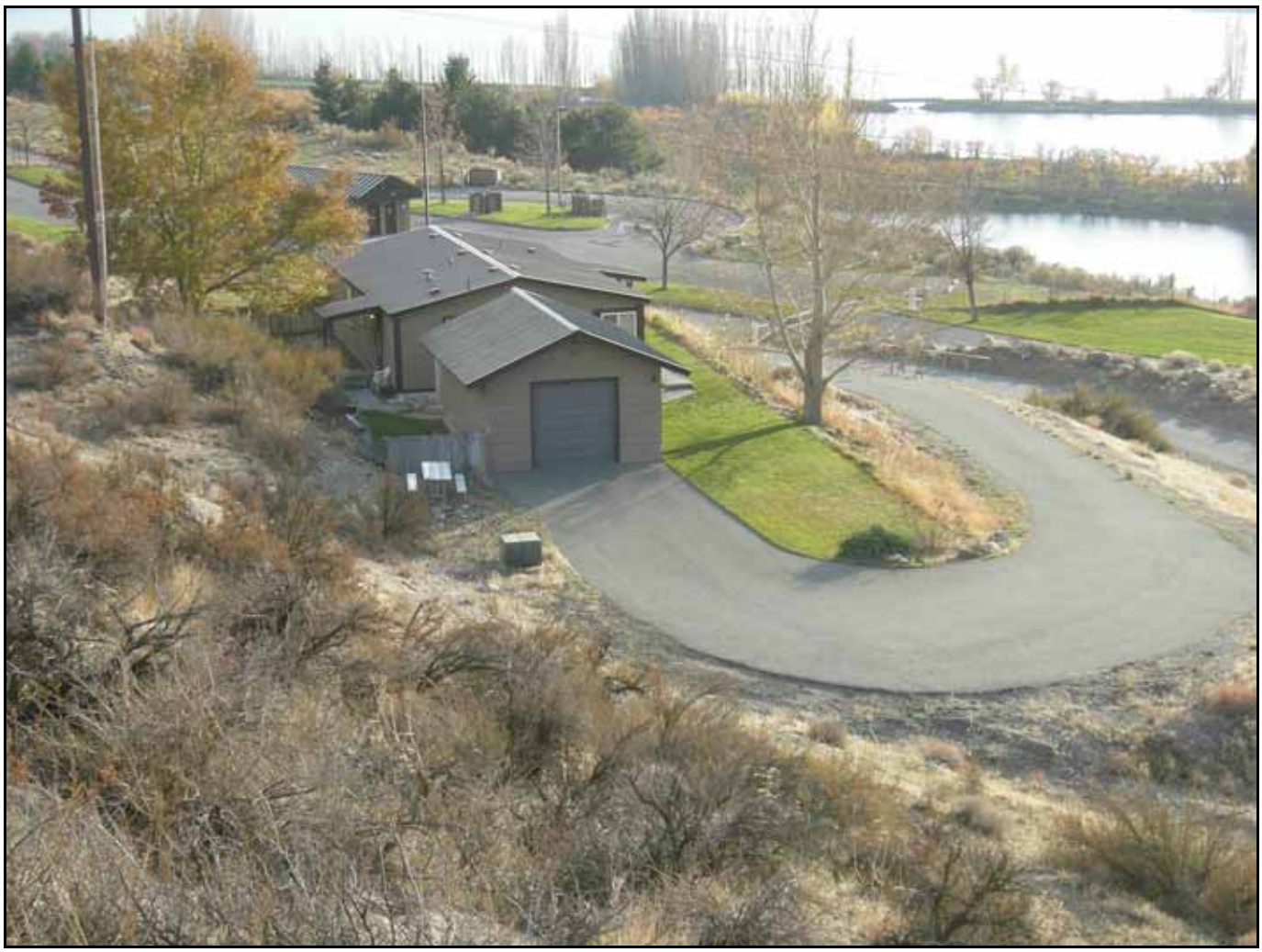
Rare Plant and Vegetation Survey of Daroga State Park



Pacific Biodiversity Institute

Rare Plant and Vegetation Survey of the Daroga State Park

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Executive Summary

Pacific Biodiversity Institute (PBI) conducted a rare plant and vegetation survey of Daroga State Park for the Washington State Parks and Recreation Commission (WSPRC). Daroga State Park covers 124.6 acres in Douglas County. The park lies between Wenatchee and Entiat along the east side of the Columbia River.

Field surveys of the park were conducted on April 13, April 28, October 15 and November 16, 2008. Nine vegetative polygons were mapped and surveyed in Daroga State Park The polygons were classified into two recognized plant associations in addition to water and developed campground areas

No rare plants listed by the State of Washington were found in Daroga State Park. There is very little suitable habitat at this park for many of the rare species in Washington. The northwest part of the park was most intensively surveyed because this was the only part of the park with suitable habitat for rare species. Some species that might be found here include species of sand dunes and species of disturbed areas.

The ecological condition of non-developed plant communities in Daroga State Park was in fair to poor condition. No polygons were found in good or excellent condition. About half of the communities were in fair condition and half were poor. About 60% of the park is developed.

There were 74 vascular plant taxa observed during surveys of Daroga State Park. Of these, 36 were non-native species, or approximately 49% of the total number of species observed. During our surveys of Daroga State Park we found two Class B noxious weeds and two Class C weeds. The most widespread noxious weed found was diffuse knapweed (*Centaurea diffusa*). Eurasian water-milfoil (*Myriophyllum spicatum*) grows in shallow waters and lagoons in the water of the Columbia River.

The map of this park's boundaries overlaps private ownerships. It was not always possible to tell what was private and what was within the park, because the private ownerships appear to be using access through the park. There are several fences that blocked access to orchards that are shown as being within the park. In order for this park to manage its resources, it is important to map and sign the boundaries.

Table of Contents

Introduction

Daroga State Park is located in Chelan County between the Wenatchee and Entiat, along the Columbia River, which is dammed along this stretch. The Park has a large grassy campground area and adjacent boating facilities. An electric transmission line goes across the park. There is also a home for the Ranger.

The soils at Daroga State Park are primarily outwash sand deposits from past flooding of the Columbia River and glacial meltwaters. Sand deposits may have been partly formed by wind movements, but they are too altered to determine this any more. The climate in the park is arid due to the rain shadow effect of the North Cascades to the west. The area receives about nine inches of precipitation.

Survey Conditions and Survey Routes

Daroga State Park was first visited on April 13. Three follow-up visits were conducted on April 28, October 15 and November 16. The survey routes are shown in Figure 1.

