National Park Service
U.S. Department of the Interior

Natural Resource Program Center

Natural Resource Condition Assessment

Nez Perce National Historical Park

Natural Resource Report NPS/UCBN/NRR—2010/333

ON THE COVER

Maps of the Nez Perce National Historic Park units located in southeast Washington, northeast Oregon, and north central Idaho with insets of pictures of each park unit.

Natural Resource Condition Assessment

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John Erixson
Northwest Management, Inc.
PO Box 9748
Moscow, ID 83843

Jack Bell
Northwest Management, Inc.
PO Box 9748
Moscow, ID 83843

Dustin Hinson
AMEC Earth and Environmental, Inc.
11810 North Creek Parkway N
Bothell, WA 98011

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All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner. This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

This report is available from the Upper Columbia Basin Network website (http://science.nature.nps.gov/im/units/ucbn/reports/) and the Natural Resource Publications Management website (http://www.nature.nps.gov/publications/NRPM).

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Executive Summary

This Natural Resource Condition Assessment (NRCA) report and accompanying geodatabase is designed to give the resource managers of Nez Perce National Historical Park (NEPE) a better understanding of the condition of natural resources within and adjacent to the park. Assessment of the natural resources was accomplished by conducting a thorough literature review, evaluating existing data, and also collecting new data on areas of the park where sufficient, reliable data for an assessment was not available. Aquatic and upland habitats were assessed and treated separately in the report. Selected threats and stressors to NEPE's natural resources were evaluated for the entire park. Information gained from this report will form the basis for development of actions to reduce and prevent impairment of NEPE's natural resources and assist in the development of desired future conditions through park planning processes.

The study is based on five management areas composed of 6th level Hydrologic Unit Code (HUC) watersheds surrounding each park unit with a two km buffer. All available geographical information was acquired for the project area to create an ArcGIS Map Project File and Geodatabase. This product is used to make all maps presented in the report and for analysis of geographically based data. All site-specific data was compiled in Geographical Information System (GIS). Upland data is available in the digital database and the aquatic data is attached to this report. Maps and pictures were provided for each upland and aquatic sample site along with a description of the site and assessment of condition.

Upland communities were sampled at eighteen sites distributed across four of the five park units; Buffalo Eddy, Old Chief Joseph Gravesite, Weippe Prairie, and Whitebird Battlefield. All were evaluated based on the NRCS ecological site description, as defined by soil type, and an established reference condition (Pellant et al. 2005). Each ecological site received a five level rating for condition in three landscape attributes; soil stability, hydrologic function, and biotic integrity. All but one plot had a soil stability attribute rating of none-slight departure from reference condition, indicating soil processes were generally in good condition and functioning properly in all four units. The hydrologic function attribute had four out of seven plots in the slight-moderate departure ratings at the Whitebird Battlefield unit. This may lead to the possibility of water quality degradation, even though the unit is a minority in its respective watershed. The biotic integrity attribute ratings indicated many areas are not in good condition. The two plots in the Old Chief Joseph Gravesite unit were rated in the none-slight departure category (<21%), seven plots in Buffalo Eddy, Weippe Prairie and Whitebird Battlefield were rated in the slight-moderate category (21%-40%), eight plots in Buffalo Eddy and Whitebird Battlefield were rated in the moderate category (41%-60%) and one plot in Buffalo Eddy was rated in the moderate-extreme category (61%-80%). Two of the four units examined, Buffalo Eddy and Weippe Prairie are recent acquisitions within the past 10 years by the National Park Service (NPS). Both of these units were used for livestock grazing and/or hay production prior to acquisition. The poor biotic integrity attribute rating indicates the two units were in poor condition at the time of acquisition, and recovery is slow.

Aquatic resources at NEPE were assessed at Lapwai Creek (Spalding), Jim Ford Creek (Weippe Prairie), and Whitebird Creek and Swartz Pond (Whitebird Battlefield). Sites were assessed

using the “proper functioning condition” (PFC) riparian assessment methodology developed by the Bureau of Land Management (BLM) for lotic flowing water habitats and lentic pond and lake habitats (Prichard et al. 1998). All three lotic aquatic sites were rated “Non-functional” with the poor condition of most sites attributed to one or more of the following threats: invasive riparian species, recreational land use, fine sediments, and/or land use practices. Swartz Pond was rated as “Proper functioning”.

Lapwai Creek and Whitebird Creek water quality was assessed based upon benthic macroinvertebrate (BMI) indicators. BMI data were analyzed using a benthic index of biotic integrity called the Idaho Stream Macroinvertebrate Index (SMI) and in-stream conditions were assessed using the Hilsenhoff Biotic Index (HBI), which is a general biotic index used to identify a relationship between macroinvertebrates and instream water quality. Lapwai Creek and Whitebird Creek were rated fair condition with SMI scores of 44 and 58, respectively. HBI scores indicated good and very good water quality conditions, with ratings of 5.5 and 4.1, respectively.

Past studies identified 20 noxious or invasive species as either potentially or physically existing in the four upland park units. Of the 20, 18 are listed as noxious weeds by the states of Idaho, Oregon, and/or Washington. Yellow starthistle is the most abundant noxious weed in some units. For example, the species makes up almost 50% canopy cover of the Buffalo Eddy unit. Accurate mapping of weeds on surrounding lands would allow NEPE’s staff to be more strategic in the noxious weed management by being prepared for possible new invaders and cooperating on control of existing species. Cooperation with adjacent landowners, both private and public, is the most effective method to prevent and control noxious weeds. To this end, NEPE is a member of the Clearwater Basin and Salmon River Cooperative Weed Management Areas, which have members of local, state, federal, and private organizations.

Climate in the Pacific Northwest is predicted to have warmer, wetter winters with a temperature increase of 3.1° F by 2030 and a 5% overall increase in precipitation (Mote et al. 2008). Precipitation is predicted to come more in the form of rain with smaller snow packs and seasonal stream flows shifting markedly toward larger winter and spring flows and smaller summer and autumn base flows (Mote et al. 2008). The 43 sub-basins in the Columbia River basin have their own sub-basin management plans for fish and wildlife but none comprehensively addresses reduced summertime flows under climate change. Possible impacts to ecosystem processes, communities, and/or species can only be addressed through future natural resource planning and enhanced monitoring programs based on projected climate changes.

Overall, NEPE has many challenges to achieve park goals for the future resource management (NPS 1997). Results of this report should assist park managers in identifying when, where, and how to improve management practices, justify additional resources, and prepare for the changes in the environment that will directly impact NEPE natural and cultural resources if climate change scenarios unfold as projected.

Acknowledgements

We wish to begin by thanking Jason Lyon, Integrated Resource Program Manager at Nez Perce National Historic Park, for his time and courteous help in all stages of the project. Mr. Lyon was extremely helpful providing us with valuable background information and was also very instrumental in the development of the project funding and design. Gerald Ladd of AMEC provided great assistance in field work. Vaiden Bloch, GIS Specialist, with Northwest Management, Inc. was invaluable in preparing the Geodatabase and map project files. We would like to thank the many staff at Northwest Management, Inc. for their edits and insightful comments on the manuscript, especially Tera King, Environmental Planner. Finally, we are very thankful for all the support and help from Lisa Garrett, NPS Upper Columbia Basin Network. She had the vision to develop and implement this project and the professionalism and dedication to guide it to completion.

Introduction

Purpose and Scope

The mission of the National Park Service is "to conserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment of this and future generations" (National Park Service 1999b). To uphold this goal, the Director of the NPS approved the Natural Resource Challenge to encourage national parks to focus on the preservation of the nation's natural heritage through science, natural resource inventories, and expanded resource monitoring (National Park Service 1999b). Through the challenge, 270 parks in the national park system were organized into 32 inventory and monitoring networks.

The Upper Columbia Basin Network (UCBN) consists of nine widely separated NPS units located in western Montana, Idaho, eastern Washington, and central Oregon. Parks of the Upper Columbia Basin Network include: Big Hole National Battlefield (BIHO), City of Rocks National Reserve (CIRO), Craters of the Moon National Monument and Preserve (CRMO), Hagerman Fossil Beds National Monument (HAFO), John Day Fossil Beds National Monument (JODA), Lake Roosevelt National Recreation Area (LARO), Minidoka Internment National Monument (MIIN), Nez Perce National Historical Park (NEPE), and Whitman Mission National Historic Site (WHMI).

As part of the Natural Resource Challenge, the NPS Water Resources Division received an increase in funding to assess natural resource conditions in national park units. Management oversight and technical support for this effort is provided by the division's Watershed Condition Assessment (WCA) Program. The WCA Program partnered with the Pacific West Region to fund and oversee an assessment at each park in the Upper Columbia Basin Network This report documents the results of the Natural Resource Condition Assessment completed for the Nez Perce National Historical Park.

Natural resource condition assessments are broad-scope ecological assessments intended to synthesize "information products" readily usable by park managers for: a) resource stewardship planning and b) reporting to performance measures such as the DOI Strategic Plan's "land health" goals. Three elements are key to making these assessments useful for both planning and performance reporting.

1. Build on data, information, and knowledge already assembled through efforts of the NPS Inventory and Monitoring Program, NPS science support programs, and from partner collaborators working in and near parks;
2. Emphasize a strong geospatial component for how the assessment is conducted and in the resulting information products;
3. Provide narrative and/or semi-quantitative descriptions of science-based reference conditions for park resources that will assist parks as they work to define Desired Future Conditions through park planning processes. These reference conditions will become more refined and quantitative over time.

Information gained from this report will form the basis for development of actions to reduce and prevent impairment of park resources through park and partnership efforts. The goals of the natural resource condition assessment are to:

- Determine the state of knowledge concerning overall natural resource condition
- Identify information gaps and resource threats
- Assess overall ecosystem health
- Set the stage to establish the context for management actions and collaboration

This report is designed to give park staff a moment-in-time assessment of the natural resources of NEPE. This report will describe the natural resources of the park (both aquatic and upland), determine the state of knowledge on their condition using existing data or new data collected at priority sites for this project, identify information gaps, draw conclusions or hypotheses on the condition of natural resources (unknown, degraded, unimpaired), identify resource threats or potential issues affecting ecosystem health, and recommend further studies.

Study Area

Historical Setting

Nez Perce Historical Park preserves and interprets a continuum of at least 11,000 years of Nez Perce culture. The archeological record, museum collection, cultural landscapes, and structures are of national significance. The park contains historical and cultural landmarks that are of legendary significance to the Nez Perce people. The park also offers a unique opportunity for visitors to gain an understanding of present-day Nez Perce culture within the Nez Perce homeland and to learn about important events of the past. The culture of the Nez Perce was shaped by the geography and the rich and varied resources of their homeland. The park includes small remaining fragments of once widespread resources dispersed throughout the Nez Perce Country. Many of the sites and resources present within these park units, such as the camas meadows of the Weippe Prairie and the petroglyphs at the Buffalo Eddy site, have become a focal point for continuation of the Nez Perce culture. The park honors the rights retained in the 1855 and 1863 treaties and applies all applicable laws, executive orders, policies, and treaties related to the protection of cultural properties and sacred sites.

Park Setting

Nez Perce National Historical Park was established as a unit of the NPS on May 15, 1965, by Public Law 89-19. The law specifies the Park was created to "facilitate protection and provide interpretation of sites in the Nez Perce Country of Idaho that have exceptional value in commemorating the history of the Nation." Specifically mentioned are sites relating to early Nez Perce culture, the Lewis and Clark expedition through the area, the fur trade, missionaries, gold mining, logging, the Nez Perce War of 1877, and "such other sites as will depict the role of the Nez Perce Country in the westward expansion of the Nation." Sites include historic buildings, battlefields, missions, landscapes, cemeteries, trails, archeological sites, and geologic formations important to the Nez Perce people. A total of 24 units were established in 1965.

Public Law 102-576 of October 30, 1992, authorized the designation of 14 additional units in Idaho, Oregon, Washington, Montana, and Wyoming. To date, 38 NEPE units, covering 2,618 acres scattered across the states of Idaho, Oregon, Washington and Montana, have been designated to commemorate the legends and history of the Nimiipuu (or Nez Perce) and their interaction with explorers, fur traders, missionaries, soldiers, settlers, gold miners, and farmers who moved through or into the area. On the basis of provisions in the enabling legislation, the purpose of Nez Perce National Historical Park is to:

- Facilitate protection and offer interpretation of Nez Perce sites in Idaho, Oregon, Washington, Montana, and Wyoming that have exceptional value in commemorating the history of the United States
- Preserve and protect tangible resources that document the history of the Nez Perce peoples and the significant role of the Nez Perce in North American history
- Interpret the culture and history of the Nez Perce peoples and promote documentation to enhance that interpretation

The areas encompassing NEPE display diversity in topography, rainfall, vegetation, and scenery ranging from the semi-arid regions of Washington to the lush high mountain meadows of Idaho and Oregon and the short grass prairies of northeastern Montana. The natural resources of NEPE are diverse and complex. Scattered throughout four states, the park units are mostly small pockets of land owned and surrounded by a patchwork of private, local, state, tribal, and other federal ownership.

Visitation at the park reached a high of 263,241 visitor days in 1996 and has fluctuated downward since to a recent low of 152,396 in 2005 (Figure 1). Visitor days per year has averaged 187,640 over the past 41 years. There is no overnight camping at any of the NEPE units, so visitation use is limited to day-use only.

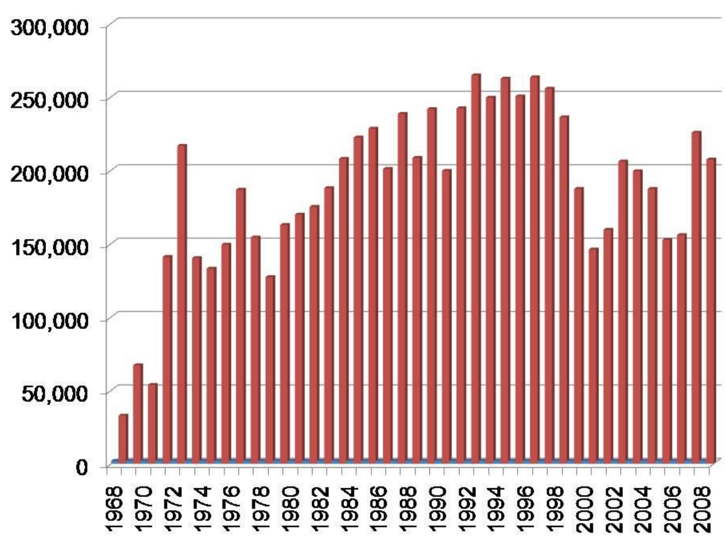

Figure 1. Number of visitors to NEPE between 1968 to 2008.

NEPE is composed of a multitude of individual units significant to the history of the Nez Perce people throughout Oregon, Washington, Idaho, and Montana, including the 24 units originally established in 1965 and the additional 14 units added in 1992. The park is rather unusual in that there is no single contiguous federal landbase forming it. The majority of park units are not owned by the National Park Service. Of the 38 units now part of the park, the NPS owns land associated with only nine; East Kamiah, Spalding, Weippe Prairie, Whitebird Battlefield, Canoe Camp, Big Hole National Battlefield, Bear Paw Battlefield, Old Chief Joseph Gravesite, and Buffalo Eddy (2,618 acres). This report provides analysis of the condition of natural resources in and around five of the units; Buffalo Eddy, Old Chief Joseph Gravesite, Spalding, Weippe Prairie, and Whitebird Battlefield. The remaining four NPS owned NEPE units were not evaluated as a component of this project. The two NEPE administered Montana units (Big Hole National Battlefield and Bear Paw Battlefield) will be evaluated as part of a separate NRCA project in the future. The other two NEPE sites (East Kamiah and Canoe Camp) are relatively small units with limited resources not warranting the level of analysis conducted here.

Buffalo Eddy

Buffalo Eddy unit was one of the 14 units added through the 1992 amendment. Approximately 94 acres were acquired by NPS including approximately 2,500' of shoreline along the Washington side of the Snake River (Figure 2). The unit is characterized by steep slopes dominated by grasses with shrubs along the bottom of the draws. There are a limited number of other visual intrusions such as power lines, fences, and a small building, and Snake River road runs along the eastern edge of the property. Elevation ranges from 800' along the river to 1,560' along the western boundary. The Buffalo Eddy unit consists of two groups of rock outcroppings on both sides of the Snake River with an eddy formed by a series of sharp bends in the River. The rocks have densely grouped clusters of petroglyphs and a few pictographs. This rock art contains hundreds of distinct images associated with early Nez Perce people.

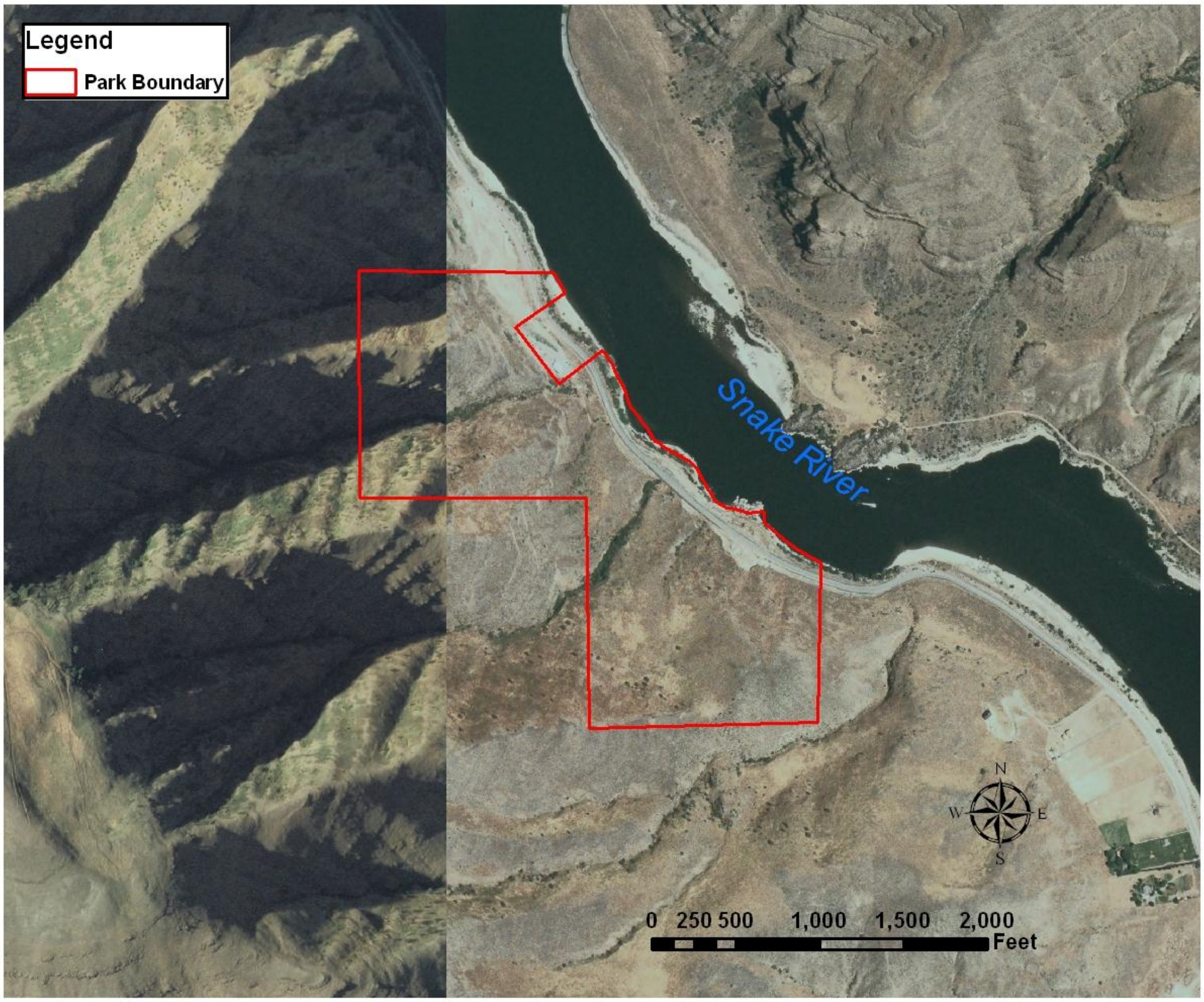

Figure 2. Map of NEPE Buffalo Eddy site in southeast Washington.

Old Chief Joseph Gravesite

The Old Chief Joseph Gravesite unit is a 5.1 acre cemetery on the west side of Oregon Highway 82, just north of Wallowa Lake and one mile south of Joseph, Oregon. Chief Joseph was reinterred at this unit in 1926. The unit was expanded to approximately 13 acres with the addition of land lying to the north (Figure 3). The cemetery, a National Historical Landmark, is sacred and sensitive for the Nez Perce people. Adjacent lands are privately owned by individuals and a consortium of irrigation companies. A path cuts through the cemetery to the west giving access to swimming and fishing at the dam and a water diversion flume outlet for Wallowa Lake. The adjacent highway is busy, and the pull out used for parking is quite narrow and just over the crest of a hill in the road. The lake is also a recreational attraction. Several residences are located across the highway from the unit and additional residential sites have been platted to the northwest. Elevation is approximately 4,450’ at the unit.

Figure 3. Map of NEPE Old Chief Joseph Gravesite in northeast Oregon.

Spalding

The Spalding unit is along U.S. Highway 95 approximately 11 miles east of Lewiston, Idaho, at the confluence of the Clearwater River and Lapwai Creek. The unit contains the park headquarters, museum, and visitor center. The approximately 90 acre unit is surrounded by private and Nez Perce tribal land that is used for agriculture and residences (Figure 4). Most of the unit is a mixed landscape of maintained visitor use and interpretive areas. The Clearwater River bounds the property to the north and U.S. Highway 95 bounds it to the south. Topography is gently sloping to the Clearwater River at an elevation of 766' to 825'.

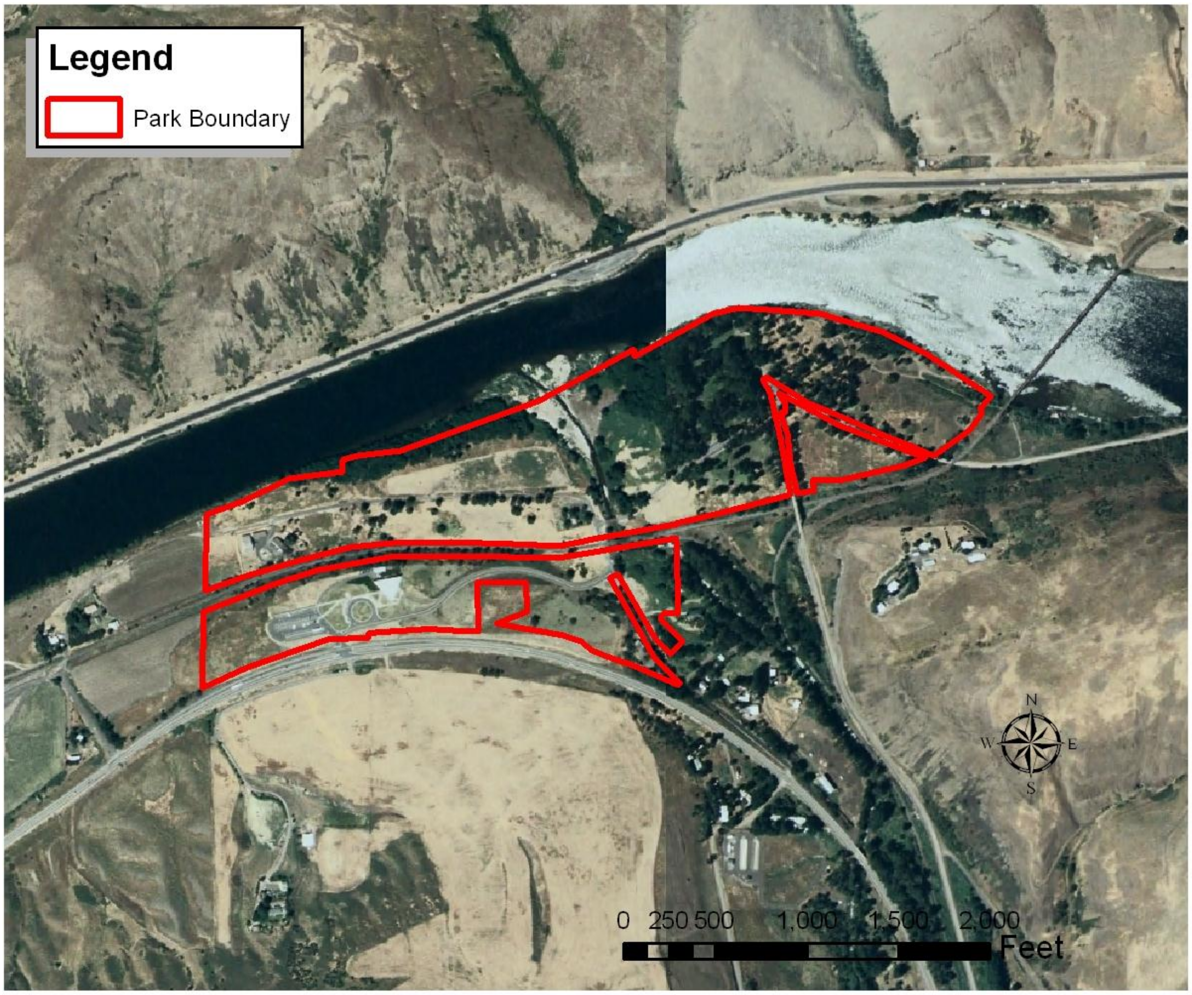

Figure 4. Map of NEPE Spalding site in northern Idaho.

Weippe Prairie

Weippe Prairie unit is a 274 acre swath of camas prairie situated approximately eight miles south of the community of Weippe, Idaho (Figure 5). The unit is a traditional gathering place where the Nez Perce harvested camas root and socialized for thousands of years. Lewis and Clark made their first contact with the Nez Perce near this site in 1805. The property was acquired by NPS in 2003 and is bordered on all sides by private property in agricultural land use. The unit was primarily used for hay and pasture production in the past, but these practices were stopped in 2007. Approximately one mile of Jim Ford Creek flows southeast to northwest through the northern 1/3 of the unit. There are no NPS visitor facilities or developments on the unit. The topography is relatively flat with an elevation of 3,010’ and less than 20’ variation across the unit.

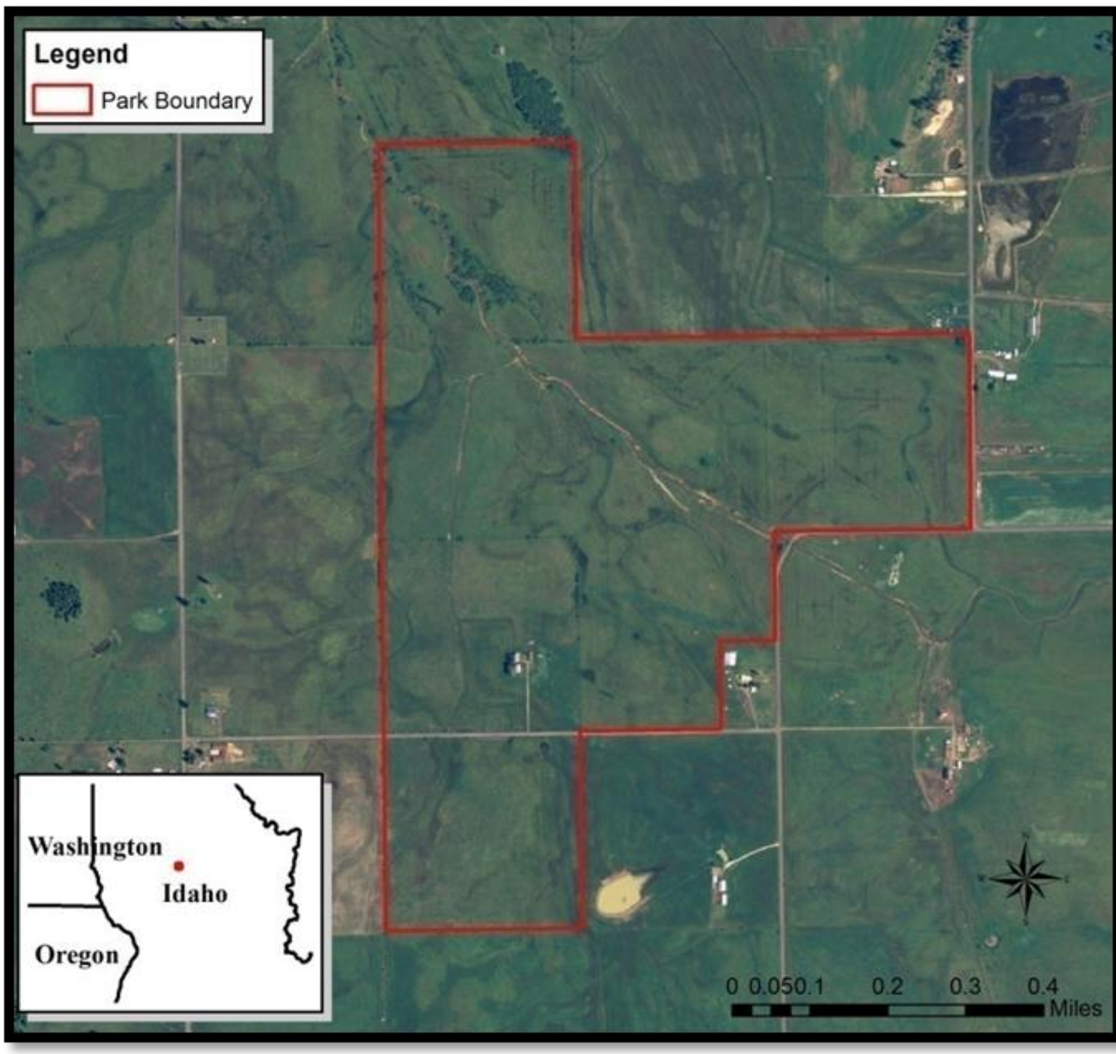

Figure 5. Map of NEPE Weippe Prairie site in northern Idaho.

Whitebird Battlefield

Whitebird Battlefield is located 15 miles south of Grangeville, Idaho, between US Highway 95 and the old Whitebird Grade, and ½ mile north of Whitebird, Idaho. The Whitebird Battlefield unit is approximately 1,245 acres of sloping topography that retains much of the appearance it probably had in 1877 (Figure 6). The surrounding land is used for open range pasture and agriculture. There are excellent views across the battlefield with minor intrusions from ranch and residential structures and associated features such as roads and fences. There are archeological sites and a few abandoned homestead remnants within the unit. The old Whitebird Grade runs on the east side of the battlefield and U.S. Highway 95 runs on the west side. The battlefield boundaries, established in 1965, include approximately 1,900 acres. In addition to the 1,245 acres owned by NPS, they also hold scenic easements on 655 acres in the surrounding area. Adjacent land is privately owned except for a parcel owned by the State of Idaho along the northwest boundary. Approximately ¼ mile of Whitebird Creek borders the unit along the southeast boundary. Swartz Pond and an adjacent wetland area are located in the northern portion of the unit. The only park facilities are a ½ mile mowed trail and interpretive signs. Elevation ranges from 1,730’ along Whitebird Creek to 2,960’ along the north boundary.

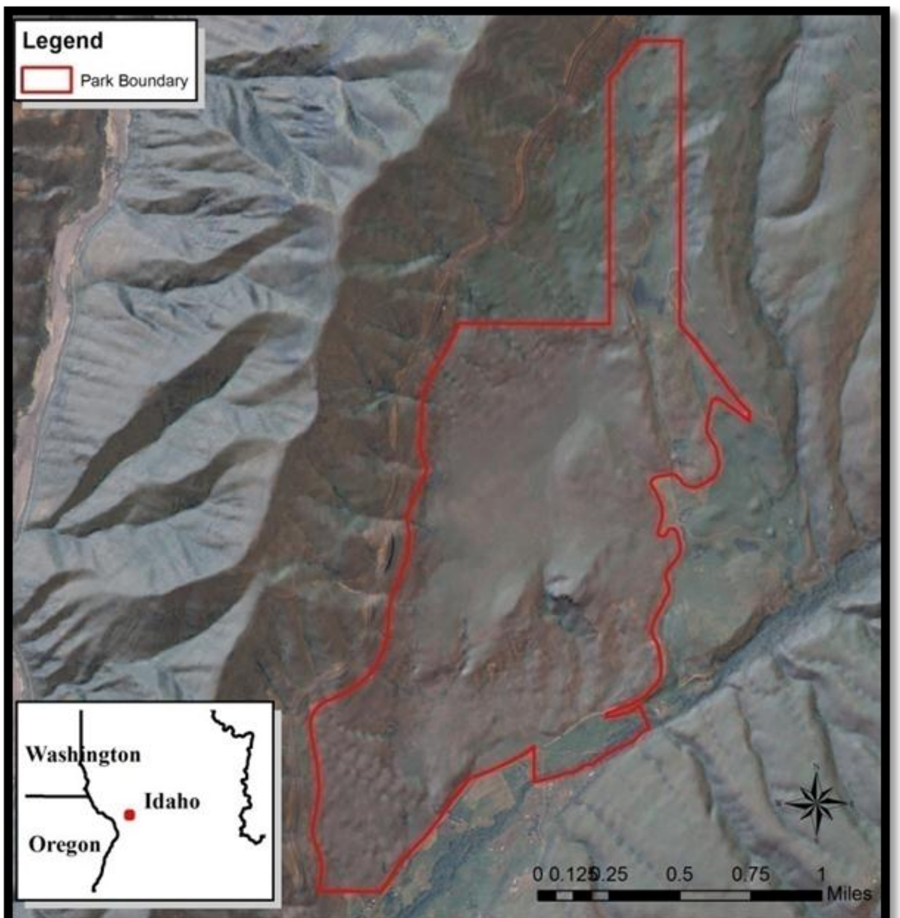

Figure 6. Map of NEPE Whitebird Battlefield site in northern Idaho.

Watersheds

River and stream drainages are uniquely identified by hydrologic unit codes. These are geographic areas based on surface topography containing a major river or a group of smaller rivers. The Pacific Northwest is number 17 of the 21 regions (HUC1) in the United States. The second level divides the 21 regions into 221 subregions. Subregions are areas drained by a river system, a reach of a river and its tributaries, a closed basin, or a group of streams forming a coastal drainage area. The third level subdivides the subregions into 378 basins. There are also 2,149 fourth level drainages, referred to as subbasins. These are further divided into 2,264 watersheds (HUC5) and over 160,000 subwatersheds (HUC6) in the United States (USGS 2009). Each level is represented by a 2-digit number starting at the left-hand side of the number with HUC6 subwatersheds being represented by a 12-digit number.

