

Description of the Habitat Unit Map for Mount Spokane State Park



Pacific Biodiversity Institute

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This document summarizes details about the Habitat Unit Map produced under A/E Services Agreement 709-191. The Habitat Unit Map is a polygon-based GIS dataset in ESRI shapefile format, delivered to the Washington Parks and Recreation Commission in June, 2009.

High resolution maps detailing the occurrence and distribution of habitat conditions across complex landscapes can provide a valuable toolset for master planning and forest health assessments in large park properties. To support development planning and forest health inventories in Mount Spokane State Park in 2008 and 2009, we created a Habitat Unit Map of a nearly 5,000 acre project area (Figure 1). This map was produced to provide a stratification framework supporting wildlife habitat suitability assessments in the project area. We produced the map using available GIS data and remotely-sensed data and imagery. The resulting Habitat Unit Map is a polygon-based GIS dataset depicting the locations of unique habitat features across the project area.

It should be noted that the Habitat Unit Map was produced entirely in a GIS environment and has not been field verified. Refinement and improvement of the accuracy of this map product was initially planned for in a larger Scope of Work that was not pursued by Washington Parks.

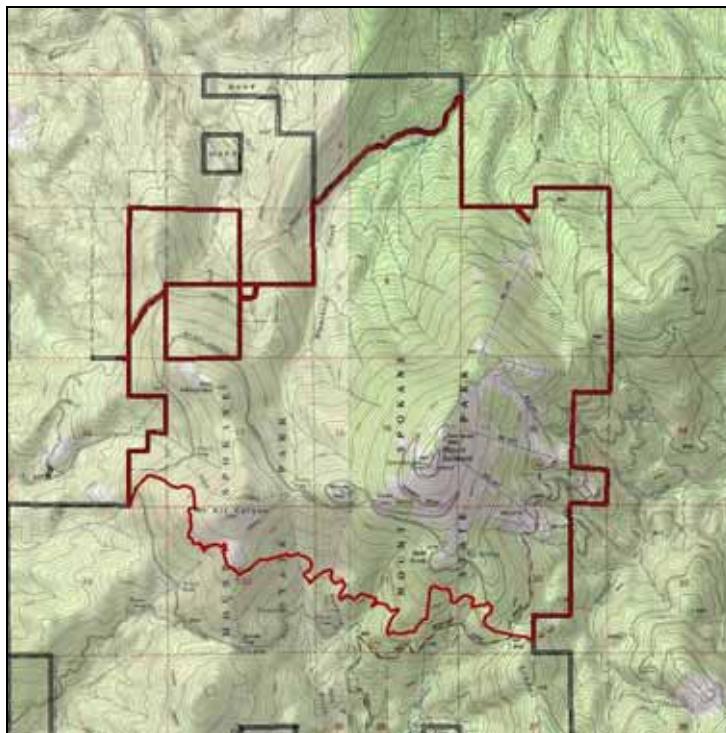


Figure 1. Project area (red polygons) for the Habitat Unit Map.

In this report and corresponding map, a Habitat Unit (HU) is defined as a polygon-based mapping unit that delineates continuous areas of unique homogeneous or repetitive habitat element conditions from surrounding landscape conditions. It is a useful and ecologically significant unit with which to conduct habitat condition analyses and subsequently represent the results and findings in a spatial context understandable to both

scientists and resource managers. A simple example of the Habitat Unit concept is provided in Figure 2, where a forest patch and a meadow are mapped as two separate Habitat Unit polygons (one polygon is purple, the other is red).

