#15LSR –KSSWCD

Watershed Assessment and Action Plan for

Fernan Creek, Blue Creek and Wolf Lodge Creek Watersheds

Near Coeur d'Alene, Idaho

June 30, 2019

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I. Introduction

This project developed from discussions begun in the Coeur d'Alene Lake Tributaries Watershed Advisory Group (WAG), specifically addressing water quality resource concerns as they relate to Total Maximum Daily Loads (TMDLs) in specific watersheds. The target watersheds (Fernan Creek, Blue Creek, and Wolf Lodge Creek) have for a variety of reasons, been major contributors to sediment and nutrient delivery to Coeur d'Alene Lake. This became a focus of the Idaho Department of Environmental Quality (IDEQ)-led WAG, as well as federal land managers, local landowners, Tribes, and the general public.

Despite a significant amount of water quality work done in these watersheds, particularly in Fernan and Wolf Lodge Creeks, there was no consensus on just what was causing the water quality degradation. Notably, since around 2000, the NE Lake Coeur d'Alene Watershed (CDAW) has experienced significant adverse changes, primarily from development and recreation pressures. Past management, fire suppression, invasive species, and increasing human settlement have decreased natural resource quality. The Idaho Forest Action Plan (FAP) identifies water quality, wildfire, conversion of forests and forest health as critical concerns. Building upon work by the (IDEQ) and the local Watershed Advisory Group (WAG), and identified in multiple scoping meetings with stakeholders, this project takes a holistic approach to identify the highest priority resources issues throughout the watershed. To achieve landscape-level strategies, this Watershed Assessment and Watershed Action Plan (WAP) have been developed while implementing a limited set of demonstration projects within the watershed to show local landowners recommended ways to manage lands and to build momentum for watershed improvement work. A map summarizing these demonstration projects is attached. This report is considered a first iteration of the Watershed Assessment and Action Plan, which will continue to be a work in progress as further actions are planned and undertaken.

For this assessment, we used a combination of information sources, including LiDAR flown for this assessment, existing information such as soil surveys, and on-the-ground surveys such as culverts.

This document is a written summary of a large amount of data. Since much of this information, such as the LiDAR, is visual and 3D, there are power point presentations and maps available on thumb drives as companion material to this summary.

A. Summary

The entire watershed area of the Fernan Creek/Blue Creek/Wolf Lodge Creek watersheds is approximately 79,000 acres, of which about 20,000 acres are privately- owned and 59,000 acres are mostly federally-owned. This federal land is primarily USDA Idaho Panhandle National Forest (IPNF), with some holdings by USDI Bureau of Land Management (BLM). See the

- Fernan Creek: 6,600 acres private, 27,600 acres federal (included)
- Blue Creek: 6,000 acres private, 11,300 acres federal (not included)
- Wolf Lodge Creek: 7,500 acres private, 40,000 acres federal (not included)

LiDAR was flown over the entire Fernan Creek watershed (IPNF included), and the Blue Creek and Wolf Lodge Creek private portions (excluding National Forest and BLM). Since this grant is federally funded, no grant funds can be used to investigate federal lands.

B. Goals

The Goals for this NE Lake CDA Tributaries Watershed Assessment and Action Plan are to identify high priority resource issues and mitigation strategies within the watershed.

High priority resource issues include:

- Threats to forest health, including conditions which create potential for increased mortality due to insects and disease, invasive plants, and less resilient forests more susceptible to wildfire and drought.
- Risk to communities and landscape ecosystems from uncharacteristic wildfire.
- Increased sedimentation and decreased water quality.
- Increased development and recreation pressures.

High priority benefits include:

- Water quality improvement in 303d listed streams, implementation of Total Maximum Daily Load (TMDLs) plans and improving stream function.
- Fish and Wildlife habitat improvement, biodiversity maintenance and improvement, and threatened and endangered species habitat protection.
- Working forests contributing market products and ecosystem values.

High priority goals are to identify and prioritize strategies to:

- Encourage and assist forest landowners move their forest stands to site specific conditions within the range of natural variability, with desired future conditions of providing resilient, vigorous site appropriate and diverse forests.
- Encourage and assist local communities and landowners to mitigate fuel loads and conditions contributing to high potential for uncharacteristic wildfire, working across the landscape.
- Address the highest sediment and water quality concerns within the watershed.
- Build on current partnerships, provide outreach, information and education to motivate people to help improve watershed conditions.

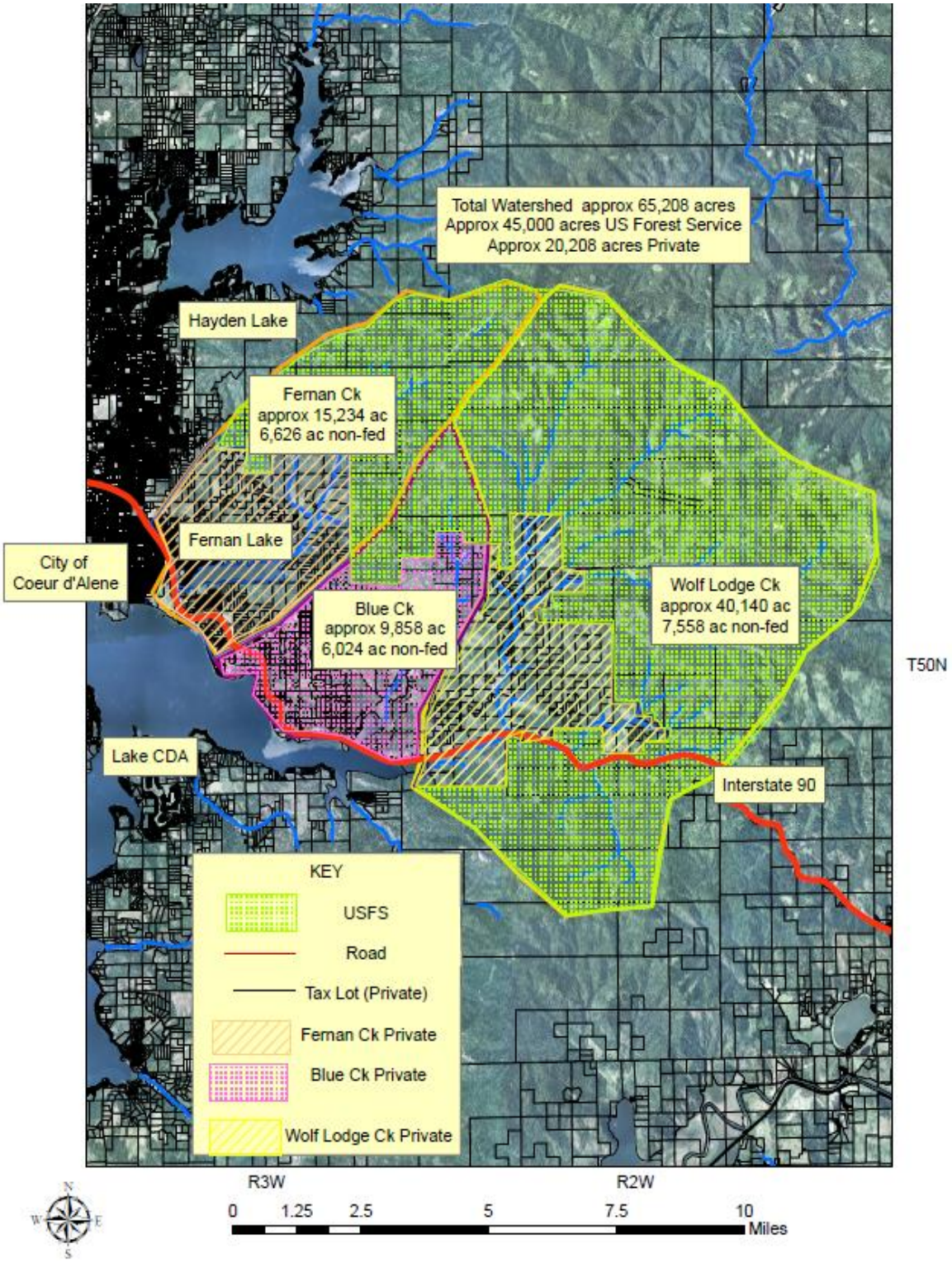
C. Focus

The focus of this Assessment and Action Plan is on private lands within the watershed, due to our role as Kootenai Shoshone Soil and Water Conservation District and our funding sources. We do partner and will continue to build partnerships with federal land management agencies, Kootenai County, local communities and other involved players in order to take a landscape approach to watershed improvement. This includes education and outreach as well as on-the-ground projects.