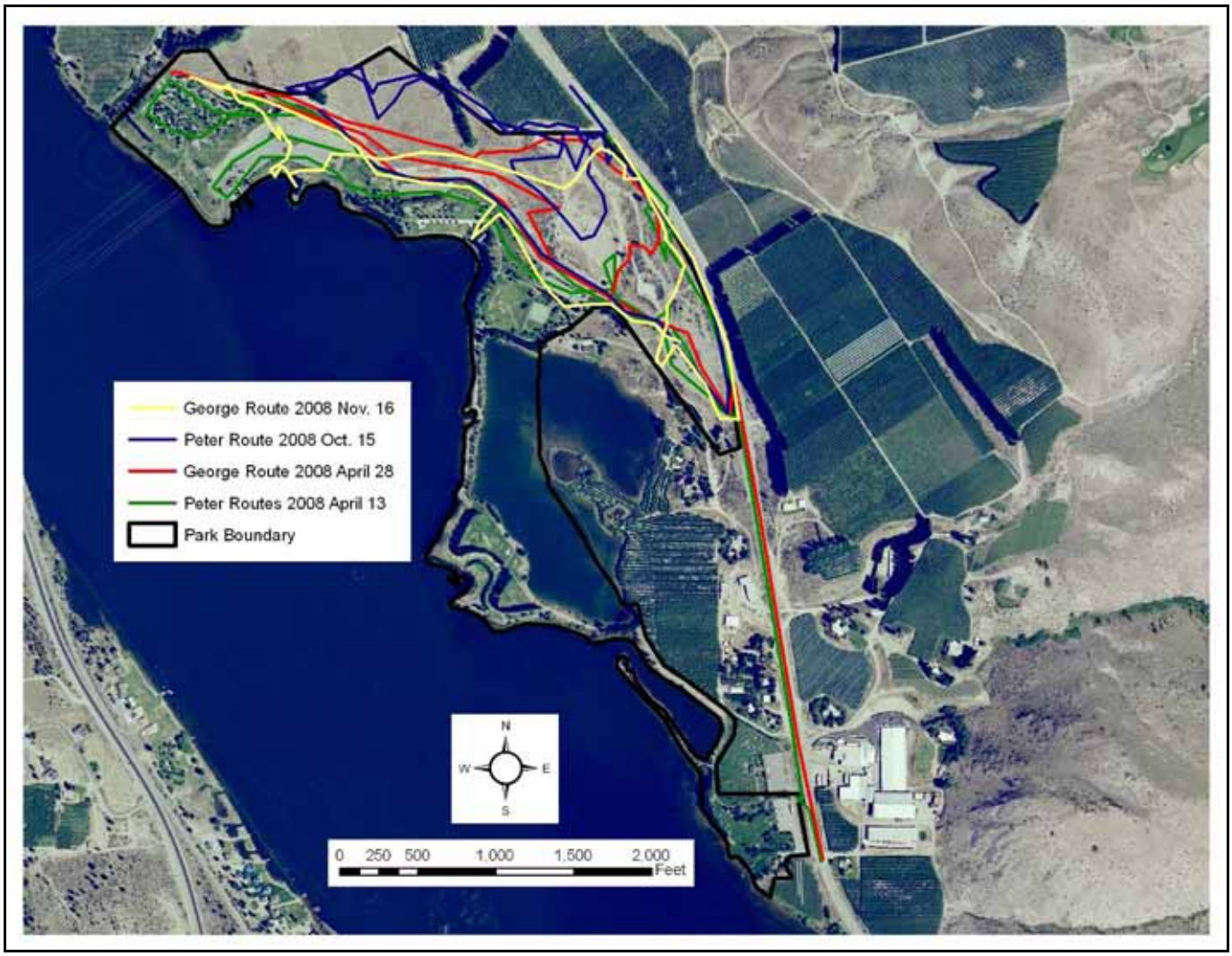

Figure 1. Field Survey Schedule and Routes.

Vegetation Communities

Methods

Pre-field reviews of literature, GIS data, and remote sensing data were conducted early in the season. Maps, GIS data, and remotely sensed data were assembled together into an ArcMap GIS project covering the project area. Topographic maps and digital elevation models (DEMs) were also assembled. Using the gathered spatial data resources, discrete vegetation polygons meant to represent specific plant communities or mosaics of plant communities were manually delineated by staff ecologists as polygon features in an ESRI shapefile format.

Parks were then visited several times during the field season to assure observation of both early and late-blooming plant species. The first visit was primarily a reconnaissance of the project area, meant to create a basic plant list for the park and to conduct initial rare plant surveys for early bloomers. Later visits focused on collecting field data for the vegetation polygon map and adding more species to the plant list during different times of the season. Before the field season was complete, all vegetation polygons that could be accessed safely were visited and field data was collected.

Plant community data was recorded on a form initially developed by the WSPRC (Appendix A). Recorded data included a wide variety of information about the vegetation composition, environmental characteristics, disturbance history and other notes for each polygon. Each polygon was rated for its overall ecological condition according to a simple ranking system (Appendix B). Vegetation community and land cover classifications were assigned using information and keys from standard literature sources cited in the Reference section of this document (Bourgeron and Engelking 1994, Clausnitzer and Zamora 1987, Crawford 1999, Crawford 2003, Daubenmire 1970, Kagan et al 2000, Kovalchik and Clausnitzer 2004, Lillybridge et al 1995, NatureServe 2008).

During field visits survey personnel had printed and digital maps available that included high-resolution aerial imagery. Digital maps were accessed in the field using ArcPad software (ESRI 2007) running on pocket PC, GPS enabled devices. Use of ArcPad allowed all survey routes to be mapped on a GPS recorder in real time, and allowed for viewing and editing data directly from field locations, resulting in field-verified attributes for the vegetation polygons.

Once gathered, the field data was edited and entered into a Microsoft Access database and linked to the vegetation polygon geodatabase. Further refinements and editing of the vegetation data stored in the personal geodatabase was made based on information collected in the field with ArcPad.

Historical Vegetation

Most of the historical vegetation at Daroga State Park has been converted or developed. Lands along the Columbia River reservoir system have been flooded. Most of the adjacent uplands are now used for developed campground areas within the park. Some of these were apparently used for agriculture (orchards) in the past.

The lower part of Daroga State Park that is closest to the Columbia River is a low relief bay. This area has undergone extensive reshaping as part of the development of the park and the adjacent reservoir.The original river shoreline is now underwater. Today the Columbia River dams regulate the water level.

Daroga State Park has only two native plant communities: Big sagebrush / bluebunch wheatgrass and Bitterbrush / bluebunch wheatgrass. The native lakeshore communities no longer exist. The areas now dominated by big sagebrush or bitterbrush are very sandy soils. These sandy soils were probably derived

as outwash after the draining of glacial meltwaters. The soils are composed of deep sand. The topography of the soils appears to be alluvial; however, wind erosion may have also played a part in their formation. Where these soils have been disturbed, they are now habitat for a number of species that favor sand dunes, such as the field sagewort (*Artemisia campestris* var. *scouleriana*; ARCAS5) and Indian rice grass (*Achnatherum hymenoides*; ACHY)

The shrub-steppe vegetation at Daroga State Park may have evolved with a frequent fire-return interval in this general area, based on its floristic similarity to nearby scattered ponderosa pine forests that had a fire-return interval of 8-15 years (Ohlson 1996). However, there is considerable scientific debate on the presettlement fire frequency of the shrub-steppe. The relative abundance of fuels and their continuity in presettlement times is largely unknown. A more conservative estimate of the fire frequency suggests it was more variable than that of coniferous systems. Wyoming big sagebrush communities were found to have fire intervals ranging from 10 to 70 years (Vincent 1992 in Paysen and others 2000, page 142; Young and Evans 1991, *ibid*.). Presettlement conditions are believed to have had a higher percentage of grasses than in the same areas today (Griffiths 1910 in Paysen and others 2000, page 142; Leopold 1924, *ibid*.)

In addition to lightning-caused fires, it is likely that native tribes burned the area on a regular basis, according to historical accounts. However, no pine trees were observed that were old enough to verify this with fire scars. Fires can burn rapidly through the shrub-steppe, such as one that burned in 2008 for many miles along the open slopes above the park.

Results

Vegetation Community Mapping

Nine vegetative polygons were mapped and surveyed in Daroga State Park (Figure 2). The polygons were classified into two recognized plant associations in addition to water and developed campground areas (Table 1). Table 2 gives additional reference information about the plant associations. The communities were assigned to a primary, secondary or a tertiary community. Primary community types are the dominant or matrix vegetation community within a polygon, whereas secondary and tertiary community types are less abundant vegetation community types that occur within the same polygon and were not conducive to being mapped as a separate polygon due to the size, shape, or pattern of the community patches within the polygon.