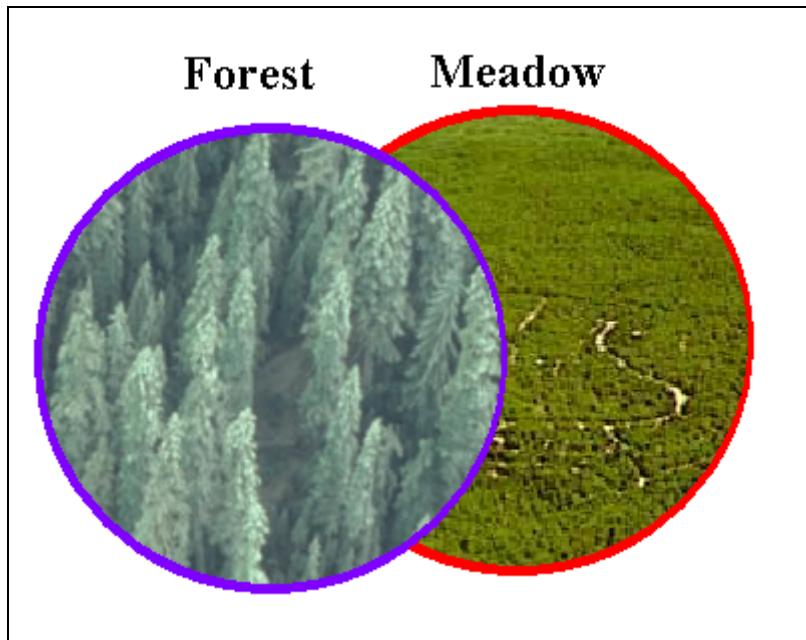


Figure 2. Example of the delineation of two adjacent Habitat Unit polygons, forest (purple) and meadow (red).

Habitat Units can be delineated based on an infinite array of potential environmental variables. The inclusion or exclusion of each environmental variable can significantly change the results of a Habitat Unit map, and the complexity of the map will increase as the number of variables incorporated increases. Our Habitat Unit Map for Mount Spokane State Park was created using the set of variables listed in Table 1. We chose these variables because 1) complete and accessible remote sensing or GIS data coverage currently exists for each of these variables across the project landscape, 2) these variables can be accurately mapped in a GIS environment without conducting extensive field surveys, and 3) these variables are each independent of each other, yet they interact to explain a large amount of the habitat unit conditions and the character of habitat elements in the project area.

A Habitat Unit map would normally include information on plant associations, species composition, and some more refined vegetation structure information derived from field assessments. Normally, the boundaries of Habitat Units would also be at least partially based on this information. This was not possible, in this case, because a scope of work item allowing fieldwork and a corresponding budget did not exist under our contract.

Table 1. Variables used in creating a Habitat Unit Map for Mount Spokane State Park

Habitat Unit Variables	Basic Description
General Habitat Type	Describes whether the unit is forest, meadow, shrubland, etc...
Aspect	Describes the general aspect of the unit
Slope	Describes the general slope steepness of the unit
Elevation	Describes the general elevation parameters of the unit
Landform	Describes the landform type on which the unit occurs
Canopy Texture	Describes the canopy texture of forested or woodland habitat types
Stand Character	Describes the stand age-class dynamics of the forested or woodland habitat types

The Habitat Units for Mount Spokane State Park were delineated by hand in a GIS environment using a suite of remote sensing and GIS based input datasets. Delineation was conducted by an experienced GIS Analyst and Conservation Scientist with extensive field knowledge of the project area. We incorporated the imagery and GIS datasets listed in Table 2 to produce the Habitat Unit Map. Resulting map features have a map scale of 1:24,000 meters.

Table 2. GIS datasets and imagery used to produce the Habitat Unit Map.

Dataset	Variables
USGS 10 meter DEM	Slope Aspect Elevation Landform Shaded Relief
ASTER 15 meter multispectral image and ETM 30 meter multispectral image	General Habitat Type
1 foot resolution True Color Aerial Photograph	General Habitat Type Canopy Texture Stand Character
ESRI GIS Server Aerial Photography	General Habitat Type Canopy Texture Stand Character
National Wetlands Inventory vector dataset	wetland locations
WA DNR 1:24,000 scale hydrography dataset	stream/riparian area locations

Because each Habitat Unit Polygon represents a continuous spatial area, the baseline variables within a given Unit will not typically be homogenous (for example elevation within one Habitat Unit may range from 4112 feet to 4320 feet). To be useful for mapping purposes, classification of baseline variables into ecologically meaningful groups is required. In-depth knowledge of the project landscape and knowledge of how wildlife or habitat conditions respond with the variable set is needed to produce useful classifications. Based on our research of wildlife/habitat interactions and our knowledge of the project area we used the classification parameters listed in Tables 3 – 9 to delineate and populate the Habitat Units at Mount Spokane State Park.

Table 3. Descriptions of habitat types in Mount Spokane State Park that were used when identifying and classifying Habitat Units.