This Assessment and Action Plan is linked with, and has nested within, a more detailed stream assessment and prioritized actions for Wolf Lodge Creek through IDEQ and River Design Group, to address in-stream and near stream improvement work, using the LiDAR acquired by this project.

This Assessment and Action Plan will be, with its Appendixes, a Landscape Forest Landowner Stewardship Plan, and includes all the elements needed for an Idaho Forest Stewardship Plan at a landscape level. Individual forest landowners will still develop a site-specific Forest Landowner Stewardship Plan for their property, on a voluntary basis. Generally, these will be parcels 5 acres and larger in size. Cost share funds are available to help develop these plans through the Environmental Quality Improvement Program (EQIP).

D. Location and Vincinity Map – Fernan Creek, Blue Creek, Wolf Lodge Creek



(note: these acre numbers are original estimates and do not match LiDAR assessment acres)

II. Watershed Assessment

A. Lidar

The foundation of the watershed assessment is the LiDAR data. As this project was being developed, advice and input from resource professionals, especially forest hydrologists, was to use LiDAR as the basis of our watershed assessment, due to the value of the information it provides. Quantum Spatial, of the Corvallis, OR, collected the data through an agreement with Puget Sound LiDAR Consortium (PSLC) in partnership with University of Idaho MILES. The cost of LiDAR acquisition is proportional to the area covered; i.e., the per-acre cost decreases as the number of acres increases. In order to get an affordable per-acre cost, KSSWCD and MILES agreed to share the cost of the LiDAR acquisition. MILES did not particularly want the coverage of the Blue Creek and Wolf Lodge Creek drainages, while KSSWCD wanted the Fernan Creek drainage adjacent to Blue and Wolf Lodge. PSLC was reluctant to collect data on the relatively small Fernan Creek watershed but was willing to make the collection flight over the entire three watersheds. This reduced the per-acre cost to a point where the two parties (MILES and KSSWCD) could afford to gather the data by agreeing to split the cost evenly.
LiDAR was flown over the entire Fernan Creek watershed (IPNF included), and the Blue Creek and Wolf Lodge Creek private portions (excluding National Forest). Since this grant is federally funded, no grant funds can be used to investigate federal lands.

KSSWCD partnered with the University of Idaho (U of I) to contract with the Puget Sound LiDAR Consortium for the LiDAR data collection. U of I wanted LiDAR over the entire Fernan Creek watershed, IPNF lands included. An agreement was struck with U of I for them to pay for the IPNF portion of the collection (20,200 acres) and KSSWCD to pay for the private portion (20,100).

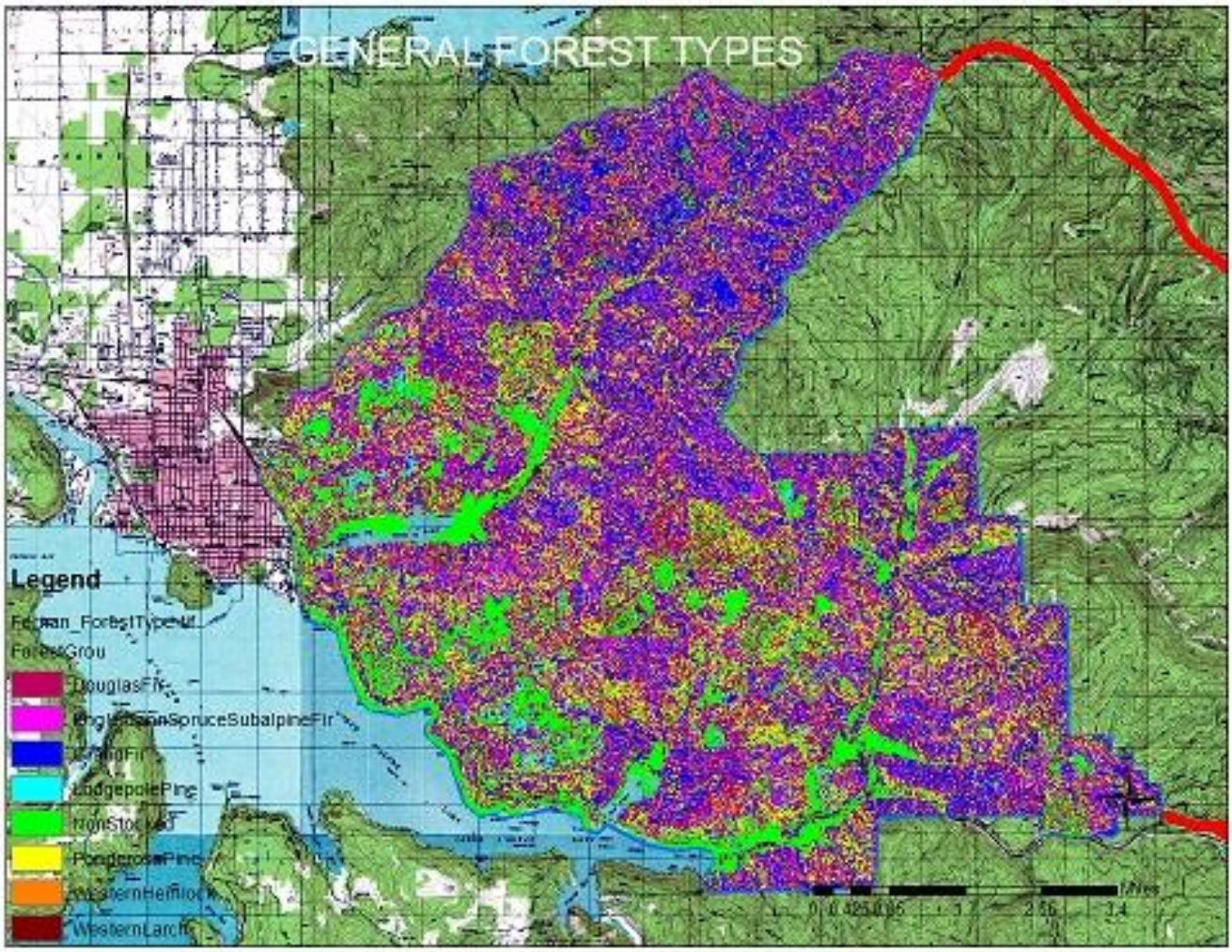
The true value of the project is in the electronic data. This report attempts to summarize the LiDAR data to the extent to assess conditions within the watershed. However, the nature of the LiDAR coverage is the ability to zoom to any particular location and either visualize it or to query the attributes. The same can be said for the (culvert) spreadsheet data. The power, in this case, of the spreadsheet is the ability to filter the data to ascertain the attributes of particular interest. This detailed information is projected to be valuable into the future, as part of the watershed improvement work in progress.