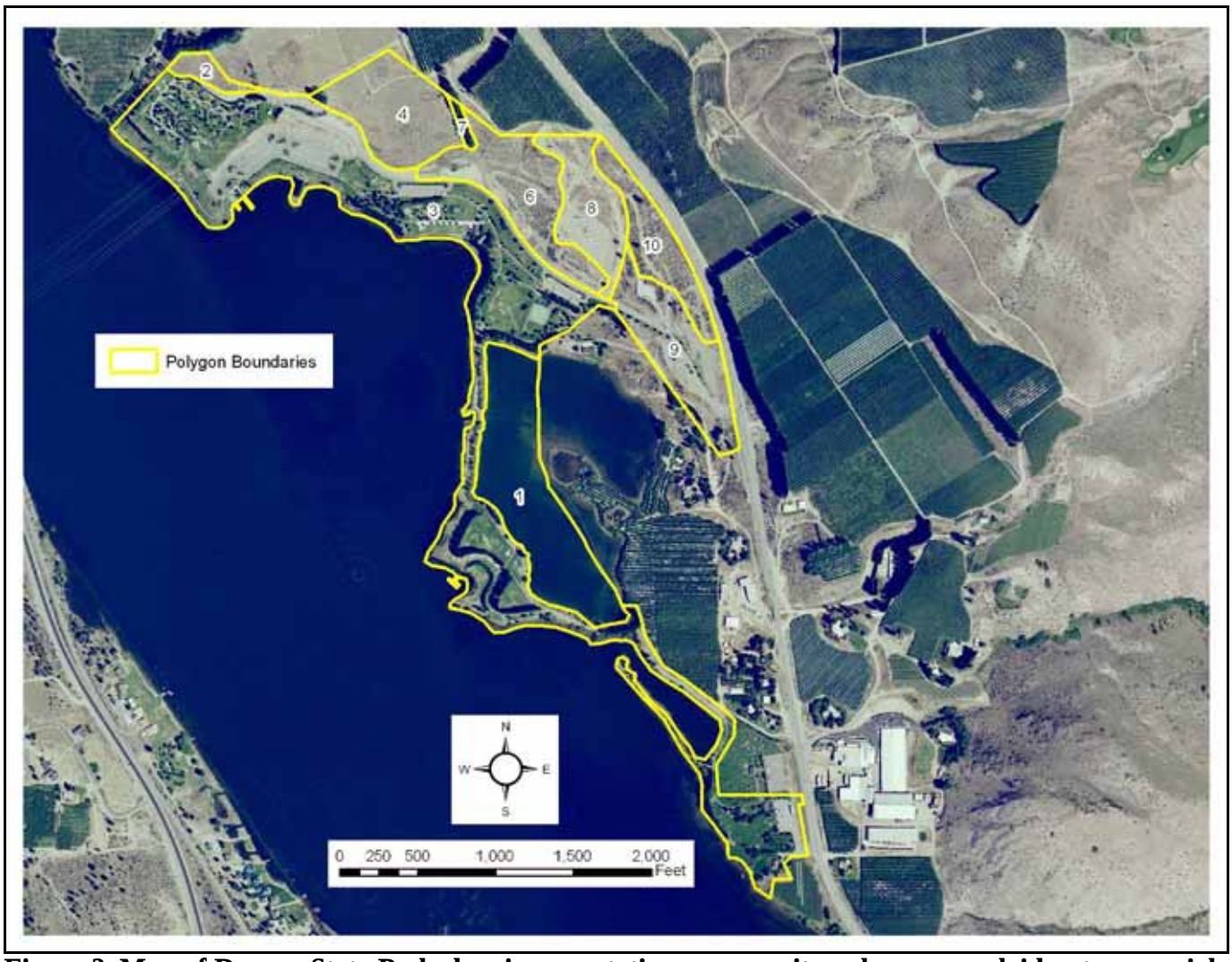

Figure 2. Map of Daroga State Park showing vegetation community polygons overlaid onto an aerial photo of the park.

Table 1. Plant communities observed in Daroga State Park.

Plant Association, Vegetation Community or Land Cover (Codes)	Plant Communities and Land Cover Observed (Codes)
Big sagebrush / bluebunch wheatgrass (ARTR2/PSSP6)	ARTR2-PUTR2/BRTE
Bitterbrush / bluebunch wheatgrass (PUTR2/PSSP6)	PUTR2/ERNI2/BRTE-ACHY; PUTR2/POPR roadcut
Water	Water
Developed	Developed campground areas

Table 2. Plant association reference table for Daroga State Park. (See Appendix C for status codes.)

Code	Scientific Names	Authority	Global Status
ARTR2/PSSP6	Artemisia tridentata / Pseudoroegneria spicata	Daubenmire 1970	G5
PUTR2/PSSP6	Purshia tridentata / Pseudoroegneria spicata	Daubenmire 1970	G3

Each vegetation community polygon has at least one primary vegetation community/land cover class assigned to it, and up to 2 additional classes. Figure 3 shows a map depicting the primary vegetation community/land cover class for each polygon within the park. Appendix D describes the attributes described for each polygon mapped within the project area.

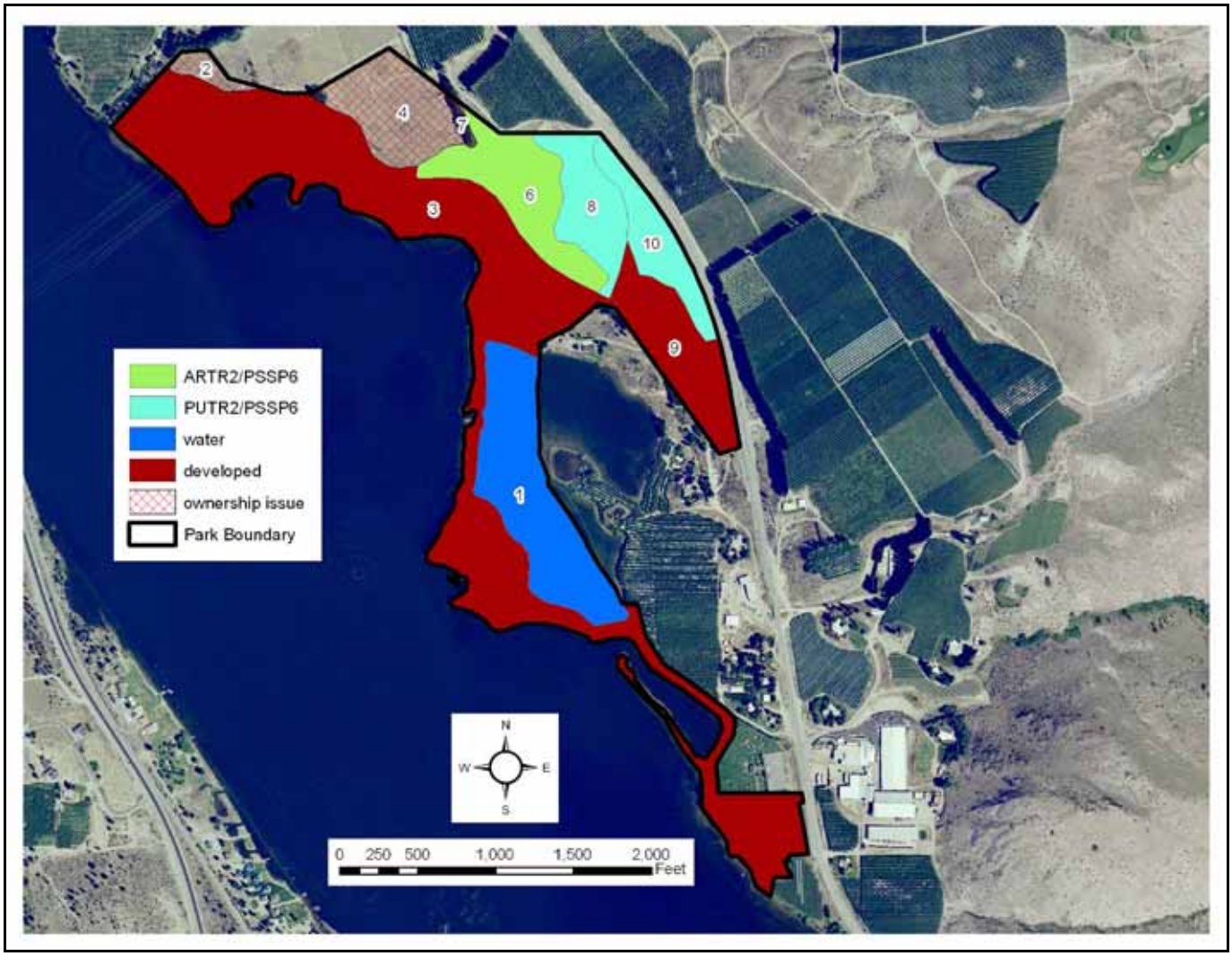

Figure 3. Map of primary plant communities attributed to each vegetation polygon.

Vegetation Community and Land Cover Types

Bitterbrush/ bluebunch wheatgrass (PUTR2/PSSP6) (G3)

Figure 4. An example of the bitterbrush / bluebunch wheatgrass plant association at Daroga State Park.

The bitterbrush / bluebunch wheatgrass association was described by Daubenmire (1970). At Daroga State Park, it occurs on slopes east of the entrance road and below Highway 97 (Figure 4). It is considered globally vulnerable to extirpation or extinction (G3 rank), but is locally common in the project area.

The bitterbrush / bluebunch wheatgrass plant association is characterized by non-forested grasses and forbs dominated by bitterbrush. Other common species are arrowleaf balsamroot (*Balsamorhiza sagittata*; BASA3), fernleaf biscuitroot (*Lomatium dissectum*; LODI) and big sagebrush (*Artemisia tridentata*; ARTR2).

The big bitterbrush / bluebunch wheatgrass association may have evolved with a frequent fire-return interval in this general area, based on its floristic similarity to nearby scattered ponderosa pine forests that had a fire-return interval of 8-15 years (Ohlson 1996). However, there is considerable scientific debate on the presettlement fire frequency of the shrub-steppe. A more conservative estimate of the fire frequency suggests it was more variable than that of coniferous systems. Wyoming big sagebrush communities were found to have fire intervals ranging from 10 to 70 years (Vincent 1992 in Paysen and others 2000, page 142; Young and Evans 1991, *ibid*.). Presettlement conditions are believed to have had a higher percentage of grasses than in the same areas today (Griffiths 1910 in Paysen and others 2000, page 142; Leopold 1924, *ibid*.)

Due to its ability of the buds to be available as winter forage, bitterbrush is known to provide critical winter browse for mule deer. However, deer sign was not observed within the park.

Big sagebrush / bluebunch wheatgrass (ARTR2/PSSP6) G5

Figure 5. The big sagebrush / bluebunch wheatgrass plant association at Daroga State Park.

At Daroga State Park the big sagebrush / bluebunch wheatgrass plant association occurs under the transmission lines north of the access road (Figure 5). This association is characterized by the dominant occurrence of big sagebrush and bluebunch wheatgrass. This community was described by Daubenmire (1970) and is listed as globally secure (G5).