General Habitat Type	Description
Blowdown - Shrubland	shrubland where a large stand mortality event killed the existing forest and much of the legacy tree stems have fallen to the ground
Conifer Woodland / Meadow	area with a widely open conifer forest canopy and herbaceous meadow-like conditions in between the canopy gaps
Conifer Woodland / Shrubland	area with a widely open conifer forest canopy and dense shrub cover in between the canopy gaps
Developed	area is significantly altered or impacted by human development and/or disturbances
Riparian Conifer Forest	area within 30 meters of a mapped stream segment that has a closed conifer forest canopy
Riparian Conifer Woodland / Shrubland	area within 30 meters of a mapped stream segment that has a widely open conifer forest canopy and dense shrub cover in between the canopy gaps
Riparian Developed	area within 30 meters of a mapped stream segment that is significantly altered or impacted by human development and/or disturbances
Riparian Shrubland	area within 30 meters of a mapped stream segment covered mostly by shrubs
Rock Outcrop	area contains large exposures of bedrock with minimal vegetation cover over the exposures
Scree / Boulder / Talus Fields	area consists mostly of loose rocks and/or boulders - vegetation coverage is minimal
Shrubland / Meadow	area possesses a mosaic of shrubland and meadow like conditions
Shrubland	area covered mostly by shrubs
Upland Conifer Forest	An upland (non-riparian) area mostly covered by a closed conifer forest canopy
Upland Meadow	area is covered mostly by herbs and/or grasses
Wetland Conifer Woodland / Shrubland	area mapped as wetland by NWI and has a widely open conifer forest canopy and dense shrub cover in between the canopy gaps

Table 4. Description of Aspect classes in Mount Spokane State Park that were used when identifying and classifying Habitat Units.

Aspect	Description
Northern	292.5 degrees to 67.5 degrees
East	67.5 degrees to 112.5 degrees
Southern	112.5 degrees to 247.5 degrees
West	247.5 degrees to 292.5 degrees
Ridgeline	effect of ridgeline landform deters assignment to a general aspect class
Saddle	effect of saddle landform deters assignment to a general aspect class

Table 5. Description of Slope classes in Mount Spokane State Park that were used when identifying and classifying Habitat Units.

Slope	Description
0 - 15 degrees	most of mapped unit is between 0 - 15 degrees slope
15 - 30 degrees	most of mapped unit is between 15 - 30 degrees slope
30+ degrees	most of mapped unit is over 30 degrees slope

Table 6. Description of Elevation classes in Mount Spokane State Park that were used when identifying and classifying Habitat Units.

Elevation	Description
4000' or below	most of mapped unit is below 4000 feet in elevation
4000' - 5000'	most of mapped unit is between 4000 and 5000 feet in elevation
5000' and above	most of mapped unit is above 5000 feet in elevation

Table 7. Description of Landform types in Mount Spokane State Park that were used when identifying and classifying Habitat Units.

Landform	Description
Mountain Drainage	bottoms of depressions, ravines, and valleys containing streams
Mountain Lower Slopes	lower portions of steeper mountain mid-slopes abutting mountain drainages
Mountain Midslope	steeper flanks of mountains between the ridgeline and the lower slopes
Mountain Ridgeline	highest points of mountain features above midslopes where steepness subsides and general aspects change dramatically
Saddle	similar and related to ridgelines however these landforms are higher than surrounding areas on 2 opposite sides yet are lower than surrounding areas on the other 2 opposite sides

Table 8. Description of forest canopy types in Mount Spokane State Park that were used when identifying and classifying Habitat Units.

Canopy Texture	Description
closed canopy	Stand canopy condition is closed (> 80% canopy cover)
mostly closed canopy with small open patches or minor openings	Stand has many dispersed small canopy gaps and/or a few large canopy gaps, however most of stand has >80% canopy cover
moderately open with patchy canopy texture	General canopy condition throughout stand is between 25% and 80% canopy cover, possibly with small open patches or a few large canopy gaps.
open woodland	The general canopy condition is evenly <25% canopy cover yet >5% canopy cover

Table 9. Description of forest stands in Mount Spokane State Park that were used when identifying and classifying Habitat Units.