Each NEPE unit is in different watershed project areas defined by HUC6 boundaries (Figure 7). The Buffalo Eddy project area is in the Snake River-Fisher Gulch subwatershed (170601030303) and lies along both sides of the Snake River. The Old Chief Joseph Gravesite project area is composed of three subwatersheds; Wallowa River-Wallowa Lake (170601050109), Lower Prairie Creek (170601050105), and Upper Prairie Creek (170601050102). The Spalding project area is at the junction of two subwatersheds; Lower Lapwai Creek (170603061304) and Lower Clearwater River (170603060606). The Weippe Prairie project area is in the Upper Jim Ford Creek subwatershed (170603060401). The Whitebird Battlefield project area has three subwatersheds; South Fork Whitebird Creek (170602090601), Lower Whitebird Creek (170602090603), and North Fork Whitebird Creek (170602090602).

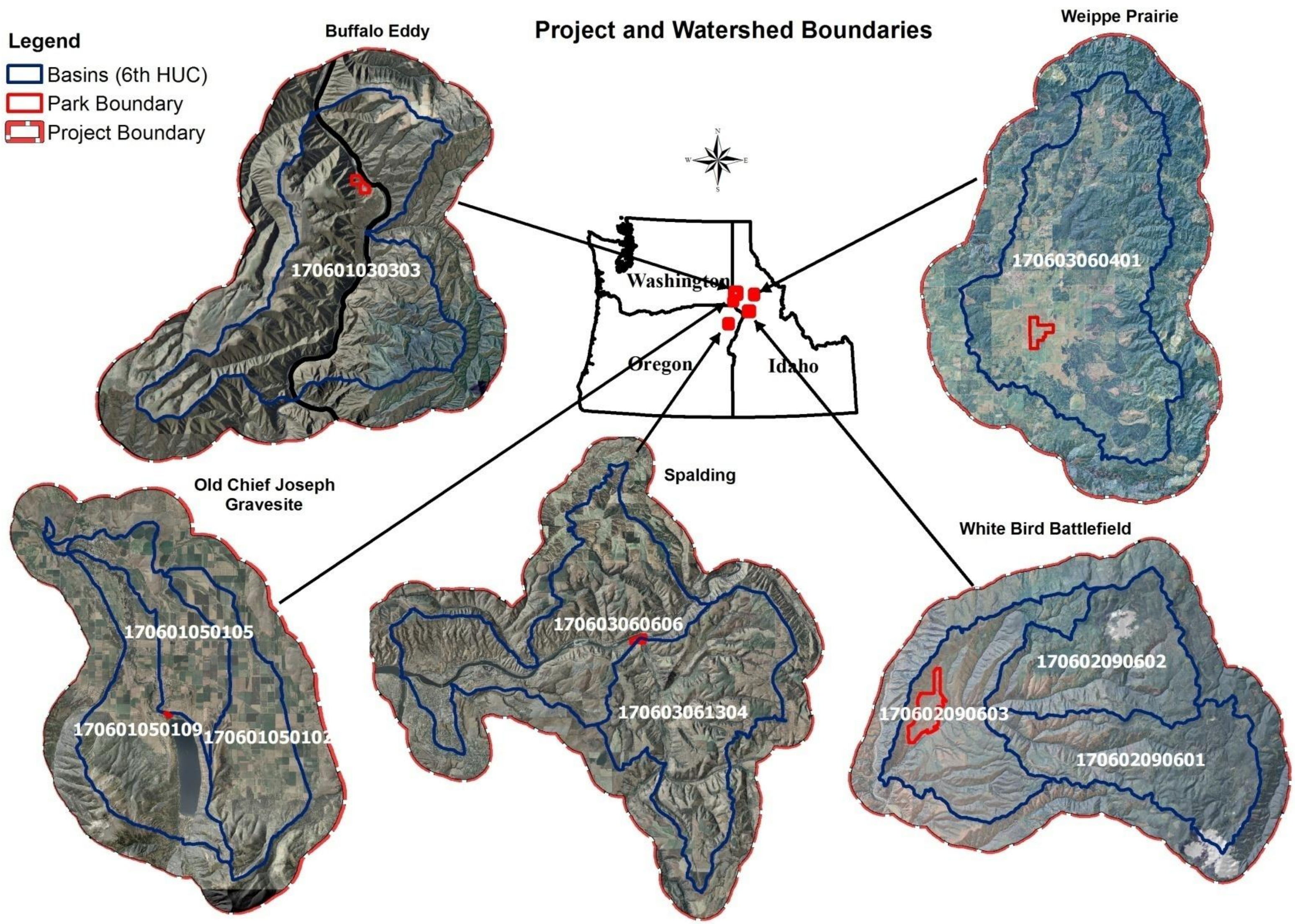

Figure 7. Map of the NEPE units and the subwatersheds (HUC6 numbers in white) that make up each project area.

Land Cover

Vegetation data was available from the LANDFIRE program (USFS and USGS 2008). Vegetation maps were created through predictive modeling using a combination of field reference information, 1999-2004 Landsat imagery, and spatially explicit biophysical gradient data. Map units were derived from National Vegetation Classification System (NVCS) Ecological Systems classification (Comer et al. 2003). The data was clipped by the watershed boundaries (described in the following "Watersheds" section), then summarized by class and mapped for each of the NEPE unit watershed project areas.

Buffalo Eddy

The Buffalo Eddy watershed (27,212 acres) is dominated by herbaceous (43.5%) and shrub (28.3%) dominated vegetation (Table 1). Agriculture (14.7%) and timber dominated vegetation (11.0%) comprise much less of the watershed and are generally found at the higher elevations within the watershed (Figure 8).

Table 1. List of ecological systems found in the NEPE Buffalo Eddy unit watershed.

NVCS Ecological Systems	Acres	Percentage
Agriculture	4,016	14.8%
Big Sagebrush-Bluebunch Wheatgrass	4,110	15.1%
Bluebunch Wheatgrass	4,474	16.4%
Bluegrass Scabland	3,598	13.2%
Chokecherry-Serviceberry-Rose	471	1.7%
Cottonwood-Willow	660	2.4%
Douglas-Fir	2,729	10.0%
Idaho Fescue	552	2.0%
Introduced Upland Vegetation - Herbaceous	1,046	3.8%
Low Sagebrush	295	1.1%
Mountain Big Sagebrush	892	3.3%
Ponderosa Pine	268	1.0%
Rough Fescue-Bluebunch Wheatgrass	1,520	5.6%
Tall Forb	684	2.5%
Wyoming Big Sagebrush	1,897	7.0%

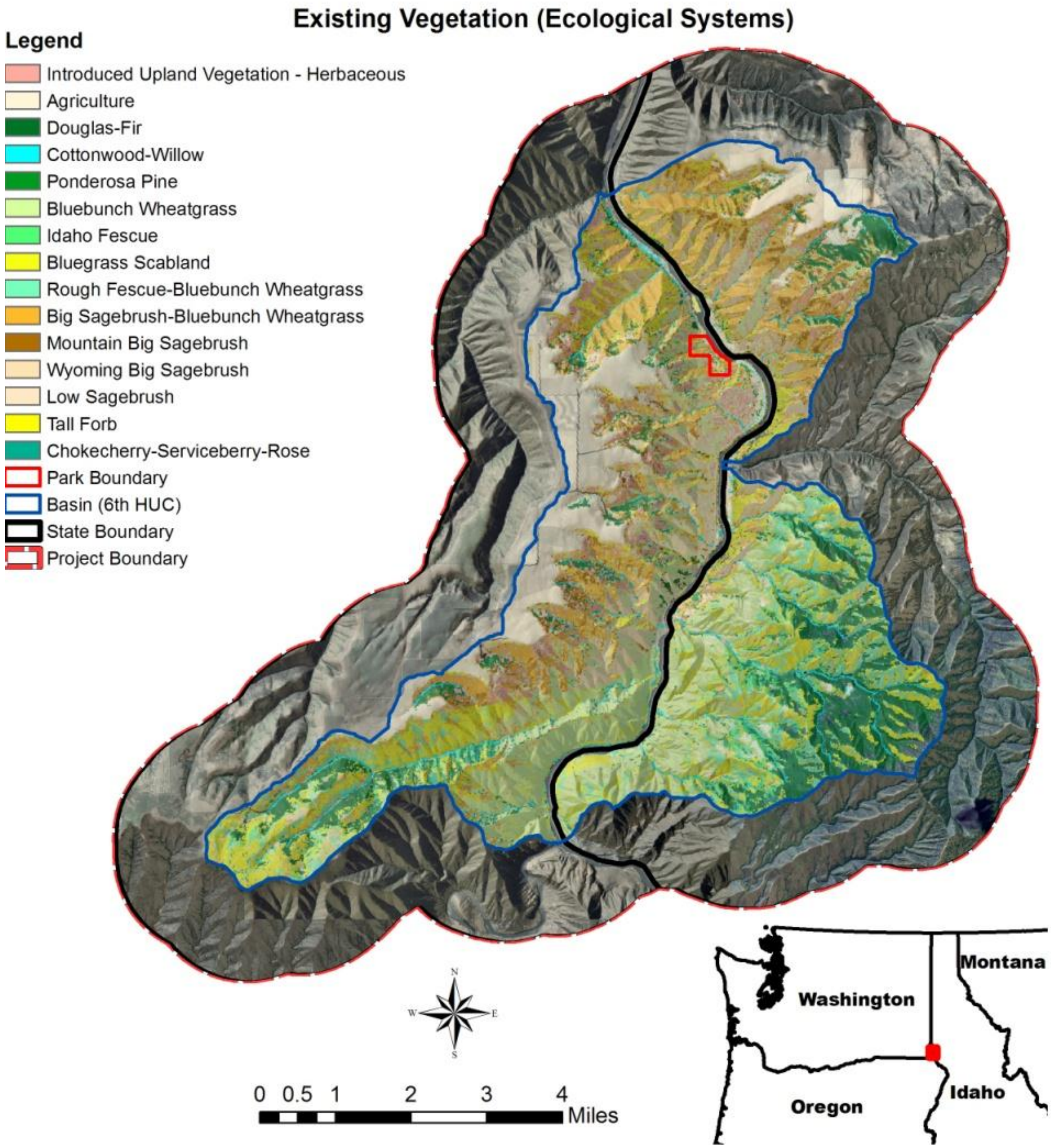

Figure 8. Map of existing vegetation based on ecological systems in the NEPE Buffalo Eddy watershed project area.

Old Chief Joseph Gravesite

The Old Chief Joseph Gravesite watershed (39,864 acres) is dominated by agriculture (37.9%) and tree-dominated vegetation (36.3%) (Table 2). Herbaceous (10.7%) and shrub-dominated vegetation (5.2%) comprise much less of the watershed, and water (3.9%) is a significant portion of the watershed due to Wallowa Lake (Figure 9).

Table 2. List of ecological systems found in the NEPE Old Chief Joseph Gravesite watershed.

NVCS Ecological Systems	Acres	Percentage
Agriculture	1,440	9.7%
Aspen	2,348	15.8%
Barren	764	5.1%
Bluegrass Scabland	169	1.1%
Chokecherry-Serviceberry-Rose	396	2.7%
Cottonwood-Willow	583	3.9%
Developed	2,040	13.7%
Douglas-Fir	702	4.7%
Engelmann Spruce-Subalpine Fir	315	2.1%
Grand Fir	239	1.6%
Ponderosa Pine	363	2.4%
Riparian	250	1.7%
Rough Fescue-Bluebunch Wheatgrass	2,067	13.9%
Rough Fescue-Idaho Fescue	428	2.9%
Tall Forb	1,692	11.4%
Whitebark Pine	1,097	7.4%

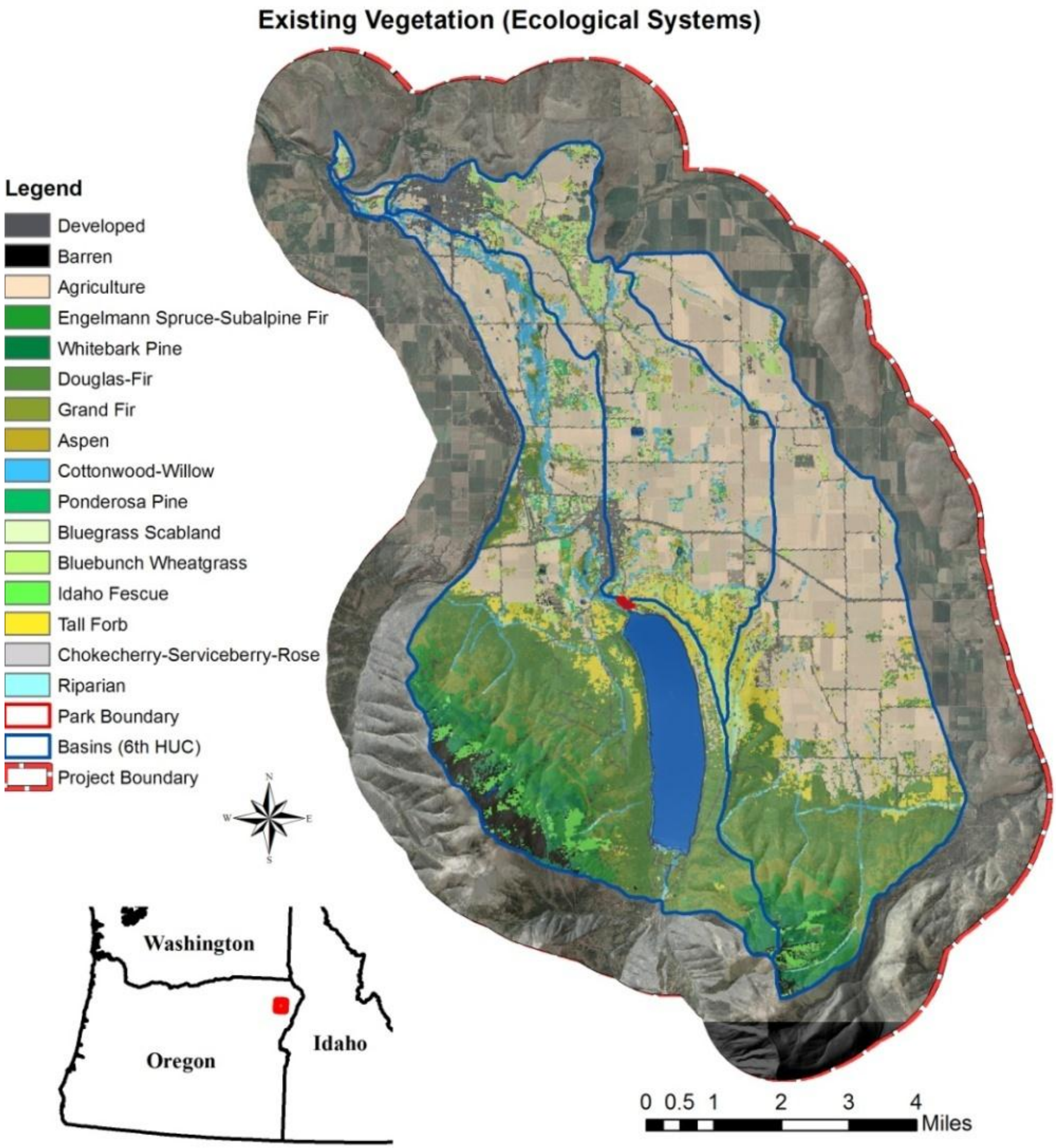

Figure 9. Map of existing vegetation based on ecological systems in the NEPE Old Chief Joseph Gravesite watershed project area.

Spalding

The Spalding watersheds (75,346 acres) are dominated by agriculture (52.9%) (Table 3). Herbaceous (12.6%) and shrub-dominated vegetation (20.4%) comprise much less of the watershed and developed areas (9.7%) is a significant portion of the watershed because much of the City of Lewiston is within the watersheds (Figure 10).

Table 3. List of ecological systems found in the NEPE Spalding watersheds.

NVCS Ecological Systems	Acres	Percentage
Agriculture	39,794	52.9%
Big Sagebrush-Bluebunch Wheatgrass	12,289	16.3%
Bluebunch Wheatgrass	3,694	4.9%
Bluegrass Scabland	1,181	1.6%
Cottonwood-Willow	2,122	2.8%
Developed	7,311	9.7%
Douglas-Fir	1,111	1.5%
Introduced Upland Vegetation - Herbaceous	4,557	6.1%
Mountain Big Sagebrush	1,147	1.5%
Wyoming Big Sagebrush	1,992	2.6%

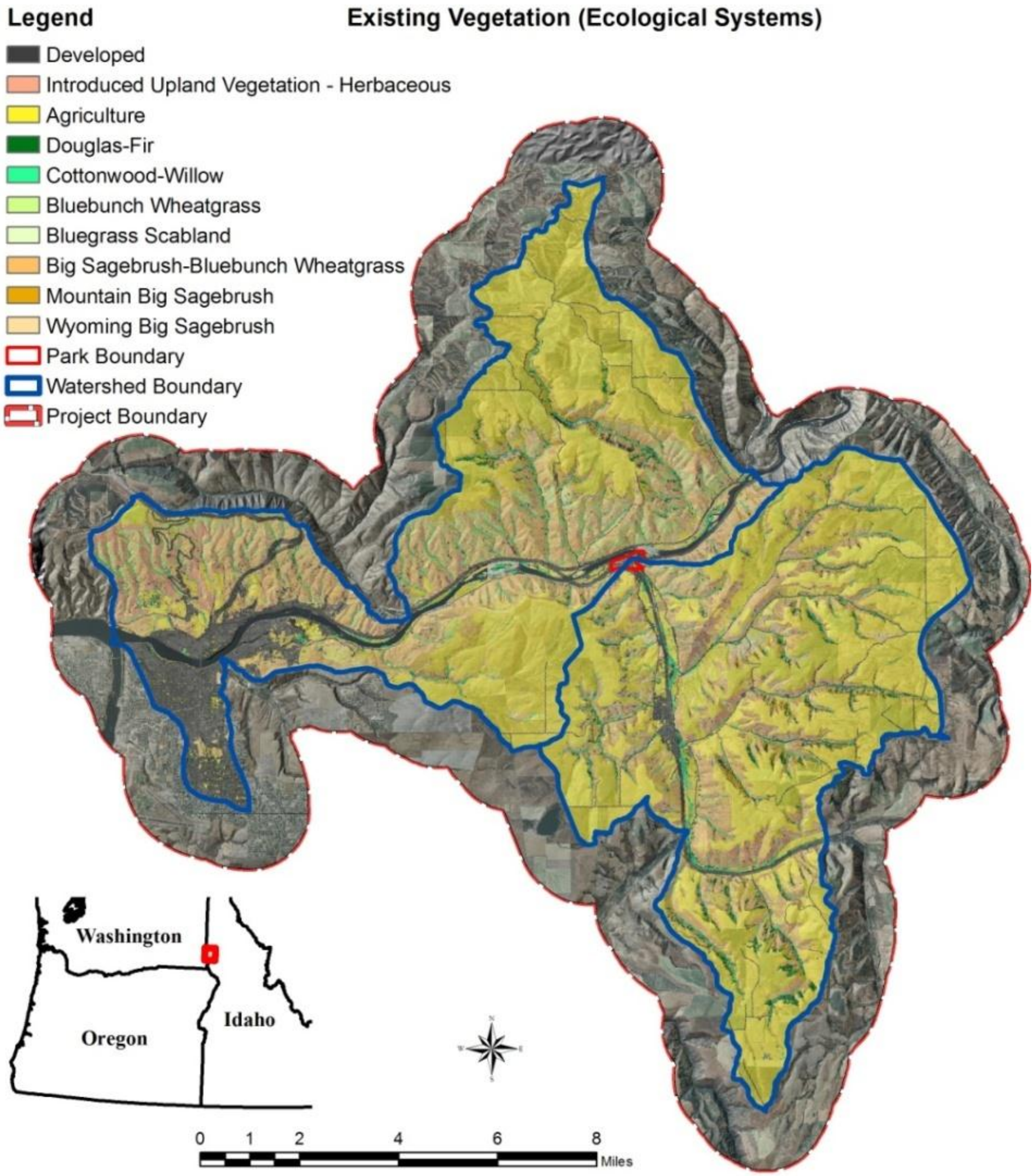

Figure 10. Map of existing vegetation based on ecological systems in the NEPE Spalding watershed project area.

Weippe Prairie

The Weippe Prairie watershed (35,240 acres) is dominated by tree-dominated vegetation (67.9%) (Table 4). Herbaceous (6.3%) and shrub-dominated vegetation (6.4%) comprise a minor component of the watershed. Introduced upland vegetation (pastures) and agriculture (mainly hay fields) comprise 6.3% of the watershed and surround the unit (Figure 11).

Table 4. List of ecological systems found in the NEPE Weippe Prairie watershed.

NVCS Ecological Systems	Acres	Percentage
Agriculture	522	1.5%
Chokecherry-Serviceberry-Rose	1,479	4.2%
Cottonwood-Willow	4,077	11.6%
Developed	377	1.1%
Douglas-Fir	5,041	14.3%
Grand Fir	18,775	53.3%
Introduced Upland Vegetation - Herbaceous	1,695	4.8%
Low Sagebrush	60	0.2%
Mountain Big Sagebrush	905	2.6%
Ponderosa Pine	94	0.3%
Rough Fescue-Bluebunch Wheatgrass	159	0.5%
Tall Forb	2,028	5.8%

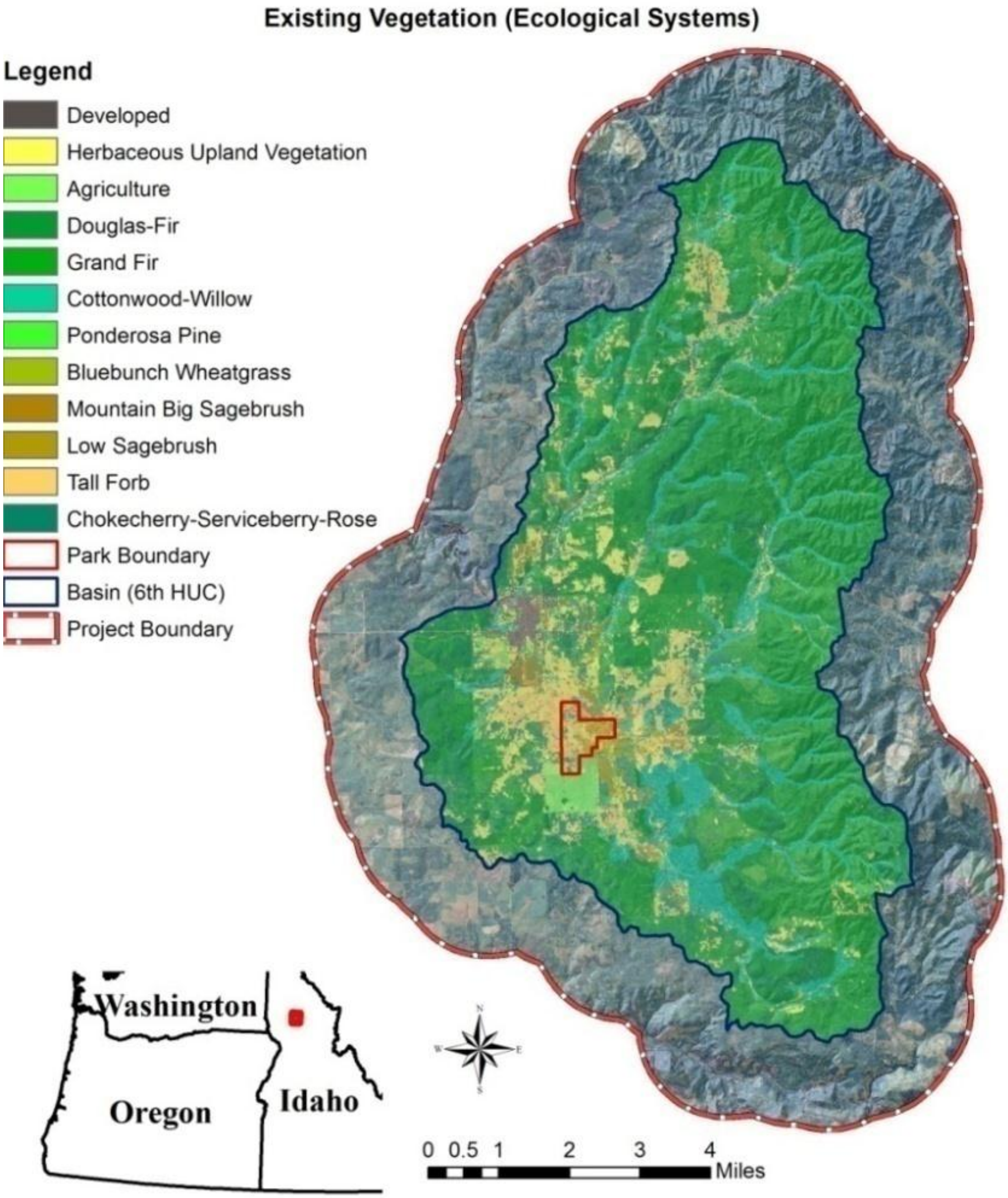

Figure 11. Map of existing vegetation based on ecological systems in the NEPE Weippe Prairie watershed project area.

Whitebird Battlefield

The Whitebird Battlefield watersheds (66,466 acres) are dominated by tree-dominated vegetation (70.7%) (Table 5) and are found in the middle to upper portions of the watersheds (Figure 12). Herbaceous (14.1%) and shrub (11.6%) dominated vegetation are a minor component in the watersheds, but are the majority of vegetation found around the park.

Table 5. List of ecological systems found in the NEPE Whitebird Battlefield watersheds.

NVCS Ecological Systems	Acres	Percentage
Agriculture	459	0.7%
Aspen	1,289	2.0%
Bluebunch Wheatgrass	1,385	2.1%
Chokecherry-Serviceberry-Rose	980	1.5%
Cottonwood-Willow	1,528	2.3%
Douglas-Fir	29,141	44.2%
Engelmann Spruce-Subalpine Fir	11,284	17.1%
Grand Fir	1,423	2.2%
Introduced Upland Vegetation - Herbaceous	7,452	11.3%
Lodgepole Pine	458	0.7%
Low Sagebrush	4,469	6.8%
Mountain Big Sagebrush	652	1.0%
Ponderosa Pine	2,253	3.4%
Rough Fescue-Bluebunch Wheatgrass	2,015	3.1%
Tall Forb	495	0.7%
Western Larch	716	1.1%

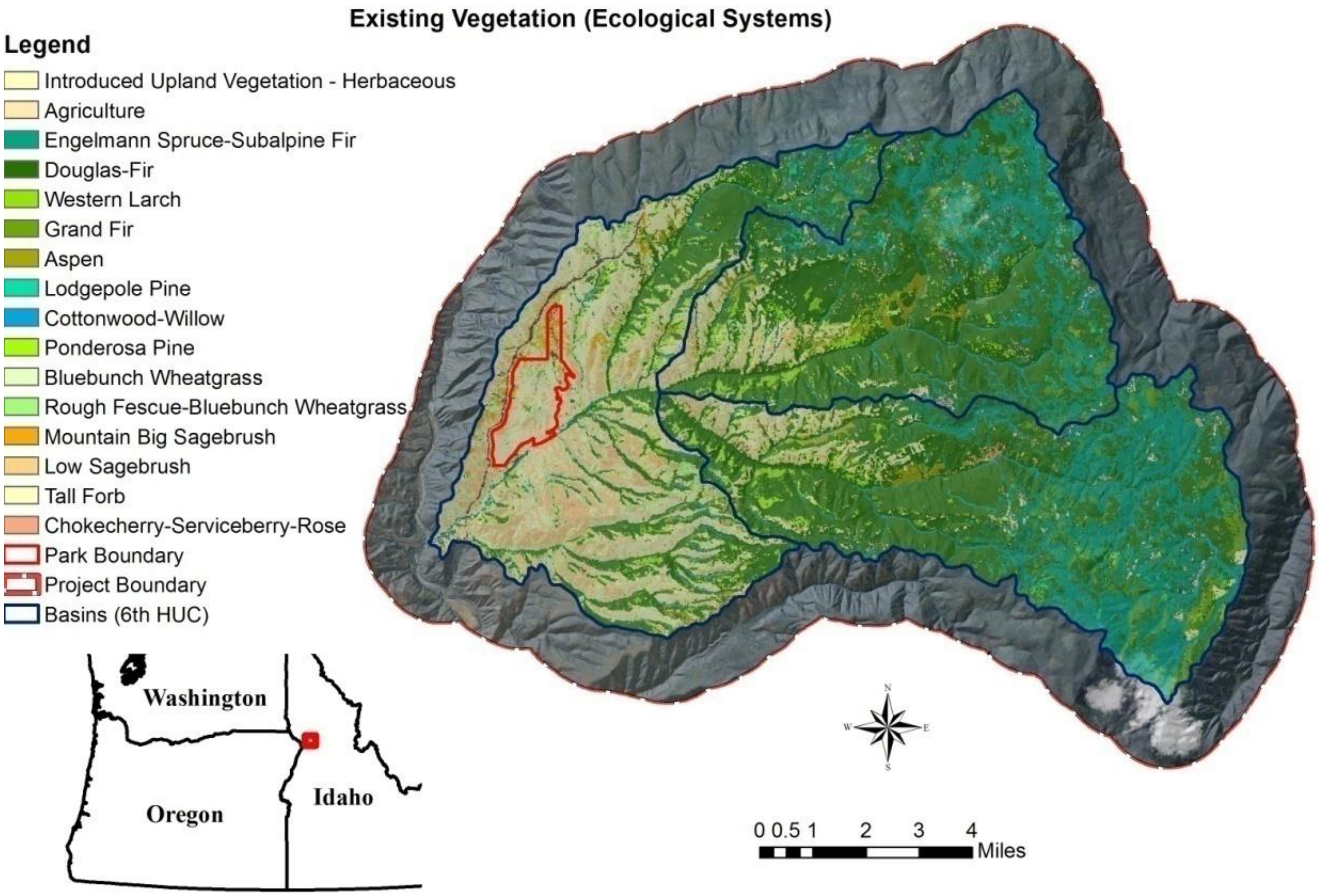

Figure 12. Map of existing vegetation based on ecological systems in the NEPE Whitebird Battlefield watershed project area.

Upland Habitats/Species

The five NEPE units are widespread geographically and diverse in the composition of plant and animal species. The five units fall into one of the three basic ecoregions; short grass prairies of the Palouse grasslands (Spalding, Weippe Prairie, and Whitebird Battlefield), sagebrush steppe of the Columbia and Snake River plateaus (Buffalo Eddy), and conifer/alpine meadows of the Blue Mountains (Old Chief Joseph Gravesite).

The Palouse short grass prairies are characterized by flat or rolling expanses of low to moderate relief with elevations ranging from below 800' to over 3,500'. The prairies are dissected by rivers and streams forming canyons and valleys. The vegetation is dominated by short grass species such as wheatgrass (*Agropyron* spp.), fescues (*Festuca* spp.), and bluegrass (*Poa* spp.).

Sagebrush steppe vegetation is characteristic of the plains and tablelands of the Columbia and Snake River plateaus at 3,000' to 4,000' in elevation. The topography is characterized by lava fields and lava flows that have been folded or faulted into ridges. The vegetation is a composition of sagebrush (*Artemisia* spp.), shadscale (*Atriplex* spp.), and bunchgrasses. Stream channels can support a dense understory of willow (*Salix* spp.), cottonwoods (*Populus* spp.), and other riparian species.

The conifer/alpine meadows ecoregion in the Blue Mountains occupies areas generally above 4,000' in elevation and below the alpine zone. The major tree species vegetation is dominated by Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*), which are the major climax conifer species.

Past inventories have documented 62 species of birds and 6 mammal species at the Buffalo Eddy unit (Dixon 2005, ICDC 2007). Mammals were not directly observed or captured in past studies, but signs of several species were noted, including the montane vole (*Microtus montanus*) and bushy–tailed woodrat (*Neotoma cinerea*). The most common summer resident bird species were the lazuli bunting (*Passerina amoena*), black–headed grosbeak (*Pheucticus melanocephalus*), yellow warbler (*Dendroica petechia*), and yellow–breasted chat (*Icteria virens*) in the netleaf hackberry lined draws. Song sparrows (*Melospiza melodia*) occupied the draws and along the Snake River. Cliffs and rocky areas were used by canyon wrens (*Catherpes mexicanus*) and rock wrens (*Salpinctes obsoletus*).

The Old Chief Joseph Gravesite has not had a site-specific inventory for plants or animals. In general, it is located in the conifer/alpine meadow ecoregion. The unit was historically a Douglas-fir/mallow ninebark (*Pseudotsuga menziesii*/*Physocarpus malvaceus*) climax plant community interspersed with bunchgrass openings. Many species of birds and mammals use the site for feeding and resting. In the spring and summer of 1999, 59 bird species were documented in the unit (Dixon and Garrett 2009). Thirteen bird species were classified as migrant, 32 as transient, 12 as likely breeders, and two as breeders.

The Spalding unit had five species of amphibians and reptiles documented in the unit with Western toad (*Bufo boreas*) considered a sensitive species (Strobl et al. 2003). Seventeen mammals were documented out of the 22 potentially occurring species, but no estimate of abundance was possible for each species. River otter (*Lutra canadensis*) in the Clearwater River were listed as a species of concern (Rodhouse et al. 2009). The most common mammals were the deer mouse (*Peromyscus maniculatus*), white-tailed deer (*Odocoileus virginianus*), and the northern pocket gopher (*Thomomys talpoides*). In the spring and summer of 1999, 69 bird species were documented in the unit (Dixon and Garrett 2009). Nine bird species were classified as migrant, 23 as transient, 25 as likely breeders, and 12 as breeders.