The LiDAR was collected by Quantum Spatial of Corvallis, OR, in collaboration with the Puget Sound LiDAR Consortium in the spring of 2015. The data was delivered as points, rasters, and vectors, and then interpreted by LiDAR specialists at USFS Moscow Forestry Services Laboratory in Moscow, ID. Field plots to ground truth the LiDAR data and use for interpretation were put in on selected locations in the watershed, by UI faculty and students.

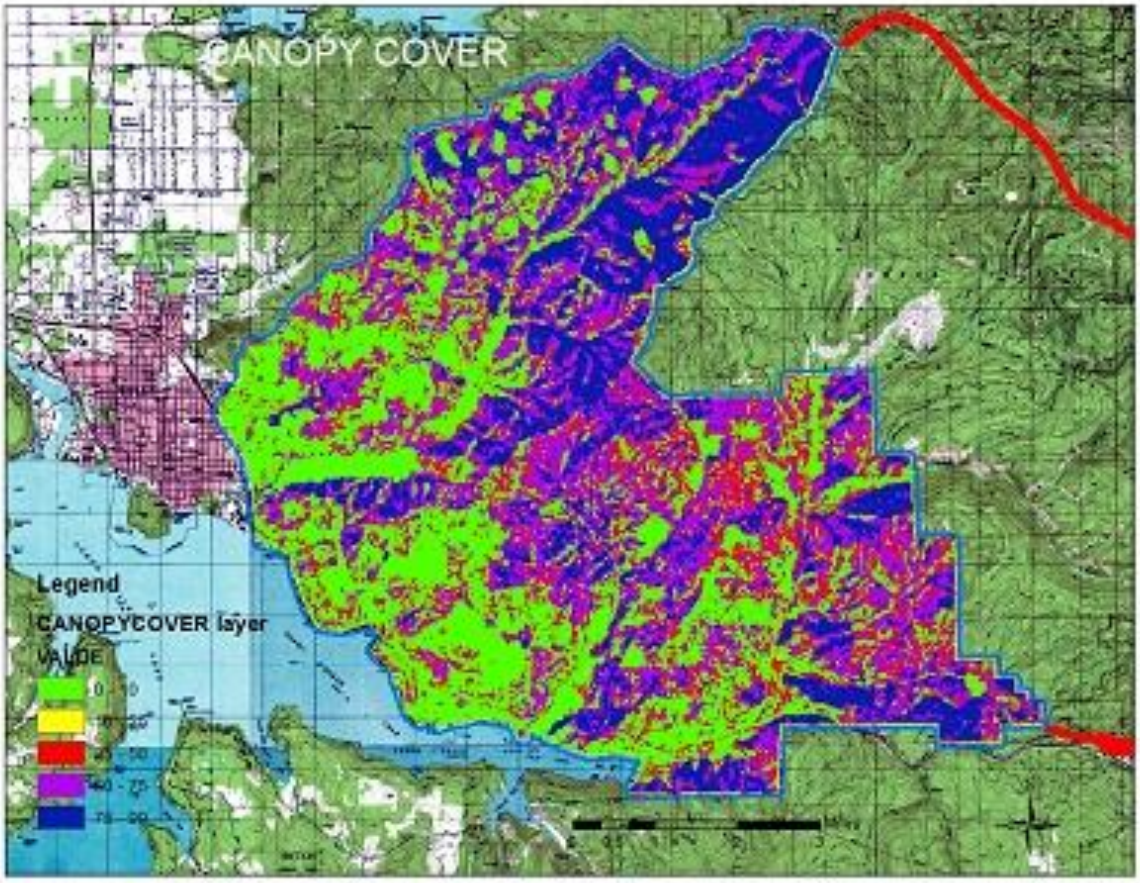
The raw and processed data is stored at several locations. The entire file collection is nearly 500 GB and is much too large to incorporate into any report. It is also useful only with GIS applications. Copies have been distributed to Idaho Department of Environmental Quality, Idaho Department of Lands, Coeur d'Alene Tribe, Kootenai County GIS, and Idaho LiDAR Consortium. Copies of the data can be obtained from KSSWCD.

Examples of LiDAR-based maps, after interpretation are shown below:

Forest Metrics



The forest types found in the watershed may be generalized as shown in the forest type cover map above. Forest types tend to run from more climax species such as grand fir, western red cedar, western hemlock, and Engelmann spruce on wetter, deeper and higher elevation soils to the more seral species of ponderosa pine, lodgepole pine and western larch on drier and lower elevation soils. This is also a functional result, not just of elevation, but also of aspect, soil type, hydrologic functions, and management practices.



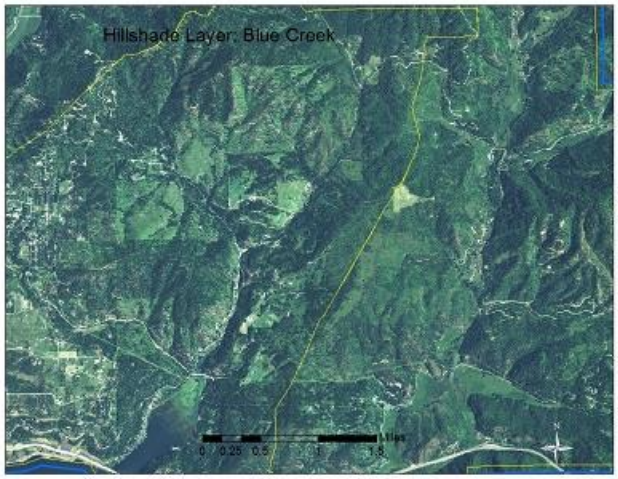
This canopy cover shows that the more densely populated and more highly developed lands have lower canopy density. This is likely a function both of development and of more intense forest management. The national forest, which has experienced minimal harvest in recent years has much of the most-dense canopy. Small pockets of low-density mark areas that have had fairly recent harvest cuts.

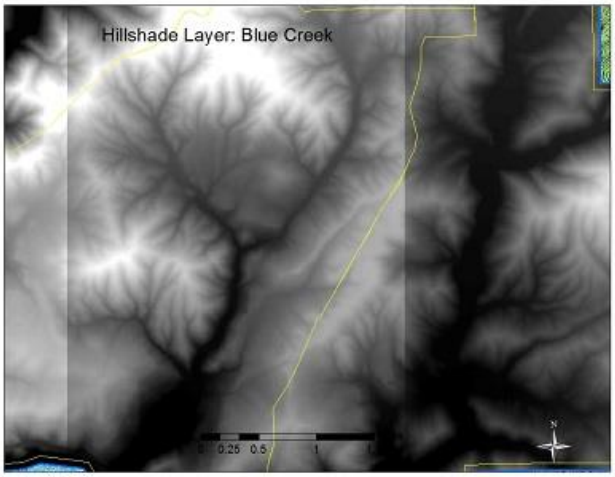
There is a ribbon of dense forest down through the very sparsely populated land from national forest in the east to the south side of Fernan Lake. These private properties are quite inaccessible to most traffic; hence, those lands are undeveloped, and the forest remains fairly dense. That is not to say that these forests are pristine or reference quality, just that they possess a more-dense canopy than those areas with greater development.