Big sagebrush occurs in areas with deep soils. It also occurs with rubber rabbitbrush (*Ericameria nauseosa*; ERNA10) and snow buckwheat (*Eriogonum niveum*; ERNI2). At Daroga State Park, it has been compromised by the invasion the exotic annual cheatgrass (*Bromus tectorum*; BRTE).

Big sagebrush and bitterbrush compete for dominance at Daroga State Park. Big sagebrush typically requires deeper soils than bitterbrush, but all soils are deep at this Park. At this site, bitterbrush appears to be more common on more highly disturbed soils.

Fire regimes are discussed under the description of Bitterbrush / bluebunch wheatgrass plant association.

Other Land Cover Types

Daroga State Park has these other land cover types:

- Water
- Developed areas with roads and campgrounds
- Ownership issue areas, where it appears adjacent landowners are using the land within the GIS boundary of the park.

Rare Plant Surveys

Methods

Daroga State Park was visited four times during the 2008 field season, during March, May, October and November. We used the Washington Department of Natural Resources Natural Heritage Program's (DNR NHP) rare plant list to determine the conservation status of vascular plants encountered in the field. We collected plant specimens for later identification when needed. We used a wide range of floras and other plant identification references (e.g. Boersma et al 2006, Flora of North America 1993+, Jolley 1988, Hitchcock and Cronquist 1973, Hitchcock et al 1955, Hickman 1993, University of Washington Burke Museum Herbarium Vascular Plant Collection, USDA 2008, Washington Natural Heritage Program 2008, Washington Natural Heritage Program. no date, Whitson et al 2000, Wilson 2006). There were no records of historic sightings for any state-listed rare plants within the park or nearby similar habitats.

Daroga State Park was first visited on April 13. Three follow-up visits were conducted on April 28, October 15 and November 16. The survey routes are shown in Figure 1. We looked for rare plants in habitats previously identified as being likely occurrence sites based on DNR NHP rare plant lists and maps of previous sightings in the surrounding area. So as not to miss any rare plants, all vascular plant species encountered during the inventory were identified on site, at base camp in the portable laboratory, or back at our office.

Survey routes were determined based on the need to cover efficiently a large proportion of the park's area throughout the field season. We surveyed areas of the park more intensively where rare plants were felt more likely to occur. This method is referred to as the intuitive-controlled method of rare plant surveys (Whiteaker 1998). Very few such areas that fit this description occurred at Daroga State Park. The habitats with loose sandy soils offered the most likely habitat for some species. Survey routes for the rare plant inventory and rare plant locations were recorded either by hand, on a hardcopy topographic map, or as GPS waypoints and trackpoints, all of which were later compiled into a single GIS data layer, depicted in Figure 1.

Results

Surveys confirmed that there were no threatened, endangered or sensitive plants in Daroga State Park. Very few areas had good habitats for rare species. One rare species with some potential for occurring here is Whited's penstemon (*Penstemon eriantherus* var. *whitedii*), which grows in dry shrub-steppe areas near the Columbia River. It does not occur here however.

Vascular Plant List for the 2008 Project Area

Only 74 vascular taxa were observed during surveys of Daroga State Park (Table 3). Five of these were only identified to the level of genus. Table 3 also identifies 36 non-native species identified within the park, or approximately 49% of the total number of species observed.

It is noteworthy that despite the low diversity and large number of non-native species at Daroga State Park, one uncommon species was found in the sandy soil shrub-steppe habitat that was not found in any of the other parks surveyed in 2008. This was the rosy gilia (*Gilia sinuata*; GISI). The habitat of disturbed sandy soils is suitable for the biology of this native species of sandy habitats.

Table 3. Vascular Plant Species of Daroga State Park. The column "Symbol" represents the plant code used on the USDA PLANTS database.

Symbol	Scientific Name with Author	National Common Name	Family	Exotic
ACMI2	Achillea millefolium L.	common yarrow	Asteraceae	
ACHY	Achnatherum hymenoides (Roem. & Schult.) Barkworth	Indian ricegrass	Poaceae	
AGCR	Agropyron cristatum (L.) Gaertn.	crested wheatgrass	Poaceae	yes
ALIN2	Alnus incana (L.) Moench	gray alder	Betulaceae	
AMAC2	Ambrosia acanthicarpa Hook.	flatspine bur ragweed	Asteraceae	yes
AMME	Amsinckia menziesii (Lehm.) A. Nelson & J.F. Macbr.	Menzies' fiddleneck	Boraginaceae	
ARHOR	Arabis holboellii Hornem. var. retrofracta (Graham) Rydb.	second rockcress	Brassicaceae	
ARCAS5	Artemisia campestris L. ssp. borealis (Pall.) H.M. Hall & Clem. var. scouleriana (Hook.) Cronquist	field sagewort	Asteraceae	
ARDR4	Artemisia dracunculus L.	tarragon	Asteraceae	
ARTR2	Artemisia tridentata Nutt.	big sagebrush	Asteraceae	
BASA3	Balsamorhiza sagittata (Pursh) Nutt.	arrowleaf balsamroot	Asteraceae	
BRTE	Bromus tectorum L.	cheatgrass	Poaceae	yes
CEDI3	Centaurea diffusa Lam.	diffuse knapweed	Asteraceae	yes
CHENO	Chenopodium L.	goosefoot	Chenopodiaceae	
CIAR4	Cirsium arvense (L.) Scop.	Canada thistle	Asteraceae	yes
COUM	Comandra umbellata (L.) Nutt.	bastard toadflax	Santalaceae	
COCA5	Conyza canadensis (L.) Cronquist	Canadian horseweed	Asteraceae	
CRYPT	Cryptantha Lehm. ex G. Don	cryptantha	Boraginaceae	
CRPT	Cryptantha pterocarya (Torr.) Greene	wingnut cryptantha	Boraginaceae	
DEPI	Descurainia pinnata (Walter) Britton	western tansymustard	Brassicaceae	
ELAN	Elaeagnus angustifolia L.	Russian olive	Elaeagnaceae	yes
ERNA10	Ericameria nauseosa (Pall. ex Pursh) G.L. Nesom & Baird	rubber rabbitbrush	Asteraceae	
ERFI2	Erigeron filifolius (Hook.) Nutt.	threadleaf fleabane	Asteraceae	
ERNI2	Eriogonum niveum Douglas ex Benth.	snow buckwheat	Polygonaceae	
ERCI6	Erodium cicutarium (L.) L'Hér. ex Aiton	redstem stork's bill	Geraniaceae	yes
ERYSI	Erysimum L.	wallflower	Brassicaceae	
GISI	Gilia sinuata Douglas ex Benth.	rosy gilia	Polemoniaceae	
GLTR	Gleditsia triacanthos L.	honeylocust	Fabaceae	yes
LASE	Lactuca serriola L.	prickly lettuce	Asteraceae	yes
LIST2	Liquidambar styraciflua L.	sweetgum	Hamamelidaceae	yes