Vertebrate inventory in the Weippe Prairie unit found 53 terrestrial vertebrate species, including two amphibians, one reptile, 42 bird, and eight mammal species (ICDC 2007). Three Idaho species of concern for conservation were documented in the inventory; sandhill crane (*Grus canadensis*), short–eared owl (*Asio flammeus*), and merlin (*Falco columbarius*) (IDFG 2005). The Weippe Prairie unit was privately owned and managed for hay and pasture production in the recent past. Currently, non-native pasture grasses, creeping bentgrass (*Agrostis stolonifera*), timothy (*Phleum pratense*), and meadow foxtail (*Alopecurus pratensis*) dominate the site. Many native species still survive in the unit , most conspicuously dominated by camas (*Camassia quamash*), a culturally important plant to the Nez Perce, and Leiberg's umbrellawort (*Tauschia tenuissima*), an Idaho state listed species of concern (IDFG 2005), listed as important species (ICDC 2007).

The Whitebird Battlefield vertebrate inventory in 2003 detected 19 (four amphibians, five reptiles, and ten mammals) of 23 species that could potentially occur in the unit (Strobl et al. 2003). There were observations of the Western toad and ringneck snake (*Diadophis punctatus*), listed as imperiled by the state of Idaho (IDFG 2005), near Swartz Pond in the northern portion of the unit. Common species found in the unit are white tailed deer, coyote (*Canis latrans*), and yellow-bellied marmots. A bird inventory in the spring and summer of 1999 documented 84 species in the unit (Dixon and Garrett 2009). Seventeen bird species were classified as migrant, 23 as transient, 33 as likely breeders, and 11 as breeders. Many were riparian species found around Swartz Pond and along Whitebird Creek.

Aquatic Habitats/Species

NEPE presently lacks information to adequately assess the condition of fish populations within the various management units. Summer steelhead (*Oncorhynchus mykiss*) is listed as threatened in the Snake River drainage under the Endangered Species Act (ESA). The National Oceanic and Atmospheric Administration - National Marine Fisheries Service (NMFS) has identified critical habitat for summer steelhead in three of the five project watersheds; Buffalo Eddy, Spalding, and Whitebird Battlefield (Figure 13). Bull trout (*Salvelinus confluentus*) is listed as threatened in Oregon, Washington, and Idaho under ESA. The United State Fish and Wildlife Service (USFWS) has proposed expansion of critical habitat for bull trout from a small section of Wallowa Creek to all of Wallowa Creek in the Old Chief Joseph Gravesite watersheds, the Snake River in the Buffalo Eddy watershed, and the Clearwater River in the Spalding watersheds. Snake River spring/summer-run chinook salmon (*Oncorhynchus tshawytscha*) and Snake River fall-run chinook salmon are listed as threatened by NMFS. All the project watersheds except Weippe Prairie contain critical habitat for both runs of chinook salmon. Maps of critical habitat are available online at http://www.nwr.noaa.gov/Salmon-Habitat/Critical-Habitat/Index.cfm.

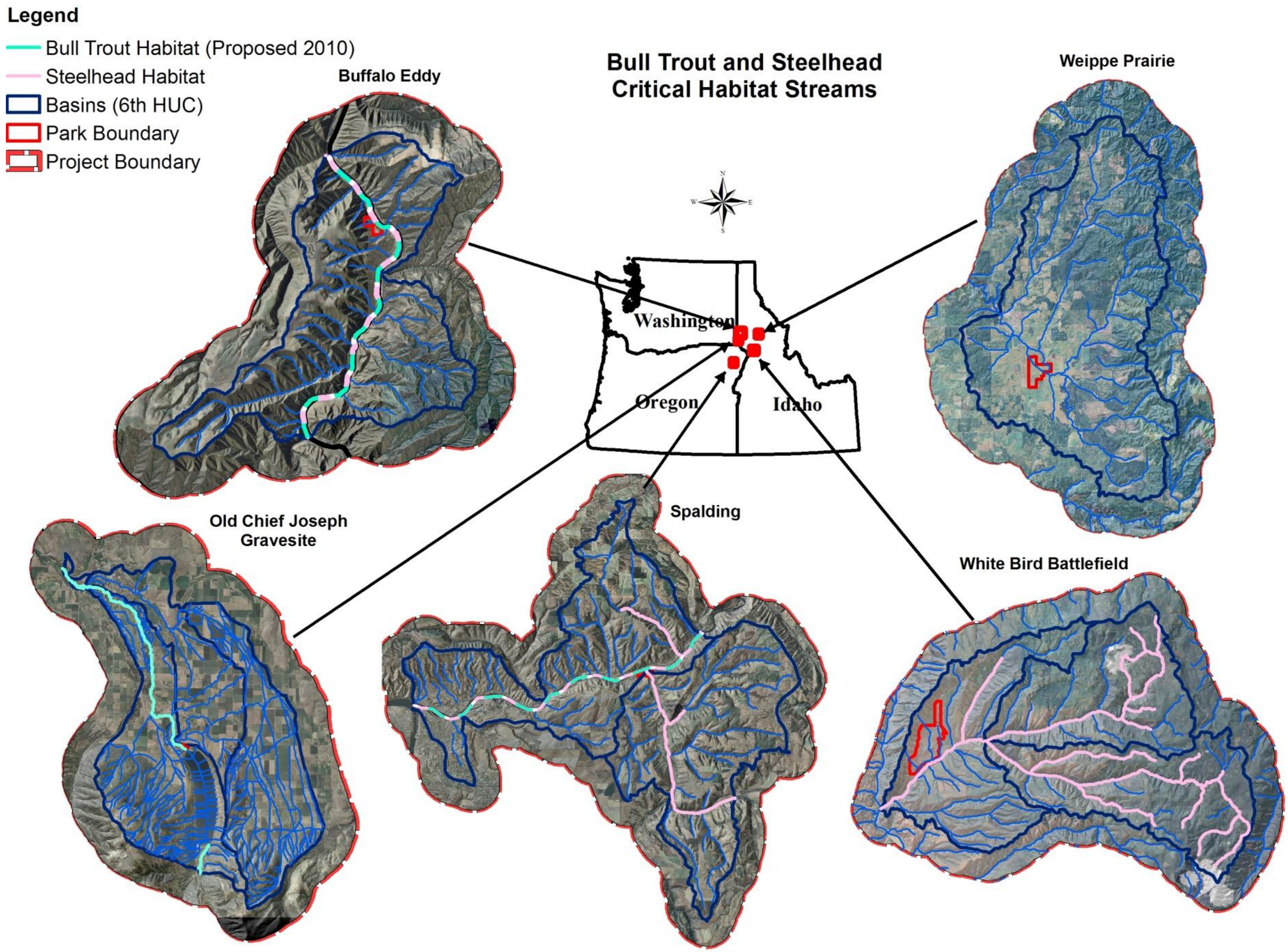

Figure 13. Map of bull trout and summer steelhead habitat in the five NEPE units project watersheds.

Water quality standards are benchmarks established to assess whether river and lake quality is adequate to protect fish and other aquatic life, recreation, agriculture, industry, drinking water, and other uses. Water quality standards are also regulatory tools used by the Oregon Department of Environmental Quality (ODEQ), Idaho Department of Environmental Quality (IDEQ) and the US Environmental Protection Agency (EPA) to prevent water pollution. States are required to adopt water quality standards by the federal Clean Water Act and to maintain a list of stream segments that do not meet the standards. This list is referred to as the 303(d) list based on the applicable section of the Clean Water Act. The Clean Water Act requires states to develop water ability goals called Total Maximum Daily Loads (TMDL) along with an implementation plan and schedule to achieve the water quality goals for 303(d) listed water bodies.

Four out of the five NEPE unit watershed project areas have segments listed for being water quality limited; Old Chief Joseph Gravesite, Spalding, Weippe Prairie, and Whitebird Battlefield (Figure 14). TMDLs include alkalinity, ammonia, chlorophyll A, dissolved oxygen, E Coli, fecal coliform, phosphate, sedimentation, temperature, pH, and others. These parameters are based on a beneficial use for cold water fish, recreation, and others. Many of the stream segments have multiple parameters listed in the database. Water quality constituents such as total phosphates, biochemical oxygen demand, and fecal coliform can also limit water quality during late summer when flows are the lowest and water temperatures are the highest.

The Buffalo Eddy watershed project area falls within the Snake River Hells Canyon subbasin. Degraded riparian conditions, channel stability, and fine sediments were the three highest rated habitat variables for restoration in the Snake River Hells Canyon subbasin (BPA 2004c). Restoration priorities in the Wallowa River watershed, which contains the Old Chief Joseph Gravesite project area, were riparian restoration and reduction of fine sediments (BPA 2004a). Highly rated potential disturbances in the watersheds in the Spalding project area were road density, landslides, surface erosion, and fine sediments (BPA 2003). In the Weippe Prairie project area, only road densities were identified as a high potential for disturbing water quality (BPA 2003). The Whitebird Battlefield is located in the lower Salmon River subbasin watersheds, which has approximately 84% of the watershed classified as highly impacted due to loss of forest habitats and habitat fragmentation (BPA 2004b). High priority restoration projects in the lower Salmon River subbasin watersheds are upland habitat protection, road and trail improvements, and wetland restoration (BPA 2004b).

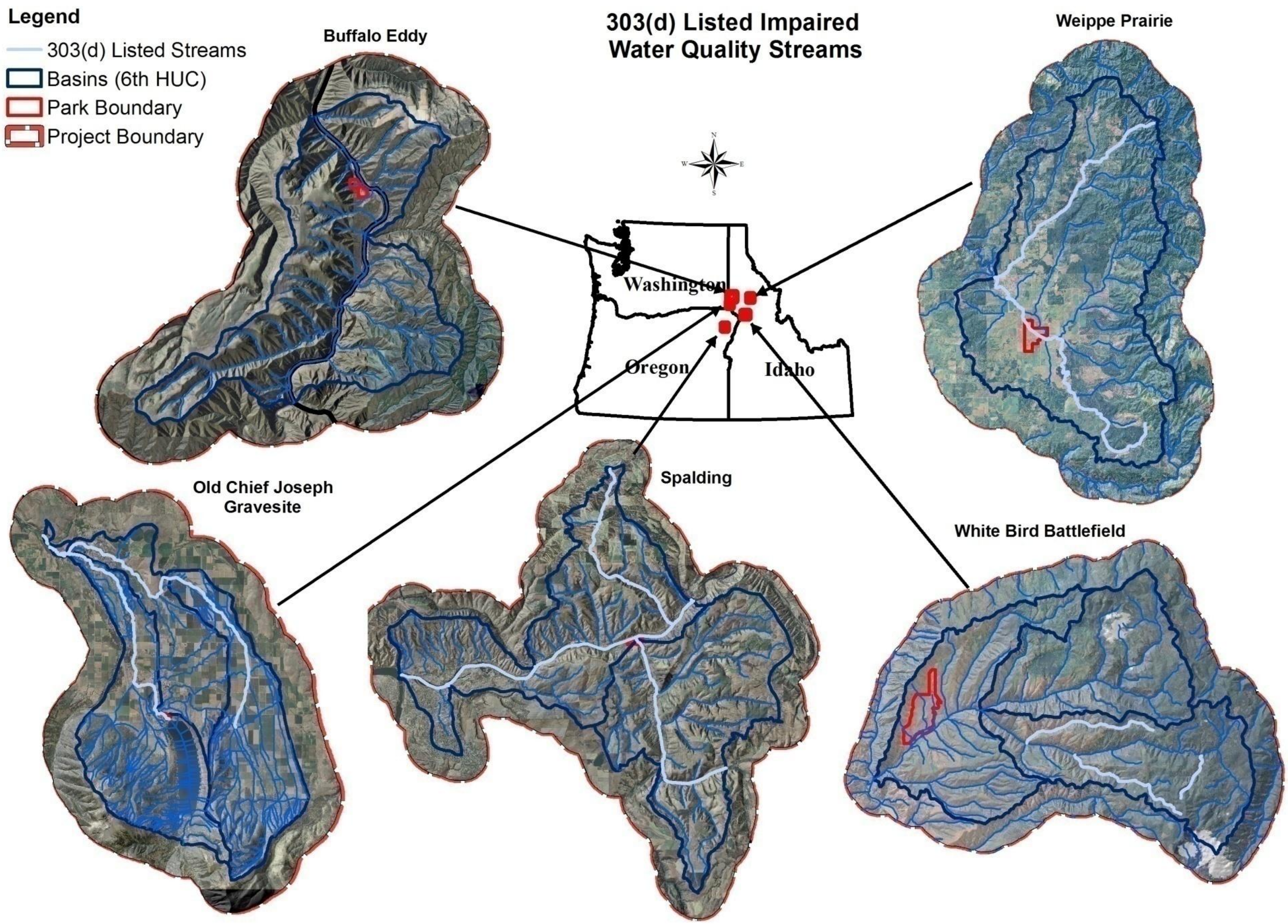

Figure 14. Map of stream segments listed as impaired by ODEQ and IDEQ under section 303(d) of the Clean Water Act in the five NEPE units project watersheds.

Climate

The five NEPE units experience a wide range of climatic patterns. Long term averages (> 30 years) were available from the Western Regional Climate Center (http://www.wrcc.dri.edu/Climsum.html). Summary data was used from weather stations near each unit (Table 6). The variability between units is due mainly to differences in elevation which range from 800' at Buffalo Eddy to 4,450' at Old Chief Joseph Gravesite. The Weippe Prairie and Old Chief Joseph Gravesite experience cold winters; however Weippe Prairie has much higher precipitation coming mainly in the form of snow in the winter months. Buffalo Eddy, Spalding, and Whitebird Battlefield units are all similar in temperature and precipitation with hot, dry summers and average high temperatures over 89° F during July. These units also receive most of their precipitation in the form of rain in the early spring and late fall. Figures 15 and 16 show the distribution of precipitation and temperature zones within the project areas of each unit.

Table 6. Summary of climate parameters at Clarkston, WA (Buffalo Eddy), Joseph, OR (Old Chief Joseph Gravesite), Lewiston, ID (Spalding), Pierce, ID (Weippe Praire), and Slate Creek Ranger Station, ID (Whitebird Battlefield).

			January		July	
Area	Annual Mean Precipitation	Annual Mean Maximum Temperature (F)	Average Maximum Temperature (F)	Average Minimum Temperature (F)	Average Maximum Temperature (F)	Average Minimum Temperature (F)
Clarkston, WA	13.13"	63.9°	38.7°	24.6°	90.5°	53.8°
Joseph, OR	17.60"	55.6°	33.0°	14.4°	80.1°	47.9°
Lewiston, ID	12.57"	63.2°	39.5°	26.9°	89.3°	59.2°
Pierce, ID	41.30"	55.6°	32.8°	16.6°	81.6°	44.1°
Slate Creek, ID	17.05"	67.2°	44.2°	29.3°	94.7°	55.3°

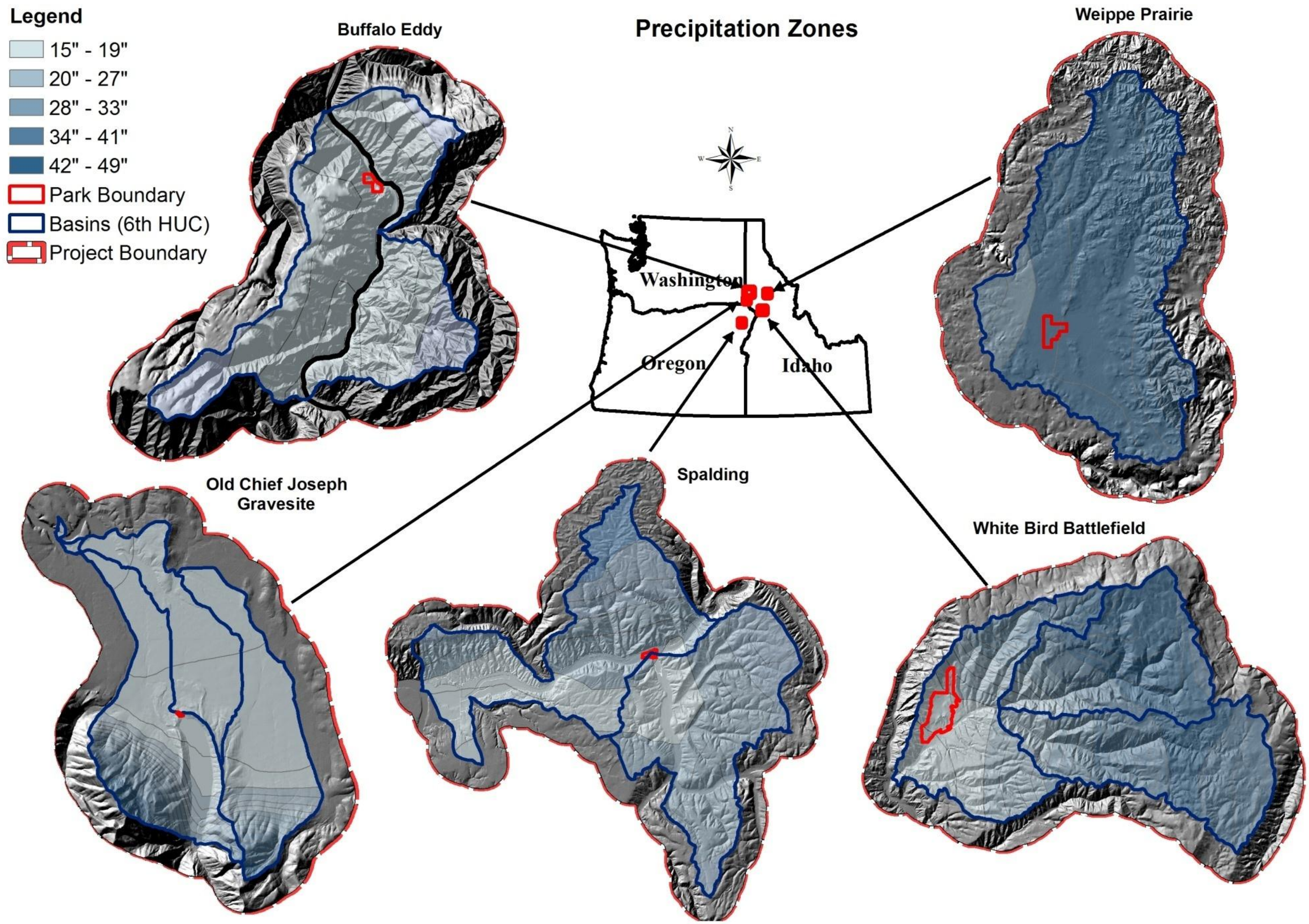

Figure 15. Map of precipitation zones in the five NEPE watershed project areas.

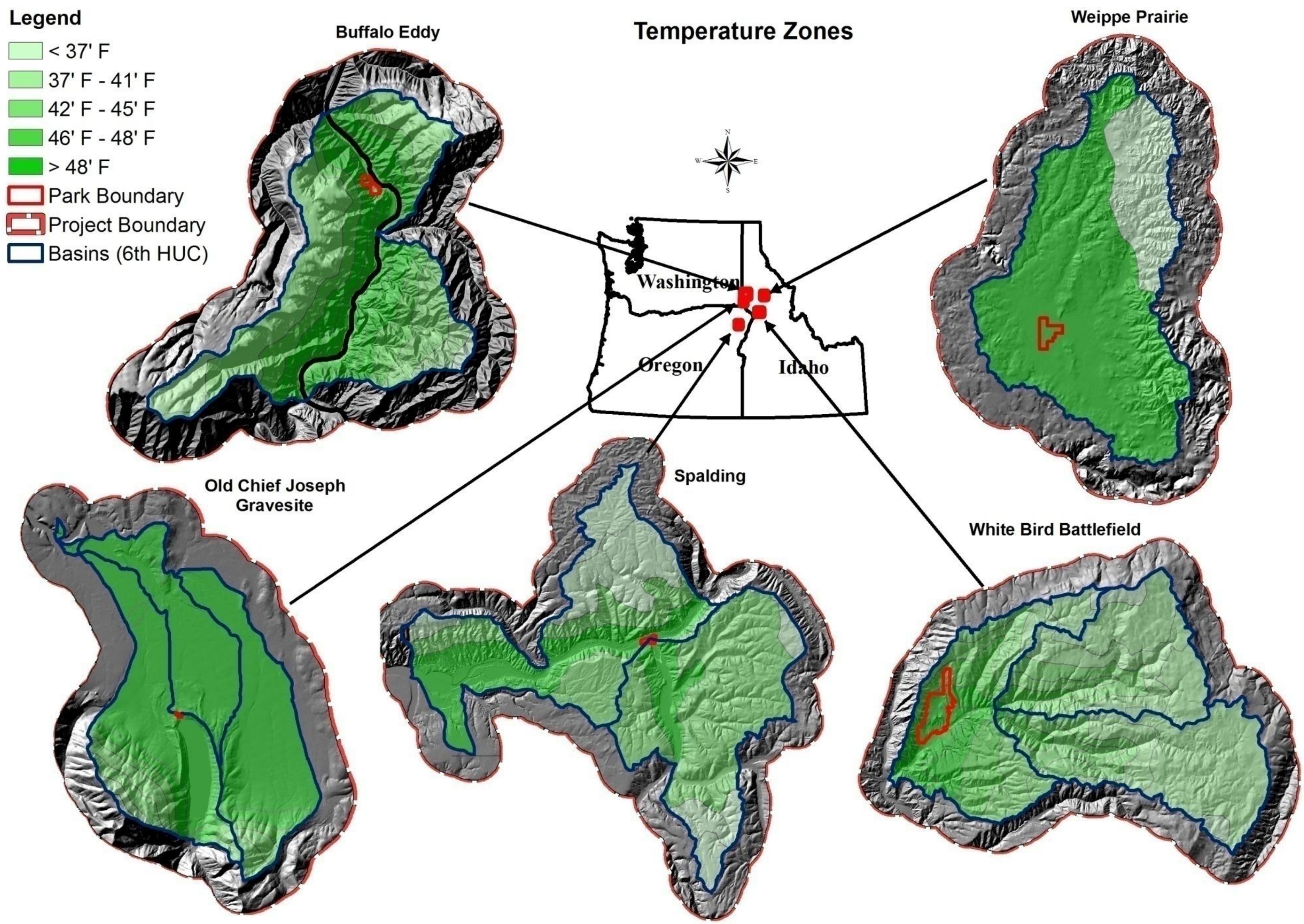

Figure 16. Map of temperature zones in the five NEPE watershied project areas.

Methods

GIS and Geodatabases

The majority of data used in this report is Geographical Information System (GIS) data in tabular form tied to spatial features, such as points, lines, and/or polygons. GIS software provides spatial analysis capabilities such as overlay, buffer, extraction, and modeling. Results can then be displayed in map and tabular form. GIS software ARCMap Version 9.3 was used to store, edit, and display data.

Map project files (Figure 17) were developed for NEPE using ArcMap software that followed the behavioral rules for data in a single Microsoft Access database. Many types of geographic datasets can be collected within a map project file including feature classes, attribute tables, and raster data sets. The NPS ArcMap 8 1/2”x11” template was used in the five NEPE map project files.

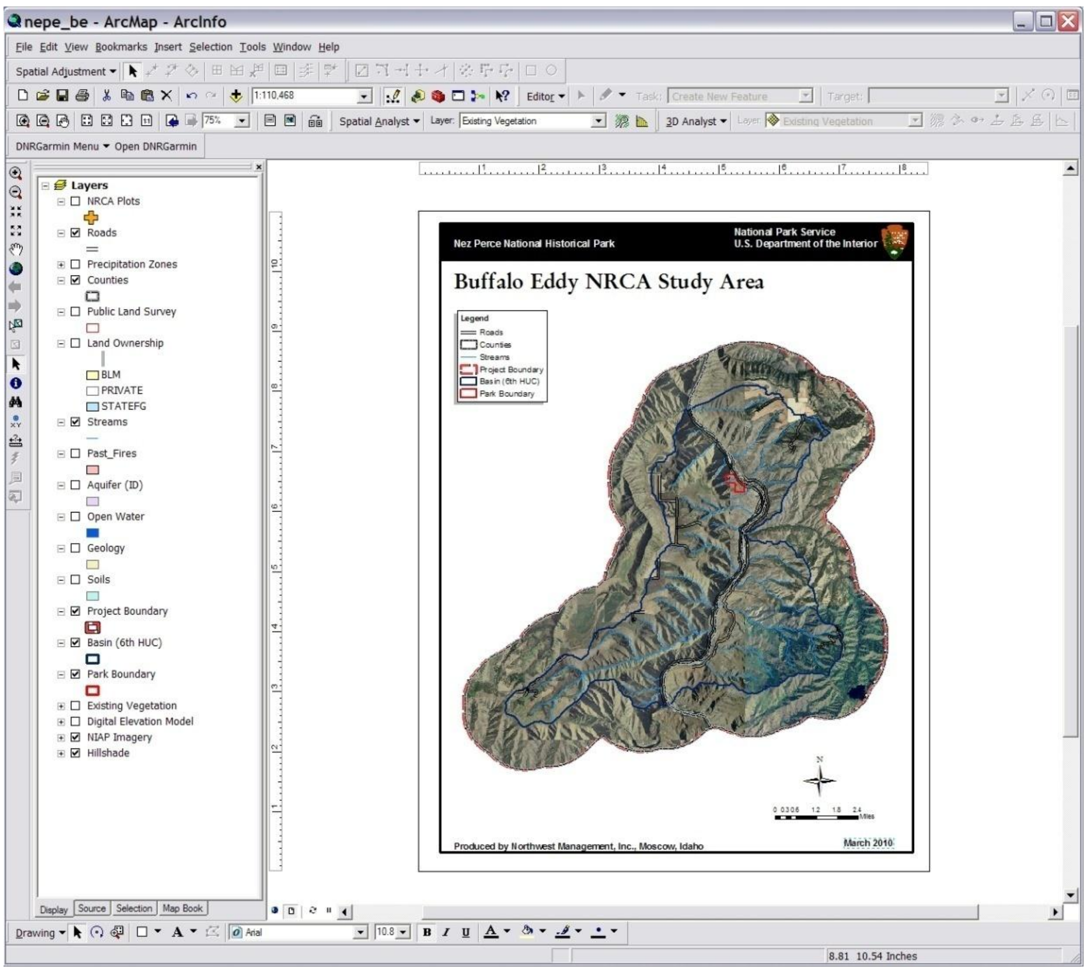

Figure 17. Screen capture of the GIS map project file of the NEPE Buffalo Eddy unit.

Geographically defined project areas were created by selecting 6th level hydrologic unit code (HUC) subwatersheds surrounding the Buffalo Eddy, Old Chief Joseph Gravesite, Spalding, Weippe Prairie, and Whitebird Battlefield units. A two kilometer buffer was added to the subwatersheds for each unit to improve map displays. General base map layers and aerial photography were developed for the full project area extent. Most layers were clipped to the subwatersheds for analysis and summarization of attributes.

The map project files were populated with GIS data through an extensive search of NPS sources and a multitude of local, state, and federal web sites. Data determined to be useful and accurate were re-projected into the North American Datum 1983 (NAD83) datum and the Universal Transverse Mercator (UTM) zone 11 projection. Metadata was generated for each layer in Federal Geographic Data Committee (FGDC) compliant format. Metadata describes the source, accuracy, data dictionary, projection, datum, and many other details about an individual layer. Aerial photography was processed and clipped to the project area using LizardTech GeoExpress software and converted into MG3 (MrSid Generation 3) format files.

Attribute information on the specific data layers clipped to the watershed basin extent were summarized in a spreadsheet based on the attribute parts, lengths, acreage, etc. of the various data layers in the map project files. The spreadsheets for each unit can be found on the DVD under the respective unit name and the subdirectory "Project Summary."

All GIS data layers were imported into an ArcGIS File Geodatabase using ArcCatalog ver. 9.3 (ESRI 2006). Feature Data Sets were created based on theme type. A geodatabase is an ArcMap file structure that stores geometry, spatial reference system, attributed datasets, network datasets, topologies, and many other features. This GIS format provides a uniform method for storing and using GIS data and provides the flexibility to add new information as it becomes available.

Map layers were organized into categories based on general theme type. Although data was not available for each theme type, the category directory is included to incorporate data that may become available in the future. The general themes used include:

- Air Resources
- Animal
- Climate
- Geography
- Geology
- Land Process
- Land Use
- Plant
- Stressors
- Water Resources

Aerial photography was not included in the geodatabase due to the limitations of processing MG3 file formats. Aerials are included in a separate directory outside the geodatabase. All the data, project file, and summary table are included on a DVD disk for distribution with this report. As a by-product of this search, a Microsoft Access database (included on DVD) was created for websites with documented GIS data that could be downloaded in various formats compatible with ESRI's ArcMap software. The database has a custom query form for doing searches on the 3,000+ entries covering Oregon, Washington, and Idaho.

NPS Data Sources

Additional non-GIS data was acquired from searches on the internet, such as NPS NatureBib (https://science1.nature.nps.gov/naturebib), and from direct contact with local and state government agencies. Table 7 is the status of inventories of the species taxa groups for NEPE. Available data from completed inventories were utilized where needed in the report. This information as well as additional data is available from the UCBN website http://science.nature.nps.gov/im/units/ucbn/inventory/index.cfm#table. A cultural landscape inventory was completed for the East Kamiah/Heart of the Monster unit (Owens 2003) but no other units have been completed.

Table 7. Status of inventories of species taxa for NEPE maintained by the UCBN.

Species Taxa	Complete	Year Completed	In-Progress	Not Complete
Mammals	✓	2003		
Birds	✓	2005		
Amphibians	✓	2003		
Reptiles	✓	2003		
Fish	✓	2005		
Invertebrates				✓
Vascular Plants	✓	2005		
Rare Plants	✓	2007		
Invasive Plants				✓

Additional non-biological data sets have been identified by the UCBN as important for park management (Table 8). Both the biologic and non-biologic inventories were considered as baseline information for development of the UCBN vital signs monitoring plan (Garrett et al. 2007). Four data sets have not been completed and one has been partially completed by the UCBN; however, some park units may have data available from other sources.

Table 8. Status of inventories of non-biological data for NEPE maintained by the UCBN.

Non-Biologic Data Sets	Complete	Year Completed	In-Progress	Not Complete
Air Quality / Emissions	✓	Unknown		
Ozone Risk	✓	2001		
Water Quality			✓	
Landcover				✓
Paleo Resources	✓	2005		
Geology			✓	
Soils			✓	
Cultural Landscapes		2003	✓	

The UCBN Monitoring Plan (Garrett et al. 2007) identifies a suite of 14 vital signs chosen for monitoring implementation in the UCBN parks over the next five years. Vital signs are "a subset of physical, chemical, and biological elements and processes of park ecosystems that are selected to represent the overall health or condition of park resources, known or hypothesized effects of stressors, or elements that have important human values" (NPS-UCBN http://science.nature.nps.gov/im/monitor/). Not all vital signs are monitored at each park. NEPE has eight vital signs established for monitoring; stream/river channel characteristics, surface water dynamics, water chemistry, aquatic macroinvertebrates, invasive/exotic plants, riparian vegetation, camas lily, and land cover and use (Garrett et al. 2007).

Upland Assessment

Ecological sites are the basis for evaluation of upland habitats using an assessment method co-developed by the Natural Resources Conservation Service (NRCS), Agricultural Research Service (ARS), Bureau of Land Management, and the United States Geological Survey (USGS). The method is described in the publication "Interpreting Indicators of Rangeland Health" (Pellant et al. 2005). Ecological site is a land classification system based on the potential of land to produce distinctive kinds, amounts, and proportions of vegetation and is used as the sample unit within each park unit. Ecological sites were identified from soil maps. Eighteen sample plots within the four units; Buffalo Eddy (4), Old Chief Joseph Gravesite (2), Weippe Prairie (5), and Whitebird Battlefield (7); were assessed using the BLM rapid assessment for rangeland health methodology. The Spalding unit was assessed only for aquatic resources because most of the unit is a mixed landscape of maintained visitor use and interpretive areas and not suitable for an upland assessment.

The rangeland health rapid assessment methodology is designed to provide a preliminary evaluation of three landscape attributes; soil/site stability, hydrologic function, and integrity of the biotic community at the ecological site level. It was developed to assist land managers in identifying areas that are potentially at risk of degradation and assist in the selection of sites for developing monitoring programs. Definitions of these three closely interrelated attributes are:

> *Soil Site Stability*: The capacity of the site to limit redistribution and loss of soil resources including nutrients and organic matter by wind and water.
>
> *Hydrologic Function*: The capacity of the site to capture, store, and safely release water from rainfall, run-on (inflow), and snowmelt (where relevant); to resist a reduction in this capacity; and to recover this capacity following degradation.
>
> *Integrity of the Biotic Community*: The capacity of the site to support characteristic functional and structural communities in the context of normal variability, to resist loss of this function and structure due to disturbance, and to recover following disturbance.

This technique was developed as a tool for conducting a moment-in-time qualitative assessment of rangeland status and as a communication and training tool for assisting land managers and other interested people to better understand rangeland ecological processes and their relationship to indicators (Pyke et al. 2002). This method uses soil survey information, ecological site descriptions, and appropriate ecological reference areas to qualitatively assess rangeland health. As part of the assessment process, 17 indicators relating to these attributes are evaluated and the category descriptor or narrative that most closely describes the site is recorded. "Optional Indicators" may also be developed to meet local needs. The critical link between observations of indicators and determining the degree of departure from the ecological site description and/or ecological reference area is part of the interpretation process.

This technique does not provide for just one rating of rangeland health, but based upon a "preponderance of evidence" approach, it provides the departure from the ecological site description/ecological reference area(s) for the three attributes: soil site stability, hydrologic function, and biologic integrity. There are five categories of departure recognized: "none to slight", "slight to moderate," "moderate," "moderate to extreme," and "extreme."

An ecological reference area is a landscape unit in which ecological processes are functioning within a normal range of variability and the plant community has adequate resistance to and resilience from most disturbances. A reference is the visual representation of the characteristics and variability of the components found in the ecological site description. A slight modification of the methodology was implemented so multiple assessments in each ecological site could be combined for analysis. A rating from one (none to slight) to five (extreme) was assigned to each category. For park units with more than one sample, an average was calculated for each indicator and then summed for each landscape attribute. There are ten indicators for soil site stability and hydrologic function and nine for biotic integrity. The score for each landscape attribute was the sum of the indicators, minus the reference conditions. Reference condition was determined to be ten for soil site stability and hydrologic function and nine for biotic integrity (based on a score of one for each indicator per attribute). Percent departure for each attribute was a proportion calculated by dividing the score by the maximum departure value; 40 for soil stability and hydrologic function and 35 for biotic integrity. The results are displayed graphically as a percent departure from the reference condition. For the narrative, the percent departure values are converted back into the associated qualitative categories: none to slight (<21%), slight to moderate (21-40%), moderate (41-60%), moderate to extreme (61-80%), and extreme (≥80%).