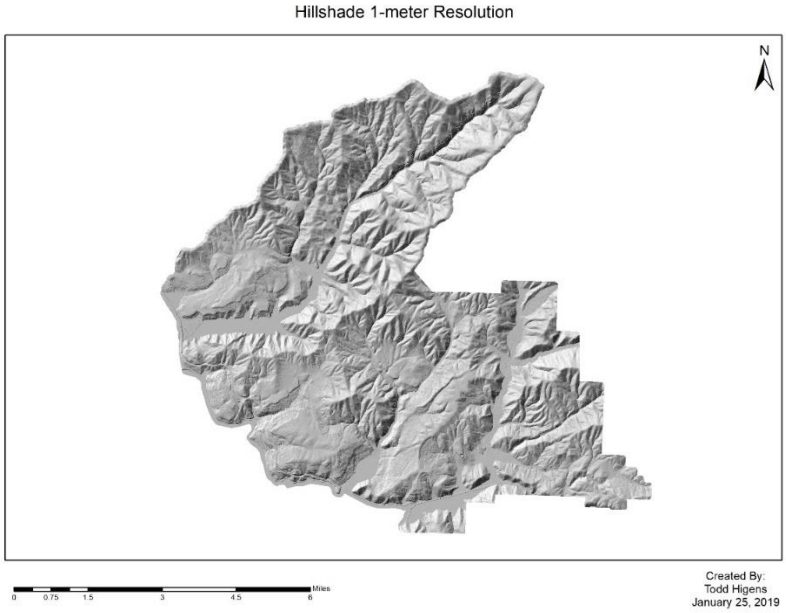
Canopy density is a relative term that should be interpreted at a plot-scale, since the data includes shrubs and small-diameter (1") saplings. On-the-ground confirmation of any given plot is essential.

Watershed/Hill Shade

The images below show the Blue Creek watershed both as orthoimagery and as hill shade imagery from LiDAR for comparison. These contrasting images can be used to show the intricacies of the watershed. The resolution can be zoomed to any degree desired. At very close resolution it can be used to expose skid trails or other features that would otherwise be concealed by forest canopy. These images are at a scale to easily visualize the complexity and detail.





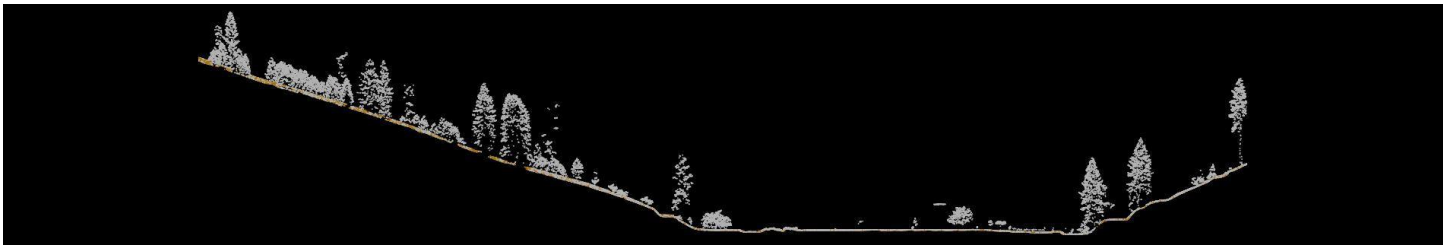


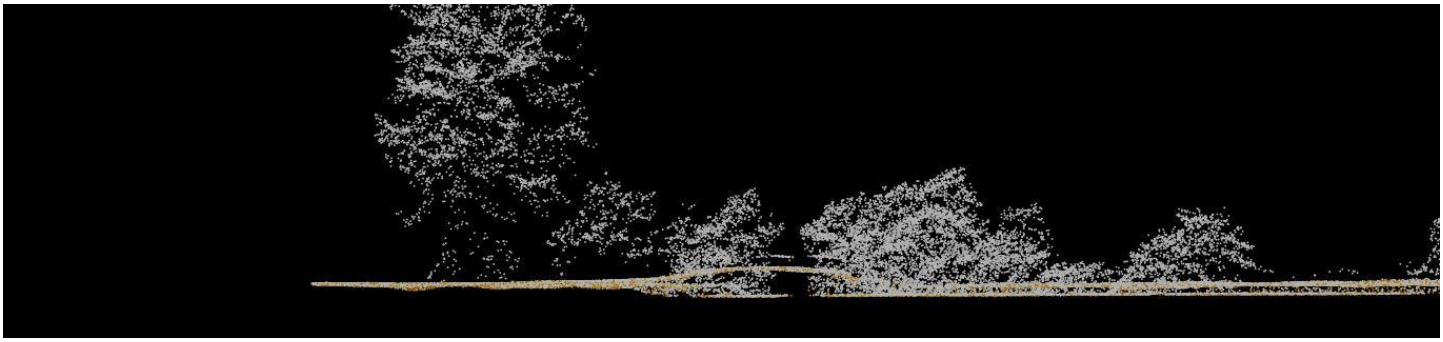
There are many sources of GIS data available to the public that can be used for conservation and environmental planning but there are some distinct advantages that LiDAR data provides over free and available data sources:

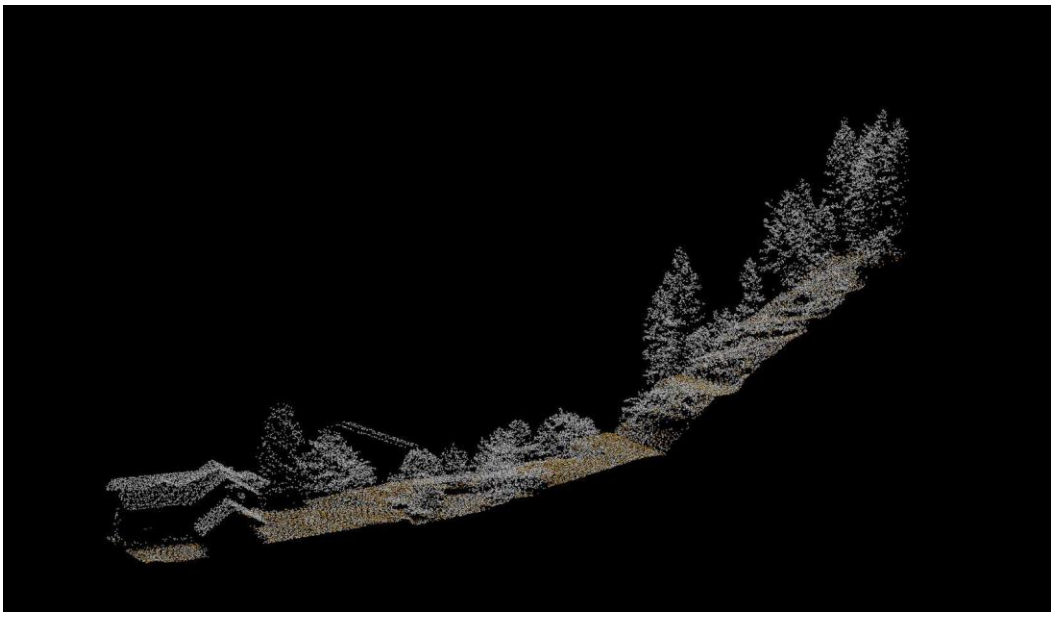
- Very high resolution of one square meter
- More accurate remote sensing
- More accurate for small scale projects
- Recent acquisition leads to more accurate temporal resolution when most free data sources are several years old
- The raw LiDAR files can be processed in any the user may need
- The LiDAR point cloud data can be used for 3D modeling