Symbol	Scientific Name with Author	National Common Name	Family	Exotic
LODI	Lomatium dissectum (Nutt.) Mathias & Constance	fernleaf biscuitroot	Apiaceae	
MACA2	Machaeranthera canescens (Pursh) A. Gray	hoary tansyaster	Asteraceae	
MAPU	Malus pumila Mill.	paradise apple	Rosaceae	yes
MEOF	Melilotus officinalis (L.) Lam.	yellow sweetclover	Fabaceae	yes
MELA2	Mentzelia laevicaulis (Hook.) Torr. & A. Gray	smoothstem blazingstar	Loasaceae	
MYSP2	Myriophyllum spicatum L.	Eurasian watermilfoil	Haloragaceae	yes
NECA2	Nepeta cataria L.	catnip	Lamiaceae	yes
OPFR	Opuntia fragilis (Nutt.) Haw.	brittle pricklypear	Cactaceae	
PHHA	Phacelia hastata Douglas ex Lehm.	silverleaf phacelia	Hydrophyllaceae	
PHLI	Phacelia linearis (Pursh) Holz.	threadleaf phacelia	Hydrophyllaceae	
PHAR3	Phalaris arundinacea L.	reed canarygrass	Poaceae	yes
PHCA7	Phlox caespitosa Nutt.	tufted phlox	Polemoniaceae	
PICEA	Picea A. Dietr.	spruce	Pinaceae	yes
PINI	Pinus nigra Arnold	Austrian pine	Pinaceae	yes
PIPO	Pinus ponderosa C. Lawson	ponderosa pine	Pinaceae	
PLLA	Plantago lanceolata L.	narrowleaf plantain	Plantaginaceae	yes
PLOR6	Platanus orientalis L.	Oriental plantree	Platanaceae	yes
POAN	Poa annua L.	annual bluegrass	Poaceae	yes
POBU	Poa bulbosa L.	bulbous bluegrass	Poaceae	yes
POPR	Poa pratensis L.	Kentucky bluegrass	Poaceae	yes
POSE	Poa secunda J. Presl	Sandberg bluegrass	Poaceae	
POBAT	Populus balsamifera L. ssp. trichocarpa (Torr. & A. Gray ex Hook.) Brayshaw	black cottonwood	Salicaceae	
PONI	Populus nigra L.	Lombardy poplar	Salicaceae	yes
PSSP6	Pseudoroegneria spicata (Pursh) A. Löve	bluebunch wheatgrass	Poaceae	
PSME	Pseudotsuga menziesii (Mirb.) Franco	Douglas-fir	Pinaceae	
PUTR2	Purshia tridentata (Pursh) DC.	antelope bitterbrush	Rosaceae	
QUERC	Quercus L.	oak	Fagaceae	yes
RUCR	Rumex crispus L.	curly dock	Polygonaceae	yes
SAEX	Salix exigua Nutt.	narrowleaf willow	Salicaceae	
SALIX	Salix L.	willow	Salicaceae	yes
SAKA	Salsola kali L.	Russian thistle	Chenopodiaceae	yes
SADO4	Salvia dorrii (Kellogg) Abrams	purple sage	Lamiaceae	
SIAL2	Sisymbrium altissimum L.	tall tumblemustard	Brassicaceae	yes
SILO3	Sisymbrium loeselii L.	small tumbleweed mustard	Brassicaceae	yes
SODU	Solanum dulcamara L.	climbing nightshade	Solanaceae	yes
SOCA6	Solidago canadensis L.	Canada goldenrod	Asteraceae	
SPCR	Sporobolus cryptandrus (Torr.) A. Gray	sand dropseed	Poaceae	
STMI13	Stephanomeria minor (Hook.) Nutt.	lesser wirelettuce	Asteraceae	
SYVU	Syringa vulgaris L.	common lilac	Oleaceae	yes
TAOF	Taraxacum officinale F.H. Wigg.	common dandelion	Asteraceae	yes
THIN6	Thinopyrum intermedium (Host) Barkworth & D.R. Dewey	intermediate wheatgrass	Poaceae	yes
TRDU	Tragopogon dubius Scop.	yellow salsify	Asteraceae	yes
VETH	Verbascum thapsus L.	common mullein	Scrophulariaceae	yes
YUFI	Yucca filamentosa L.	Adam's needle	Agavaceae	yes

Discussion and Recommendations

Noxious Weeds

A list of the noxious weeds found at Daroga State Park is presented in Table 4. The noxious weeds that were observed within each polygon are recorded in the corresponding record in the vegetation database for the park, which is included in this report as Appendix D

During our surveys of Daroga State Park we found two Class B noxious weeds and two Class C weeds. The most widespread noxious weed found was diffuse knapweed (*Centaurea diffusa*). Eurasian water-milfoil (*Myriophyllum spicatum*) grows in shallow waters and lagoons in the water of the Columbia River.

Table 4. State listed noxious weeds at Daroga State Park.

Symbol	Scientific Name with Author	National Common Name	State Weed Status
CEDI3	Centaurea diffusa Lam.	diffuse knapweed	B
CIAR4	Cirsium arvense (L.) Scop.	Canada thistle	C
MYSP2	Myriophyllum spicatum L.	Eurasian water-milfoil	B
PHAR3	Phalaris arundinacea L.	reed canarygrass	C

Ecological Condition

The ecological condition of Daroga State Park was based on the rating descriptions (see Appendix B for definitions). A map of the overall ecological condition is presented in Figure 6.

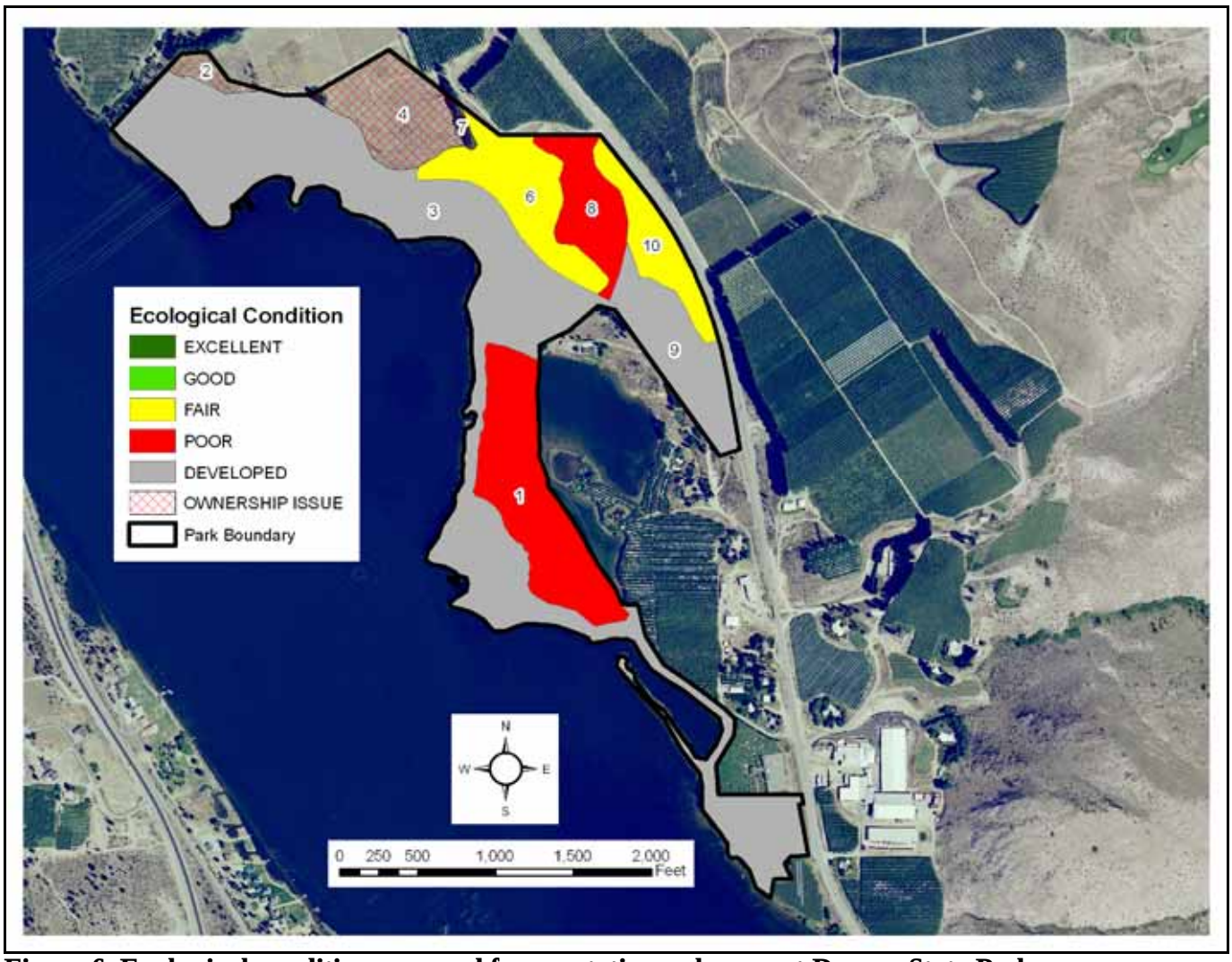

Figure 6. Ecological condition assessed for vegetation polygons at Daroga State Park.

The ecological condition of non-developed plant communities in Daroga State Park was in fair to poor condition. No polygons were found in good or excellent condition. About half of the communities were in fair condition and half were poor. About 60% of the park is developed.

Several management features contribute to the low quality of habitats in the park. Polygon 8 is a bone yard and is used as an outdoor dump. It appears to be used by the private orchard above the park. The disturbance caused by trucking material into this site keeps plants from establishing, except for some hardy weeds. Secondly, there is an electric transmission line and several towers located in the park, going in a line from the northwest to the southeast. Apparently, maintenance trucks access this transmission line without a defined road system. This causes a chronic disturbance and can transport noxious weeds to and from the site. Thirdly, there are actively managed apple orchards operating on lands mapped as State Park ownership in the GIS data. These are managed for the benefit of fruit cultivation, but to the detriment of native ecosystems. Management that does not benefit native ecosystems includes herbicide applications; driving across park property for access; fence building; planting non-native species; irrigation; and creation of fallow fields when operations cease.

The percentage of non-native taxa was approximately 49% of 74 taxa. This is a very low plant diversity number and a very high ratio of non-native taxa, compared to other natural areas.