An access database was developed for digitally storing site data, comments, and the 17 indicator values. A GPS point was collected at the center point of each sample site. Sample sites varied from one to five acres in size as noted in the database. Maps were generated for each ecological site sampled that show the sample site(s) and other land features.

Aquatic Assessments

Evaluation of onsite aquatic resources at NEPE included an assessment of the riparian resource condition of Lapwai Creek, Whitebird Creek, Swartz Pond, and Jim Ford Creek and an assessment of the in-stream condition of Lapwai Creek and Whitebird Creek based upon benthic macroinvertebrate indicators. Benthic macroinvertebrates were not collected from Jim Ford Creek because the substrate was composed entirely of fine sediments (BMI assessment protocols used require sampling coarse substrates).

Riparian Habitat

The condition of riparian areas often controls and dictates the quality of aquatic and wildlife resources that depend on these important zones of influence. Riparian habitat serves many functions including erosion control, aquatic shading and cooling, insect production, shoreline bank stabilization, and providing woody debris. Riparian areas are often the most diverse habitat areas within a watershed because they contain the greatest resource diversity and productivity (Barber 2005). Riparian areas serve as a buffer between aquatic habitats and upland activities that potentially affect those habitats. In addition, these areas often contain wetlands where water is filtered, retained, and slowly released to the surface throughout the year. Maintenance of properly functioning riparian habitat can influence the quality and quantity of surface waters and the species that depend upon these habitats.

Lapwai Creek, Whitebird Creek, Swartz Pond, and Jim Ford Creek were assessed using the "proper functioning condition" riparian assessment method developed by the Bureau of Land Management (Prichard et al. 1998). The PFC method evaluates 17 hydrology, vegetation, and stream geomorphology indicators of riparian condition or "health" and subsequently assigns a functionality rating to each site.

The "proper functioning condition" of a riparian area refers to the stability of the physical system, which in turn is dictated by the interaction of geology, soil, water, and vegetation. A properly functioning riparian area is in dynamic equilibrium with its stream flow forces and channel processes. The channel adjusts in slope and form to handle larger runoff events with limited perturbation of channel characteristics and associated riparian/wetland plant communities. Because of this stability, properly functioning riparian areas can maintain fish and wildlife habitat, water quality enhancement, and other important ecosystem functions even after larger storms. In contrast, nonfunctional systems subjected to the same storms might exhibit excessive erosion and sediment loading, loss of fish habitat, loss of associated wetland habitat, and so on.

Based on assessments of the hydrologic, vegetative, and geomorphology elements of the riparian area, one of the following three functionality ratings is assigned to each site:

<u>Proper Functioning Condition</u>: Streams and associated riparian areas are functioning properly when adequate vegetation, landform, or large woody debris is present to:

1. Dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality.
2. Filter sediment, capture bedload, and aid floodplain development.
3. Improve floodwater retention and groundwater recharge.
4. Develop root masses that stabilize stream banks against cutting action.
5. Develop diverse ponding and channel characteristics to provide habitat and the water depths, durations, temperature regimes, and substrates necessary for fish production, waterfowl breeding, and other uses.
6. Support greater biodiversity.

<u>Functional-At Risk</u>: These riparian areas are in functional condition, but an existing soil, water, vegetation, or related attribute makes them susceptible to degradation. For example, a stream reach may exhibit attributes of a properly functioning riparian system, but it may be poised to suffer severe erosion during a large storm in the future due to likely migration of a headcut or

increased runoff associated with recent urbanization in the watershed. When this rating is assigned to a stream reach, its "trend" toward or away from PFC is assessed.

Nonfunctional: These are riparian areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows, and thus are not reducing erosion, improving water quality, sustaining desirable channel and riparian habitat characteristics, and so on as described in the PFC definition. The absence of certain physical attributes such as a floodplain where one should exist is an indicator of nonfunctioning conditions.

PFC assessment does not refer to the successional stage of the riparian-wetland vegetation community (Biggam et al. 2005). Rather, the evaluation is based on the concept that in order to manage for such things as potential natural vegetation communities or desired fish and wildlife habitat features, the basic elements of physical stability (e.g., energy dissipation and streambank stabilization) must first be in place and functioning properly. For example, a vegetation community recovering from a recent fire may be in an early successional stage due to loss of trees and shrubs, but that stage may still provide sufficient physical stability for the riparian area to accommodate flood flows without significant erosion and channel change. That geomorphically stable and "properly functioning" condition allows for recovery of the desired features of later successional systems such as in-channel woody debris that creates desired fish habitat or riparian tree and shrub layers that provide diverse bird habitats.

Benthic Macroinvertebrates

Benthic macroinvertebrates are well suited for biomonitoring assessments within rocky substrate stream habitats for several reasons such as (Morley 2000; Fore et al. 1996):

1. The macroinvertebrate community is extremely diverse, represented by thousands of different species with a variety of feeding strategies;
2. The pollution tolerance levels of macroinvertebrates range from very high to very low;
3. Sampling macroinvertebrates can be performed with relative ease with simple equipment;
4. The aquatic life spans of macroinvertebrates range from several weeks to several years, which provides an indication of stream quality over a period of time, not just during the sampling window;
5. Unlike fish, macroinvertebrates are fairly limited in mobility, meaning they cannot avoid polluted areas. The adults lay the eggs and the benthic larvae are dependent upon the water quality and habitat to survive;
6. The methods for collecting, subsampling, preserving, and identifying macroinvertebrates are well established, facilitating comparison of data between sites;
7. Macroinvertebrates can be found in any aquatic habitat as long as the water quality is high enough to sustain them; and
8. Macroinvertebrate communities can recover rapidly from repeated sampling events, providing the ability for repeated sampling.

Channel characteristics were observed and BMI samples were collected within the reaches of Lapwai Creek and Whitebird Creek that flow through the Spalding and Whitebird Battlefield sites, respectively. Samples were collected from Lapwai Creek on June 16, 2008 and from

Whitebird Creek on August 5, 2008 due to high flows encountered on the first site visit to Whitebird Creek in mid-June 2008.

A Surber sampler was used to collect three replicate BMI samples in a single, uniform riffle habitat unit within each creek. A Surber sampler was selected to collect BMI because it allows sampling a uniform one-square-foot (144 square inch) area. Sampling began in the downstream portion of the riffle and proceeded upstream for the three replicates. At each replicate sampling location, the following methodology was used.

1. Place Surber sampler on the selected sampling spot with the opening of the nylon net facing upstream. Brace the frame and hold it firmly on the creek bottom.
2. Lift the larger rocks resting within the frame and brush off crawling or loosely attached organisms so that they drift into the net.
3. Once the larger rocks are removed, disturb the substrate vigorously with a trowel or small rake for 60 seconds. This disturbance should extend to a depth of about 10 cm to loosen organisms in the interstitial spaces, washing them into the net.
4. Lift Surber out of the water. Tilt the net up and out of the water while keeping the open end upstream. This helps to wash the organisms into the receptacle.
5. On the creek bank, empty contents of Surber into large bucket. Rinse Surber and empty into bucket until all organisms are removed. Great care should be taken in this step to collect and preserve all organisms from the Surber sampler as well as from the rocks and water in the bucket. Use of a magnifying glass and tweezers is essential. Rinse bucket through sieve to remove water from sample. Pick out large debris (sticks and leaves) after carefully removing any invertebrates.
6. Use spatula to move sample from sieve into a plastic vial. Fill vial to the top with isopropyl alcohol. Put label on inside of vial with name of sampler, date, and location. Write location and date on top of vial lid.
7. Return to the location of the first sample; walk upstream and collect another sample of invertebrates. Repeat this process for a total of eight replicate samples from each site. The eight replicates are combined into one composite sample for shipment to the laboratory for analysis.

All BMI samples were shipped to ABR, Incorporated in Forest Grove, Oregon for sorting, identification, and analysis. Each sample was processed using standard laboratory sample handling and labeling protocols. A Caton gridded tray was used to subsample 500 organisms from original samples. Using this subsampling procedure, each sample was evenly distributed across a 30-square wire-mesh tray. Individual squares were randomly selected and the contents removed and placed into a Petri dish. Macroinvertebrates were removed from the sample material under a dissecting microscope. This process was repeated until 525-550 organisms were subsampled. The remainder of the sample (the unsorted fraction) was then inspected for large or rare taxa that were not encountered during the subsampling procedure; these large/rare taxa were recorded on the laboratory bench sheet as such and placed in a separate vial. The following products resulted from the sample sorting procedure.

1. 525-550 macroinvertebrates sorted into a series (4-7) of small vials by order, class, and/or phylum.
2. A separate vial containing organisms found during the large/rare search (if performed).
3. Sorted residue – material from which the 525-550 organisms were sorted.
4. Unsorted fraction – portion of the original sample that was not sorted.

Macroinvertebrate identification also followed standard protocols. Macroinvertebrates were identified to the lowest practical taxonomic level, generally genus or species for most taxonomic groups except mites, Oligochaetes, microcrustaceans, and *Chironomidae*.

All raw data were entered into Excel spreadsheets and were crosschecked against paper copies of the data for errors and omissions before the data were analyzed. Data were analyzed with a multimetric index known as the Benthic Index of Biotic Integrity or IBI. The IBI utilizes information concerning the abundance and composition of a stream's benthic macroinvertebrate community to assess the overall biological integrity of the stream ecosystem. As such, "biological integrity" is defined as "the ability to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity and functional organization comparable to that of natural habitat of the region" (Karr and Dudley 1981). In practice, the B-IBI provides quantitative scores for ten metrics that describe individual key attributes of the benthic macroinvertebrate community. Scores for the ten metrics are summed and the cumulative site score is categorized into a level of impairment based on a pre-determined scale.

Since macroinvertebrate communities differ from region to region, multi-metric indexes have been developed and calibrated for use within particular regions or states. The Idaho Stream Macroinvertebrate Index was developed by the Idaho Department of Environmental Quality to assess impairment of streams within three defined ecoregions of the State of Idaho: Northern Mountains, Central and Southern Mountains, and Basins. Lapwai Creek is in the Basins region of Idaho while Whitebird Creek is in the Central and Southern Mountains region. Categorical scales established for each Idaho SMI region are detailed in Table 9.

Table 9. Idaho Stream Macroinvertebrate Index (SMI) impairment categories.

Rating	Northern Mountains	Central and Southern Mountains	Basins
Very Good	84-100	80-100	76-100
Good	65-83	59-79	51-75
Fair	44-64	40-58	34-50
Poor	22-43	20-39	17-33
Very Poor	0-21	0-19	0-16

One of the metrics used in the Idaho SMI as a basis for instream condition was the HBI, which is a general biotic index used to identify a relationship between macroinvertebrates and instream water quality. The HBI was first developed in 1977 to assess low dissolved oxygen concentrations related to organic pollutant loading (Hilsenhoff 1998). The HBI was improved in 1987 and modified further in 1998 to allow assessment of conditions throughout the year. Categorical scales established for water quality and degree of organic pollution based on the HBI are identified in Table 10.

Table 10. Water quality classifications for the modified Hilsenhoff Biotic Index (HBI).

Index Value	Water Quality	Degree of Organic Pollution
0.00-3.50	Excellent	No apparent organic pollution
3.51-4.50	Very Good	Slight organic pollution
4.51-5.50	Good	Some organic pollution
5.51-6.50	Fair	Fairly significant organic pollution
6.51-7.50	Fairly Poor	Significant organic pollution
7.51-8.50	Poor	Very significant organic pollution

Wildfire

The Buffalo Eddy and Whitebird Battlefield units have similar vegetation. Fire regimes for sagebrush/bluebunch wheatgrass communities vary from 40 to over 200 years on very dry sites (Bunting et al. 2002, Kitchen and McArthur 2007). Prior to acquisition of these units by the NPS, the wildfire history is unknown. A wildfire burned approximately 856 acres within the Whitebird Battlefield unit in 2004.

The Spalding and Weippe Prairie park units are not included in the wildfire analysis due to the location of the units relative the Wildland Urban Interface (WUI). Each of these units is embedded in the WUI and agricultural setting of the area and contained within a rural fire district. The two units included in the analysis are subject to more of a wildland fire regime.

To analyze the condition of vegetation outside the park units, LANDFIRE (Landscape Fire and Resource Management Planning) tools were utilized. LANDFIRE is a multi partner project producing consistent and comprehensive maps and data describing vegetation, wildland fuel, and fire regimes across the United States. It is a shared project between multiple agencies that produces data products for vegetation composition and structure, surface and canopy fuel characteristics, and historical fire regimes. The methodologies are science based and include extensive field referenced data.

The LANDFIRE Project produces maps of simulated historical fire regimes and vegetation conditions using the LANDSUM landscape succession and disturbance dynamics model. Several LANDFIRE data layers were used to summarize various fire related characteristics for the NEPE unit project areas. LANDFIRE data sets are available by zones across the United States. The specific zone was acquired for each NRCA area. Surrounding 6th level hydrologic boundaries were used as an analysis area in each park for clipping raster data from the specified zone. Where more than one LANDFIRE zone was present within an analysis area, each zone was clipped then merged to create the data set for that analysis area. Tables summarizing key characteristics such as area and percentages were developed for each LANDFIRE data layer analyzed.

LANDFIRE data is a coarse scale depiction product intended for state and regional applications; however it is utilized here as a starting point or first pass estimate for general determination of conditions. Finer scale determinations should be derived locally using methodology described in the Fire Regime Condition Class (FRCC) Guidebook (Hann et al. 2004). The resulting products can then be appropriately applied to local units for purposes such as fire management planning, land use planning, and other landscape analyses. Generally, FRCC derived locally using the guidebook process describes ecological departure at finer scales (LANDFIRE 2007).

FRCC is a widely accepted measure of change to key ecosystem components such as vegetation, fuels, fire frequency, and disturbance. In order to estimate FRCC, a determination of reference or historical natural landscape conditions are needed for comparison. LANDFIRE has attempted this by producing simulated data layers of historical conditions and the departures from current condition to produce condition class characteristics. These data layers include Bio Physical Setting (reference vegetation), Fire Regime Group (Historic Fire Regime), FRCC Departure, and Fire Regime Condition Class (departure from historic conditions). Each unit is analyzed separately using the key LANDFIRE data layers related to FRCC and summarized by data layer along with other useful fire related data produced by LANDFIRE.

Noxious Weeds

Noxious weeds of importance to NEPE were identified in Garrett et al. 2007. A complete list of noxious weeds for the state of Oregon can be found at http://www.oregon.gov/ODA/PLANT/WEEDS/statelist2.shtml#A_List , for Idaho at http://www.idahoag.us/Categories/PlantsInsects/NoxiousWeeds/watchlist.php and Washington at http://www.nwcb.wa.gov/weed_list/weed_list.htm. Each state has a different classification method. Oregon classifies noxious weeds into two categories based on control requirements; Class A (eradicate or contain) and Class B (control) (Oregon Department of Agriculture 2009). Idaho has three classes for the 57 noxious weeds; Early Detection/Rapid Response (EDRR), Containment, and Control. Washington has three classes for noxious weeds Class A (eradicate, 39 species), Class B (contain and prevent, 70 species) and Class C (County enforcement, 32 species) Washington State NWCB 2009). GIS data on noxious weeds was acquired from past investigations and placed in the NEPE geodatabase under stressors. State and county level databases were searched for noxious weed locations and local county weed superintendents were contacted for unpublished data; however, GIS data was not available from these sources. The Oregon Department of Agriculture (ODA) has a weed mapping website, www.weedmapper.org, for logging new locations and displaying existing locations of a specific weed species within the state or county. Idaho Department of Agriculture (IDA) does not have GIS data or maps of noxious weeds available to the public.

Upland Assessment Results

GIS and Geodatabase

The NEPE Geodatabases were populated with 38 shapefiles and images (Appendix A). These are all accessible from the ArcGIS Map Project file located on the DVD included with this report. Additional copies are available from the Upper Columbia Basin Network's website http://science.nature.nps.gov/im/units/ucbn/reports/.

Unit Specific Assessments

Unit specific upland assessments were made in the four park units identified in the methods section. The following is an evaluation of each ecological site by park unit with maps of sample points and soils, which are the basis for the departure ratings of the three landscape attributes. All data collected at the 18 sample points were digitized into a Microsoft Access database and a shapefile was generated from GPS locations. The database is included with the enclosed DVD and the shapefile is located in the three NEPE Geodatabases under the Geography category called nrca_plots.shp. Appendix B includes a table with all indicator ratings by plot. Appendix C is a species list with canopy cover by plot. Conclusions and recommendations that apply to all the sites sampled are discussed in the Summary and Recommendations section of this report.

Buffalo Eddy

The Buffalo Eddy unit is composed mainly of a Cool Stony, 15+ Precipitation Zone (PZ) ecological site (R009XY203WA). The site is dominated by soils developed from loess, colluvium, and slope alluvium derived from weathered basalt parent material. Four plots located near the middle of the unit were sampled. The average soil stability and hydrologic function attributes were rated as none-slight departure, 8.8% and 16.9%, respectively. The average biotic integrity attribute was rated as moderate departure (47.9%) due to the presence of invasive plants, increased litter, and hampered reproductive capability of the native perennial grasses (Figure 18).

The four plots are in a Laufer-Rockly-Rock soil that is a stony loam to clay loam over a cobbly clay loam dominated subsurface. Soil depths vary from 13" to 19" and are considered well drained. The historic climax plant community is Idaho fescue (*Festuca idahoensis*)/bluebunch wheatgrass (*Pseudoroegneria spicata*).

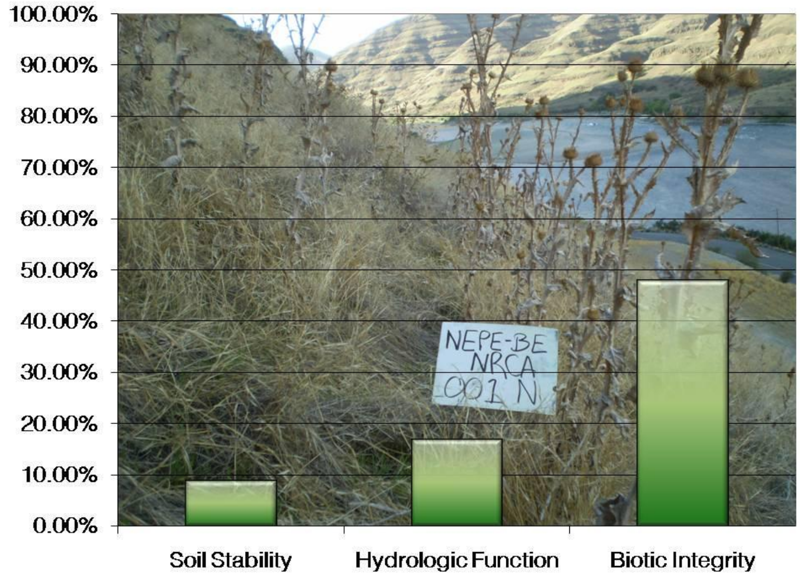

Figure 18. Percent departure from reference condition of the three landscape attributes in the Cool Stony, 15+ PZ ecological site, Buffalo Eddy unit, NEPE (background is plot 1).

All four plots are on very steep slopes (60-110%) at an elevation of approximately 1,100' (Figure 19). Three of the four plots (1, 2, and 4) exhibit similar biotic integrity landscape attribute departure values (57.1%, 48.6%, and 62.9%, respectively). The current vegetation on these plots is dominated by cheatgrass (*Bromus tectorum*) and ripgut brome (*Bromus rigidus*) with the noxious weed, yellow starthistle (*Centaurea solstitialis*) dominating the forb composition. Plot 1 forb layer was dominated by Scotch Thistle (*Onopordum acanthium*). Plot 3 is located geographically near the other three plots, but on a much steeper slope (110%). This plot is dominated by Idaho fescue (60%) and bluebunch wheatgrass (40%) but no yellow starthistle was present. The biotic integrity attribute departure rating was only 22.9%. The relatively poor biotic

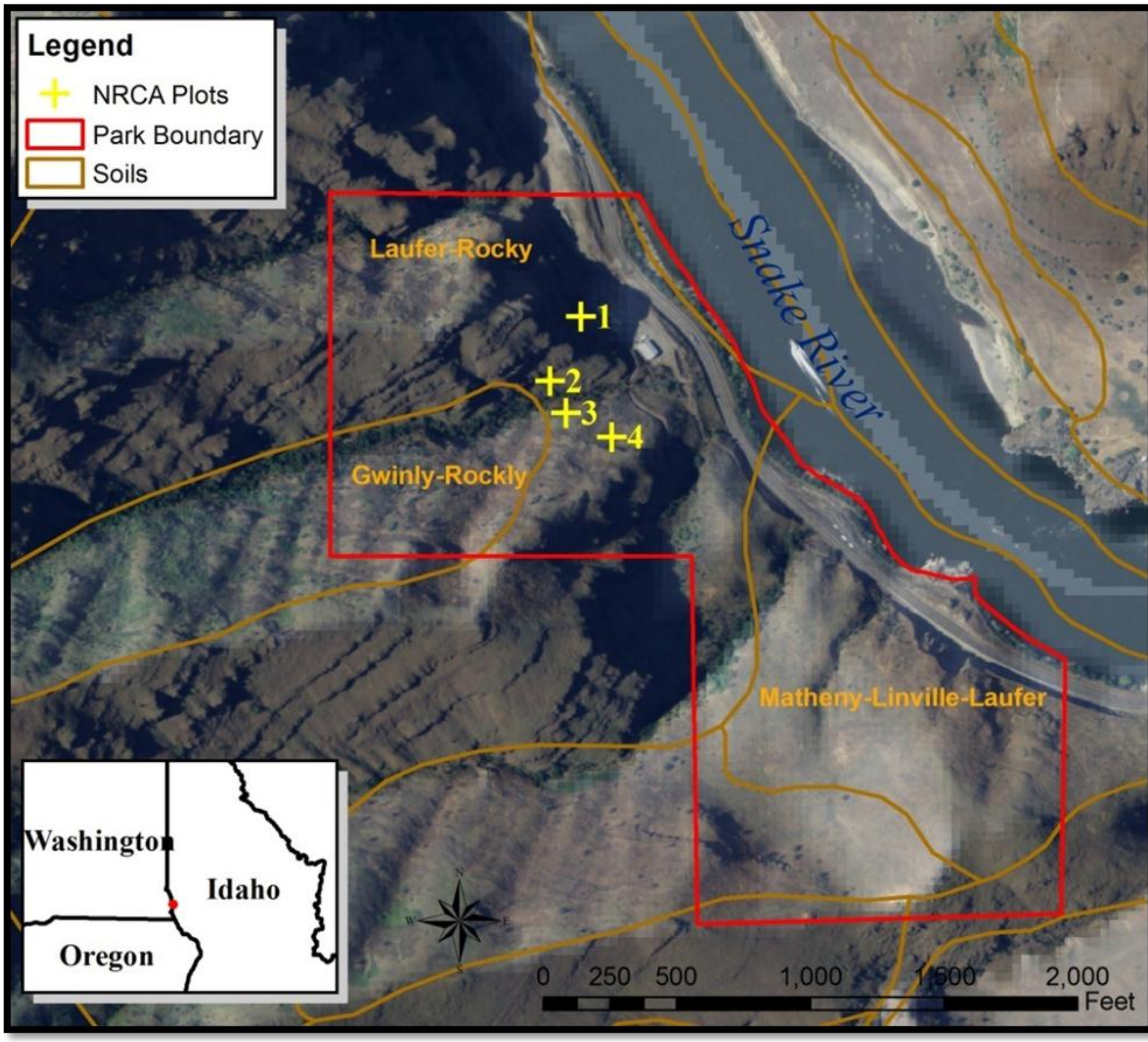

Figure 19. Map of ecological site sample plots 1, 2, 3, and 4 in the Buffalo Eddy unit, NEPE.

integrity rating on plots 1, 2, and 4 is due to over-grazing by livestock in the past. Plot 3 was not used by livestock due to the steep slope. The steep slopes and restricted accessibility to the unit will limit the vegetation management options to those that can be implemented by hand, such as pulling or spraying. No correlation was evident from the plot data suggesting a relationship between slope or aspect and occurrence of the various noxious weeds.

Old Chief Joseph Gravesite

The Old Chief Joseph Gravesite unit is a Mountain Loamy, 17-24 PZ ecological site (R009XY018OR). The site is dominated by soils developed from mixed glacial till overlaid by loess and volcanic ash. Two plots were located in the middle of the unit and sampled. The average departure ratings for all three landscape attributes; soil stability, hydrologic function, and biotic integrity were rated as none-slight; 2.5%, 2.5%, and 12.9%, respectively (Figure 20).

The unit is mainly a Rondowa stony loam soil over a gravelly/cobbly loam dominated subsurface. Soil depth is up to 60" and is considered well-drained. The historic climax plant community is Idaho fescue (*Festuca idahoensis*)/bluebunch wheatgrass (*Pseudoroegneria spicata*).

Both plots are on gentle slopes (10%) at an elevation of approximately 4,450' (Figure 21). The two plots had similar soil stability and hydrologic function attribute departure ratings with values ≤5%. The biotic integrity attribute departure values were more variable with Plot 1 rated at 20.0% and Plot 2 at 5.7%. The difference was due to the dominance of the non-native grass (50% cover) Kentucky bluegrass (*Poa pratensis*) in plot 1. Plot 2 was dominated by the native climax species, Idaho fescue (35%) and bluebunch wheatgrass (25%). The natural resources and functions in the unit are in very good condition. Only a trace amount of the noxious weed, spotted knapweed (*Centaurea stoebe*), was found in plot 1. Due to the small size of the unit, the natural resources and landscape functions will be greatly affected by activities on nearby or adjacent lands.

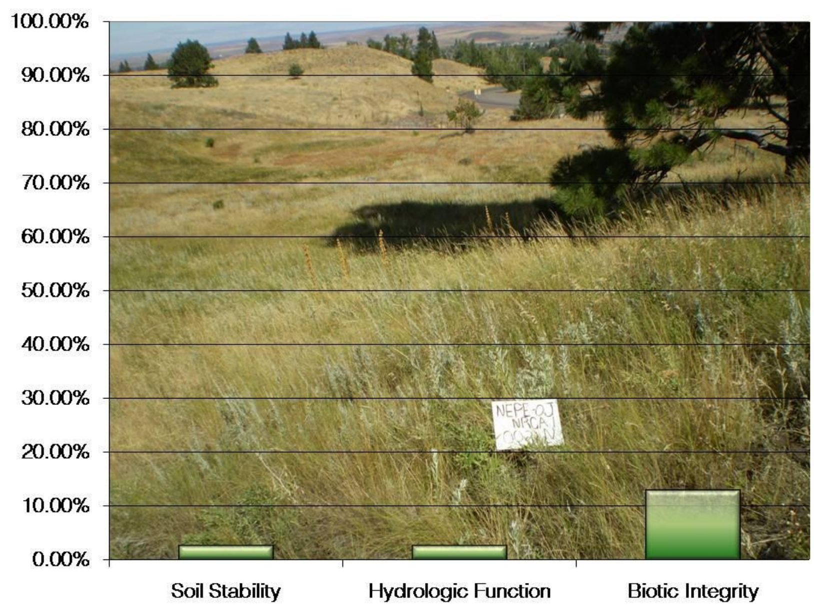

Figure 20. Percent departure from reference condition of the three landscape attributes in the Mountain Loamy, 17-24 PZ ecological site, Old Chief Joseph Gravesite unit, NEPE (background is plot 1).

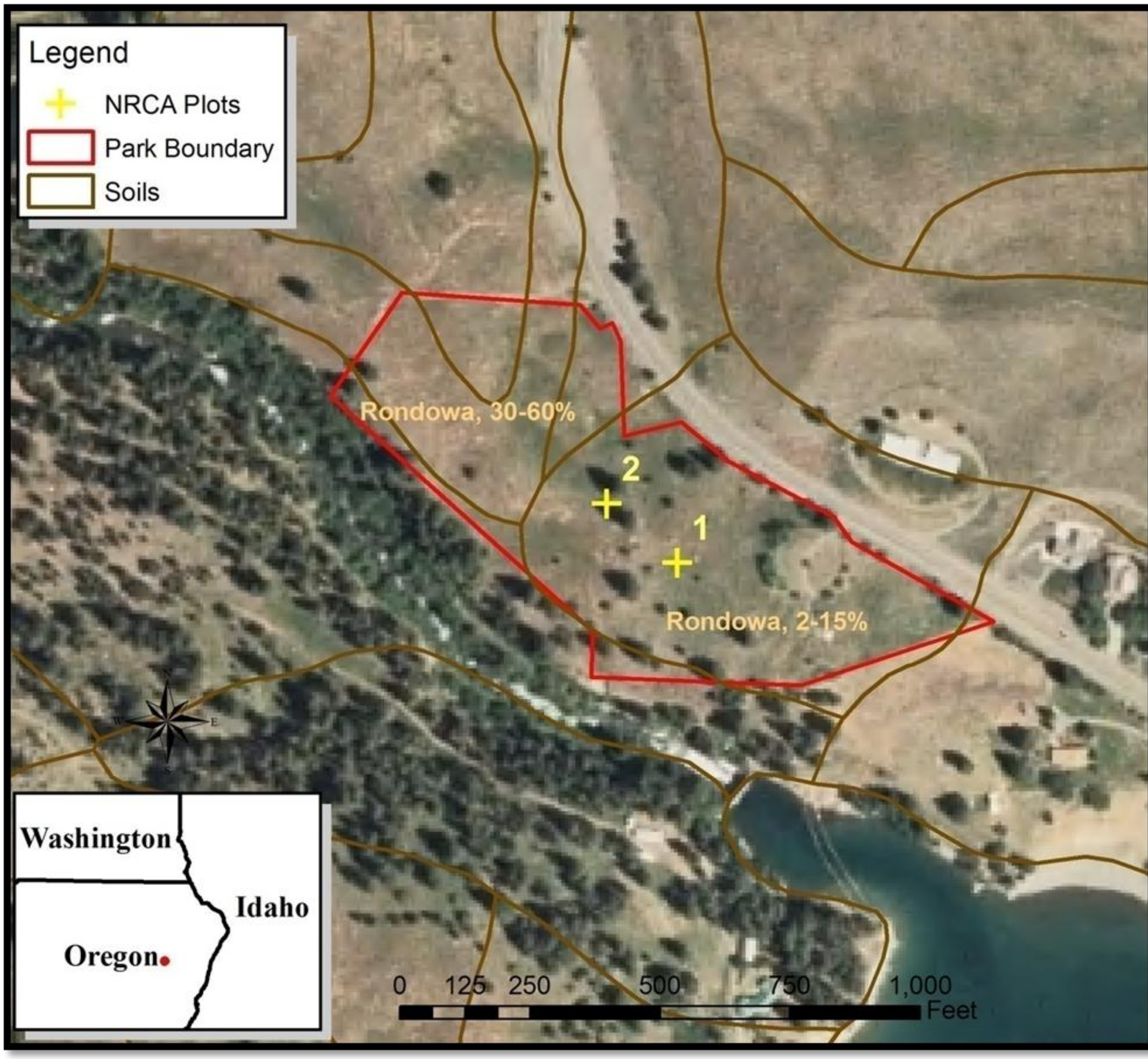

Figure 21. Map of ecological site sample plots 1 and 2 in the Old Chief Joseph Gravesite unit, NEPE.

Weippe Prairie

The Weippe Prairie unit is composed mainly of a wet meadow ecological site. The site is dominated by soils developed from loess and alluvium over lacustrine sediments. Five plots were sampled and were distributed throughout the unit. The average soil stability and hydrologic function attributes were rated as none-slight departure, 3.5% and 7.0%, respectively. The average biotic integrity attribute was rated as slight-moderate departure (27.4%) due to the presence of non-native plants introduced when property was used for hay production (Figure 22).

The soils in the unit are all characteristic of wet meadow riparian habitats. One plot was located in a Gramil-Reggear complex soil, two plots were in a Gramil-Lewhand complex soil, and two were in a Lewhand-Burntcreek complex soil. Soil depths can reach 70” on 0-5% slopes and are considered poorly drained. The historic climax plant communities range from scattered black hawthorne/Saskatoon serviceberry (*Crategus douglasii*/*Amelanchier alnifolia*) shrubs dominated by grasses, mainly bentgrass (*Agrostis* spp.), to wetter sites dominated by water sedge (*Carex aquatilis*) and rushes (*Juncus* spp.).

All five plots were on slopes <2% at an elevation of approximately 3,000’ (Figure 23). There was little variability between plots in all three landscape attributes. The current vegetation on all the plots is a mix of seeded non-native perennial grasses used for past hay production and native grasses and forbs that have persisted over time in the hay fields. Most plots are dominated by the non-native grasses timothy (*Phleum pratense*), orchardgrass (*Dactylis glomerata*), and Kentucky bluegrass. Many native species of forbs make up a substantial (>5%) composition of the plots, such as small camas (*Camassia quamash*). The only noxious weeds found in the unit were orange hawkweed (*Hieracium aurantiacum*) and Canada thistle (*Cirsium arvense*), but they did not dominate any sites (<1%). The flat slopes and accessibility to the unit allows for many vegetation management options in the future. The other species of concern is sulphur cinquefoil *(Potentilla recta)* which is actively being managed in the unit. The species is present throughout the northern 2/3 of the unit (Rodhouse and Jocius 2009).

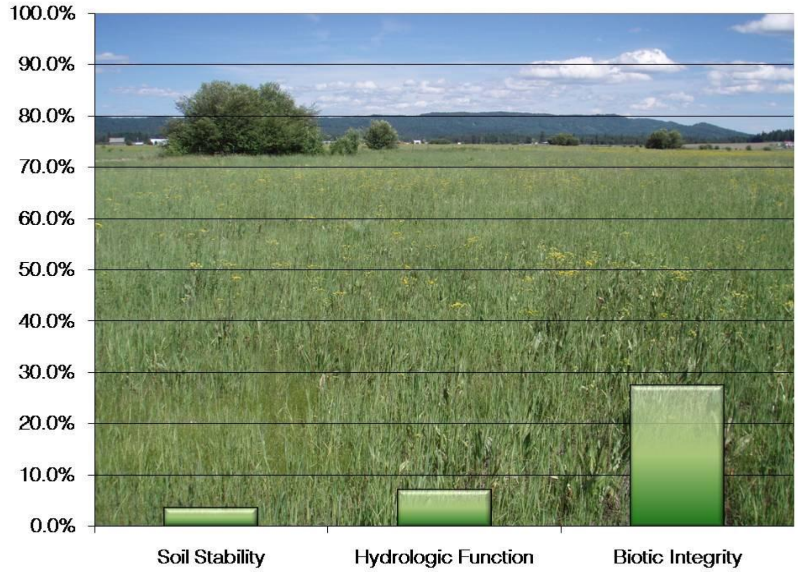

Figure 22. Percent departure from reference condition of the three landscape attributes in the Mountain Loamy, 17-24 PZ ecological site, Weippe Prairie unit, NEPE (background is plot 4).