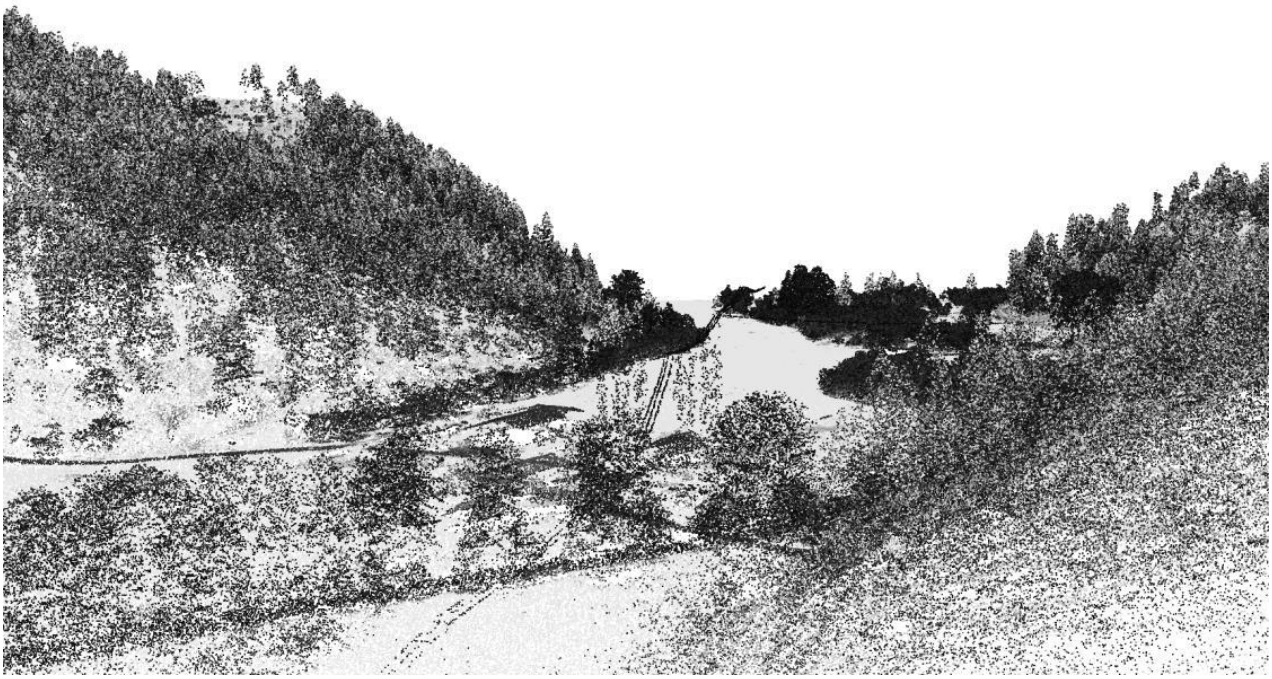
- The LiDAR point cloud data can be used in many other GIS software platforms (AutoCAD Civil 3D, GRASS, QGIS)

Site Specific Use







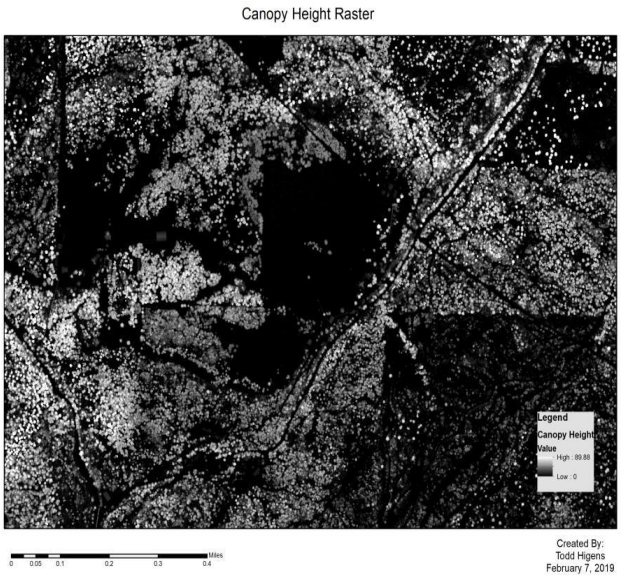


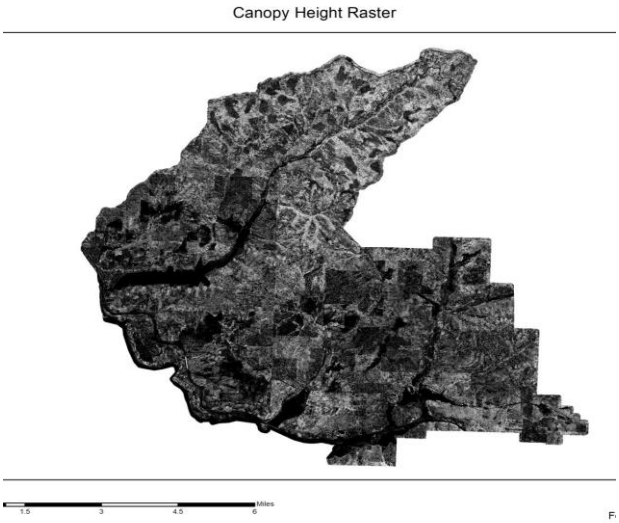
Additional Potential:

With the LiDAR and derivatives, there is still great potential to create informative interpretations for this watershed. IDEQ plans to contract to create more intensive stream assessments for Fernan and Blue Creeks, similar to the one River Design Group conducted on Wolf Lodge Creek, to drive stream improvement projects. The USFS Fernan Ranger District requested a copy of this LiDAR data to help plan management and restoration projects. IDL used this LiDAR data to work with University of Washington remote sensing students.

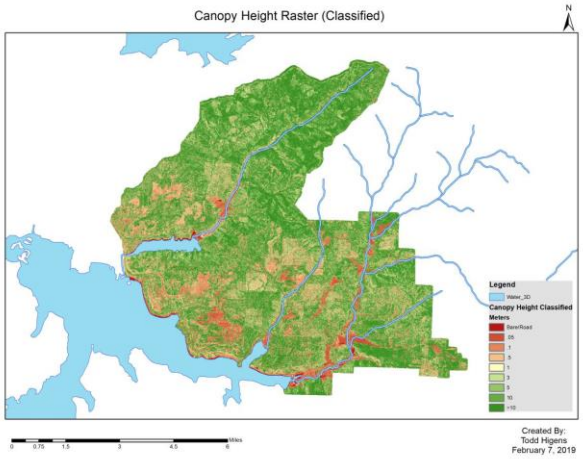
Potential Future Projects could consider exploring the feasibility of building cross-walks between LiDAR and Fire Behavior Fuel Models; attempting to derive biomass and available biomass estimates for markets; using LiDAR to model individual projects and project criteria. Partnerships with colleges and Universities could be explored to conduct these projects.