Restoration Opportunities

There are limited restoration opportunities at Daroga State Park. It should be possible to designate access routes for use by the utility districts and authorized adjacent private landowners. Unauthorized access could be discouraged by use of a locked gate; however, some of the access may be occurring through valid rights-of-way. One of the access routes to private land goes through the bone yard in polygon 8, northward. It appears to be used frequently.

The use of the bone yard should be planned consistent with a management plan for the park. If such an area is a desirable facility, then it should be inspected for noxious weeds and for safety hazards on a regular basis.

Other Recommendations

Ownership maps should be maintained and updated on a yearly basis. This map should be in a digital format that is available for public access.

Several areas currently mapped as being inside the GIS ownership boundary of Daroga State Park are either controlled or owned by adjacent landowners (Figures 3 and 6). These areas include active apple orchards (polygon 7) (Figure 7); fallow orchards (polygons 2 and 4); private driveways (southwest side of polygon 9); electric utility right-of-way (polygons 2, 4, 6, 7, 8, 10); and access roads to private lands (polygons 6, 8). The park boundary is not marked and it is very difficult, on the ground, to determine where the park begins and ends. If the GIS ownership boundary is correct, then there is significant private use being made of State property. We recommend that this situation be investigated further.

Figure 7. Apple orchard within Daroga State Park.

GIS Products Produced

Associated with this report are polygon layers created by PBI depicting the vegetation community types and associated data mapped within Daroga State Park. The datasets have been converted into ESRI shapefile formats and provided to WSPRC. The spatial datasets are complete with metadata meeting FGDC standards. Refer to the associated metadata for descriptions and attribute definitions for each spatial dataset.

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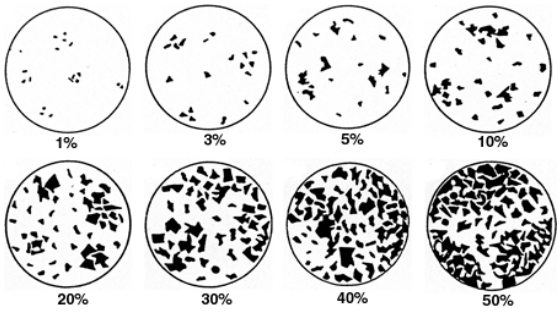
Appendix A - Vegetation Survey Codes and Instructions

Site = name of locality of map project **Name/Date** = your name / day-month-year completed polygon survey
Polygon # = number you put on map
Survey intensity
1 = walked or could see most of polygon (high confidence in survey data)
2 = walked or could see part of polygon interior (moderate confidence)
3 = walked perimeter or could see part of polygon interior (low confidence)
4 = photo interpretation or other remote survey

TOTAL VEGETATION COVER includes all vascular plants, mosses, lichens and foliose lichens (crustose lichens excluded they are considered rock); this never exceeds 100%. Space between leaves/branches is included in "cover".

Code	**Cover (%)**	Cover mid-pt
0	0	0
1	<1	0.5
2	1-5	3
3	5-25	15
4	25-60	43
5	60-90	75
6	>90	95



TREES, SHRUBS, GRAMINOIDS, FORBS, EXOTICS cover includes the space between leaves/branches. Each Life form category canopy cover must be 0-100%. Therefore, the sum of all life forms (layers) can exceed 100%. List most abundant species in each life form category; when trees are cored, note DBH, species, length of core, number of rings counted.

EXOTICS = primary species observed; secondary species observed (please pay special attention to noxious weeds). Also, note the relative abundance of exotics in each polygon, using the 1-6 cover codes noted above.

SOIL SURFACE estimate to nearest **%** the following, the sum of the categories adds to 100%. Describe in comments if there is wide variation in any category; note % standing water if it is persistent or characteristic of site.
Water = exposed standing or flowing water
Rock Outcrop = exposed bedrock including detached boulders over 1m across
Talus = exposed large, loose rocks
Gravel/Cobble = large fragments between sand and boulder
Bare Ground = exposed mineral soil
Mosses/Lichens = nonvascular plant cover on soil
Litter = includes logs, branches, and basal area of plants
Caves = area covered by caves
Mines = area covered by mines

LAND USE - put 0 (zero) if not applicable to site.
Logging
1 = unlogged, no evidence of past logging or occasional cut stumps not part of systematic harvest of trees, no or very little impact on stand composition
2 = selectively logged: frequent cut stumps but origin of dominant or co-dominant cohort appears to be natural disturbance
3 = heavy logging disturbance with natural regeneration: many cut stumps that predate the dominant or co-dominant cohort with no tree planting
4 = tree plantation: dominant cohort appears to be planted after clearcutting
Stand Age
1 = very young 0-40 yr
2 = young 40-90 yr
3 = mature 90-200 yr
4 = old-growth 200+ yr
5 = young with scattered old trees (2-10 old trees per acre)
6 = mature with scattered old trees
Fire
Note presence of fire (i.e. charcoal, fire scars, etc.) and, if present , estimate time of fire.
Agriculture
1 = active annual cropping
2 = active perennial herbaceous cropping
3 = active woody plant cultivation
4 = fallow, plowed no crops this yr
5 = Federal CRP
6 = other
Livestock
1 = active heavy grazing (most forage used, soil compaction or churning)
2 = active moderate grazing (25-75% forage used)
3 = active light grazing (lots of last yr's litter left)
4 = no current, heavy past grazing
5 = no current, light past grazing
6 = no obvious sign of grazing

Development

1 = actively used facilities
2 = roads
3 = established trails
4 = abandoned facilities
5 = none obvious
6 = multiple types (detail in comments)

Wildlife

1 = heavy ungulate use
2 = moderate ungulate use
3 = light to no ungulate use
4 = burrowing animals
5 = active beaver
6 = active porcupine
7 = other, list animal

Recreation Use Severity

1 = heavy use, abundant soil and vegetation displacement off trail/road
2 = moderate use, frequent soil and vegetation displacement off trail/road
3 = light use, little sign of activity off trail/road

Recreation Use Primary Type

1 = wheeled
2 = hoofed
3 = pedestrian
4 = combination of above
5 = other

Hydrology

1 = unaltered 2 = altered; dams, dikes, ditches, culverts, etc 3 = not assessed

Descriptions of Plant Communities

PLANT ASSOCIATION (PA) = list all PAs encountered in polygon survey, in comments list source of name if not on provided key. NOTE: Contractor is required to consult with the WNHP to obtain the most current classification and condition ranking information available.

Existing Vegetation Community – Write down the major tree/shrub/grass-forb-fern community type. Pay attention to indicator species. Alien species may be included in community description.

Condition Rank of PA in key or estimate. (The condition of each plant vegetation community polygon shall be rated using the codes listed in Appendix B.)

% of Polygon = your estimate of % of polygon covered by this plant community

Pattern = how PA is distributed in stand

1 = matrix (most of polygon)	3 = small patches	5 = scattered, more or less evenly repeating	7 = other
2 = large patches	4 = clumped, clustered, contiguous	6 = linear	

Appendix B – Ecological Condition Ranking System

Ecological Condition Ranks

When assessing conservation priorities and management decisions, it can be useful to rank natural communities into levels of ecological condition. For example, an unfragmented area with high native species diversity, absence of non-native species and little soil erosion often has greater conservation value than another area in the same habitat type that is fragmented, infested with weeds or has erosion problems. Likewise, areas with a lower ecological condition rank may be targets for restoration activities.

The flowing ecological condition ranks were applied to vegetation polygons that were surveyed in this project:

- **Excellent Ecological Condition**

Areas in this class have very few non-native plants. The composition and structure of native vegetation in this condition class correspond to the natural range of variation characteristic to this habitat type. Old-growth conditions often exist. Species diversity of native plants and animals is often high relative to the natural community under consideration. Wildlife habitat conditions are optimal for species of conservation concern. Soil compaction, accelerated erosion and hydrologic alteration are absent. Direct signs of human-induced ecological stress are absent. Many rare plant and animal species may only exist within this condition class.

- **Good Ecological Condition**

Areas in this class have few non-native plants. The composition and structure of native vegetation in this condition class correspond to the natural range of variation characteristic to this habitat type. Old-growth conditions may exist, but have been subject to some human-induced stress. Species diversity of native plants and animals is moderately high relative to the natural community under consideration. Wildlife habitat conditions are adequate for species of conservation concern. Soil compaction, accelerated erosion and hydrologic alteration do not significantly influence the area. Direct signs of human-induced ecological stress are infrequent. Some rare plant and animal species may exist within this condition class.

- **Fair Ecological Condition**

Areas in this class often have both native and non-native plants. The composition and structure of native vegetation in this condition class is altered from the natural range of variation characteristic to this habitat type. Old-growth conditions are absent. Species diversity of native plants and animals is lower than the two higher condition classes. Wildlife habitat conditions may be adequate for some species of conservation concern, but not adequate for many. Soil compaction, accelerated erosion and hydrologic alteration may influence the area. Direct signs of human-induced ecological stress are frequent. Most rare plant and animal species are only infrequently encountered within this condition class.