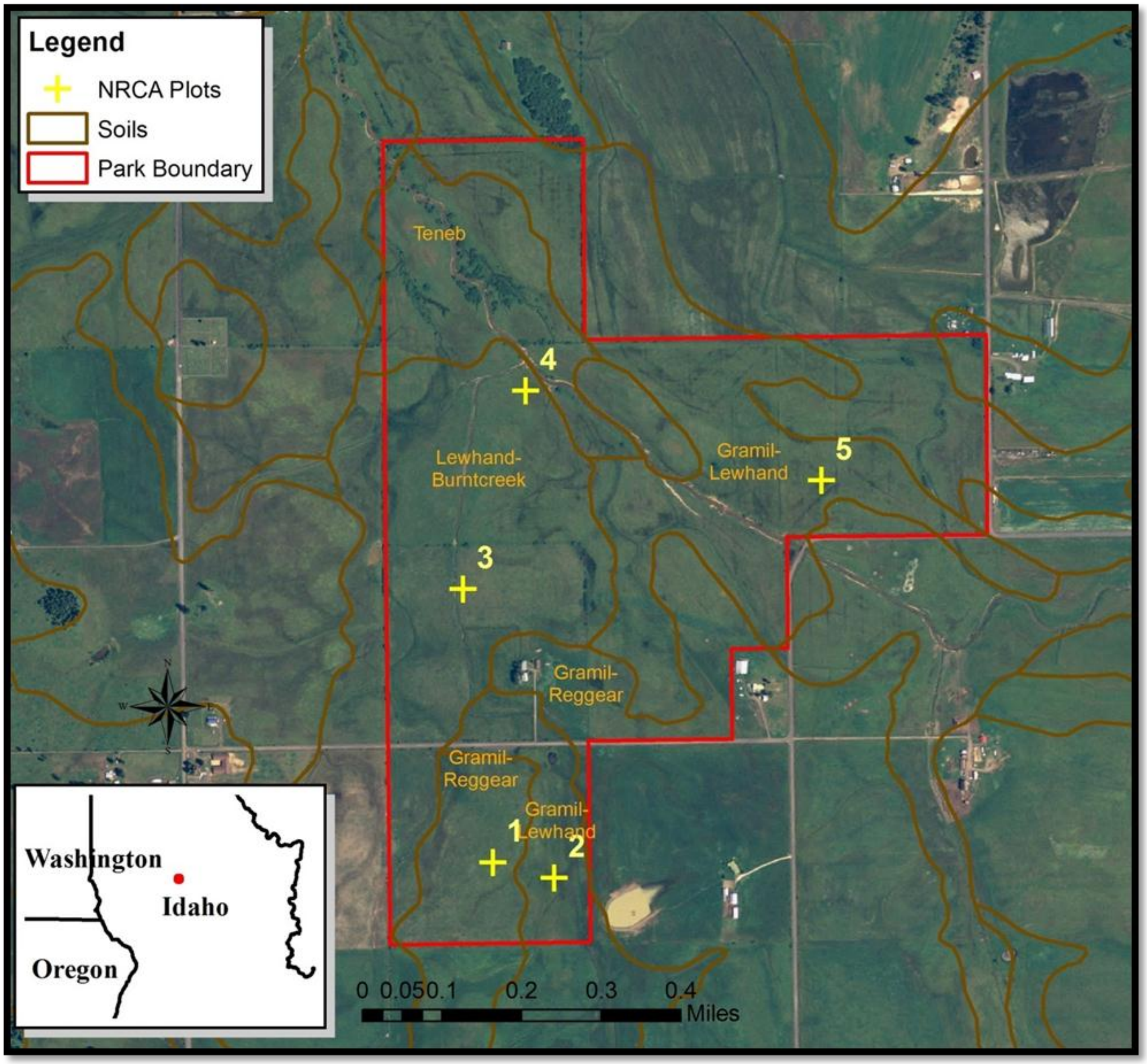

Figure 23. Map of ecological site sample plots 1-5 in the Weippe Prairie unit, NEPE.

Whitebird Battlefield

The Whitebird Battlefield unit is composed of two major ecological sites. Banner soil is a Loamy, 12-16 PZ (R009XY006ID) and the Tannahill soil is a South Slope Loamy, 12-16 PZ (R009XY012ID) ecological site with two and three plots in each, respectively (Figure 24). Two minor soils were sampled with one plot each. Lawyer soil is a North Slope Loam, 16-22 PZ (R009XY002ID) and Xerofluvent soil does not have an ecological site. The following sections describe the results of the landscape attribute ratings for each ecological site in this unit.

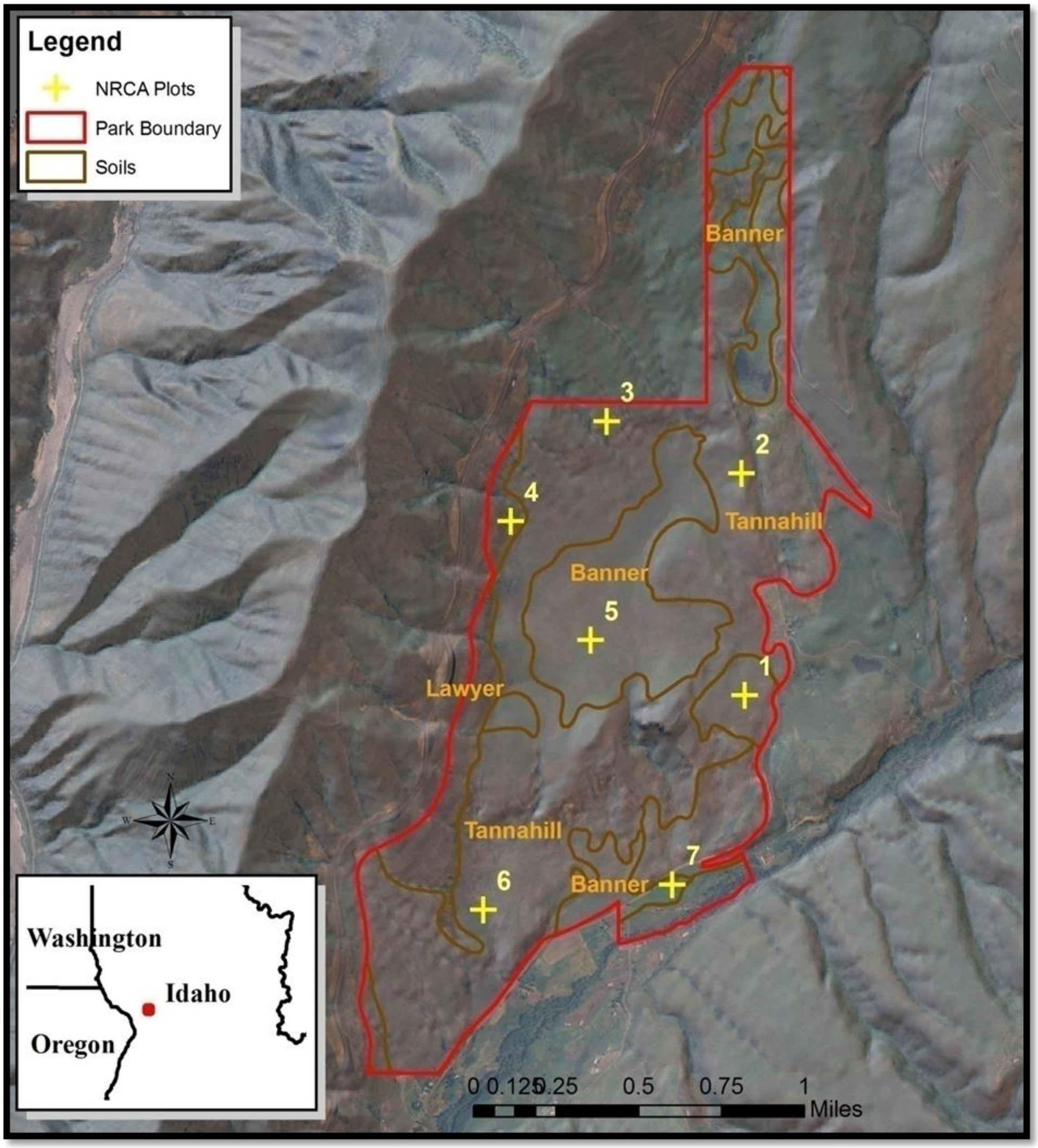

Figure 24. Map of ecological site sample plots 1-7 in the Whitebird Battlefield unit, NEPE.

Loamy, 12-16 PZ Ecological Site:
The Loamy, 12-16 PZ ecological site is dominated by silt loam soils developed from loess over alluvium derived from basalt parent material. Three plots were sampled in the west, east and northern portion of the unit. The average soil stability attribute was rated as none-slight departure, 10.0% and the hydrologic function attribute was rated slight-moderate, 20.0% (Figure 25). The average biotic integrity attribute was rated as moderate departure at 46.7% due to the dominance of non-native plants and noxious weeds.

The soil is primarily a Banner silt loam with depths of up to 60" on 3-25% slopes. The soil is considered well drained. The historic climax plant community is a bluebunch wheatgrass-bluegrass (*Poa* spp.) with a well developed perennial forb composition.

Plot 1 is a 15% east-facing slope at an elevation of 2,095', plot 5 is a 5% northeast-facing slope at an elevation of 2,135', and plot 7 is a 3% east-facing slope at 1,770' elevation. There was little variability between plots in all three landscape attributes. Plot 5 was rated slight-moderate departure in the hydrologic function attribute (22.5%), which was higher than the average. The vegetation on all three plots is dominated by non-native annual grass; cheatgrass, Japanese brome (*Bromus japonicas*), and ventenata (*Ventenata dubia*). Plot 7 was located in a field previously used for hay production as evidenced by the substantial cover of non-native perennials, timothy (20%) and tall wheatgrass (*Thinopyrum intermedium*) (15%). Almost no native species were in plot 1 but plot 5 did have bluebunch wheatgrass (10%) and great basin wildrye (*Leymus cinereus*) (8%), both native perennial bunch grasses. Noxious weeds were well established with field bindweed (*Convolvulus arvensis*), Dalmatian toadflax (*Linaria dalmatica*), and yellow starthistle (*Centaurea solstitialis*) (>5%) in all three plots and medusahead (*Elymus caput-medusae*) was established in plots 1 and 7. Mediterranean sage (*Salvia aethiopis*) is present in the Whitebird Battlefield park unit but was not observed by field crews.

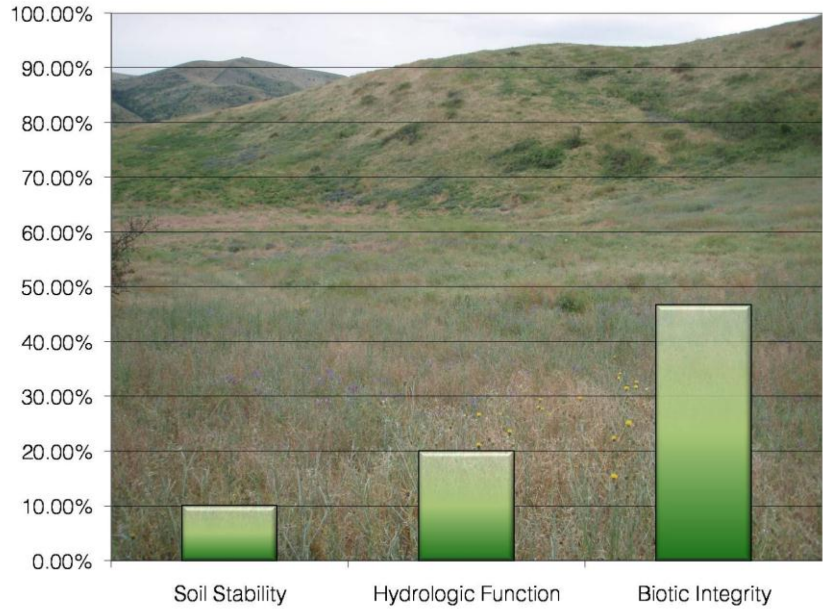

Figure 25. Percent departure from reference condition of the three landscape attributes in the Loamy, 12-16 PZ ecological site, Whitebird Battlefield unit, NEPE (background is plot 1).

South Slope Loamy, 12-16 PZ Ecological Site:
The South Slope Loamy, 12-16 PZ ecological site is dominated by cobbly loam soils developed from loess over colluvium derived from basalt parent material. Three plots were sampled along the western and southern portion of the unit. The average soil stability attribute was rated as none-slight departure, 15.8% (Figure 26). The hydrologic function landscape attribute was rate a slight-moderate departure, 22.5%. The average biotic integrity attribute was rated as moderate departure, 59.0%, very close to reaching a moderate-extreme rating. The high departure ratings were due to the dominance of non-native plants and noxious weeds.

The soil is primarily a Tannahill cobbly loam with depths of up to 60" on 20-90% slopes. The soil is considered well drained. The historic climax plant community is a bluebunch wheatgrass-Sandberg bluegrass (*Poa secunda*) with a well developed perennial forb composition.

Plot 2 is a 20% west-facing slope at an elevation of 2,280', plot 3 is a 50% southwest-facing slope at an elevation of 2,455', and plot 6 is a 20% south-facing slope at 1,830'. There was little variability between plots in all three landscape attributes. The vegetation on all three plots is dominated by non-native annual grass; cheatgrass, Japanese brome, ventenata, and medusahead. Almost no native species were in plot 2 and 6; plot 3 did have a small stand of black hawthorne/ Wood's rose (*Crategus douglasii/Rosa woodsii*). Noxious weeds were well established in all three plots. Both plot 3 and 6 had medusahead and all three plots had substantial cover of field bindweed (>20%). Plot 2 was dominated by yellow starthistle (70%).

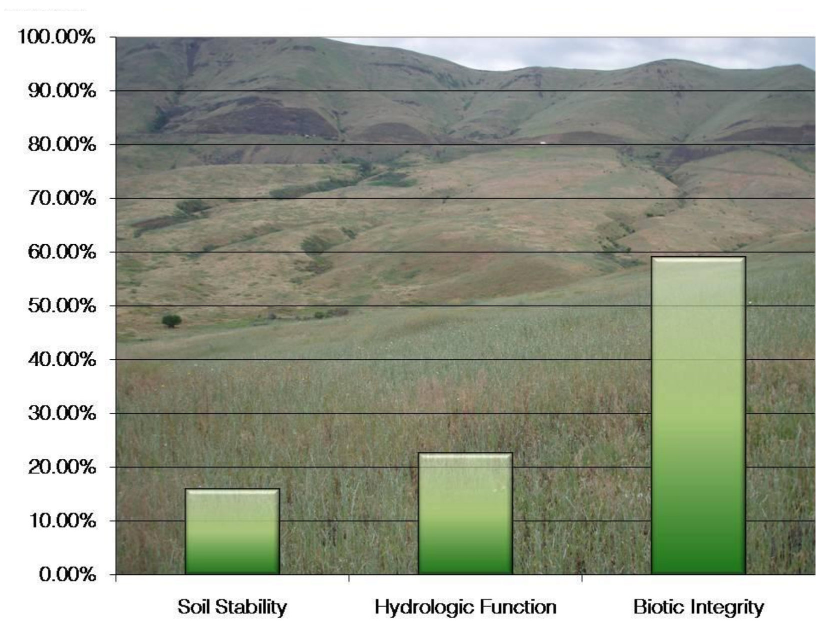

Figure 26. Percent departure from reference condition of the three landscape attributes in the South Slope Loamy, 12-16 PZ ecological site, Whitebird Battlefield unit, NEPE (background is plot 2).

North Slope Loamy, 16-22 PZ Ecological Site:
The North Slope Loamy, 16-22 PZ ecological site is dominated by silt loam soils developed from loess over alluvium derived from basalt parent material. One plot was sampled along the western edge of the unit. The soil stability and hydrologic function attributes were rated as none-slight departure, 10.0% and 15.0%, respectively (Figure 27). The biotic integrity attribute was rated as moderate departure at 54.3% due to the dominance of non-native plants and noxious weeds.

The soil is primarily a Lawyer silt loam with depths of up to 60" on 40-90% slopes. The soil is considered well drained. The historic climax plant community is an Idaho fescue-bluebunch wheatgrass with a well developed perennial forb composition and minor shrub cover (<5%) from black hawthorne and common snowberry (*Symphoricarpos albus*).

Plot 4 is a 55% east-facing slope at an elevation of 2,360'. The vegetation is dominated by non-native annual grass, cheatgrass (50%), and the noxious weed, field bindweed (40%). Almost no native species were in the plot. Other noxious weeds in the plot were Dalmatian toadflax and yellow starthistle with cover values >2%.

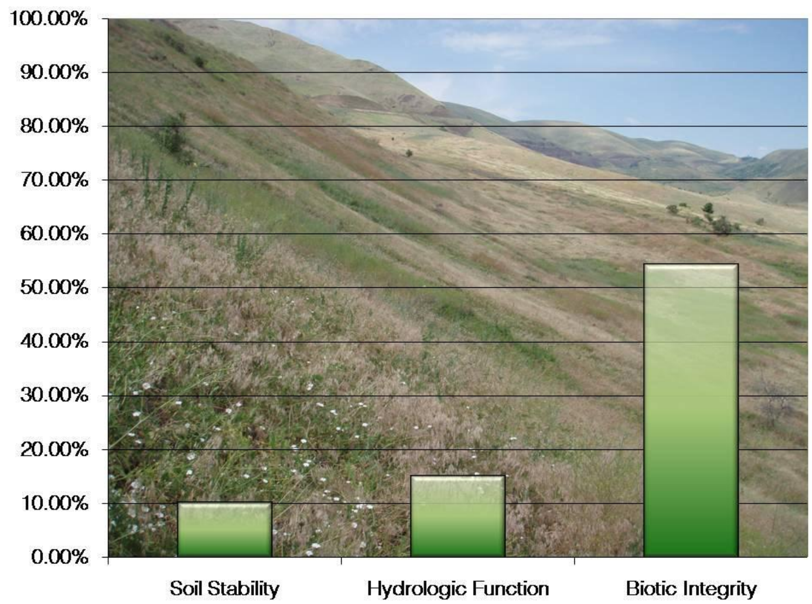

Figure 27. Percent departure from reference condition of the three landscape attributes in the North Slope Loamy, 16-22 PZ ecological site, Whitebird Battlefield unit, NEPE (background is plot 4).

Figure 28 is a photograph of the condition of the three landscape attributes in the North Slope ecological site, Whitebird Battlefield unit, NEPE.

Figure 28. Reference condition of the three landscape attributes in the North Slope ecological site, Whitebird Battlefield unit, NEPE.

Summary of All Upland Sites

Table 11 is a summary of the departure values by plot for each landscape attribute along with site physiographic information such as slope, aspect, and elevation. All but one plot had a soil stability attribute rating of none-slight departure from reference condition. The hydrologic function attribute had four out of seven plots in the slight-moderate departure ratings at the Whitebird Battlefield unit. The soil integrity attribute indicates that park lands are in good condition, functioning properly and not contributing to soil erosion in their respective watersheds. The hydrologic function attribute is not functioning as well in one park its respective watershed. Based on current soil stability and hydrologic function ratings under current park management, water quality should be stable to improving in the future.

The biotic integrity attribute ratings indicated many areas are not in good condition. Only two plots were rated in the none-slight departure category (<21%), seven fell into the slight-moderate category (21%-40%), eight in the moderate category (41%-60%) and one in the moderate-extreme category (61%-80%). All park units examined, except for Old Chief Joseph Gravesite and Whitebird Battlefield, were acquired within the past ten years. Each of these units has a history of livestock grazing and/or hay production except for Old Chief Joseph Gravesite. The poor biotic integrity attribute ratings indicate the three units are in poor condition, but with the change in management away from livestock production, this rating should improve over time.

Future projects, such as vegetation mapping and vital sign monitoring, will provide geographically-based information that will allow for more detailed analysis of vegetation succession and distribution. This information will provide the ability to compare physiographic and other landscape attribute relationships to vegetation patterns in the future. Vegetation management plans can be developed with this type of detailed information that, when implemented, will begin the process of reducing non-native and noxious plants and increasing native plants and the ecosystem processes they support.

Table 11. Summary of departure ratings for landscape attributes and physiographic attributes for NEPE upland sample plots.

Park Unit	Plot No	Soil Stability % Departure	Hydrologic Function % Departure	Biotic Integrity % Departure	Slope (%)	Aspect (degrees)	Elevation (ft)	Topographic Position
Buffalo Eddy	1	12.5%	20.0%	57.1%	90	70	1,015	Toeslope
Buffalo Eddy	2	10.0%	17.5%	48.6%	60	90	1,010	Toeslope
Buffalo Eddy	3	5.0%	10.0%	22.9%	110	10	1,035	Toeslope
Buffalo Eddy	4	7.5%	20.0%	62.9%	70	30	1,065	Toeslope
Old Chief Joseph Gravesite	1	5.0%	5.0%	20.0%	10	100	4,460	Valley Floor
Old Chief Joseph Gravesite	2	0.0%	0.0%	5.7%	10	320	4,460	Valley Floor
Weippe Prairie	1	0.0%	2.5%	22.9%	1	0	3,000	Valley Floor
Weippe Prairie	2	10.0%	15.0%	28.6%	1	0	3,005	Valley Floor
Weippe Prairie	3	0.0%	2.5%	25.7%	1	0	3,005	Valley Floor
Weippe Prairie	4	5.0%	7.5%	28.6%	1	0	3,000	Valley Floor
Weippe Prairie	5	2.5%	7.5%	31.4%	1	0	3,020	Valley Floor
Whitebird Battlefield	1	5.0%	15.0%	48.6%	15	80	2,095	Toeslope
Whitebird Battlefield	5	12.5%	22.5%	37.1%	5	60	2,135	Step in Slope
Whitebird Battlefield	7	12.5%	22.5%	54.3%	3	100	1,770	Valley Floor
Whitebird Battlefield	2	22.5%	27.5%	60.0%	20	250	2,280	Footslope
Whitebird Battlefield	3	10.0%	15.0%	57.1%	50	210	2,455	Footslope
Whitebird Battlefield	6	15.0%	25.0%	60.0%	10	120	1,830	Footslope
Whitebird Battlefield	4	10.0%	15.0%	54.3%	55	90	2,360	Footslope

Aquatic Assessment Results

Spalding - Lapwai Creek

Lapwai Creek is a left bank tributary to the Clearwater River, joining it 11 miles east of the confluence of the Snake and Clearwater Rivers at Lewiston, Idaho. The watershed drains approximately 267 square miles and is characterized by rolling plains dissected by deep stream valleys and extreme fluctuations in stream flow. Land use in the Lapwai Creek watershed is primarily agriculture, mainly dryland cereal grains, and livestock production.

A lotic riparian assessment was conducted in June 2008 on the reach of Lapwai Creek that flows through the Spalding unit (Figure 29). Lower Lapwai Creek has been confined through much of its course due to agricultural land uses and the proximity of U.S. Highway 95. Channel confinement on the Spalding site includes rip rap and earthen stream bank armoring resulting in limited floodplain interaction, which prevents typical energy dissipation and sediment processing expected in a natural stream system. Levees and rip rap banks have also limited lateral movement of the channel and have minimized the potential extent of the Lapwai Creek riparian area onsite. The riparian zone does not allow lateral movement and recolonization of riparian species. Erosion from upstream sources has resulted in embedded substrates onsite. The presence of bridge abutments just upstream of the Spalding unit further confines the channel and limits connectivity with riparian resources. During low flows each year, three to four beaver dams are established along the creek on the Spalding site (Jason Lyon, personal communication). The dams provide flood control during heavy precipitation events, and assists in the processing of sediment and nutrients, while providing excellent nursery habitat for juvenile salmonids.

Riparian vegetation consists of a narrow strip of young-to-mature cottonwood trees as well as a dense coverage of non-native species, including reed canarygrass and Bohemian knotweed, which is preventing native understory colonization (Figure 30). Invasive herbaceous plants fail to remain rigid in high stream flows resulting in limited flow dissipation. There is a diverse composition of riparian vegetation on-site; however, the confined channel with little access to floodplain limits establishment of wetland plants. Most riparian plant species are upland species growing along the perched stream banks. These species are providing a stabilizing root structure to the stream banks and are protecting the banks from excessive erosion.

Lapwai Creek lacks sufficient in-channel large wood debris (LWD) to dissipate stream energy, affect channel formation, and process in-channel sediment. Other than a few mature cottonwood trees on-site, significant sources of new LWD within the adjacent riparian area are not present. Because stream energy cannot dissipate laterally, Lapwai Creek is vertically unstable and attempts to dissipate energy through down-cutting, especially immediately downstream of the on-site bridge abutments. Lapwai Creek is a chute-like channel, which limits the formation of stable point bars and subsequent revegetation. The delta of a low-to-mid gradient stream, such as Lapwai Creek, typically consists of a braided stream, with numerous secondary channels that provide additional fish habitat and access to a more thoroughly developed riparian area.

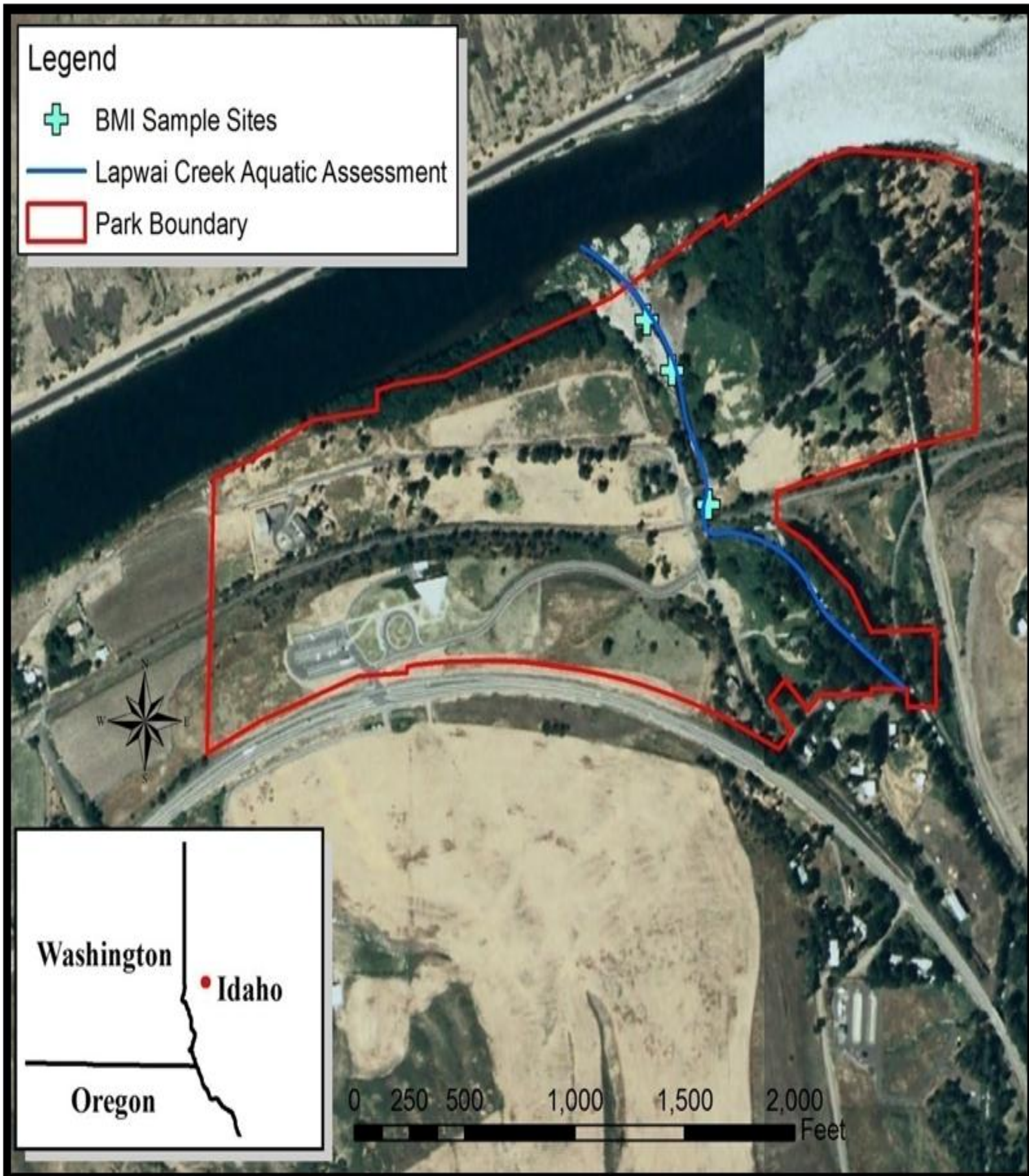

Figure 29. Map of the lotic riparian and BMI assessment sites on Lapwai Creek in the NEPE Spalding unit.

Figure 30. Photograph of the lotic sampling site on Lapwai Creek in the NEPE Spalding unit.

The PFC evaluation of the Lapwai Creek stream reach in the Spalding unit resulted in a summary determination of "Nonfunctional" (Appendix D). As defined above, these are riparian areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows, and thus are not reducing erosion, improving water quality, and sustaining desirable channel and riparian habitat characteristics. Lapwai Creek channel confinement (i.e., rip rap, earthen levees) creates an unnatural system that is not currently capable of naturally dissipating stream energy and functioning properly. As a result, the stream will continue to be non-functional until channel confinement pressure is reduced through levee setback associated with the railroad tracks that allows natural stream sinuosity and floodplain connectivity to be re-established.

Channel characteristics were observed and BMI samples collected within the reaches of Lapwai Creek on June 16, 2008 (Figure 31). The Lapwai Creek BMI site appeared greenish-brown in color due to spring run-off flow conditions in early June (Table 12). The stream substrate was dominated by gravel, but also contained boulders, cobbles, sand, and silt. Substrate embeddedness was approximately 45 percent. An estimated 90 percent of the substrate was comprised of inorganic material. Organic substrate consisted of minor amounts of muck and debris along the stream margins. The steep stream banks were slightly eroded and consisted of moderately compacted dirt and rock. Much of the right stream bank was armored with large boulders to protect the upstream bridge abutments from mass wasting and erosion. The channel cross-section formed a rectangular to u-shape with no signs of undercut banks. Bank vegetation consisted mostly of grasses and shrubs with scattered herbaceous plants and deciduous trees providing approximately five to ten percent shading to the stream throughout the day.

At the Lapwai Creek BMI site the water contained no apparent odors or surface contamination. At the site the stream averaged 12.5 m wide, 0.2 m deep, and flowed at approximately 1.1 m/s.

The riffle from which the samples were collected was approximately 11.0 m long and 4.0 m wide. Each of the three replicate samples collected at the site were approximately 5.0 m apart.

The Lapwai Creek site received an Idaho SMI score of 44, corresponding to “fair” ecological conditions in the Basins region of Idaho (Table 10). The site received a Hilsenhoff Biotic Index value of 5.5, which corresponds to “good” water quality conditions and “some” organic pollution. These results are similar to those reported in a Lapwai Creek water quality study conducted by Starkey (2009) in 2008, which indicated Lapwai Creek at the Spalding site received an HBI value of 5.97. Benthic index results suggest that this site is currently supporting and maintaining a relatively balanced community of organisms that has the composition, diversity, and functional organization comparable to that of natural habitat within the same region.

Figure 31. Photograph of Lapwai Creek benthic macroinvertebrate sampling site (white flagging identifies replicate sampling locations).

Table 12. Summary of raw and metric BMI scores for Lapwai Creek at the Spalding unit of NEPE based on the Idaho SMI.

RAW SCORE	
Taxa Richness	25
Mayfly Richness	6
Stonefly Richness	0
Caddisfly Richness	3
Percent Plecopter	0
Modified HBI	5.5
% Dominant (5)	84
Scraper Taxa	7
Clinger Taxa	11
METRIC SCORE (Riffle Criteria)	
Taxa Richness	68
Mayfly Richness	60
Stonefly Richness	0
Caddisfly Richness	33
Percent Plecoptera	0
Modified HBI	56
% Dominant (5)	34
Scraper Taxa	88
Clinger Taxa	58
TOTAL SCORE	**44**

Whitebird Battlefield - Whitebird Creek

Whitebird Creek, a right bank tributary to Idaho's Salmon River, drains approximately 104 mi^2 of land area. Whitebird Creek flows along the eastern boundary of the Whitebird Battlefield unit, the largest of the 38 NEPE sites. A lotic riparian assessment was conducted in June 2008 on this approximately ¼ mile reach of Whitebird Creek along the Battlefield's south eastern boundary (Figure 32).