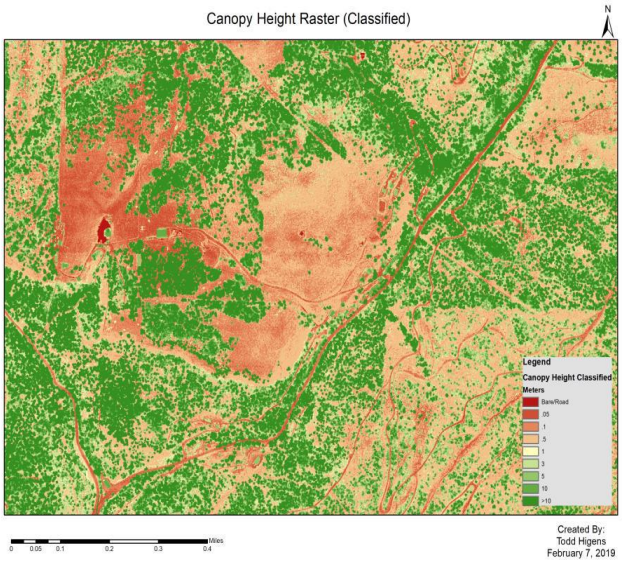
LiDAR Canopy Height Raster





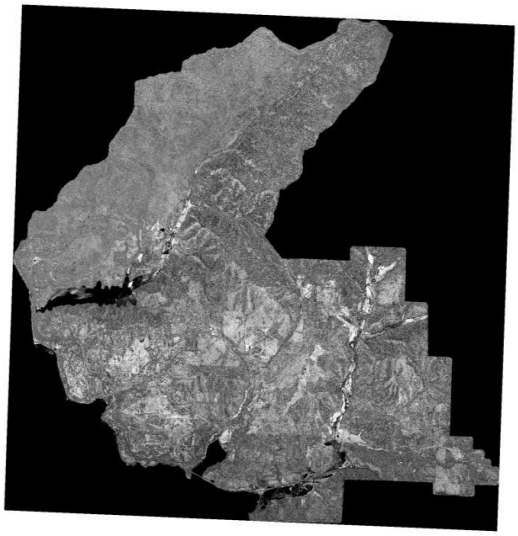
LiDAR Canopy Height Raster Classified





WCG LiDAR Data – Basic LiDAR Rasters

Intensity Raster



1.5 3 4.5 6 Miles

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Bare Earth Raster 1-meter Resolution

3 4.5 6 Miles

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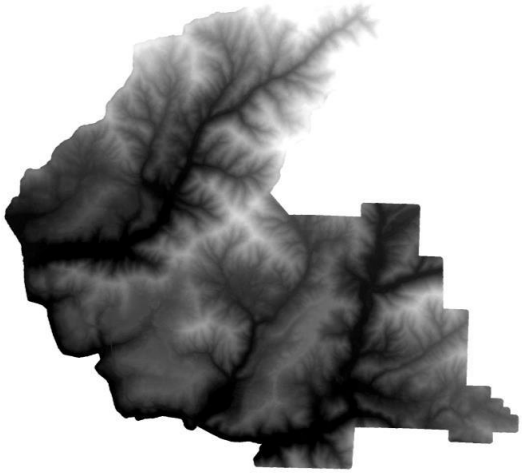
Highest Hit



1.5 3 4.5 6 Miles

Raster’s Derived From LiDAR Data

Aspect Raster 1-meter Resolution

1.5 3 4.5 6 Miles

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Hillshade 1-meter Resolution

1.5 3 4.5 6 Miles

Ja

Slope Raster 1-meter Resolution

1.5 3 4.5 6 Miles

F

B. Geology and Climate

Physiography and Climate

The subset (project area) of the HUC 12 watershed area lies within Major Land Resource Area 43A – Northern Rocky Mountains. It is characterized by thrust- and block-faulted mountains; and hills (USDA 2006), ridges, and narrow and broad drainageways. It is dissected and drained by creeks and streams that generally flow from a northeast to southwest direction, eventually terminating in Fernan and Coeur D Alene lakes. Elevation range is about 2,129 ft at Blue Creek Bay (Coeur D Alene Lake) to 2,400 ft in major creek bottoms of the drainages of Fernan, Blue and Wolf Lodge Creeks. Hills (Kern Butte) and broad ridges (Folsom Ridge) are represented by elevations of about 2,400 ft to 3,400 ft. Mountains such as Kelly, Treasure and Huckleberry are examples with elevation greater than 3,400 ft. The highest point within the watershed boundary is 5,348 ft near Skitwish Peak. Slope ranges from 0% in creek bottoms to 95% on some very steep, south-facing hillslopes along Marie Creek. There is a strong precipitation gradient from west to east, that increases with elevation with a mean annual precipitation of about 26.5 inches near the southwest end of Fernan Lake to 62 inches at Skitwish Peak. (PRISM 2004). Mean annual air temperature exhibits a similar gradient, again correlated with elevation, but trending in a southwest to northeast direction, of about 47°F along the southwestern boundary decreasing to 38°F near Skitwish Peak. (Crookston and Rehfeldt 2010).

Geology

Majority of the area consists mainly of Precambrian metamorphic rocks (IGS 2018) and metasedimentary rock of the Belt supergroup. Major formations include: the Pritchard (lower, upper), Burke, Revett and a small amount of the St. Regis formation confined to the northeast project boundary. Kern Butte and Kelly Mountain are within the Prichard formation (lower-Kern Butte, upper-Kelly Mountain) map unit (IGS 2018). Copper Mountain and Lonesome Creek are in the map unit of the Burke formation. The Revett Formation map unit includes topographical features such as Treasure and Wolf Lodge Mountains and Skitwish Peak. Specific rock types of these formations include, but not limited to; quartzite, siltite and argillite. Tertiary age sediments are noted on Folsom Ridge and on benches within and along some of the drainageways within the mid to upper part of the watershed. A very small amount of younger, igneous extrusive rocks (Basalt – Grande Ronde and Priest Rapids member) are present in lower elevation areas near the western and southern edges of the project boundary; south of Fernan Hill and south of Kern Butte, respectively. Quaternary age sediments (alluvium) are found in major creek bottoms like Wolf Lodge creek. (IGS 2018).

C. Soils

Important and major landforms within the project area include; flood plains, flood plain steps, hill slopes, broad ridges, and mountain slopes. Non-soil areas such as water bodies are: Fernan Lake and Blue Creek Bay on Coeur D Alene Lake.

Soils on hill and mountain slope landforms: largest extent within the area.

1. Cool, moist soils on these landforms (on north and east aspects) support a mixed conifer and forb understory vegetation. Conifer species associated with these soils include: Western Redcedar, Western Hemlock, Grand Fir, Western White Pine, and Rocky Mountain Douglas Fir. The soils are characterized by a thick (> 14 inches) volcanic ash mantle (ash fall dominantly from Mt. Mazama) that overlie weathered metamorphic or metasedimentary rock. Surface texture is medium and subsoil textures range from medium to coarse. They are well drained and saturated hydraulic conductivity is high in surface layers and moderately high in the subsoil. These soils are rated in hydrologic soil group B. (USDA 2018

a, b). Effective rooting depth is typically 40 to greater than 60 inches deep. They have high to very high value for timber productivity. Example soils in this group are: Boulder Creek family, Huckle series, Honeyjones and Hugus families. (USDA 2018 a, b).

2. Cool, dry soils on these landforms (on west and south aspects) support a mixed conifer and shrub/forb understory vegetation. Conifer species associated with these soils include: Rocky Mountain Douglas Fir, Grand Fir, Western Larch and Ponderosa Pine. The soils are characterized by a mixed loess and volcanic ash mantle that overlie weathered metamorphic or metasedimentary rock. Medium surface and subsoil textures are common in these soils. They are well drained and have a moderately high saturated hydraulic conductivity. Soils in this group are rated in hydrologic soil group B. (USDA 2018b). Effective rooting depth is typically 40 to greater than 60 inches deep. These soils have moderately high to high value for timber productivity. The Ardenvoir and McCrosket soil series are representative of soils with these soil properties and qualities. (USDA 2018b).

