal wet-dry cycles.

USDA - U.S. Department of Agriculture.

USDA NRCS - USDA Natural Resources Conservation Service.

USFWS - U.S. Fish and Wildlife Service.

USLE - Universal Soil Loss Equation.

Vegetative Geo-Grid - A plastic cellular system filled with soil (used for slope stabilization) then planted with vegetation to enhance soil retention, water retention, and aesthetic properties for soil stabilization.

Viable Population - A population of sufficient size to maintain its existence over time despite normal fluctuations in population levels.

WAC - Washington Administrative Code.

WAARNG - Washington Army National Guard.

Water Bar - A smooth, shallow ditch or depressional area that is excavated at an angle across a sloping road, used to reduce the downward velocity of water and to divert water off and away from the road surface.

Water Capacity - The maximum liquid water that a sample of soil or snow is capable of holding.

Watershed Complex - A compilation of associated subwatersheds.

Wattle - Bundles of cuttings from willows, alders, or similar plants used for slope stabilization.

WDFW - Washington Department of Fish and Wildlife.

WDNR - Washington Department of Natural Resources.

Weir - A dam placed across a water course to raise or divert flow.

Wetlands - Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted from life in saturated soil conditions. Wetlands include marches, bogs, swamps, small ponds, river overflows, mud flats, and wet meadows.

YTC - Yakima Training Center.