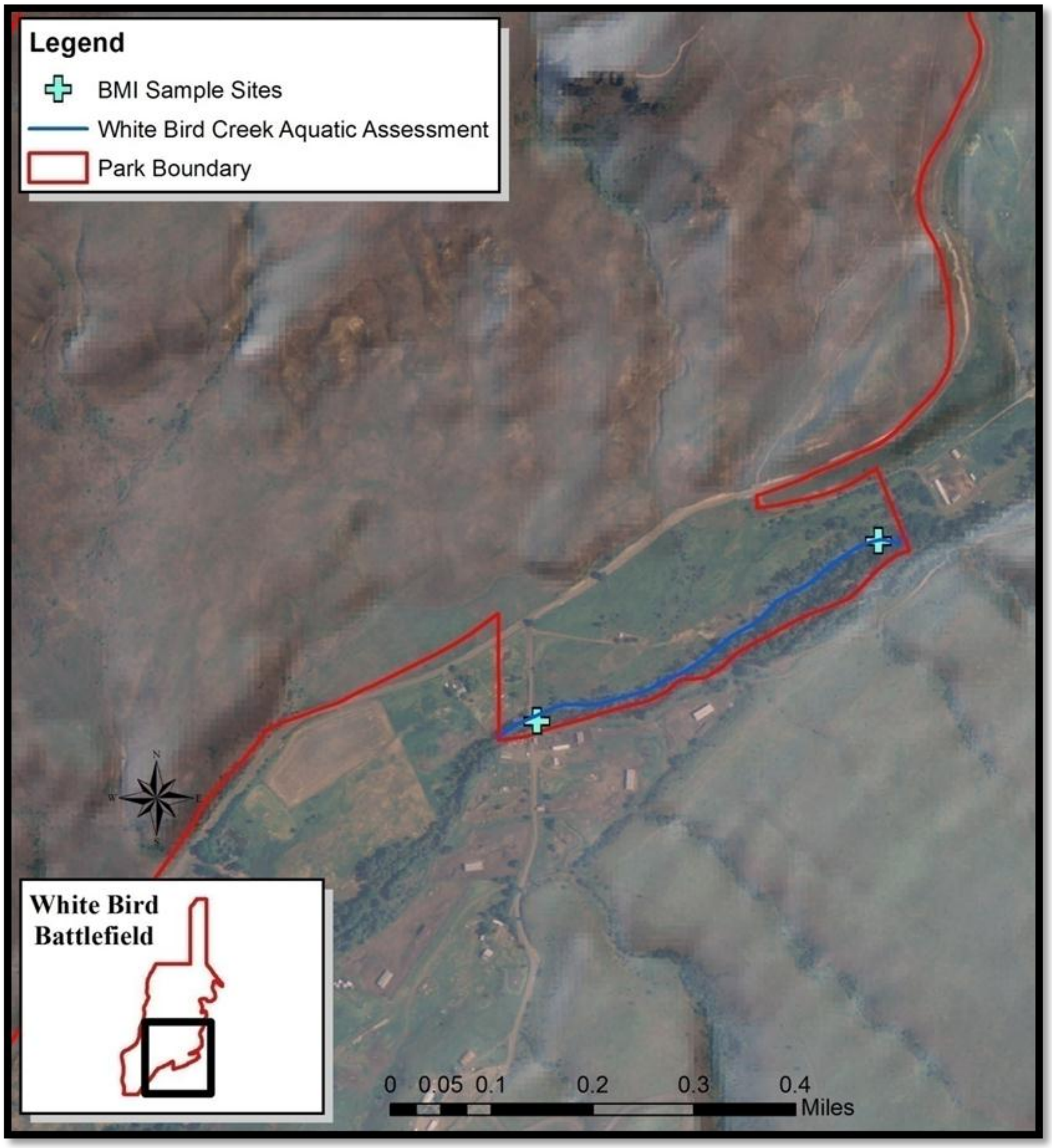

Figure 32. Map of the lotic riparian and BMI assessment sites on Whitebird Creek in the NEPE Whitebird Battlefield unit.

Approximately 3.5 miles of Whitebird Creek near the community of Whitebird, Idaho, including the assessed stream reach, was channelized in the 1950s for flood control purposes by the U.S. Department of the Army (81-516 Flood Control Act of 1950 found at http://www.nww.usace.army.mil/dpn/publaw.htm) (present day Army Corps of Engineers). Channel confinement on the Battlefield site, accomplished through levee construction and revetments, has resulted in minimal floodplain interaction and reduced channel sinuosity. This lack of channel meandering and floodplain connection prevents energy dissipation and sediment processing expected in a natural stream system. Limited lateral movement of the Whitebird Creek channel has also resulted in limiting the potential extent of the riparian area on-site. Whitebird Creek is channelized along a steep embankment. The riparian area is limited by topography and has therefore achieved its potential extent as long as the channel remains confined to its current location by levees and revetments.

The riparian area contains a diverse age-class distribution and composition of vegetation. The riparian vegetation consists mostly of facultative and facultative-upland plants, which indicates very little groundwater connection between the Whitebird Creek channel and adjacent riparian area (Figure 33). Although very little wetland vegetation exists in the riparian area, the vegetation that is present is vigorous and contains root masses capable of withstanding high stream flow events. The riparian vegetation structure along the creek also provides energy dissipation and bank protection during high stream flow events.

Figure 33. Photograph of the lotic sampling sites on Whitebird Creek in the NEPE Whitebird Battlefield unit.

Whitebird Creek riparian area contains mature vegetation that is a potential source of LWD; however, the confined chute channel maintains velocities that do not allow LWD to stay in channel. As a result, very little LWD is present within the onsite Whitebird Creek channel that is capable of dissipating energy. No point bars were evident on-site at the time of the assessment. Whitebird channel confinement minimizes natural lateral movement that would occur naturally in this system. Minimal erosion and sedimentation from the upper watershed was evident in the assessed reach.

The PFC evaluation of the Whitebird Creek stream reach on the Whitebird Battlefield unit resulted in a summary determination of “Nonfunctional” (Appendix D). As defined above, these are riparian areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows, and thus are not reducing erosion, improving water quality, and sustaining desirable channel and riparian habitat characteristics. Whitebird Creek channel confinement (i.e., levees and revetments) creates an unnatural system that is not currently capable of naturally dissipating stream energy and functioning properly. As a result, the stream will continue to be non-functional until channel confinement pressure is reduced through levee setback that allows natural stream sinuosity and floodplain connectivity to be re-established. Other pressures in the upper watershed, including grazing and timber harvest, cannot be controlled by NPS managers but are not considered significant enough to affect long term functioning of the riparian area and stream as long as on-site restoration occurs.

The Whitebird Creek BMI site contained very little turbidity due to summer low flow conditions in August (Figure 34). The stream substrate was dominated by cobbles and boulders, but also contained smaller percentages of gravel, sand, and silt. Substrate embeddedness was approximately 5-10 percent with an estimated 90-95 percent of the substrate being comprised of inorganic material. Organic substrate consisted of minor amounts of muck and debris along the stream margins. The moderately steep stream banks were stable and consisted of rock and rip-rap. Most of the stream banks in this area were armored with large boulders to protect the downstream bridge abutments from mass wasting and erosion. The channel cross-section formed a v-shape with no signs of undercut banks. Bank vegetation consisted mostly of grasses, shrubs, and deciduous trees. Deciduous shrubs and trees (e.g., cottonwood, willow, etc.) provided approximately 50 percent shading to the stream throughout the day.

At the Whitebird Creek BMI site the water contained no apparent odors or surface contamination. At the site the stream averaged 9.5 m wide, 0.2 m deep, and flowed at approximately 0.5 m/s. The riffle from which the samples were collected was approximately 18.0 m long and 9.5 m wide. Each of the three replicate samples collected at the site were approximately 2-3 m apart.

The Whitebird Creek site received an Idaho SMI score of 58, corresponding to "fair" ecological conditions in the Central and Southern Mountains region of Idaho (Table 13). The site received a Hilsenhoff Biotic Index value of 4.1, which corresponds to "very good" water quality conditions and "slight" organic pollution. Benthic index results suggest that this site is currently supporting and maintaining a relatively balanced community of organisms that has the composition, diversity, and functional organization comparable to that of natural habitat within the same region.

Figure 34. Photograph of Whitebird Creek benthic macroinvertebrate sampling site (orange flagging identifies replicate sampling locations).

Table 13. Summary of raw and metric BMI scores for Whitebird Creek at the NEPE Whitebird Battlefield unit based on the Idaho SMI.

RAW SCORE	
Taxa Richness	17
Mayfly Richness	3
Stonefly Richness	2
Caddisfly Richness	4
Percent Plecopter	16
Modified HBI	4.1
% Dominant (5)	66
Scraper Taxa	4
Clinger Taxa	8
METRIC SCORE (Riffle Criteria)	
Taxa Richness	50
Mayfly Richness	33
Stonefly Richness	33
Caddisfly Richness	57
Percent Plecoptera	79
Modified HBI	81
% Dominant (5)	95
Scraper Taxa	50
Clinger Taxa	47
TOTAL SCORE	**58**

Whitebird Battlefield – Swartz Pond

Swartz Pond is located in the northern portion of the Whitebird Battlefield unit (Figure 35). The pond is a natural feature and is one of several natural seeps along a fault through the upper portion of the battlefield. A man-made dam was created to capture surface run-off and enlarge the size of the pond in the 1880's in the location of an existing pond/wetland by Swartz. The resulting depressional wetland provides a source of water and habitat to wildlife. The Swartz Pond wetland site was assessed in June 2008.

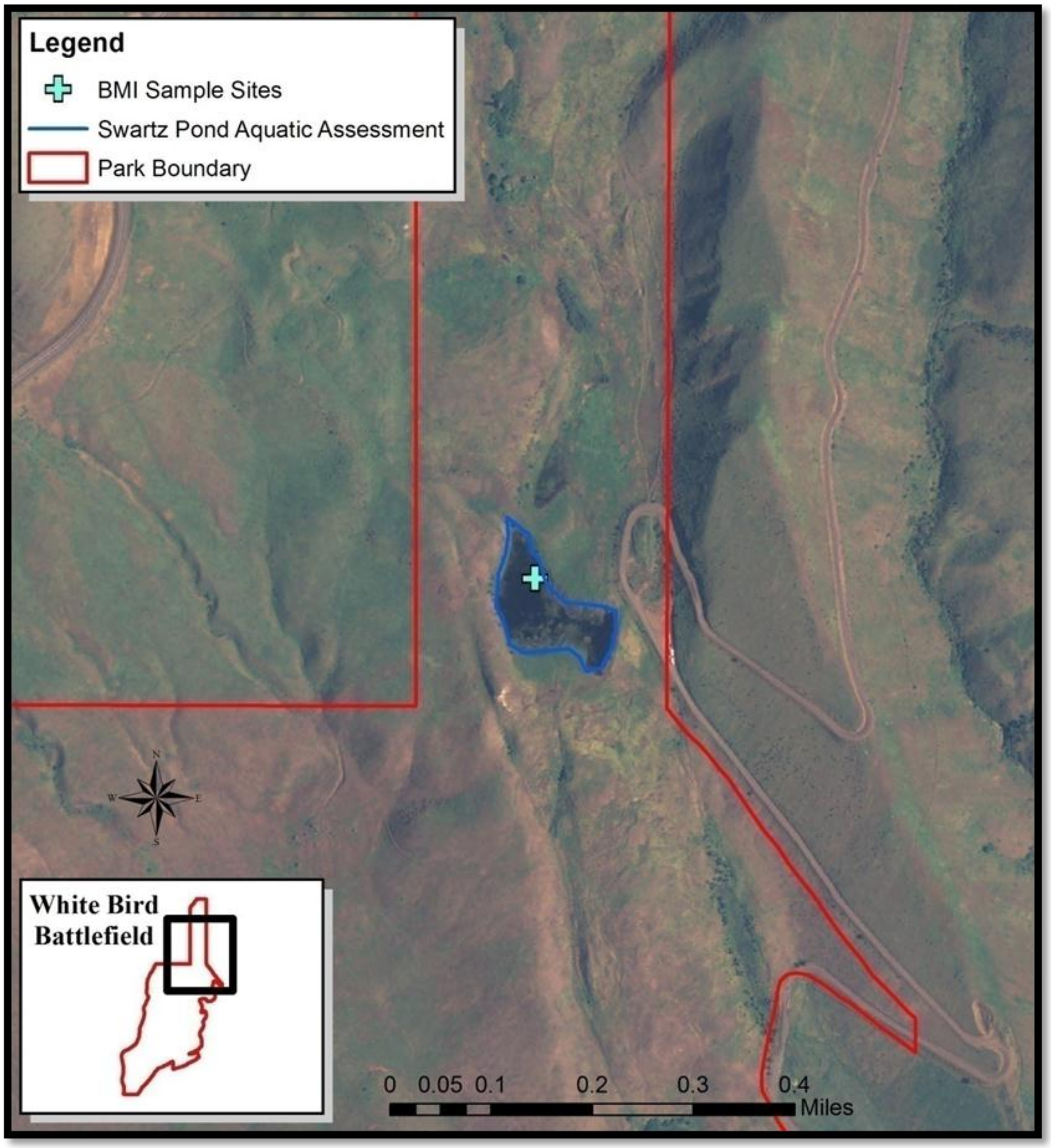

Figure 35. Map of the lentic wetland assessment site on Swartz Pond in the NEPE Whitebird Battlefield unit.

The extent of Swartz Pond and its associated wetland is currently limited by topography. Water levels in the riparian-wetland area appear to remain fairly static throughout the year, with maximum levels occurring during the spring runoff period and minimum levels during the summer low flow months. The riparian-wetland area appears to have achieved its potential extent on-site. Natural flow patterns at this site are altered by roads and the man-made earthen berm.

The riparian-wetland requires vegetation to dissipate wind and wave energy rather than LWD or rock, which is not present due to the landscape setting. A diverse age-class and composition of vigorous riparian-wetland plants are present and are supported by a sufficient source of water (Figure 36). Upland vegetation surrounding the Swartz Pond site consists of numerous invasive species, including thistle. The on-site riparian-wetland vegetation provides ample wave and wind energy dissipation through structural diversity and root masses. During the June 2008 field assessment there was extensive use of Swartz Pond and surrounding emergent herbaceous wetland by diverse bird populations.

Swartz Pond and its associated depressional wetland remain saturated throughout the year, which provides the hydrology necessary to maintain hydric soil conditions. Hydric soils may not persist to such a large extent if the earthen dam were not present to inundate surface water runoff.

Figure 36. Photograph of Swartz Pond lentic sampling site in the NEPE Whitebird Battlefield unit.

The PFC evaluation of Swartz Pond on the Whitebird Battlefield unit resulted in a summary determination of “Proper Functioning Condition” (Appendix D). Properly functioning lentic riparian-wetland areas are those that contain adequate vegetation, landform, or debris to:

- Dissipate energies associated with wind action, wave action, and overland flow from adjacent sites, thereby reducing erosion and improving water quality;
- Filter sediment and aid floodplain development;
- Improve flood-water retention and ground-water recharge;
- Develop root masses that stabilize islands and shoreline features against cutting action; restrict water percolation;

- Develop diverse ponding characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, water bird breeding, and other uses that increase biodiversity.

Although Swartz Pond requires the presence of the man-made earthen dam to continue to function properly, it is providing wildlife habitat and biodiversity that would otherwise be deficient throughout much of the Whitebird Battlefield unit. Biodiversity of plant and wildlife species could be improved by increasing the complexity of habitat types. For example, creation of more than one ponded area, creating island habitats, or building hummocks in the wetland fringe would provide potential for a wider range of plant and wildlife species to use the site.

Weippe Prairie – Jim Ford Creek

The 274-acre NEPE Weippe Prairie site contains approximately one-mile of Jim Ford Creek and associated riparian area (Figure 37). From its location on the Weippe Prairie, Jim Ford Creek flows through the City of Weippe and then through a narrow steep basalt canyon to its confluence with the Clearwater River.

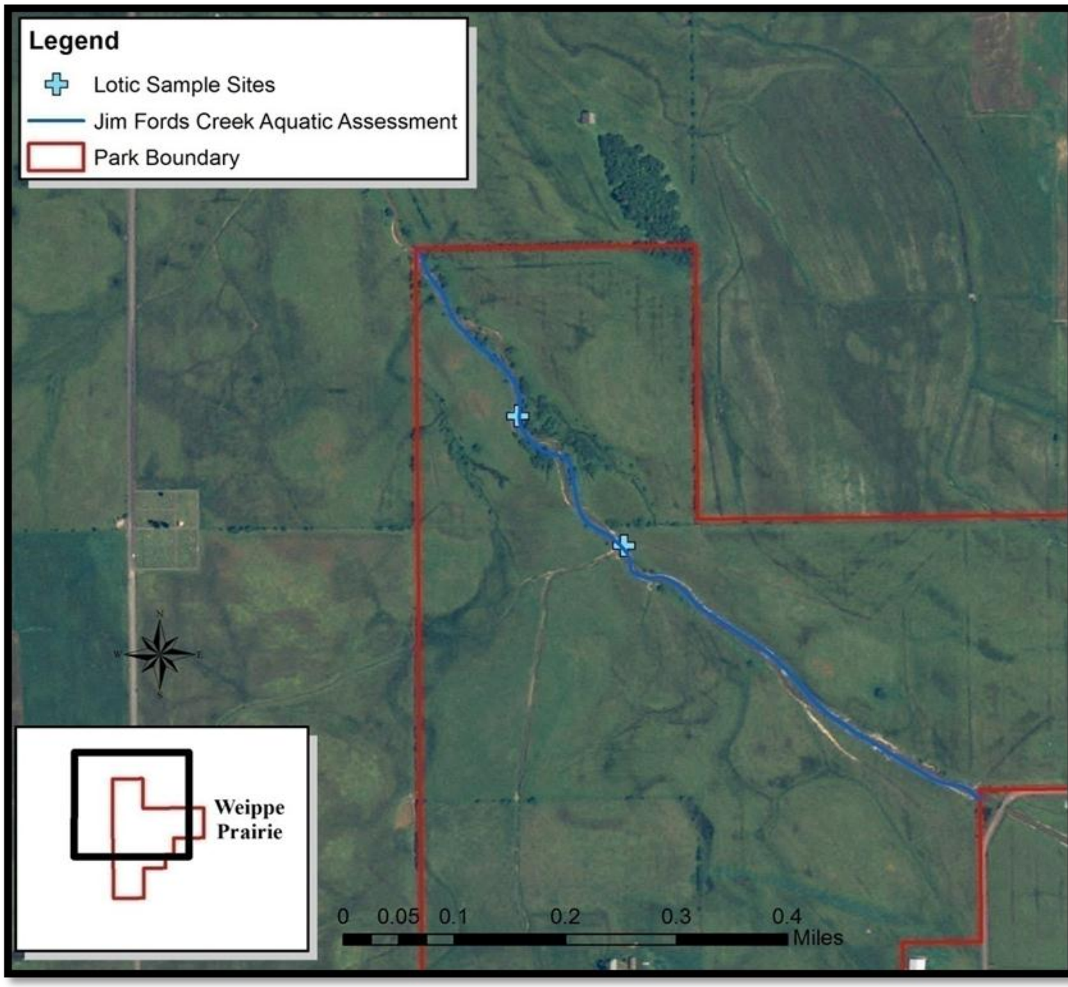

Figure 37. Map of the lotic riparian assessment sites on Jim Ford Creek in the NEPE Weippe Prairie unit.

The Jim Ford Creek reach was assessed in June 2008. The Jim Ford Creek is an incised stream channel within the unit. The incising limits over bank flows during flood events thereby limiting connectivity between the stream channel and the floodplain (Figure 38). Because the assessed reach of Jim Ford Creek flows through the Weippe Prairie, it has a very low gradient, which creates a depositional area for sediment loads transported from the upper watershed. Low gradient streams flowing through low gradient meadows or prairies commonly contain extremely sinuous channels due to the prevalence of fine substrates in the streambanks. However, Jim Ford Creek channel does not appear to move laterally and has apparently been channelized to allow agricultural land use of the prairie habitat. The deeply entrenched Jim Ford Creek channel limits the establishment of riparian vegetation by disconnecting surface water flooding and groundwater sources from potential hydrophytic vegetation. These observations were supported by NPS technical staff in a field investigation in August 17-19, 2009 (Noon and Smillie 2009). Although the potential for a healthy riparian zone is very high, the Jim Ford Creek riparian zone seems to be static or diminishing in extent throughout the assessed reach. The reach is greatly

Figure 38. Photograph of the lotic sampling sites on Jim Ford Creek in the NEPE Weippe Prairie unit.

influenced and degraded by land uses in the upper watershed, including but not limited to timber harvest activities, rural land use, grazing, and non-irrigated croplands.

Very little woody vegetation exists within the Jim Ford Creek riparian zone. In addition, there is very little diversity in the age and composition of riparian vegetation. The riparian zone contains very few obligate and facultative wetland species due to the disconnection of the riparian zone with the surface water and the groundwater table. The steep, unstable streambanks of Jim Ford Creek are barren and contain very little stabilizing vegetation capable of withstanding high streamflow events.

LWD is almost entirely absent within the Jim Ford Creek channel and there is no source of LWD within this reach. Large woody vegetation is present in the upstream forested reaches of Jim Ford Creek and would be capable of providing a source of LWD within this depositional reach. LWD is not being established in the stream channel due to LWD being deposited upstream or because the on-site conditions do not allow LWD capture (i.e., high bank chute-like channel). This reach of Jim Ford Creek does not appear to overtop its banks during flood stages, which makes LWD deposition difficult. In addition, point bars that begin to form along this reach are unstable and highly erosive due to fine sediments, which results in limited vegetation establishment. Vegetation present on the stream banks is not capable of withstanding high flow events. Jim Ford Creek throughout the Weippe Prairie appears to be downcutting, which creates vertical streambanks and prevents the lateral channel movement common in low-gradient streams. Stream substrate is comprised entirely of fine sediment and erosion from stream banks is excessive.

The PFC evaluation of Jim Ford Creek in the Weippe Prairie unit resulted in a summary determination of “Nonfunctional” (Appendix D). Nonfunctional riparian areas are those that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows, and are not reducing erosion, improving water quality, and sustaining desirable channel and riparian habitat characteristics. A long history of disturbing land use practices on-site and throughout the watershed has created an unnatural system that is currently not capable of naturally dissipating stream energy and functioning properly. The stream currently does not contain enough lateral movement to allow dissipation of stream energy through meanders. Stream meanders help dissipate hydraulic potential energy within a stream channel through scour and turbulent eddies. Limited lateral movement of this stream channel will cause Jim Ford Creek to continue to be non-functional until channel restoration occurs that allows natural stream sinuosity and floodplain connectivity to be re-established. Other pressures in the watershed, including agriculture and timber harvest, cannot be controlled by NPS managers and are certainly contributing factors to the condition of the stream reach and habitat.

Threats and Stressors

Threats and stressors are defined as a condition or situation, occurrence, or factor causing a negative impact to a natural resource. These can be further divided into naturally occurring or human-caused depending on their source. This section reports on two upland, fire and noxious weeds, and four aquatic; flow diversions, recreational land use, agricultural land use, and fine sediments; threats and stressors. Climate change is addressed as a threat to both upland and aquatic natural resources.

Upland Resources

The two major threats to upland resource at NEPE are wildfire and noxious weeds. Each upland resource threat is described in more detail below as well as discussions of potential strategies to address upland resource risks.

Wildfire

Wildfire is a dominant ecosystem process in most natural temperate North American grasslands and forests. The wildfire in the short grass prairie ecoregion of NEPE historically was the most prevalent natural disturbance process, influencing composition, diversity, energy, and nutrient cycles (Kauffman et al. 1997). Wildfire is a major threat to the upland resources in the Buffalo Eddy and Whitebird Battlefield units from fire ignitions on or adjacent to park lands. Fire history at NEPE prior to acquisition by NPS is not well documented. Since Buffalo Eddy and Weippe Prairie have recently been acquired by the NPS, and the fact that very few fires have occurred since establishment, there is inconclusive data to establish fire frequency, character, or intensity within the boundaries of these individual NEPE units.

Washington Department of Natural Resources (WDNR) maintains historic fire start data but no fires have been recorded in the Washington portion of the Buffalo Eddy project area. The Bureau of Land Management has recorded fire starts in Idaho since 1972. Table 14 lists the four wildfire starts recorded by the BLM over the past 34 years within the two project areas. Half the starts were naturally caused, mainly by lightning, the other half were human caused, near the town of Whitebird, Idaho. One of the starts near Whitebird, Idaho, was human caused and led to an 856 acre wildfire on February 13, 2004 (no map available). Two other major fires occurred outside park unit boundaries within each project area in 2000 (Figure 39). The Maloney Creek fire burn on the Idaho side of the Buffalo Eddy project area and the Burnt Flats fire burned 37% (24,808) of the Whitebird Battlefield project area.

Table 14. Number of wildfire starts in two NEPE unit from 1972-2007.

Park Unit	BLM	WDNR	Human Caused	Naturally Caused
Buffalo Eddy	1	0	0	1
Whitebird Battlefield	3		2	1

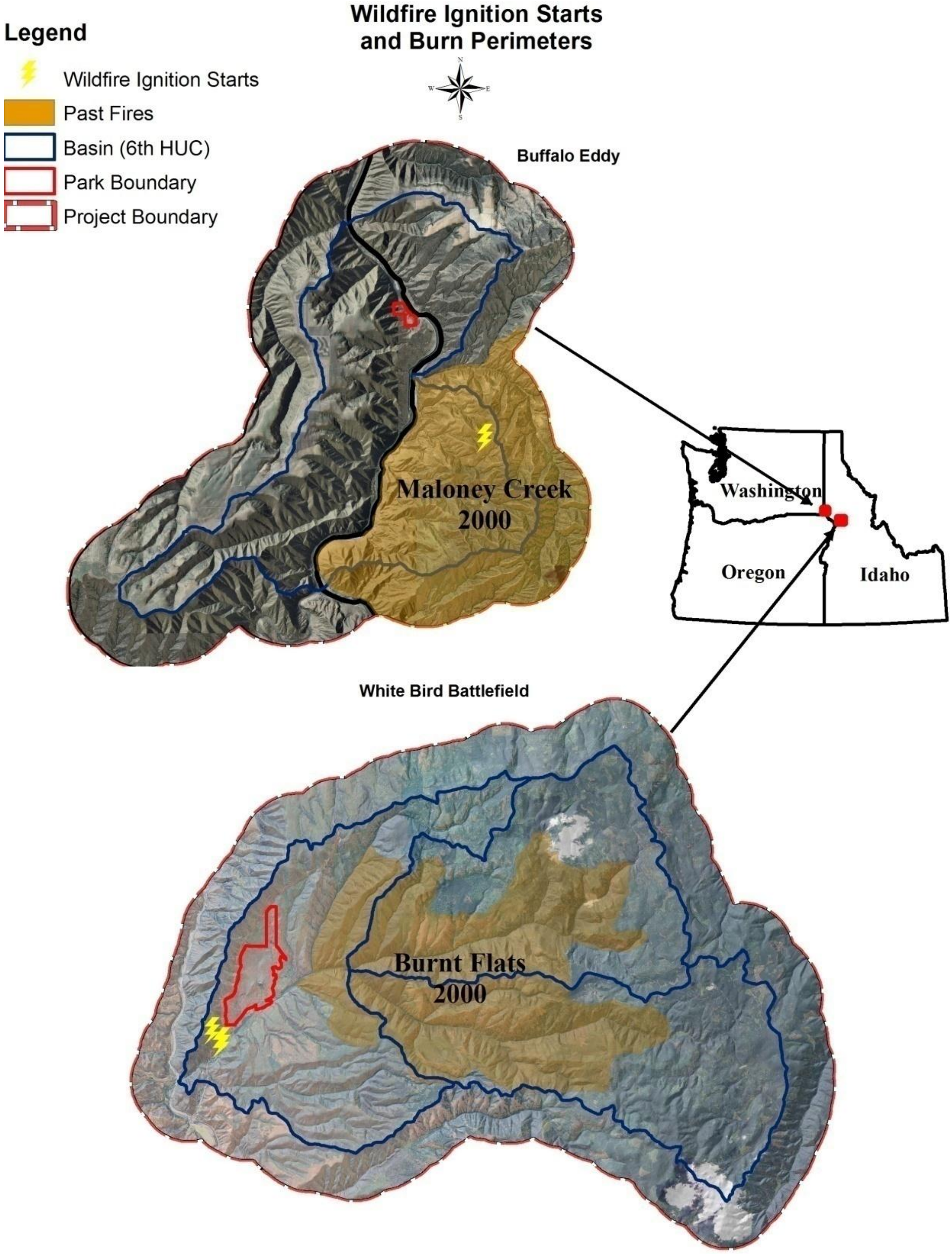

Figure 39. Maps of wildfire starts and fire perimeters in Buffalo Eddy and Whitebird Battlefield unit project areas.

Fire Regime Condition Class

Fire Regime Condition Class is a LANDFIRE data layer that categorizes the departure of current vegetation condition from reference or historical condition (LANDFIRE 2007). Alterations in the vegetative landscape due to fire management activities, fire exclusion, ungulate activity, insect and disease infestations, climate change and invasive plants have occurred over time to influence the existing cover vegetation. FRCC data simulates departure from reference conditions using the LANDSUM landscape succession and disturbance dynamics model. The three condition classes describe low departure (Condition Class I), moderate departure (Condition Class II), and high departure (Condition Class III). Within each Fire Regime Group (FRG) are the three different condition classes. The condition classes coarsely separate each FRG based on potential for change in smoke production; hydrologic function; vegetative composition, structure and resilience. Condition Class I indicates that the cover types are not a significant risk for change. Condition Class II indicates moderate risk and Condition Class III indicates high risk for change. This departure is calculated based on changes to species composition, structural stage, and canopy closure.

Both the Buffalo Eddy and Whitebird Battlefield units are dominated by Condition Class II (Table 15). The majority of vegetative cover in these units are in a low to moderate departure from reference conditions. In 2000 both units had larger wildfires within the project watersheds that reduced the risk for change and the FRCC rating. Figure 40 displays maps of the spatial distribution of FRCC by NEPE unit.

Table 15. Summary of acres of Fire Regime Condition Class the Buffalo Eddy and Whitebird Battlefield units in NEPE.

	Buffalo Eddy		**Whitebird Battlefield**	
Fire Regime Condition Class	**Acres**	**% Total**	**Acres**	**% Total**
Fire Regime Condition Class I	7,201	26.5%	11,039	16.6%
Fire Regime Condition Class II	10,913	40.1%	45,160	67.9%
Fire Regime Condition Class III	4,478	16.5%	9,621	14.5%

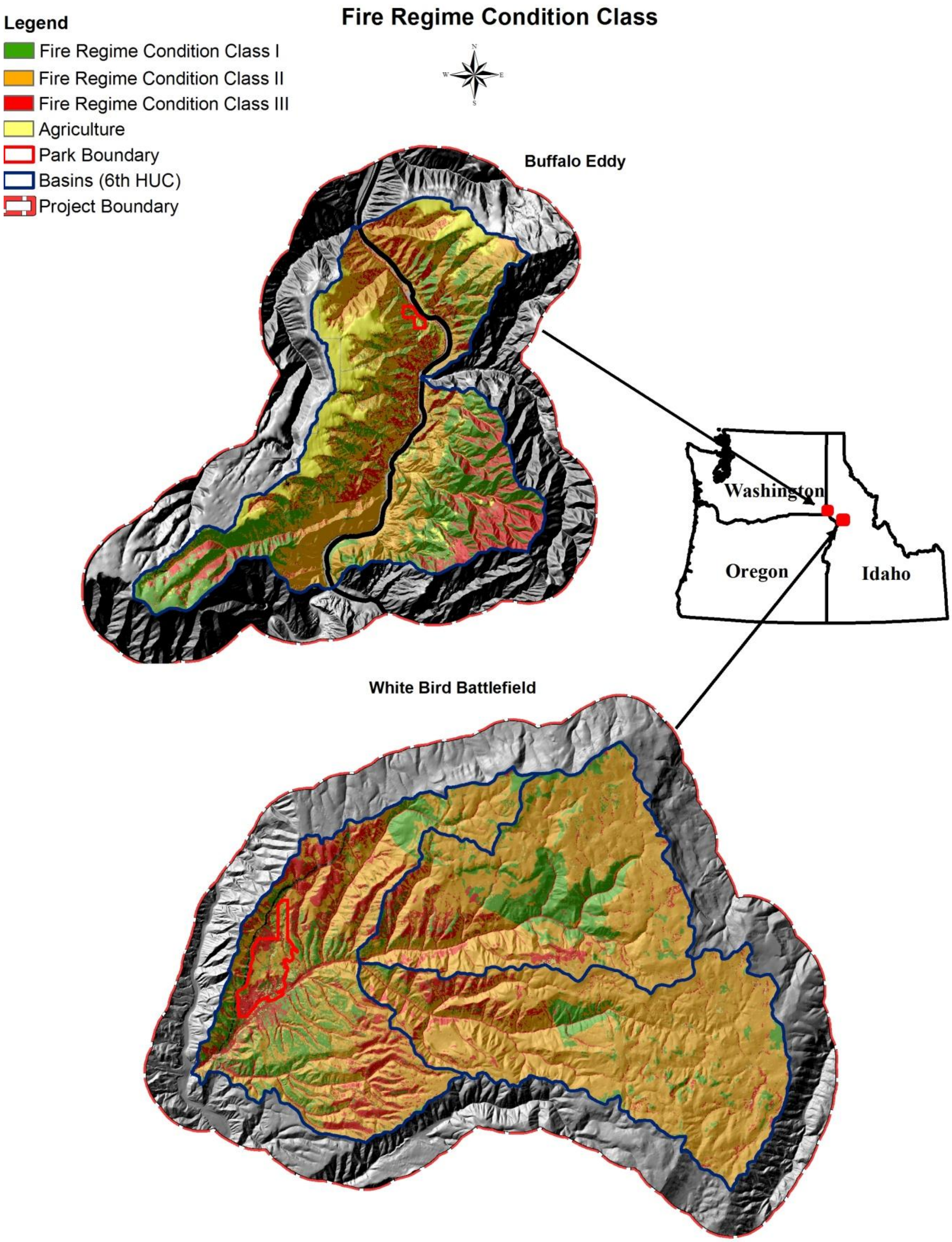

Figure 40. Maps of Fire Regime Condition Class for the Buffalo Eddy and Whitebird Battlefield units in NEPE.

Noxious Weeds

Garrett et al. (2007) developed a list of important noxious and non-native plant species based on the knowledge of NPS park staff. They identified ten invasive and noxious weed species for NEPE. This report begins with this list and then examined recent inventories, the current plant list for NEPE and the field work for this report to assess site specific conditions.

An inventory of plant species was conducted in the Buffalo Eddy and Weippe Prairie units in 2006 and 2007 (ICDC 2007). During the site-specific field investigations for this report in 2008, a species list was developed for each plot and the occurrence of noxious weeds was extracted from the list. The site-specific field investigation purpose was to assess the overall condition of natural resource processes and did not necessitate development of a complete species list for the units and some noxious species may have missed during the field investigation.