Stand Character	Description
mostly even aged - some patches of different age classes	The canopy visible from photographs appears to be mostly of even-aged and/or even height trees
multi-age class canopy structure	The canopy visible from photographs appears to contain substantial amounts of trees of different age classes and/or height classes

Our resulting Habitat Unit Map also includes ancillary data to the “General Habitat Type” classifications. These variables are known as Sub-Type Class1 and Sub-Type Class2. Each Sub-Type Class is a hierarchical step below the General Habitat Type Classification. Their purpose is to provide additional ecologically significant data for each Habitat Unit so that adequate stratification goals can be optimally obtained in future assessment and/or planning scenarios. Table 10 lists all the potential Sub-Type Class variables and their relationships to the General Habitat Types.

Table 10. Additional Sub-Classes of Habitat types used to create the Habitat Unit Map.

General Habitat Type	Sub-Type Class1	Sub-Type Class2
Blowdown - Shrubland		
Conifer Woodland / Meadow	Associated with large meadow complex	
Conifer Woodland / Meadow	Associated with large shrubland complex	
Conifer Woodland / Meadow	Associated with tree mortality event	
Conifer Woodland / Meadow	Ridgeline	
Conifer Woodland / Meadow	Small Clearing in Forest Matrix	
Conifer Woodland / Shrubland	Associated with large meadow complex	
Conifer Woodland / Shrubland	Associated with Logging / Fire?	
Conifer Woodland / Shrubland	Associated with tree mortality event	
Conifer Woodland / Shrubland	Heavy Blowdown Area	
Conifer Woodland / Shrubland	Small Clearing in Forest Matrix	
Conifer Woodland / Shrubland	Small Clearing in Forest Matrix	
Developed	Clear-Cut	Recent
Developed	Infrastructure	Heavily
Developed	Infrastructure	Minimal

General Habitat Type	Sub-Type Class1	Sub-Type Class2
Developed	Infrastructure	Moderate
Developed	Ski Runs	Minimal
Riparian Conifer Forest	1st order stream	
Riparian Conifer Forest	2nd order stream	
Riparian Conifer Forest	3rd order stream	
Riparian Conifer Forest	4th order stream	
Riparian Conifer Woodland / Shrubland	1st order stream	
Riparian Developed	1st order stream	housing complex
Riparian Developed	1st order stream	ski run
Riparian Shrubland	1st order stream	
Rock Outcrop	Conifer Woodland / Meadows	summit
Rock Outcrop	Herbaceous Meadows	ridgeline
Rock Outcrop	Unknown	
Scree / Boulder / Talus Field	large patch	ridgeline
Scree / Boulder / Talus Field	small patches	midslope
Scree / Boulder / Talus Field	small patches	ridgeline
Shrubland	Large complex associated with tree mortality event	Below Ridgeline
Shrubland	Moderate Clearing in Forest Matrix	
Shrubland	Moderate Clearing in Forest Matrix	Stream Drainage Landform
Shrubland	Moderate clearing in woodland complex	Along Ridgeline
Shrubland	Small Clearing in Forest Matrix	
Shrubland	Small Clearing in Forest Matrix	Along Ridgeline
Shrubland	Small Clearing in Forest Matrix	Stream Drainage Landform
Shrubland	Small Clearing in Forest Matrix	
Shrubland / Meadow	Associated with large meadow complex	
Upland Conifer Forest	Mixed Conifer	
Upland Conifer Forest	Sub-Alpine Fir	
Upland Conifer Forest	Sub-Alpine Fir - Mixed Conifer	
Upland Conifer Forest	Upland Conifer Forest	Mixed Conifer
Upland Conifer Forest	Upland Conifer Forest	Sub-Alpine Fir - Mixed Conifer
Upland Meadow	Large South Facing Meadow	Dry
Upland Meadow	Large South Facing Meadow	Dry with seeps
Upland Meadow	Ridgeline Meadow Complex	Dry
Upland Meadow	Small Clearing in Forest Matrix	Dry
Upland Meadow	Small Clearing in Woodland Matrix	Dry
Wetland Conifer Woodland / Shrubland	1st order stream	

Using focal statistics on the USGS 10 meter DEM, we calculated the mean slope and mean elevation for each habitat unit polygon. These statistics are provided in the GIS data along with the acreage calculation for each habitat unit polygon, in addition to the attributes described in this document.