- **Poor Ecological Condition**

Areas in this class are often dominated by non-native plants. The composition and structure of native vegetation in this condition class is often dramatically altered from the natural range of variation characteristic to this habitat type. Old-growth conditions are absent. Species diversity of native plants and animals is often low. Wildlife habitat conditions are not adequate for most species of conservation concern. Soil compaction, accelerated erosion and hydrologic alteration often influence the area. Direct signs of human-induced ecological stress are frequent. Rare plant and animal species are seldom encountered within this condition class.

- **Developed**

Developed portions of the park property: campgrounds, offices, facilities, infrastructure, etc.

- **Ownership Issue**

Areas within the GIS boundary of the park that appear to be owned or controlled by another entity other than the WSPRC.

Appendix C – Definitions of Vegetation Community Conservation Status

The following table defines the ranking system for plants and plant communities used by the Washington State Natural Heritage Program.

Code	Definition
G1	Critically imperiled throughout its range; extremely rare with five or fewer occurrences or very few remaining acres.
G2	Imperiled throughout its range; rare with six to 20 occurrences or few remaining acres.
G3	Either very rare and local throughout its range or found locally in a restricted range; uncommon with 21 to 100 occurrences.
G4	Apparently secure throughout its range, though it may be quite rare in some parts of its range, especially at the periphery; many occurrences.
G5	Demonstrably secure in its range, though it may be quite rare in some parts of its range, especially at the periphery; ineradicable under present conditions.
S1	Critically imperiled in Oregon; extremely rare with five or fewer occurrences or very few remaining acres.
S2	Imperiled in Oregon; rare with six to 20 occurrences or few remaining acres.
S3	Either very rare and local in Oregon or found locally in a restricted range; uncommon with 21 to 100 occurrences.
S4	Apparently secure in Oregon, though it may be quite rare in some parts; many occurrences.
S5	Demonstrably secure in Oregon, though it may be quite rare in some parts; ineradicable under present conditions.
U	Unknown
NA	Natural Heritage Rank not available
NR	Not Ranked

Appendix D – Vegetation Survey Data

Polygon Number 1

ParkName:
Daroga

Survey Intensity	1
Observer	GW
Date	11/16/2008
Total Vegetation	2
Trees Total	0
Dominant Trees	
emergent	0
maincanopy	0
subcanopy	0
Shrubs Total	0
Dominant Shrubs	
> 1.5' tall	0
< 1.5' tall	0
Graminoids Total	0
Dominant Graminoids	
Graminoids Perennial	0
Graminoids Annual	0
Forbs Total	2
Dominant Forbs	MYSP2
Forbs Perennial	2
Forbs Annual	0
Ferns Total	0
Ferns Evergreen	0
Ferns Deciduous	0
ExoticsTotal	2
Exotics Perennial	2
Exotics Annual	0
Water	100
Rock Outcrop	0
Gravel	0
Logging	0
Fire:	0
Stand Age	0
Agriculture	0
Livestock	0
Development	6 (reservoir)
Wildlife	0
Recreation Severity	1
Recreation Type	5 (boating)
Hydrology	2

Exotic Species

Noxious Exotic Plants
MYSP2
Other Exotic Plants

Water:	100
Rock:	0
Talus:	0
Gravel:	0
Bare Ground:	0
Moss Lichen:	0
Litter:	0

Vegetation Types

		Percent	Pattern	Rank
Existing Veg1:	water	100	Matrix	POOR
Veg Community1:	riverbar			
Existing Veg2:		0		
Veg Community3:				
Existing Veg3:		0		
Veg Community3:				

Notes:

Polygon Number 10

ParkName:
Daroga

Survey Intensity	1
Observer	GW
Date	11/16/2008
Total Vegetation	4
Trees Total	2
Dominant Trees	PIPO
emergent	2
maincanopy	0
subcanopy	1
Shrubs Total	3
Dominant Shrubs	PUTR2, ARTR2, ERNA10,ERNI2, OPFR
> 1.5' tall	3
< 1.5' tall	2
Graminoids Total	4
Dominant Graminoids	ACHY, PSSP6, BRTE
Graminoids Perennial	2
Graminoids Annual	3
Forbs Total	2
Dominant Forbs	LODI, PHCA7, ACMI2, LASE
Forbs Perennial	1
Forbs Annual	2
Ferns Total	0
Ferns Evergreen	0
Ferns Deciduous	0
ExoticsTotal	4
Exotics Perennial	2
Exotics Annual	4
Water	0
Rock Outcrop	0
Gravel	0
Logging	0
Fire:	0
Stand Age	0
Agriculture	0
Livestock	0
Development	6 (transmission
Wildlife	3
Recreation Severity	3
Recreation Type	3
Hydrology	1

Exotic Species

Noxious Exotic Plants
CEDI3
Other Exotic Plants
SAKA, BRTE, LASE

Water:	0
Rock:	0
Talus:	0
Gravel:	0
Bare Ground:	50
Moss Lichen:	1
Litter:	49

Vegetation Types

		Percent	Pattern	Rank
Existing Veg1:	PUTR2/ERNI2/BRTE-ACHY	100	Matrix	FAIR
Veg Community1:	PUTR2/PSSP6			
Existing Veg2:		0		
Veg Community3:				
Existing Veg3:		0		
Veg Community3:				

Notes: Almost pure sand. Too harsh for most weeds, so functional ecology for PUTR2, ACHY, ERNI2

Polygon Number 2

ParkName:
Daroga

Survey Intensity	1
Observer	GW
Date	11/16/2008
Total Vegetation	0
Trees Total	0
Dominant Trees	MAPU
emergent	0
maincanopy	0
subcanopy	0
Shrubs Total	0
Dominant Shrubs	ERNA10, PUTR2
> 1.5' tall	0
< 1.5' tall	0
Graminoids Total	0
Dominant Graminoids	BRTE
Graminoids Perennial	0
Graminoids Annual	0
Forbs Total	0
Dominant Forbs	CEDI3, ERCI6, TRDU, COCA5, SILO3
Forbs Perennial	0
Forbs Annual	0
Ferns Total	0
Ferns Evergreen	0
Ferns Deciduous	0
ExoticsTotal	5
Exotics Perennial	5
Exotics Annual	2
Water	0
Rock Outcrop	0
Gravel	0
Logging	
Fire:	
Stand Age	
Agriculture	
Livestock	
Development	
Wildlife	
Recreation Severity	
Recreation Type	
Hydrology	

Exotic Species

Noxious Exotic Plants
CEDI3
Other Exotic Plants
BRTE, ERCI6, TRDU

Water:	0
Rock:	0
Talus:	0
Gravel:	0
Bare Ground:	0
Moss Lichen:	0
Litter:	0

Vegetation Types

		Percent	Pattern	Rank
Existing Veg1:	private property?	100	Matrix	OWNERS
Veg Community1:	ownership issue			
Existing Veg2:		0		
Veg Community3:				
Existing Veg3:		0		
Veg Community3:				

Notes: fenced off (private?); it's an old logged orchard (MAPU 3%, BRTE 70%, CEDI3 5%, PUTR2 1%, ERNA10 5%, TRDU, ERCI6, SILO3, COCA5).

Polygon Number 3

ParkName:
Daroga

Survey Intensity	2
Observer	GW
Date	11/16/2008
Total Vegetation	5
Trees Total	3
Dominant Trees	PONI, QUERC, PINI, PSME, GLTR, LIST2, PICEA, PLOR6, ALIN2
emergent	2
maincanopy	3
subcanopy	2
Shrubs Total	1
Dominant Shrubs	SALIX, ELAN, SAEX
> 1.5' tall	1
< 1.5' tall	0
Graminoids Total	5
Dominant Graminoids	POPR, THIN6, POAN, PHAR3
Graminoids Perennial	5
Graminoids Annual	1
Forbs Total	1
Dominant Forbs	CEDI3, VETH, SOCA6, PLLA
Forbs Perennial	1
Forbs Annual	0
Ferns Total	0
Ferns Evergreen	0
Ferns Deciduous	0
ExoticsTotal	5
Exotics Perennial	5
Exotics Annual	2
Water	3
Rock Outcrop	0
Gravel	5
Logging	0
Fire:	0
Stand Age	0
Agriculture	0
Livestock	0
Development	1
Wildlife	7 (geese)
Recreation Severity	1
Recreation Type	4
Hydrology	1

Exotic Species

Noxious Exotic Plants
MYSP2, CEDI3, PHAR3
Other Exotic Plants
POPR, POAN

Water:	3
Rock:	0
Talus:	0
Gravel:	5
Bare Ground:	25
Moss Lichen:	0
Litter:	67

Vegetation Types

		Percent	Pattern	Rank
Existing Veg1:	developed	100	Matrix	DEVELO
Veg Community1:	developed			
Existing Veg2:		0		
Veg Community3:				
Existing Veg3:		0		
Veg Community3:				

Notes: Aquatics - MYSP2, SAEX, PHAR3; photo 11 is of poly 3, photo 10 is of poly 2.