Table 16 summarizes the occurrence of noxious and invasive species for each source of data. A total of 20 species were identified from all lists and studies, with 18 listed as noxious weeds by the states of Idaho, Oregon, and Washington (IAC 2009, ODA 2009, and WSNWCB 2009). Noxious weeds are selected and classified differently by state. Thirteen species in Table 16 are listed by all three states. Three species are listed by both Oregon and Washington and one each by Oregon and Washington.

Fifteen of the noxious weed species in Table 16 are found in the official vascular plant list (370 species) for NEPE (http://science.nature.nps.gov/im/units/ucbn/inventory/index.cfm#table). The noxious weed species not found on the list are due mainly to the increased efforts to document the conditions in the park units and not necessarily actual increases in noxious weed infestations.

Yellow starthistle was described as a dominant species in the Buffalo Eddy unit (ICDC 2007). The study documented 143 plant species, of which 46 (32%) were non-native and three were listed noxious weeds by the state of Washington. Native plants only existed on very steep slopes and rock outcrops that precluded past livestock grazing. Non-native grasses also dominated the Weippe Prairie unit (ICDC 2007). Creeping bentgrass (*Agrostis stolonifera*), timothy (*Phleum pretense*), and meadow foxtail (*Alopecurus pratensis*) were listed as the dominant grass species. Even though the majority of the unit was used for hay and pasture production, the inventory documented 162 plant species, of which only 47 (29%) were non-native and three were listed as noxious weeds by the state of Idaho. Past land use practices highly disturbed the native plant composition in both units, yet they still continue to support a large number of native plant species.

A detailed plant inventory was not available for the Old Chief Joseph Gravesite or Whitebird Battlefield units. The field investigation for this report indentified 24 plant species in the Old Chief Joseph Gravesite unit, with seven (29%) non-native species and one listed noxious weed by the state of Oregon. Native plants dominated the unit except for a Kentucky bluegrass (*Poa pratensis*), a non-native grass (Appendix C). Thirty four plant species were identified in the Whitebird Battlefield unit and 22 (65%) were non-native with six listed as noxious weeds by the state of Idaho. Cheatgrass, yellow starthistle, and field bindweed (*Convolvulus arvensis*) dominated most of the unit with native species accounting for a minor percentage of the canopy cover (Appendix C).

Table 16. List of invasive and noxious weed species identified as important or located within NEPE boundaries.

Common Name	Scientific Name	Listed Noxious Weed in Idaho, Oregon, or Washington	Monitoring Plan 2007	NEPE Plant List 2005	Inventory Weippe Praire and Buffalo Eddy 2006-7	NRCA Plots 2008
Jointed Goatgrass	*Aegilops cylindrica*	I,O,W	x			
Hoarycress	*Cardaria draba*	I,O,W	x	x		
Spotted Knapweed	*Centaurea maculosa*	I,O,W	x	x		
Yellow Starthistle	*Centaurea solstitialis*	I,O,W	x	x	x[1]	x[1,3]
Canada Thistle	*Cirsium arvense*	I,O,W	x	x	x[2]	
Bull thistle	*Cirsium vulgare*	O,W				x[1]
Poison Hemlock	*Conium maculatum*	I,O,W	x	x		
Field bindweed	*Convuvulus arvensis*	I,O,W	x	x		x[3]
Houndstongue	*Cynoglossum officinale*	I,O,W	x	x	x	x[3,4]
Common Tansy	*Descurainia pinnata*		x			
Teasal	*Dipsacus fullonum*		x	x		
Orange Hawkweed	*Hieracium aurantiacum*	I,O,W			x[2]	x[2]
St John's-wort	*Hypericum perfoliatum*	O,W		x		
Kochia	*Kochia scoparia*	O,W		x		
Dalmatian Toadflax	*Linaria dalmatica*	I,O,W	x	x		x[3]
Yellow Toadflax	*Linaria vulgaris*	I,O,W	x			x[3]
Scotch Thistle	*Onopordum acanthium*	I,O,W	x	x	x[1]	
Reed Canarygrass	*Phalaris arundinacea*	W		x	x[2]	
Bohemian Knotweed	*Polygonum x bohemica*	I,O,W		x		x[5]
Medusahead	*Taeniatherum caput-medusae*	O		x		x[3]

[1] Noxious weed species found in the Buffalo Eddy unit.

[2] Noxious weed species found in the Weippe Prairie unit.

[3] Noxious weed species found in the Whitebird Battlefield unit.

[4] Noxious weed species found in the Old Chief Joseph Gravesite unit.

[5] Noxious weed species found in the Spalding unit.

Noxious weed location maps outside NEPE boundaries were not available in GIS data format. The state of Oregon's Weedmapper website (http://www.weedmapper.org/) does provide maps on screen for noxious weeds. Figure 41 is a composite of screen captured maps for Dalmatian toadflax and yellow starthistle in Wallowa County outside the Old Chief Joseph Gravesite unit boundaries.

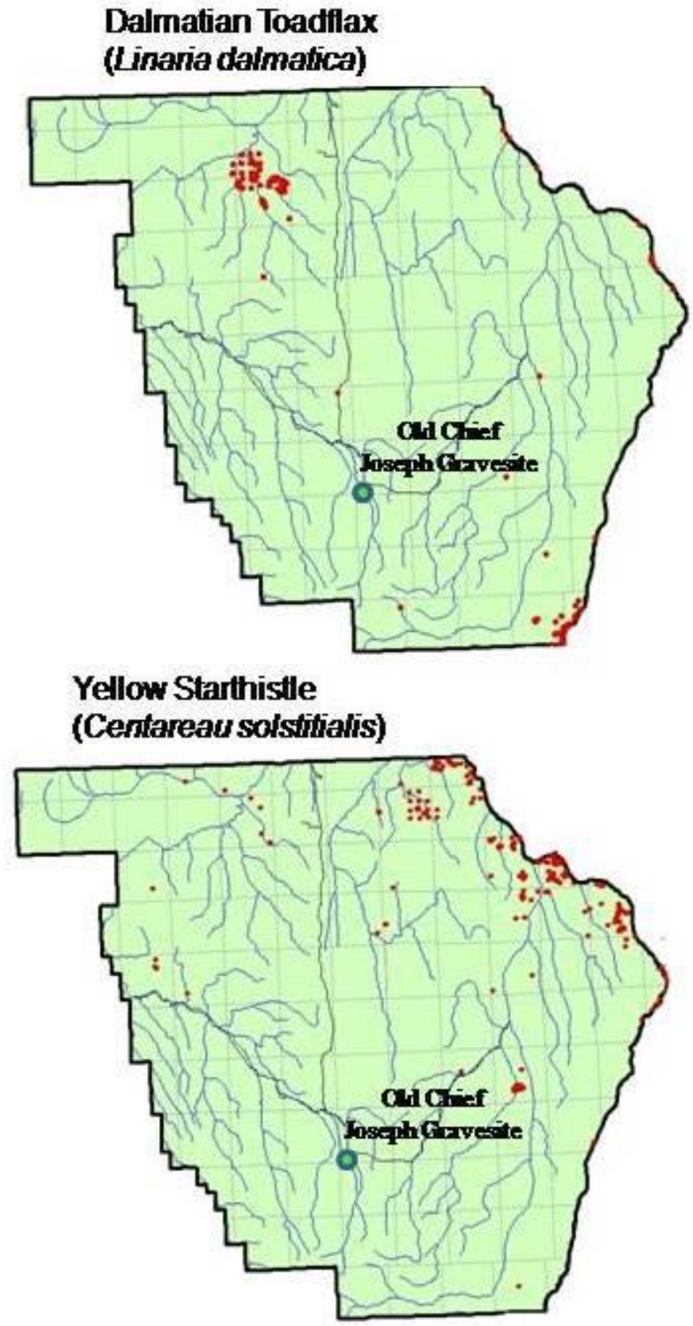

Figure 41. Maps of the locations of two noxious weeds in Wallowa County, Oregon, from the Oregon Department of Agriculture's Weedmapper website (http://www.weedmapper.org/).

Management of all species of noxious weeds is important for good stewardship of natural resources. Some species pose greater threats to the natural resources of NEPE and are not necessarily the most abundant at the present time. The Pacific Northwest Weed Management Handbook (Peachey 2009) describes five major management options for land managers. Below is a summary of the options:

1. Prevention is the most cost effective method for management of noxious species.
2. Biological management in the use of other organisms against noxious or invasive weeds.
3. Cultural management techniques integrate numerous components to minimize the impact of noxious weeds.
4. Mechanical management physically manipulates the noxious weed directly or the ground to kill or prevent sprouting.
5. Herbicides are chemicals used in many forms, liquid or solids, to directly kill or prevent germination of noxious weeds.

Prevention should be the highest priority for vegetation management activities. All management planning involving ground disturbing activities should include a section on revegetation and invasive weed control. Most noxious and invasive weed species initially become established on disturbed sites and preventing colonization should always be the goal. Another prevention option is being actively involved with outside organizations focused on weed management.

The Oregon Department of Agriculture has a Noxious Weed Program with a staff stationed in eight cities throughout Oregon and a State Weed Board. The State Weed Board establishes priorities for management activities and award grant funds for county and local activities. Each county has one or more people responsible for noxious weed control on private lands. Complete descriptions of the ODA Noxious Weed Program can be found at http://www.oregon.gov/ODA/PLANT/WEEDS/. Idaho has established Cooperative Weed Management Areas (CWMA) defined by distinguishable hydrologic, vegetative, or geographic zone based upon geography, weed infestations, climatic or human-use patterns. A CWMA may be composed of a portion of a county, a county, portions of several counties, or portions of more than one state. CWMAs are formed by landowners and land managers in a given area for the purpose of working cooperatively to control noxious weeds and CWMA program details can be found online at http://www.idahoag.us/Categories/PlantsInsects/NoxiousWeeds/cwmas.php. In Washington each county has a County Weed Board (CWB) responsible for noxious weed control on private lands in their jurisdiction. Complete descriptions of all CWB can be found at http://www.nwcb.wa.gov/links.htm.

Cooperation with adjacent landowners, private and public, is the most effective method to prevent and control noxious weeds. NEPE management units are geographically located in several weed management areas. The Buffalo Eddy unit is located in the Asotin County Weed Control Board jurisdiction. The Old Chief Joseph Gravesite unit is located in the Wallowa County Weed Control area. Weippe Prairie is a part of the Clearwater Basin CWMA and Whitebird Battlefield is in the Salmon River CWMA, which the NPS are participating members

(NPS 1999a). Coordinating weed prevention and control efforts reduce the cost of noxious weed management and increase the effectiveness of management activities.

Internally, NEPE follows an integrated pest management plan (IPM) for invasive weed species and other pests (NPS 1999a). The plan identifies the thresholds that must be reached prior to the use of mechanical, chemical, or biocontrol control methods for poison hemlock (*Conium maculatum*), spotted knapweed (*Centaurea maculosa*), thistles (*Cirsium* spp.), yellow starthistle, and other noxious weed species. The plan stresses monitoring before and after treatment to determine efficacy of the treatment and ensure cultural and environmental effects are minimal. The IPM plan also recognizes revegetation of treatment sites is necessary to prevent the re-establishment of the targeted noxious plant species.

Wildfire and Prescribed Fire/Noxious Weed Interaction

Wildfires are a natural process in the short grass ecoregion and can be expected to occur outside of the park unit boundaries. NEPE has established a goal to “aggressively control all unplanned wildfires…” along with the goal of protecting natural and cultural resources from damage by fire (NPS 2004). NEPE recognize their park units are relatively small and are surrounded by private lands. Prescribe fire can be used to either control invasive species or restore historical fire regimes. However, the decision to use fire as a management tool must consider the potential interrelationships between fire and invasive species.

Historical fire regimes did not occur in the presence of invasive plants, and the use of fire may not be a feasible or appropriate management action if fire tolerant invasive plants are present (Brooks and Pyke 2001). Many non-native plant invasions increase fire frequency by increasing the fuel surface-to-volume ratio, increasing horizontal fuel continuity, and creating a fuel packing ratio that facilitates ignition. At the same time, these invasions generally decrease, and change the spatial pattern of fire intensity and soil heating as discontinuous, woody shrubland fuels are replaced by more continuous, herbaceous grassland fuels (Brooks et al. 2004). The management of fire and invasive plants must be closely integrated for each to be managed effectively.

Land Use Changes

While conducting the site specific assessments it was very apparent that a major threat to natural resource values at the Old Chief Joseph Gravesite and Weippe Prairie units comes from changes in land use on adjacent private lands. Both these units are surrounded by private land being used for homes and agricultural practices (Figure 42). Agricultural lands are often targeted for development of rural homesites because of the gentle topography and reduced costs for infrastructure development. NPS owned lands will not be developed, which makes lands adjacent to them attractive for private development. Additional homes and other developments, such as roads and recreation facilities, will increase susceptibility to invasive plants and negatively impact the use of park lands by sensitive wildlife species. Future developments could also negatively impact surface water flows by changes to natural landscape patterns through excavation and construction that can concentrate surface water flows and harden surfaces, which prevent water infiltration and increases overland flow. Trespass issues may also increase in areas where the park boundaries are not well marked. In 2007 the Oregon Department of Parks and Recreation purchased 62 acres (referred to as the Marr Ranch) adjacent and north of the Old

Chief Joseph Gravesite to prevent development of home sites and protect the integrity of the cemetery and cultural resources on the purchased property.

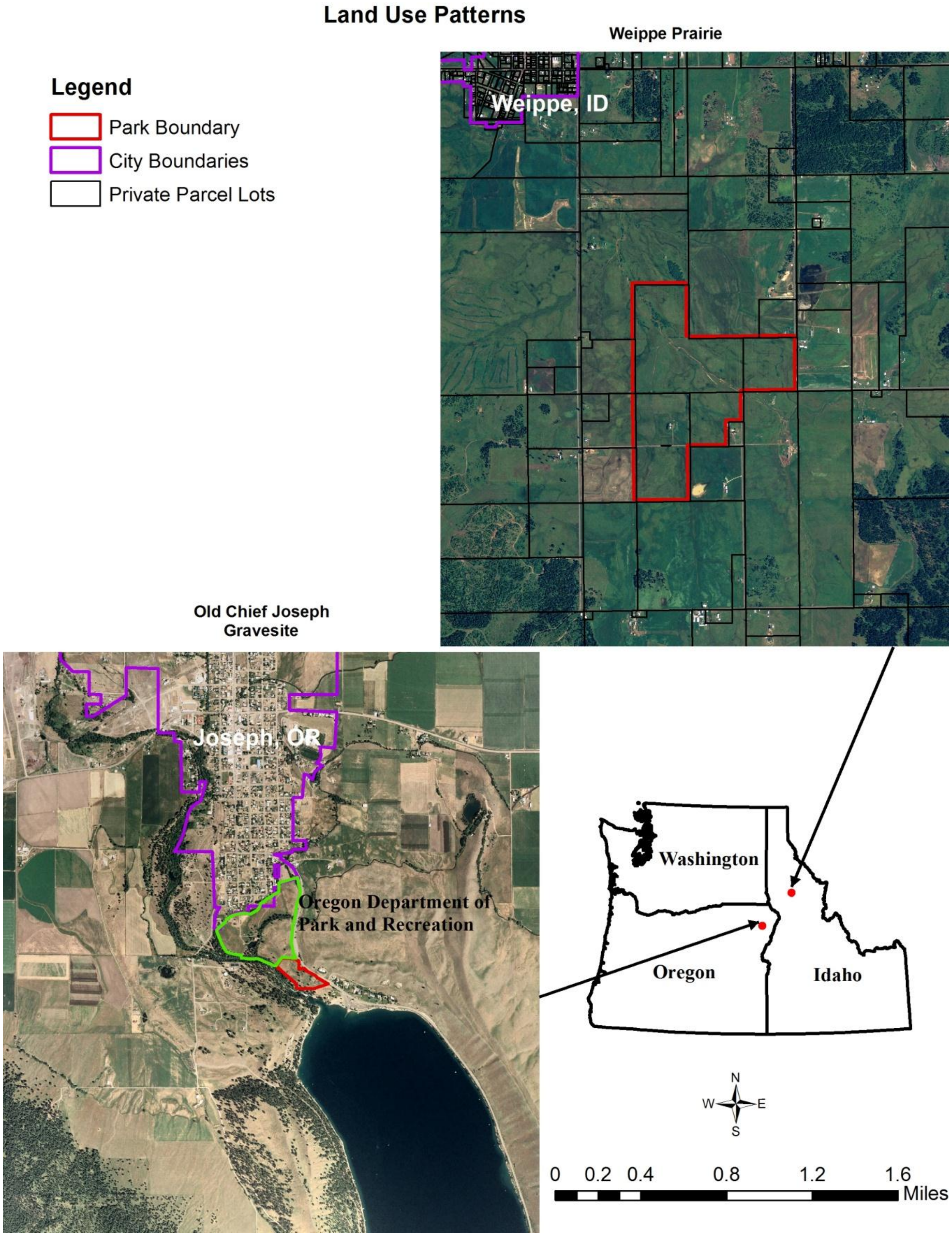

Figure 42. Maps of Old Chief Joseph Gravesite and Weippe Prairie units showing the location of cities and private lands.

Aquatic Resources

Aquatic resource threats/stressors in NEPE units include invasive riparian species, recreational use, fine sediments, and land use practices. Each aquatic resource threat is described in more detail below in addition to discussions of potential strategies to address the risks that are threatening onsite aquatic resources

Invasive Riparian Species

Reed canarygrass (*Phalaris arundinacea*) and Bohemian knotweed (*Polygonum cuspidatum*) exist in varying quantities in NEPE riparian areas, especially Lapwai Creek in the Spalding unit. These invasive species are problematic because they form large, single-species stands that out compete native species. Riparian invasive species will become a much greater concern for managers if not held in check through constant noxious weed management of riparian areas. Prevention of new and spreading colonies of reed canarygrass and Bohemian knotweed is the most efficient and cost effective method of management and control. This is especially true for the Weippe Prairie unit where canaryreed grass is common along the roadside ditches near the unit. Prevention can be accomplished by maintaining complex native overstory canopies. Both of these invasive species require large amounts of light penetration to the soil surface for seed germination. Maintaining a healthy overstory component will reduce the chances of establishment and spread of both species. Additional means of control include jute matting with an additional three to four inches of mulch that will prevent sunlight from getting to the invasive plants long enough to allow overstory vegetation to mature. Managers must be persistent in control efforts over time because once established invasive species will likely never be fully eradicated from NEPE lands.

Recreational Land Use

Recreational use at NEPE units is a common occurrence due to the number of tourists visiting the park sites each year. The Spalding site likely receives the most use; therefore Lapwai Creek has the greatest potential for human-induced impacts. It is important to manage use of the onsite aquatic resources in a way that educates the public without compromising the integrity of the resource. This can be accomplished by ensuring healthy vegetated riparian buffers exist around all NEPE streams to protect instream resources from surrounding land use impacts. Park managers should also educate the public about the importance of restricting access within riparian areas and staying on park trails or roads. An educational riparian area sign and platform that allows tourists to view riparian areas would be good additions to the park. Educational signs could demonstrate to the public the importance of riparian areas for benefiting aquatic and terrestrial resources.

Fine Sediments

Fine sediment deposited on streambeds after salmonids spawn reduces the survival from egg to fry if levels are excessive. Fine sediment also affects the number and diversity of invertebrates, which provides an important food resource for salmonids. Fine sediments are produced in the uplands, transported towards a stream where they are either deposited on the banks or enter the stream. As channels migrate laterally, streambanks are eroded and fine sediments enter the stream. Grazing, agricultural practices, upstream timber harvest, and roadway development have all resulted in accelerated sediment production and delivery to NEPE surface waters and stream channels. It is difficult to manage sediment loading onsite when it is the result of upstream land use activities; however, it is possible to help control and prevent fine sediments from entering NEPE streams from onsite sources. In some cases, particularly in smaller streams, wood can be used to retain sediment (creating step pools along steeper gradient reaches), promote bed and bank stability, and thereby reduce the volume of sediment delivered to downstream reaches. Another effective way to reduce non-point sources of sediment within NEPE park units is to ensure densely vegetated riparian buffers exist to trap sediments prior to delivery to the streams. Most of the sediment problems in NEPE watersheds exist due to channelization of the streams to utilize riparian zones for agricultural activities. Levee setback would be another way to allow some natural sediment processing to occur onsite. Levee setback would allow the streams to laterally migrate and deposit sediments into a network of secondary channels and/or floodplains during high flows.

Land Use Practices

Agricultural practices within NEPE watersheds have resulted in channelization of many streams, loss of floodplain habitat, and reduced vegetative density and overall width of riparian areas. In addition, streams are often followed or crossed by roads and used as transportation corridors. All channelized sections of NEPE streams could be improved by setting back levees, where feasible, to allow for natural stream processes to occur (e.g., floodplain connection, sediment processing, fish habitat development, etc.). Elevated water temperatures are the primary water quality concern in Lapwai Creek (Starkey 2009), which could have significant impacts to resident and anadromous salmonids due to decreases in dissolved oxygen concentrations. Widening riparian areas and increasing riparian plant density would help cool stream water (through shading and groundwater reconnection) and minimize delivery of on-site fine sediment to the streams.

Climate Change

The Intergovernmental Panel on Climate Change (IPCC) is a scientific intergovernmental body set up by the World Meteorological Organization and by the United Nations Environment Program. The IPCC Working Group II focuses on climate change impacts, adaptation, and vulnerability. Parry et al. (2007) published a technical summary of their most recent findings. Listed below are a few of the notable findings from the report.

- Observational evidence from all continents and most oceans show that many natural systems are being affected by regional climate changes, particularly temperature increases.
- A global assessment of data since 1970 has shown it is likely that anthropogenic warming has had a discernible influence on many physical and biological systems.
- Other effects of regional climate changes on natural and human environments are emerging, although many are difficult to discern due to adaptation and non-climatic drivers.
- Some large-scale climate events have the potential to cause very large impacts, especially after the 21st century.
- Impacts of climate change will vary regionally but, aggregated and discounted to the present, they are very likely to impose net annual costs which will increase over time as global temperatures increase.
- Vulnerability to climate change can be exacerbated by the presence of other stresses.

- Future vulnerability depends not only on climate change but also on development pathway.
- Many impacts can be avoided, reduced or delayed by mitigation.

The IPCC Working Group II published a report on many areas of the world. North America was addressed by Field et al. (2007) and they documented three observable connections between climate change and terrestrial ecosystems. They found changes in seasonal timing of life-cycle events and phenology, plant growth or primary production, and biogeographic distribution. They also noted that direct impacts on organisms have indirect effects on ecological mechanisms (competition, herbivory, disease) and disturbance (wildfire, hurricanes, human activities).

Plants green-up and flower earlier in the spring and leaf fall occurs later in the fall. Primary production has increased in North American forests over the past 10 years (Boisvenue and Running 2006). Nesting and breeding occurs earlier, migration is earlier for migratory species, and some species are shifting home ranges to higher elevations or to more northern latitudes.

A warming climate encourages wildfires through a longer summer period that further reduces fuel moisture, promoting easier ignition and faster spread (Boisvenue and Running 2006). Westerling et al. (2006) found that in the last three decades the wildfire season in the western U.S. has increased by 78 days, and burn durations of fires greater than 2,500 acres in area have increased from 7.5 to 37.1 days, in response to a spring/summer warming of 0.87°C.

The Joint Institute for the Study of Atmosphere and Oceans (JISAO) is a cooperative institute between the National Oceanic and Atmospheric Administration (NOAA) and the University of Washington. JISAO has published a report titled “Impacts of climate variability and change in the Pacific Northwest” (Mote et al. 2008). Their modeling predicts warmer, wetter winters, an increase of 3.1° F. by 2030 and a 5% increase in precipitation. Precipitation would come more in the form of rain with smaller snow packs.

The predicted climate changes forecast little change in the annual flow of the Columbia River, but seasonal flows will shift markedly toward larger winter and spring flows and smaller summer and autumn flows (Hamlet and Lettenmaier 1999). The changes in flows will likely coincide with increased water demand, principally from regional growth, but also induced by climate change. Climate change is also projected to impact urban water supplies within the basin. For example, a 3.6° F warming projected for the 2040s would increase demand for water in Portland, Oregon by 1.5 billion gallons per year with an additional demand of 5.5 billion gallons per year from population growth, while decreasing supply by 1.3 billion gallons per year (Mote et al. 2008). The 43 sub-basins in the Columbia River basin have their own sub-basin management plans for fish and wildlife but none comprehensively addresses reduced summertime flows caused by climate change.

The direct and indirect impact of these predicted changes in climate on natural resources at a local scale is uncertain and may not be appropriate projected for parks with unique characteristics (Wiens and Bachelet 2010). Changes could be positive or negative depending on the ecosystem processes, communities, and/or species under consideration. Listed below are specific effects on species and ecosystems attributed to global climate change (Mawdsley et al. 2009, The Heinz Center 2009).

1. Shifts in species distributions, often along elevational gradients.
2. Changes in the timing of life-history events, or phenology, for particular species.
3. Decoupling of coevolved interactions, such as plant-pollinator relationships.
4. Effects on demographic rates, such as survival and fecundity.
5. Reductions in population size.
6. Extinction or extirpation of range-restricted or isolated species and populations.
7. Direct loss of habitat due to sea-level rise, increased fire frequency, bark beetle outbreaks, altered weather patterns, glacial recession, and direct warming of habitats.
8. Increased spread of wildlife diseases, parasites, and zoonoses.
9. Increased populations of species that are direct competitors of focal species for conservation efforts.
10. Increased spread of invasive or non-native species, including plants, animals, and pathogens.

To deal with these potential impacts The Heinz Center (2009) recommends applying an adaptive management framework that (1) identifies actions to achieve management objectives, (2) uses modeling to predict outcomes of management, (3) implements management and monitoring activities, and (4) uses results from monitoring to update management activities. NEPE has initiated this process through the implementation of the UCBN Vital Signs Monitoring Plan (Garrett et al. 2007).

Mawdsley et al. (2009) identified 16 adaptation strategies in the four major adaptive strategies (listed above) to conserve species and ecosystems from the effects of global climate change. Many of the strategies are focused at the national and regional level and would not be applicable to an individual park. The major category titled “Strategies Related to Monitoring and Planning” identifies four adaptation strategies that could be implemented at the park-level and are listed below.

1. Evaluate and enhance monitoring programs for wildlife and ecosystems.
2. Incorporate predicted climate-change impacts into species and land-management plans, programs, and activities.
3. Develop dynamic landscape conservation plans.
4. Ensure wildlife and biodiversity needs are considered as part of the broader societal adaptation process.

Once species and ecosystems identified at risk to global climate change are identified, these four adaptive strategies can be implemented. The current monitoring plan and this watershed based report are the beginnings of meeting items one and three. Future planning can incorporate more specific recommendations based on the results of monitoring efforts within the park and research conducted outside the park.

Some suggested systems to monitor may include:

1. Monitoring change in the plant community and abundance of plant species in the Weippe Prairie’s wet ecosystem may provide early indicators of change in the system due to the

increasing precipitation, increases in temperature, and the associated elevated evapotranspiration.

2. Fire frequency and severity in both the Buffalo Eddy and Whitebird units may increase as wet springs and late winter provide additional precipitation and as summer temperatures increase.
3. Each of the park units may see an increase in weed invasion with the change in temperature and precipitation regimes; thus exacerbating existing weed problems and providing an avenue for new infestations.

Summary and Recommendations

Upland Assessment

This report examined upland sample sites in NEPE covering all four park units using a rapid resource assessment methodology (Pellant et al. 2005). The findings for each site are found in the results section of this report. All but one plot had a soil stability attribute rating of none-slight departure from reference condition. The hydrologic function attribute had seven plots in the slight-moderate departure ratings in two of the five units, Buffalo Eddy and Whitebird Battlefield. The soil integrity attribute indicates that park lands are in good condition, functioning properly and not contributing to soil erosion in their respective watersheds. The hydrologic function attribute is not functioning as well in two park units and may be contributing to water quality degradation, but both units are a minority of their respective watersheds. Based on current soil stability and hydrologic function, ratings should be stable to improving in the future.

The biotic integrity attribute ratings indicated many areas are not in good condition. Only one plot was rated in the none-slight departure category (<21%), eight fell into the slight-moderate category (21%-40%), eight in the moderate category (41%-60%) and one in the moderate-extreme category (61%-80%). All park units examined, except for Whitebird Battle Field and Old Chief Joseph Gravesite, were acquired in the past ten years. Each of the park units, except for Old Chief Joseph Gravesite, have a history of livestock grazing and/or hay production. The poor biotic integrity attribute ratings indicate the three units were in poor condition at the time of acquisition. Because the NPS has changed the management focus away from livestock use the biotic integrity rating should improve over time. Future projects, such as vegetation mapping and vital sign monitoring, will provide geographically-based information that will allow for more detailed analysis of vegetation succession and distribution. This information will provide managers with the ability to compare physiographic and other landscape attribute relationships to vegetation patterns. Vegetation management plans can be developed with this type of detailed information that when implemented will begin the process of reducing non-native and noxious plants and increasing native plants and the ecosystem processes they support.

The PFC evaluation of all three lotic riparian sites at NEPE resulted in a summary determination of “Nonfunctional” (Table 17). These riparian areas are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows, and thus are not reducing erosion, improving water quality, and sustaining desirable channel and riparian habitat characteristics. Lapwai Creek channel confinement creates an unnatural system that is not currently capable of naturally dissipating stream energy and functioning properly. Whitebird Creek channel confinement creates an unnatural system that is not currently capable of naturally dissipating stream energy and functioning properly. Jim Ford Creek riparian area does not provide adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and has a long history of pre-NPS agricultural land use practices on-site and throughout the watershed. As a result, all three streams will continue to be non-functional until channel confinement pressure is reduced through levee setback that allows natural stream sinuosity and floodplain connectivity to be re-established.

Table 17. Summary of ratings for three lotic and one lentic aquatic habitat sampling sites in NEPE.

Site	Functional Rating	SMI Score	HBI Score
Spalding – Lapwai Creek	Non-Functional	44 (Fair)	5.5 (Good)
Whitebird Battlefield – Whitebird Creek	Non-Functional	58 (Fair)	4.1 (Very Good)
Whitebird Battlefield – Swartz Pond	Proper Functioning		
Weippe Prairie – Jim Ford Creek	Non-Functional		

The Lapwai and Whitebird Creeks received Idaho SMI scores corresponding to a "fair" ecological condition (Table 17). They received a HBI value of "good" and "very good" water quality conditions, respectively. Both benthic index results suggest both sites are currently supporting and maintaining a relatively balanced community of organisms that have the composition, diversity, and functional organization comparable to that of natural habitat within the same region.

The PFC evaluation of Swartz Pond on the Whitebird Battlefield unit resulted in a summary determination of "Proper Functioning Condition" (Table 17). Properly functioning lentic riparian-wetland areas are those that contain adequate vegetation, landform, or debris. Although Swartz Pond requires the presence of the man-made earthen dam to continue to function properly, it is providing wildlife habitat and biodiversity that would otherwise be deficient throughout much of the unit. Biodiversity of plant and wildlife species could be improved by increasing the complexity of habitat types.

Threats and Stressors

Threats and stressors thought to be the most important to management of NEPE's natural resources were examined using available information and the conclusions and recommendations are summarized in the following sections.

Fire

Historically, fire was the most prevalent natural disturbance process in these ecosystems. Fire is the dominant process influencing composition, diversity, energy, and nutrient cycles (Kauffman et al. 1997). Wildfire originating within or adjacent to park lands is a threat to the upland resources at NEPE. The data presented in the report indicates the watersheds surrounding the park units have not experienced wildfire for many years and have a higher likelihood for experiencing wildfire. Fire Regime Condition Class ratings are moderate in areas outside the Buffalo Eddy and Whitebird Battlefield units. Both units had major fires within the project watershed boundaries in 2000, which reduced the hazard ratings.

The risk of wildfire within the two NEPE units described above is relatively high due to the domination of annual forbs and grasses. Big sagebrush communities have experienced major declines in the past 150 years principally from land conversion, and increased fire frequencies created by invasion of annual grasses, like cheatgrass and medusahead (Kitchen and McArthur 2007). Mean fire return intervals for big sagebrush communities were estimated from post-fire succession rates to be from 40-80 years and up to 200 years for Wyoming sagebrush found in drier environments (Kitchen and McArthur 2007). Perennial bunchgrass communities have also experienced transition to annual grass dominated communities due to shorter fire return intervals (<20 years).

Prescribed fires can have a similar negative impact on perennial bunchgrass communities where cheatgrass and medusahead are dominant (Whisenant 1990, Pellant 1996, Reid et al. 2008). Cheatgrass and medusahead are especially competitive with perennial plants after a wildfire when additional nitrogen is released by the burning of standing biomass and litter (Pellant 1996). Cheatgrass and medusahead dominated communities are very difficult to rehabilitate and can significantly decrease fire return intervals from >70 years to <5 years (Billings 1994, Pellant 1996, Archer 2001). Prescribed fire is not a successful control method for annual noxious weeds like yellow starthistle (DiTomaso et.al. 2006). Current park management should maintain or improve biotic condition with the prevention of prescribed fires in degraded habitats and suppression of all wildfires.

Noxious Weeds

Table 16 summarizes the occurrence of noxious and invasive species researched for this report. A total of 20 species were identified from all lists and studies, with 18 listed as noxious weeds by the states of Idaho, Oregon, and Washington (IAC 2009, ODA 2009, and WSNWCB 2009). Yellow starthistle is a dominant species in the Buffalo Eddy unit and a major species in the Whitebird Battlefield unit.

Management of all species of noxious weeds is important for good stewardship of natural resources. Some species pose greater threats to the natural resources of NEPE but are not necessarily the most abundant at the present time. The Pacific Northwest Weed Management Handbook (Peachey 2008) describes five major options for land managers. Below is a summary of the options.

1. Prevention is the most cost effective method for management of noxious species.
2. Biological management is the use of other organisms against noxious or invasive weeds.
3. Cultural management techniques integrate numerous components to minimize the impact of noxious weeds.
4. Mechanical management physically manipulates the noxious weed directly or the ground to kill or prevent sprouting.
5. Herbicides are chemicals used in many forms (liquid or solids) to directly kill or prevent germination of noxious weeds.

Cooperation with adjacent landowners, private and public, is the most effective method to prevent and control noxious weeds. To this end, NEPE participates in the Salmon River and Clearwater Basin Cooperative Weed Management Areas, which has members from local, state, federal, and private organizations.