Soils on broad ridge landforms: second largest extent within the area.

Cool, moist soils on this landform (all aspects) support a mixed conifer and forb understory vegetation. Conifer species associated with these soils include: Western Redcedar, Western Hemlock, Grand Fir, Western White Pine and Rocky Mountain Douglas Fir. The soils are characterized by a thick (> 14 inches) volcanic ash mantle (Chatcolet series) and a mixed mantle of volcanic ash and sediments (Mokins series) that overlie lacustrine deposits (Tertiary sediments). Surface textures are medium and subsoil textures are fine and moderately fine. They are well drained and moderately well drained and have high a saturated hydraulic conductivity in the surface and low to moderately high and saturated hydraulic conductivity in the subsoil. Some soils have a seasonally perched water table at depths of 14 to 30 inches in the spring. The soils are rated in hydrologic soil groups C and D. (USDA 2018b). Effective rooting depth is greater than 60 inches deep. These soils have moderately high to high value for timber productivity. The Chatcolet and Mokins series are examples of a soil with these characteristics. (USDA 2018b).

Soils on flood plains and flood plain step landforms: small extent within the area.

Cool, saturated soils on these landforms support Western Redcedar and varied riparian vegetation, including hydrophytic plants. These soils formed in local, mixed alluvium. The alluvium is highly variable ranging from fine sediments to coarse sand and gravel and is often stratified. Textures range from fine to very coarse. They are very poorly to moderately well drained and can have a low to very high saturated hydraulic conductivity. Soils in this group rate in hydrologic soil groups D and C. (USDA 2018 a, b). Depth to apparent water table ranges from 0 to 24 inches. Rare to frequent flooding for brief to long periods in the spring is common. (USDA 2018 a, b). Effective rooting depth is 40 to greater than 60 inches deep. The Ramsdell series, Aquic Xerofluvents, Typic Humaquepts and Pokey families are examples of a soils with these soil properties and qualities. (USDA 2018 a, b).

A complete Soil Report for the private lands within the watershed is in the Appendix. A summary table is presented here, for the soil types, with map unit name, acres on private land within the watershed, habitat type, site index, volume growth rate in cu ft/ac/yr for forest soils, and potential fire damage hazard. (Insert Table and Map)

Summary of Soil Types within NE Lake CDA Tributaries (Wolf Lodge, Blue, Fernan Creeks) Watershed Private Land

Map Unit Symbol	Map Unit Name	Acres in Watershed	Percent of Watershed	Habitat Type	Site Index	Volume Growth Rate (CMAI) cu ft/ac/yr	Potential Fire Hazard Damage
101 and 2nmO	Aquic Xerofluvents, nearly level	260	1.20%				Low
105 and 2nm4	Blinn Loam, 5 to 35% slope, very stony	856	3.90%	Grand fir/twinflower	Gf 69	129	Moderate
106	Blinn Loam, 35 to 65% slope, very stony	606	2.80%	Grand fir/twinflower	Gf 69	129	High
110	Cald Silt Loam	297	1.40%	wet meadow			Low
112	Chatcolet cobbly loam, 7 to 25% slopes	97	0.40%	Western redcedar/ ladyfern	Wp 80	157	Moderate
113 and 2nmd	Chatcolet cobbly loam, 25 to 65% slopes	1,037	4.70%	Western redcedar/ ladyfern	Wp 80	157	High
115	Cougarbay silt loam	47	0.20%	wetland			Low
2v72k	Huckle ashy silt loam, 35 to 75% slopes	349	1.20%	Western hemlock/ queencup beadlily	Df 69	76	High
124	Huckle-Ardenvoir association, 5 to 35% slopes	283	1.30%	Grand fir/twinflower	Df 63-69	63-76	High
125 and 2nms	Huckle-Ardenvoir association, 35 to 75% slopes	1,041	4.80%	Grand fir/twin flower w/ hemlock/beadlily	Df 63-69	63-76	High
130	Typic Udivitrands-Typic Humaquepts-Pokey families	376	1.70%	Broad stream bottoms, complex			Moderate
132	Kruse silt loam, 5 to 20% slopes	67	0.30%	Grand fir/ninebark	Df 125 Pp 120	157 143	Moderate
135	Lacy gravelly loam, very stony-Rock outcrop, 5-35% slopes	20	0.10%	Ponderosa pine/idaho fescue	Pp 63	43	Moderate
136	Lacy-Bobbitt association, 5 to 35% slopes, very stony	225	1.00%	P pine/idaho fescue Doug fir/snowberry	Pp 63-106	43-114	Moderate

137	Lacy-Bobbitt association, 35 to 65% slopes, very stony	356	1.60%	P pine/idaho fescue Doug fir/snowberry	Pp 63-106	43-114	High
146 and 2nng	McCrosket-Ardenvoir assoc, 20-35% slopes	1,449	6.60%	Doug fir/snowberry	Pp 88 Gf 55	86 114	High
147	McCrosket-Ardenvoir assoc, 35-65% slopes	2,248	10.30%	P pine/idaho fescue Doug fir/snowberry	Pp 88 Df 102	82 121	High
148 and 2v72b	McCrosket-Tekoa assoc, 12 to 60% slopes	2,197	10.00%	P pine/idaho fescue Doug fir/ninebark	Pp 88 Df 87	65-82 121	High
149	McGuire-Marble assoc, 0 to 7% slopes	60	0.30%	P pine/idaho fescue/snowberry	Pp 76-84	57	Moderate
151	Mokins silt loam, 5 to 20% slopes	328	1.50%	Grand fir/twinflower	Wp 60	114	Moderate
152	Mokins silt loam, 20 to 35% slopes	50	0.20%	Grand fir/twinflower	Wp 60	114	High
154 and 2nnq	Mokins-Chatcolet complex, 5 to 20% slope	1,223	5.60%	Grand fir/twinflower W redcedar/ladyfern	Wp 60-80	114-157	Moderate
157	Porrett silt loam, wetland	23	0.10%	Western red cedar			High
159	Pywell muck, 0-2% slopes, Frequently flooded, wetland	37	0.20%	sedge plants			High
160 and 2nnx	Ramsdell silt loam	345	1.60%	Black cottonwood Western redcedar			Moderate
165	Santa ashy silt loam, 2 to 8% slopes	192	0.90%	Grand fir/ninebark	Pp 111 Gf 111	124 175	Moderate
166	Santa ashy silt loam, 8 to 15% slopes	273	1.20%	Grand fir/ninebark	Pp 111 Gf 111	124 175	Moderate
167	Santan ashy silt loam, 15 to 35% slopes	16	0.10%	Grand fir/ninebark	Pp 111 Gf 111	124 175	High
186	Taney silt loam, 3 to 7% slopes	19	0.10%	Douglas fir/snowberry	Pp 85 Df 100	72 100	Low
189	Tekoa gravelly silt loam, 5 to 20% slopes	3	0.00%	Ponderosa pine/idaho fescue	Pp 77	57	Moderate
205	Water	487					