Polygon Number 4

ParkName:
Daroga

Survey Intensity	1
Observer	PM
Date	10/15/2008
Total Vegetation	0
Trees Total	0
Dominant Trees	
emergent	0
maincanopy	0
subcanopy	0
Shrubs Total	0
Dominant Shrubs	
> 1.5' tall	0
< 1.5' tall	0
Graminoids Total	0
Dominant Graminoids	
Graminoids Perennial	0
Graminoids Annual	0
Forbs Total	0
Dominant Forbs	
Forbs Perennial	0
Forbs Annual	0
Ferns Total	0
Ferns Evergreen	0
Ferns Deciduous	0
ExoticsTotal	0
Exotics Perennial	0
Exotics Annual	0
Water	0
Rock Outcrop	0
Gravel	0
Logging	
Fire:	
Stand Age	
Agriculture	
Livestock	
Development	
Wildlife	
Recreation Severity	
Recreation Type	
Hydrology	

Exotic Species

Noxious Exotic Plants

Other Exotic Plants

Water:	0
Rock:	0
Talus:	0
Gravel:	0
Bare Ground:	0
Moss Lichen:	0
Litter:	0

Vegetation Types

		Percent	Pattern	Rank
Existing Veg1:	private property?	100	Matrix	OWNERS
Veg Community1:	ownership issue			
Existing Veg2:		0		
Veg Community3:				
Existing Veg3:		0		
Veg Community3:				

Notes:

Polygon Number 6

ParkName:
Daroga

Survey Intensity	1
Observer	GW
Date	11/16/2008
Total Vegetation	5
Trees Total	1
Dominant Trees	MAPU
emergent	0
maincanopy	0
subcanopy	1
Shrubs Total	3
Dominant Shrubs	ERNA10, PUTR2, ARTR2, ERNI2, ELAN
> 1.5' tall	3
< 1.5' tall	2
Graminoids Total	4
Dominant Graminoids	BRTE, ACHY
Graminoids Perennial	1
Graminoids Annual	4
Forbs Total	2
Dominant Forbs	CEDI3, VETH, MACA2, AMAC2, PHHA, ERCI6, SAKA, LASE,
Forbs Perennial	2
Forbs Annual	2
Ferns Total	0
Ferns Evergreen	0
Ferns Deciduous	0
ExoticsTotal	4
Exotics Perennial	2
Exotics Annual	4
Water	0
Rock Outcrop	0
Gravel	2
Logging	0
Fire:	0
Stand Age	0
Agriculture	0
Livestock	0
Development	6 (transmission
Wildlife	3
Recreation Severity	2 (wheeled use to
Recreation Type	4
Hydrology	1

Exotic Species

Noxious Exotic Plants
CEDI3
Other Exotic Plants
SAKA, BRTE, LASE, AMAC2

Water:	0
Rock:	0
Talus:	0
Gravel:	2
Bare Ground:	30
Moss Lichen:	0
Litter:	68

Vegetation Types

		Percent	Pattern	Rank
Existing Veg1:	ARTR2-PUTR2/BRTE	100	Matrix	FAIR
Veg Community1:	ARTR2/PSSP6			
Existing Veg2:		0		
Veg Community3:				
Existing Veg3:		0		
Veg Community3:				

Notes: Poly 5 is a sandy roadcut. Poly 7 is private - row of PONI

Polygon Number 7

ParkName:
Daroga

Survey Intensity	1
Observer	GW
Date	11/16/2008
Total Vegetation	0
Trees Total	0
Dominant Trees	
emergent	0
maincanopy	0
subcanopy	0
Shrubs Total	0
Dominant Shrubs	
> 1.5' tall	0
< 1.5' tall	0
Graminoids Total	0
Dominant Graminoids	
Graminoids Perennial	0
Graminoids Annual	0
Forbs Total	0
Dominant Forbs	
Forbs Perennial	0
Forbs Annual	0
Ferns Total	0
Ferns Evergreen	0
Ferns Deciduous	0
ExoticsTotal	0
Exotics Perennial	0
Exotics Annual	0
Water	0
Rock Outcrop	0
Gravel	0
Logging	
Fire:	
Stand Age	
Agriculture	
Livestock	
Development	
Wildlife	
Recreation Severity	
Recreation Type	
Hydrology	

Exotic Species

Noxious Exotic Plants

Other Exotic Plants

Water:	0
Rock:	0
Talus:	0
Gravel:	0
Bare Ground:	0
Moss Lichen:	0
Litter:	0

Vegetation Types

		Percent	Pattern	Rank
Existing Veg1:	private property - row of PONI	100	Matrix	OWNERS
Veg Community1:	ownership issue			
Existing Veg2:		0		
Veg Community3:				
Existing Veg3:		0		
Veg Community3:				

Notes:

Polygon Number 8

ParkName:
Daroga

Survey Intensity	2
Observer	PM
Date	10/15/2008
Total Vegetation	4
Trees Total	0
Dominant Trees	
emergent	0
maincanopy	0
subcanopy	0
Shrubs Total	3
Dominant Shrubs	ERNI2, ERNA10, PUTR2
> 1.5' tall	3
< 1.5' tall	2
Graminoids Total	3
Dominant Graminoids	BRTE, ACHY
Graminoids Perennial	1
Graminoids Annual	3
Forbs Total	3
Dominant Forbs	CEDI3, SAKA, PHHA, PHLI, CHENO
Forbs Perennial	3
Forbs Annual	2
Ferns Total	0
Ferns Evergreen	0
Ferns Deciduous	0
ExoticsTotal	4
Exotics Perennial	3
Exotics Annual	4
Water	0
Rock Outcrop	0
Gravel	10
Logging	0
Fire:	0
Stand Age	1
Agriculture	0
Livestock	0
Development	6 (powerlines, lots
Wildlife	3
Recreation Severity	3
Recreation Type	3
Hydrology	0

Exotic Species

Noxious Exotic Plants
CEDI3, SAKA
Other Exotic Plants
BRTE

Water:	0
Rock:	0
Talus:	0
Gravel:	10
Bare Ground:	35
Moss Lichen:	0
Litter:	55

Vegetation Types

		Percent	Pattern	Rank
Existing Veg1:	PUTR2/ERNI2/BRTE-ACHY	100	Matrix	POOR
Veg Community1:	PUTR2/PSSP6			
Existing Veg2:		0		
Veg Community3:				
Existing Veg3:		0		
Veg Community3:				

Notes:

Polygon Number 9

ParkName:
Daroga

Survey Intensity	1
Observer	GW
Date	11/16/2008
Total Vegetation	4
Trees Total	2
Dominant Trees	POBAT, QUERC, PIPO
emergent	2
maincanopy	2
subcanopy	0
Shrubs Total	3
Dominant Shrubs	PUTR2, SADO4, ERNI2, YUFI, SYVU, ERNA10
> 1.5' tall	2
< 1.5' tall	3
Graminoids Total	3
Dominant Graminoids	BRTE, PSSP6, AGCR, POPR, SPCR
Graminoids Perennial	3
Graminoids Annual	3
Forbs Total	2
Dominant Forbs	ACMI2, LODI, BASA3, PHHA, MELA2, SILO3, MEOF, ARHOR,
Forbs Perennial	2
Forbs Annual	2
Ferns Total	0
Ferns Evergreen	0
Ferns Deciduous	0
ExoticsTotal	3
Exotics Perennial	3
Exotics Annual	3
Water	0
Rock Outcrop	0
Gravel	3
Logging	0
Fire:	0
Stand Age	0
Agriculture	0
Livestock	0
Development	6 (house, road)
Wildlife	3
Recreation Severity	1 (ranger station)
Recreation Type	1
Hydrology	1

Exotic Species

Noxious Exotic Plants
CEDI3
Other Exotic Plants
BRTE, AMAC2, AGCR, VETH, ERCI6,

Water:	0
Rock:	0
Talus:	0
Gravel:	3
Bare Ground:	40
Moss Lichen:	0
Litter:	57

Vegetation Types

		Percent	Pattern	Rank
Existing Veg1:	developed	80	Matrix	DEVELO
Veg Community1:	developed			
Existing Veg2:	PUTR2/POPR roadcut	20	Large patch	DEVELO
Veg Community3:				
Existing Veg3:		0		
Veg Community3:				

Notes: Combine with 11; photo 9 of poly 9, photo 8 of poly 11. Poly 9 is probably private.