Aquatic Habitat Threats

Riparian invasive species will become a much greater concern for managers if not controlled through constant noxious weed management. Prevention of new and spreading colonies of reed canarygrass and Bohemian knotweed is the most efficient and cost effective method of management and control. Prevention can be accomplished by maintaining complex native overstory canopies. Maintaining a healthy overstory component will reduce the chances of establishment and spread of both species. Additional means of control include jute matting with an additional three to four inches of mulch that will prevent sunlight from getting to the invasive plants and allow overstory vegetation to mature. Managers must be persistent in control efforts over time because once established invasive species will likely never be fully eradicated from NEPE lands.

Fine sediment deposited on streambeds after salmonids have spawned will reduce the survival from egg to fry if levels are excessive. Fine sediment also affects the number and diversity of invertebrates, which provides an important food resource for salmonids. It is difficult to manage sediment loading found in streams within the park resulting from upstream land use activities. However, it is possible to help control and prevent fine sediments from entering NEPE streams from onsite sources. In smaller streams, wood can be used to retain sediment by creating step pools along steeper gradient reaches. Wood debris also promotes bed and bank stability. Another effective method for reducing non-point sources of sediment is to maintain densely vegetated riparian buffers that trap sediments prior to delivery into streams.

Climate Change

The direct and indirect impact of predicted changes in climate on natural resources at NEPE is complex and difficult to manage. Changes could be positive or negative depending on the ecosystem processes, communities, and/or species under consideration. Listed below are specific effects on species and ecosystems attributed to global climate change (Mawdsley et al. 2009, The Heinz Center 2009).

1. Shifts in species distributions, often along elevational gradients.
2. Changes in the timing of life-history events, or phenology, for particular species.
3. Decoupling of coevolved interactions, such as plant-pollinator relationships.
4. Effects on demographic rates, such as survival and fecundity.
5. Reductions in population size.
6. Extinction or extirpation of range-restricted or isolated species and populations.
7. Direct loss of habitat due to sea-level rise, increased fire frequency, bark beetle outbreaks, altered weather patterns, glacial recession, and direct warming of habitats.
8. Increased spread of wildlife diseases, parasites, and zoonoses.
9. Increased populations of species that are direct competitors of focal species for conservation efforts.
10. Increased spread of invasive or non-native species, including plants, animals, and pathogens.

Mawdsley et al. (2009) identified 16 adaptation strategies in the four major adaptive strategy categories to conserve species and ecosystems from the effects of global climate change. Many of the strategies are focused at the national and regional level and would not be applicable to an individual park. The major category titled "Strategies Related to Monitoring and Planning" identifies four adaptation strategies that could be implemented at the park-level, which are listed below.

1. Evaluate and enhance monitoring programs for wildlife and ecosystems.
2. Incorporate predicted climate-change impacts into species and land management plans, programs, and activities.
3. Develop dynamic landscape conservation plans.
4. Ensure wildlife and biodiversity needs are considered as part of the broader societal adaptation process.

General Threats and Stressors

Due to the lack of consistent quantitative information on many threats and stressors, impacts were evaluated in a qualitative manner. Table 18 is an overall estimate of the potential impact to the three major landscape attributes from the threats and stressors reported previously; wildfire, noxious weeds, and land use changes for upland habitats and invasive riparian species, recreational land use, fine sediments, and land use practices for aquatic habitats and climate change. The actual impact from these threats and stressors to any specific site will vary depending on the existing natural resource and landscape setting.

Table 18. Matrix of potential impact from threats/stressors examined in this report to the major resources/processes at NEPE.

Threats/Stressors	**Major Resources/Processes**		
Upland Habitats	**Soils**	**Hydrologic**	**Biotic**
Wildfire	Moderate	High	High
Noxious weeds	Low	Moderate	High
Land Use Change	Moderate	Moderate	High
Aquatic Habitats			
Invasive Riparian Species	Low	High	High
Recreational Land Use	Moderate	High	Moderate
Fine Sediments	Moderate	High	Moderate
Land Use Practices	Low	Moderate	High
All Habitats			
Climate Change	Low	High	Moderate
Key to Rating for Threats/Stressors			
Potential impact to resource	High	Moderate	Low

Data Gaps

Many types of information were not available for this report. We have summarized below important data that would improve natural resource management by NEPE staff. We did not estimate cost or indicate agency responsibility due to the extensive nature of the data. This hopefully will provide guidance to NEPE staff on future data collection efforts within and outside the park.

1. Accurate and standardized land cover/use mapping for the project area that meets National Map Accuracy Standards (± 40’) and is repeatable over time. This information is very important for any watershed modeling of water quality attributes, wildfire risk assessment, and other resource values.
2. Noxious weed maps in digital format on adjacent private and public lands within the project boundary. Currently no county, state, federal, or other organization collect and map noxious weed locations in the NEPE project area. Managers would be more aware of possible new invaders and could develop better management strategies for existing species with this information.

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Appendix A – List of NRCA Geodatabase Data by Theme

Theme	Layer Name[1]
Air Resources	
Animal	
Steelhead habitat	nepebe_steelhead
Bull Trout habitat	nepebe_bulltrout
Climate	
Precipitation	Precipitation
Temperature	tempave
Geography	
Roads	nepebe_roads
Highways	nepebe_highways
NRCA Plots	nepebe_nrca_plots
Park Boundary	nepebe_bndy
Public Land Survey System	nepebe_PLSS
Project Bounday	nepebe_projbndy
Cities	nepebe_cities
Geology	
Geology	nepebe_geology_MUID
Park Soils	nepebe_soils
Land_Process	
Landuse	
Land Ownership	nepebe_ownership
Plant	
Stressors	
Wildfire Perimeters	nepebe_burn_perimeters
Wildfire Starts	nepebe_wildfire_starts
Water Resources	
Watershed Basin - 6th HUC	basins_nepebe
Major Streams	nepebe_streams
Lakes	water_bodies
303d Listed Streams	nepebe_streams303d
Springs	water_sources
Streams (all)	nepebe_water_courses_all
NRCA Aquatic Plots	aquatic_plots
Raster Data	
Digital Elevation Model	nepebe_dem
Hillshade	nepebe_hlsd
Existing Vegetation (LANDFIRE)	nepebe_evt
Fire Regime Condition Class (LANDFIRE)	nepebe_frcc

[1] – Each park Unit has a separate geodatabase and layers are name by the convention of “nepe” plus the 2 letter designate for each Unit; “be” = Buffalo Eddy, “oj” = Old Chief Joseph Gravesite, “sp” = Spalding, “we” = Weippe Prairie, and “wb = Whitebird Battlefield.

Appendix B – Landscape Indicator scores by Plot for Upland Assessment

Plot No.	Park Unit	Ecological Reference Code	Soil Name	1. Rills	2. Waterflow	3. Pedestal	4. Bare	5. Gullies	6. Wind	7. Litter	8. Soil Surface	9. Soil Degredation
1	Buffalo Eddy	R009XY203 WA	Laufer	N-S	N-S	N-S	S-M	N-S	N-S	N-S	M	M
2	Buffalo Eddy	R009XY203 WA	Rocky	N-S	N-S	N-S	S-M	N-S	N-S	N-S	M	S-M
3	Buffalo Eddy	R009XY203 WA	Laufer	N-S	N-S	N-S	N-S	N-S	N-S	N-S	S-M	S-M
4	Buffalo Eddy	R009XY203 WA	Laufer	N-S	N-S	N-S	N-S	N-S	N-S	N-S	S-M	M
11	Old Chief Joseph Gravesite	R009XY018 OR	Rondowa	N-S	N-S	N-S	N-S	N-S	N-S	N-S	S-M	S-M
12	Old Chief Joseph Gravesite	R009XY018 OR	Rondowa	N-S	N-S	N-S	N-S	N-S	N-S	N-S	N-S	N-S
111	Weippe Prairie	(Wetland soil)	Gramil-Lewhand	N-S	N-S	N-S	N-S	N-S	N-S	N-S	N-S	N-S
112	Weippe Prairie	(Wetland soil)	Gramil-Lewhand	N-S	S-M	N-S	S-M	S	N-S	N-S	S-M	N-S
113	Weippe Prairie	(Wetland soil)	Lewhand-Burtcreek	N-S	N-S	N-S	N-S	N-S	N-S	N-S	N-S	N-S
114	Weippe Prairie	(Wetland soil)	Lewhand-Burtcreek	N-S	N-S	N-S	S-M	N-S	N-S	N-S	N-S	N-S
115	Weippe Prairie	(Wetland soil)	Gramil-Reggear	N-S	N-S	N-S	N-S	N-S	N-S	N-S	N-S	N-S
1111	Whitebird Battlefield	R009XY006ID	Banner	N-S	N-S	N-S	N-S	N-S	N-S	N-S	M	N-S
1112	Whitebird Battlefield	R009XY012ID	Tanahill	N-S	S-M	S-M	S-M	N-S	N-S	M	M	M
1113	Whitebird Battlefield	R009XY012ID	Tanahill	N-S	N-S	N-S	N-S	N-S	N-S	S-M	S-M	M
1114	Whitebird Battlefield	R009XY002ID	Lawyer	N-S	N-S	N-S	S-M	N-S	N-S	M	N-S	S-M
1115	Whitebird Battlefield	R009XY006ID	Banner	N-S	N-S	N-S	N-S	N-S	N-S	N-S	M	S-M
1116	Whitebird Battlefield	R009XY012ID	Tanahill	N-S	N-S	N-S	N-S	N-S	N-S	N-S	M	M
1117	Whitebird Battlefield	R009XY006ID	Banner	N-S	N-S	N-S	S-M	N-S	N-S	N-S	M	S-M

Appendix B (continued).

Plot No.	Park Unit	Ecological Reference Code	Soil Name	10. Plant Canopy Cover	11. Compaction	12. Function Structure	13. Plant Mortality	14. Litter Amount	15. Annual Production	16. Invasive Species	17. Reproduction
1	Buffalo Eddy	R009XY203 WA	Laufer	S-M	N-S	M-E	M	M	M	E	M-E
2	Buffalo Eddy	R009XY203 WA	Rocky	S-M	N-S	M-E	M	M	M	M-E	M
3	Buffalo Eddy	R009XY203 WA	Laufer	S-M	N-S	S-M	M	S-M	N-S	S-M	S-M
4	Buffalo Eddy	R009XY203 WA	Laufer	M	N-S	E	M	M-E	M-E	E	M-E
11	Old Chief Joseph Gravesite	R009XY018 OR	Rondowa	N-S	N-S	M	N-S	N-S	N-S	M	S-M
12	Old Chief Joseph Gravesite	R009XY018 OR	Rondowa	N-S	N-S	S-M	N-S	N-S	N-S	S-M	N-S
111	Weippe Prairie	(Wetland soil)	Gramil-Lewhand	N-S	N-S	M-E	N-S	S-M	S-M	M	S-M
112	Weippe Prairie	(Wetland soil)	Gramil-Lewhand	N-S	N-S	M-E	N-S	M	S-M	M	S-M
113	Weippe Prairie	(Wetland soil)	Lewhand-Burtcreek	N-S	N-S	M-E	N-S	S-M	S-M	M	M
114	Weippe Prairie	(Wetland soil)	Lewhand-Burtcreek	N-S	S-M	M-E	N-S	S-M	S-M	M-E	S-M
115	Weippe Prairie	(Wetland soil)	Gramil-Reggear	S-M	S-M	M-E	N-S	S-M	M	M-E	S-M
1111	Whitebird Battlefield	R009XY006ID	Banner	M	N-S	M-E	S-M	M	M	E	M-E
1112	Whitebird Battlefield	R009XY012ID	Tanahill	M	N-S	E	S-M	M	M	E	E
1113	Whitebird Battlefield	R009XY012ID	Tanahill	S-M	N-S	E	M	M	M	E	M-E
1114	Whitebird Battlefield	R009XY002ID	Lawyer	S-M	N-S	E	S-M	M-E	M-E	e	M-E
1115	Whitebird Battlefield	R009XY006ID	Banner	S-M	N-S	M	N-S	M-E	S-M	M	M
1116	Whitebird Battlefield	R009XY012ID	Tanahill	M	N-S	E	M	M	M	E	M-E
1117	Whitebird Battlefield	R009XY006ID	Banner	M	S-M	M-E	M	M	M	M-E	M-E

Appendix C – List of Plant Species at NRCA Upland Assessment Points

				Aerial Cover by Plot																	
				Buffalo Eddy				Old Chief Joseph		Weippe Prairie					White Bird Battlefield						
Species Name	Growth Form	Non-Native	Noxious	1	2	3	4	1	2	1	2	3	4	5	1	2	3	4	5	6	7
Achillea millefolium	Forb					10			2	2		0.5								0.5	
Amsinckia retrorsa	Forb				1		5														
Anthemis cotula	Forb	X								1	0.5	1		0.5							
Astragalus canadensis	Forb																	5	10	5	
Astragalus sp.	Forb																0.5				
Brodiaea douglasii	Forb									0.5											
Camassia quamash	Forb									2	15	3		15							
Centaurea solstitialis	Forb	X	X	40	25		15								0.5	70	1	2	1	35	5
Cirsium arvense	Forb	X	X												1						
Cirsium vulgare	Forb	X	X	5			2														
Convolvulus arvensis	Forb	X	X												5	20	20	40	20	25	10
Cynoglossum officinale	Forb	X	X					1													0.5
Delphinium distichum	Forb										0.5			0.5							
Descurainia pinnata	Forb														20	1	1	3	7		15
Eriogonum niveum	Forb				0.5																
Eriogonum strictum	Forb							0.5	2												
Erodium cicutarium	Forb	X								0.5		5									
Galium aparine	Forb																		0.5		
Helianthus annuus	Forb	X																0.5			
Hieracium aurantiacum	Forb	X								0.5	0.5			0.5							
Lactuca serriola	Forb	X													2	5			2		0.5
Lepidium virginicum	Forb																		0.5		
Leucanthemum vulgare	Forb	X								0.5	0.5			0.5							
Linaria dalmatica	Forb	X	X												0.5			15			
Linaria vulgaris	Forb	X	X																0.5		

Appendix C (continued).

				Aerial Cover by Plot																	
				Buffalo Eddy				Old Chief Joseph		Weippe Prairie					White Bird Battlefield						
Species Name	Growth Form	Non-Native	Noxious	1	2	3	4	1	2	1	2	3	4	5	1	2	3	4	5	6	7
Lomatium dissectum	Forb											0.5									
Lupinus arbustus	Forb											1									
Lupinus wyethi	Forb							0.5	5								3				
Machaeranthera canescens	Forb								4												
Madia gracilis	Forb	X													5						
Medicago lupulina	Forb	X								0.5											
Penstemon globosus	Forb									0.5											
Penstemon procerus	Forb											0.5									
Ranunculus uncinatus	Forb										5			5							
Rumex acetosella	Forb	X								0.5											
Solanum dulcamara	Forb	X																		0.5	
Solidago canadensis	Forb										0.5		2	0.5							
Sysimbrium altissimum	Forb						5	0.5													
Toxicodendron radicans	Forb	X															2				
Tragopogon dubius	Forb	X						0.5		0.5							0.5			0.5	
Trifolium repens	Forb	X								0.5											
Vicia angustifolia	Forb	X																0.5			
Vicia villosa	Forb			20	10		25														
Agrostis exarata	Grass	X																			
Bromus inermis	Grass	X						15	2	10											
Bromus japonicus	Grass	X													1	15	5		30	25	
Bromus mollis	Grass	X																		15	
Bromus rigidus	Grass	X		40			10	15													
Bromus spp	Grass	X																	30		
Bromus tectorum	Grass	X		30	50	20	90								45	25	40	50	5	5	50
Dactylis glomerata	Grass	X						3		3	15			15							

Appendix C (continued).

Species Name	Growth Form	Non-Native	Noxious	Aerial Cover by Plot: Buffalo Eddy 1	Buffalo Eddy 2	Buffalo Eddy 3	Buffalo Eddy 4	Old Chief Joseph 1	Old Chief Joseph 2	Weippe Prairie 1	Weippe Prairie 2	Weippe Prairie 3	Weippe Prairie 4	Weippe Prairie 5	White Bird Battlefield 1	White Bird Battlefield 2	White Bird Battlefield 3	White Bird Battlefield 4	White Bird Battlefield 5	White Bird Battlefield 6	White Bird Battlefield 7
Elymus caput-medusae	Grass	X	X												40		1			25	15
Festuca idahoensis	Grass					60		1	35												
Hesperostipa comata	Grass							2													
Juncus effusus	Grass													5							
Juncus tenuis	Grass										5		0.5								
Koeleria macrantha	Grass							2	1												
Leymus cinereus	Grass			0.5				20											8		
Phleum pratense	Grass	X								35	35	40		35							20
Poa pratensis	Grass	X						50	5	5		10			0.5						
Poa secunda	Grass								2												
Pseudoroegneria spicata	Grass			15	40	40		1	25							0.5	5		10		
Stipa comata	Grass															0.5					
Thinopyrum intermedium	Grass	X													2					0.5	15
Ventenata dubia	Grass	X								0.5	4	2	10	4	30				30	30	
Amelanchier alnifolia	Shrub								1												
Artemisia cana	Shrub							1	5												
Artemisia frigida	Shrub							1													
Crataegus douglasii	Shrub											0.5		0.5	0.5		10				2
Prunus virginiana	Shrub							1	0.5												
Rosa woodsii	Shrub							3	1								0.5			0.5	
Sambucus cerulea	Shrub				0.5																
Symphoricarpos albus	Shrub								0.5												
Malus fusca	Tree																			5	2
Pinus ponderosa	Tree							1	1												

Appendix D – Aquatic Site Properly Functioning Condition Checklists and Invertebrate Site Description Forms

Lotic Standard Checklist

Name of Riparian-Wetland Area: NEPE – Lapwai Creek_____________________________
Date: 6/16/08_ Segment/Reach ID: Bridge to mouth____________Acres: _______________
ID Team Observers: Hinson, Ladd____

Yes	No	N/A	HYDROLOGY
	X		1) Floodplain above bankfull is inundated in “relatively frequent” events
X			2) Where beaver dams are present they are active and stable
	X		3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)
	X		4) Riparian-wetland area is widening or has achieved potential extent
	X		5) Upland watershed is not contributing to riparian-wetland degradation
Yes	**No**	**N/A**	**VEGETATION**
X			6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
X			7) There is diverse composition of riparian-wetland vegetation for maintenance/recovery)
	X		8) Species present indicate maintenance of riparian-wetland soil moisture characteristics
X			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
X			10) Riparian-wetland plants exhibit high vigor
	X		11) Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows
	X		12) Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)
Yes	**No**	**N/A**	**EROSION/DEPOSITION**
	X		13) Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
	X		14) Point bars are revegetating with riparian-wetland vegetation
	X		15) Lateral stream movement is associated with natural sinuosity
X			16) System is vertically stable
X			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)

Remarks (numbers correspond to checklist items)

1. No indication of floodplain connection due to channel incision and bank armoring.
2. Active beaver use of reach; Jason Lyon indicates 3-4 dams present during low flow.
3. Reach is wide and shallow with very little sinuosity due to channel confinement.
4. Riparian zone is not widening due to straight chute channel that doesn't allow lateral movement and recolonization of riparian species; upland species present on armored banks but very few wetland species.
5. Cemented, embedded substrate due to upland erosion; invasive plants choking out natives; bridges and channelization are confining channel.
6. Sapling cottonwood are present in addition to middle and mature age classes.
7. Good diversity, but many herbaceous invasive species present.
8. Confined channel with little access to floodplain limits establishment of wetland plants.
9. Banks are being stabilized by mature root masses
11. Invasive herbaceous plants will tend to lay over in high streamflows rather than dissipate flow.
12. Some LWD sources (e.g., cottonwood) but not enough mature woody riparian vegetation to affect channel formation.
13. Very little, if any, floodplain access until reaching the mouth of Lapwai Creek as it flows into the Clearwater River.
14. Chute-like channel limits point bar formation and revegetation.
15. Very little lateral stream movement.
16. Vertical movement due to limited sinuosity – energy dissipation occurs vertically.
17. Single channel with no mid-channel bars.

Summary Determination

Functional Rating:
Proper Functioning Condition _____
Functional – At Risk ______
Nonfunctional __X__
Unknown _____

Trend for Functional – At Risk:
Upward _____
Downward _____
Not Apparent _____

Additional notes:

1. Bohemian Knotweed is beginning to colonize within the narrow riparian, which is going to prevent colonization of native understory.

Are factors contributing to unacceptable conditions outside the control of the manager?

Yes __X__
No _____

If yes, what are those factors?

___ Flow regulations
_X_ Channelization
___ Augmented flows
___ Mining activities
___ Road encroachment
_X_ Other (specify): __Agriculture____________________
___ Upstream channel conditions
___ Oil field water discharge

Lotic Standard Checklist

Name of Riparian-Wetland Area: NEPE – Whitebird Creek ________________________
Date: 6/16/08___Segment/Reach ID: NPS property upstream of day use road Acres: _______
ID Team Observers: Hinson, Ladd ____

Yes	No	N/A	HYDROLOGY
	X		1) Floodplain above bankfull is inundated in "relatively frequent" events
	X		2) Where beaver dams are present they are active and stable
	X		3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)
X			4) Riparian-wetland area is widening or has achieved potential extent
X			5) Upland watershed is not contributing to riparian-wetland degradation
Yes	**No**	**N/A**	**VEGETATION**
X			6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
X			7) There is diverse composition of riparian-wetland vegetation for maintenance/recovery)
	X		8) Species present indicate maintenance of riparian-wetland soil moisture characteristics
X			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
X			10) Riparian-wetland plants exhibit high vigor
X			11) Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows
	X		12) Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)
Yes	**No**	**N/A**	**EROSION/DEPOSITION**
	X		13) Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
	X		14) Point bars are revegetating with riparian-wetland vegetation
	X		15) Lateral stream movement is associated with natural sinuosity
X			16) System is vertically stable
X			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)

Remarks (numbers correspond to checklist items)

1. Channelized Whitebird Creek has very little potential to associate with floodplain.
3. No sinuosity due to channel confinement.
4. Riparian extends to topographic threshold.
8. Vegetation consists mostly of FAC and FAC Upland plants.
9. Stable root structures on banks.
12. Potential source of LWD present but confined chute channel does not allow LWD to stay in channel.
13. Very little LWD and no overflow channels capable of dissipating energy; this is a very high energy system w/o much dissipation due to confinement.
14. No point bars evident.
15. Confinement minimizes natural lateral movement.
17. Minimal erosion from watershed is evident.

Summary Determination

Functional Rating:
Proper Functioning Condition _____
Functional – At Risk _____
Nonfunctional __X__
Unknown _____

Trend for Functional – At Risk:
Upward _____
Downward _____
Not Apparent _____

Additional notes:

1. Good potential exists to re-establish connection with floodplain on NPS property through levee setback.
2. Cannot control land use in upper watershed, which includes grazing and timber management.

Are factors contributing to unacceptable conditions outside the control of the manager?

Yes __X__
No _____

If yes, what are those factors?

___ Flow regulations
_X_ Channelization
___ Augmented flows
___ Mining activities
_X_ Road encroachment
___ Other (specify)______________________________
_X_ Upstream channel conditions
___ Oil field water discharge

Lotic Standard Checklist

Name of Riparian-Wetland Area: NEPE – Jim Ford Creek______________________
Date: 6/17/2008_ Segment/Reach ID: Jim Ford - 1____________Acres: _______________
ID Team Observers: Hinson, Ladd____

Yes	No	N/A	HYDROLOGY
	X		1) Floodplain above bankfull is inundated in "relatively frequent" events
	X		2) Where beaver dams are present they are active and stable
	X		3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)
	X		4) Riparian-wetland area is widening or has achieved potential extent
	X		5) Upland watershed is not contributing to riparian-wetland degradation
Yes	**No**	**N/A**	**VEGETATION**
	X		6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
	X		7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)
	X		8) Species present indicate maintenance of riparian-wetland soil moisture characteristics
	X		9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
	X		10) Riparian-wetland plants exhibit high vigor
	X		11) Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows
	X		12) Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)
Yes	**No**	**N/A**	**EROSION/DEPOSITION**
	X		13) Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
	X		14) Point bars are revegetating with riparian-wetland vegetation
	X		15) Lateral stream movement is associated with natural sinuosity
	X		16) System is vertically stable
	X		17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)

Remarks (numbers correspond to checklist items)

1. No indication of floodplain connection due to channel incision with any evidence of over bank flows.
2. No beaver dams present
3. Reach has a low gradient. The banks consist of fine substrates, which indicates that this stream should be much more sinuous and have lateral movement.
4. The deeply entrenched channel is minimizing riparian connectivity. Riparian zone actually seems to be static or diminishing.
5. Upland watershed has major influence of riparian degradation from agriculture and forestry.
6. No presence of woody species, could thrive if growing
7. There is very little diversity of riparian vegetation composition
8. Very few obligate and fac-wet species present in the riparian zone due to the disconnection with the water table
9. Little to no vegetation exist along stream banks to withstand high streamflow events
10. Vegetation is absent and diminishing due to low water table and stream disconnected by high banks
11. Stream banks are bare and steep
12. No large woody material exists along stream banks due to the lack of an onsite source
13. Reach does not overtop its banks during flood stages
14. Point bars are unstable and highly erosive with minimal vegetation coverage. Vegetation present will not withstand high flow events therefore revegetation is not occurring
15. Stream is incised with steep vertical banks channelizing the stream channel not allowing the reach to move laterally
16. The channel is downcutting
17. Stream banks are unstable with fine substrates. Erosion is excessive and fines abundant.

Summary Determination

Functional Rating:
Proper Functioning Condition _____
Functional – At Risk _____
Nonfunctional __X__
Unknown _____

Trend for Functional – At Risk:
Upward _____
Downward _____
Not Apparent _____

Additional notes:
1. Substrate is silty sand to sandy silt with little to no gravels shows healthy flushing flow events are few.

Are factors contributing to unacceptable conditions outside the control of the manager?
Yes __X__ No _____

If yes, what are those factors?
_X_Flow regulations
_X Channelization
___ Augmented flows
___ Mining activities
___ Road encroachment
_X__ Other (specify)_Agriculture, Timber Harvest
_X_ Upstream channel conditions
___ Oil field water discharge

Lentic Standard Checklist

Name of Riparian-Wetland Area: NEPE – Swartz Pond ___
Date: 6/17/08___ Segment/Reach ID: _Swartz Pond_______________Acres: ________________
ID Team Observers: _Hinson, Ladd_____________ ____________________________________

Yes	No	N/A	HYDROLOGY
X			1) Riparian-wetland area is saturated at or near the surface or inundated in "relatively frequent" events
X			2) Fluctuation of water levels is not excessive
X			3) Riparian-wetland area is enlarging or has achieved potential extent
X			4) Upland watershed is not contributing to riparian-wetland degradation
X			5) Water quality is sufficient to support riparian-wetland plants
	X		6) Natural surface or subsurface flow patterns are not altered by disturbance (i.e., hoof action, dams, dikes, trails, roads, rills, gullies, drilling activities)
X			7) Structure accommodates safe passage of flows (e.g., no headcut affecting dam or spillway)
Yes	No	N/A	VEGETATION
X			8) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
X			9) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)
X			10) Species present indicate maintenance of riparian-wetland soil moisture characteristics
X			11) Vegetation is comprised of those plants or plant communities that have root masses capable of withstanding wind events, wave flow events, or overland flows (e.g., storm events, snowmelt)
X			12) Riparian-wetland plants exhibit high vigor
X			13) Adequate riparian-wetland vegetative cover is present to protect shoreline/soil surface and dissipate energy during high wind and wave events or overland flows
X			14) Frost or abnormal hydrologic heaving is not present
		X	15) Favorable microsite condition (i.e., woody material, water temperature, etc.) is maintained by adjacent site characteristics
Yes	No	N/A	EROSION/DEPOSITION
X			16) Accumulation of chemicals affecting plant productivity/composition is not apparent
X			17) Saturation of soils (i.e., ponding, flooding frequency, and duration) is sufficient to compose and maintain hydric soils
X			18) Underlying geologic structure/soil material/permafrost is capable of restricting water percolation
X			19) Riparian-wetland is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)
		X	20) Islands and shoreline characteristics (i.e., rocks, coarse and/or large woody material) are adequate to dissipate wind and wave event energies

Remarks (numbers correspond to checklist items)

3. Wetland expansion limited by topography; no appearance of shrinking wetland.
6. Natural flow patterns are altered by roads and the man-made earthen berm used to dam flow and create inundation
15. Special microsite conditions not necessary to sustain water budget or function property.
20. Wetland requires vegetation to dissipate wind and wave energy rather than LWD or rock, which is not in present due to landscape setting.

Summary Determination

Functional Rating:
Proper Functioning Condition __X__
Functional – At Risk _____
Nonfunctional _____
Unknown _____

Trend for Functional – At Risk:
Upward _____
Downward _____
Not Apparent _____

Additional notes:

1. Extensive bird use of Swartz Pond and surrounding emergent herbaceous wetland.
2. Upland invasive vegetation, including thistle, surrounds wetland.
3. Earthen berm dam allows this wetland to persist when it likely wouldn't otherwise.

Are factors contributing to unacceptable conditions outside the control of the manager?

Yes __X__
No _____

If yes, what are those factors?

___ Dewatering ___ Mining activities ___ Watershed condition
___ Dredging _X_ Road encroachment _X_ Land ownership
_X_ Other (specify) ____

Appendix E – Benthic Macroinvertebrate Site Description Summaries

Lapwai Creek

Name of Park Unit Site: ____NEPE - Spalding__________________________________

Date: __6/16/2008_Segment/Reach ID: Lapwai 1___________Stream: Lapwai Creek___

ID Team Observers: __Hinson, Ladd____

Stream Channel

Description	Yes/No
Channelized	Y

Stream Substrate and Shoreline Condition

Description	Percent (%)
Inorganic Substrate	90
Organic Substrate	10
Embeddedness	45
Sediment	10
Stream Shading	5-10

Site Measurements

Description	Meters
Stream Width	12.5
Surface Velocity (m/s)	1.1
Water Depth (Average)	0.2
Riffle Length	11.0
Riffle Width (Average)	4.0

Whitebird Creek

Name of Park Unit Site: ____NEPE – Whitebird Battlefield___________________________

Date: __8/5/2008_Segment/Reach ID: Whitebird 1_________Stream: __Whitebird Creek__

ID Team Observers: __Hinson, Ladd____

Stream Channel

Description	Yes/No
Channelized	Y

Stream Substrate and Shoreline Condition

Description	Percent (%)
Inorganic Substrate	90-95
Organic Substrate	5-10
Embeddedness	5-10
Sediment	5
Stream Shading	50

Site Measurements

Description	Meters
Stream Width	9.5
Surface Velocity (m/s)	0.5
Water Depth (Average)	0.2
Riffle Length	18.0
Riffle Width (Average)	9.5

Appendix F – Macroinvertebrate Taxa List

	Stream	Lapwai Creek	Whitebird Creek
	Site	Lapwai 1	Whitebird 1
	Date	6/16/2008	8/5/2008
	Habitat	18	30
	Percent Subsampled	08-610-02	08-610-03
	ABR Sample ID	Lapwai Creek	Whitebird Creek
OLIGOCHAETA		4	
Trombidiformes	Trombidiformes	7	1
Amphipoda	*Crangonyx*		
Decapoda	Pacifasticus	1	
Isopoda	*Caecidotea*	2	
Coleoptera	*Microcylloepus*		
	Optioservus	7	4
	Ordobrevia	1	2
	Zaitzevia		19
	Psephenus	33	7
Diptera	*Atherix*		
	Chironomidae	31	2
	Chironomini		5
	Polypedilum		5
	Diamesinae		
	Diamesa		
	Orthocladiinae		
	Brillia		
	Eukiefferiella		
	Limnophyes		
	Orthocladius/Cricotopus complex	180	
	Thienemanniella	3	
	Tanypodinae		
	Tanytarsini		8
	Tanytarsus/Micropsectra	150	8
	Empididae		
	Hemerodromia	3	
	Neoplasta		
	Prosimulium		
	Simulium	40	
	Antocha		
	Hexatoma		
Ephemeroptera	*Acentrella turbida*	1	
	Baetis flavistriga		
	Baetis tricaudatus	18	
	Baetis damaged		
	Diphetor hageni		3
	Fallceon quilleri		
	Baetidae damaged		3
	Pseudocloeon		

	Stream	Lapwai Creek	Whitebird Creek
	Site	Lapwai 1	Whitebird 1
	Date	6/16/2008	8/5/2008
	Habitat	18	30
	Percent Subsampled	08-610-02	08-610-03
	ABR Sample ID	Lapwai Creek	Whitebird Creek
	dardanum		
	Drunella grandis		
	Ephemerella excrucians	2	
	Ephemerella imm		
	Cinygmula	1	
	Ecdyonorus criddlei	1	
	Epeorus		
	Rhithrogena		
	Heptageniidae damaged	6	5
	Paraleptophlebia bicornuta		
	Leptophlebiidae damaged		
	Asioplax		
	Tricorythodes	5	
Lepidoptera	*Petrophila*	1	
Odonata	*Ophiogomphus*		
	Argia	1	
Plecoptera	*Zapada columbiana Gr.*		
	Malenka		1
	Isogenoides		
	Skwala		
	Calineuria californica		11
	Doroneuria		
	Hesperoperla pacifica		
	Pteronarcys		
	Pteronarcidae damaged		
Trichoptera	*Amiocentrus aspilus*		1
	Brachycentrus	11	
	Glossosoma		
	Glossosomatidae pupae		
	Helicopsyche borealis	1	1
	Hydropsyche	1	1
	Cheumatopsyche		
	Hydroptila		
1	*Leucotrichia*		
	Ochrotrichia		
	Lepidostoma		
	Nectopsyche		
	Dicosmoecus		1
	Onocosmoecus unicolor		
	Chimarra		
Gastropoda	*Ferrissia*		

	Stream	Lapwai Creek	Whitebird Creek
	Site	Lapwai 1	Whitebird 1
	Date	6/16/2008	8/5/2008
	Habitat	18	30
	Percent Subsampled	08-610-02	08-610-03
	ABR Sample ID	Lapwai Creek	Whitebird Creek
	Lymnaeidae		
	Gyraulus parvus		
	Physella		
Pelecypoda	Pisidiidae		1
TURBELLARIA	Turbellaria	1	
NEMATA	Nemata	5	
	Total	517	89

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