448	Hubub-Honeyjones families, mod weathered beltrock	108	0.50%	hemlock/queencup beadlily			High
449 and 462	Hugus-Honeyjones families, complex, north aspects	930	4.20%				High
463	Hugus-Bouldercreek-Humic Udivtrands families, toeslopes	127	0.60%	W redcedar/ladyfern			High
464	Hugus-Honeyjones families, mod weathered, south aspects	164	0.70%	Grand fir/queencup beadlily			High
466	Bouldercreek family, weakly weathered metasedimentary	174	0.80%	W redcedar/ queencup beadlily			High
467 and 468	Bouldercreek-Humic families, weakly weathered, lower slopes	122	0.50%				High
470	Boulder-Ahrs families, weakly weathered, south aspects	21	0.10%				High
471	Ahrs-Rock outcrop-Typic Vixtrixrands, south aspect	564	2.60%	Douglas fir/ninebark			High
472	Hugus-Honeyjones-Goshawk complex, south aspects	703	3.20%	Grand fir/beadlily hemlock/beadlily			High
473	Hugus-Goshawk-Minaloosa complex, south aspects	1,450	6.60%	Grand fir/beadlily Douglas fir/ninebark			High
477	Honeyjones familiy, weakly weathered, north aspects	244	1.10%				High
478	Typic Vixtrixrands-Rock outcrop-Lotuspoint south aspects dry	244	1.10%				High
480	Bouldercreek-Humic Udivitrands weakly weathered north aspects	581	2.70%	W redcedar/ beadlily/ladyfern			High
483	Typic Vitrixerands-Ahrs complex, south aspects	95	0.40%				High
488	Timberbutte-Rock outcrop complex, south aspects, dry	161	0.70%	Douglas fir/ninebark			High
490	Hugus-Honeyjones complex, mod weathered, north aspects	138	0.60%	W redcedar/beadlily Grand fir/beadlily			High
		20693					

Forest soils range from a site index of fairly high, 175 for Grand fir, down to quite low, 63 on ponderosa pine. Volume Growth Rates (Cumulative Mean Annual Increment) in cubic feet per acre per year also vary from a high of 175 cu ft/ac/yr down to 43 cu ft/ac/yr. Some soils within the watershed are too shallow and droughty, or too rocky to be able to support trees; these do not show a site index or volume growth rate. Other soils are wet meadows and wetlands, these also do not have site indexes or volume growth rates.

The potential for fire damage hazard is also rated for each soil, most of the acres in this watershed are in the High category.

Summary:

Forest Habitat Types

Western red cedar/ladyfern	**1,865 acres**
Western red cedar/queencup beadlily	174
Western hemlock/queencup beadlily	457
Grand fir/queencup beadlily	1,005
Grand fir/twinflower	4,387
Grand fir/ninebark	548
Douglas fir/snowberry	1,458
Douglas fir/ninebark	2,175
Ponderosa pine/Idaho fescue	4,753
Wetlands, wet meadows, streambottoms, sedge	1,362

Note: Habitat types show what the site is capable of growing at successional climax stage, given lack of disturbance over long time periods. These are not necessarily current vegetation types nor the tree species best suited for the sites in terms of long-term forest health and vigor.

Site Index	**Less than 70**	**70 to 120**	**Over 120**	**Not Rated**
Grand fir, Doug fir	3,135 acres	19 acres		7,211
White pine	378	2,357		
Ponderosa pine	604	6,435	67	

Productivity cu ft/ac/yr	**Less than 100**	**100-121**	**Over 121**	**Not Rated**
(CMAI)	4,514 acres	4,075 acres	4,386 acres	7,211 acres
Potential Fire Damage Hazard	**High**	**Moderate**	**Low**	**Not Rated**
	15,578 acres	4,005 acres	623 acres	0 acres

These are acres showing susceptibility of soils to wildfire damage, and are somewhat different, but related, to the wildfire risk ratings under the “Wildfire” section, which are more related to fuel loads, slopes and other wildfire risk factors.

Within the watershed, there are 487 acres of water (Fernan and Blue Lakes).

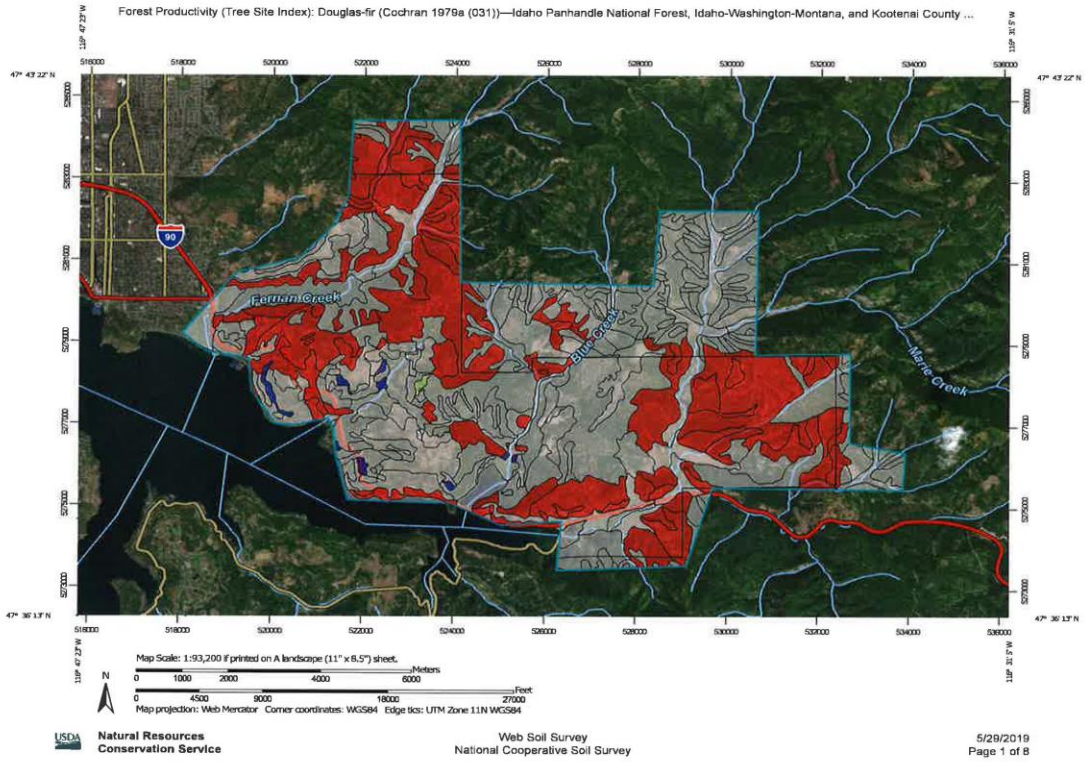
The soils show potential farmland of:

Prime Farmland	650 ac
Prime Farmland if drained	19
Prime Farmland if irrigated	186

Prime farmland if drained and protected from flooding	381
Farmland of statewide importance	137
Farmland of statewide importance if drained	1,503
TOTAL	2,786 acres

Note: Many of these potential farmland acres have already been developed (overlay soils farmland map with development map); mostly with residential development and other uses (e.g. golf course). Other acres identified as potential farmland on this map, especially those which would need to be drained and protected from flooding, are more valuable to the watershed as wetlands connecting the stream to the floodplain, for example along the lower end of Wolf Lodge Creek where it enters Lake Coeur d'Alene.

1. Map 1 (Appendix 2)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- <= 87
- > 87 and <= 100
- > 100 and <= 125
- Not rated or not available

Soil Rating Lines
- <= 87
- > 87 and <= 100
- > 100 and <= 125
- Not rated or not available

Soil Rating Points
- <= 87
- > 87 and <= 100
- > 100 and <= 125
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Idaho Panhandle National Forest, Idaho-Washington-Montana
Survey Area Data: Version 5, Sep 14, 2018

Soil Survey Area: Kootenai County Area, Idaho
Survey Area Data: Version 16, Sep 13, 2018

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 15, 2010—Nov 4, 2016

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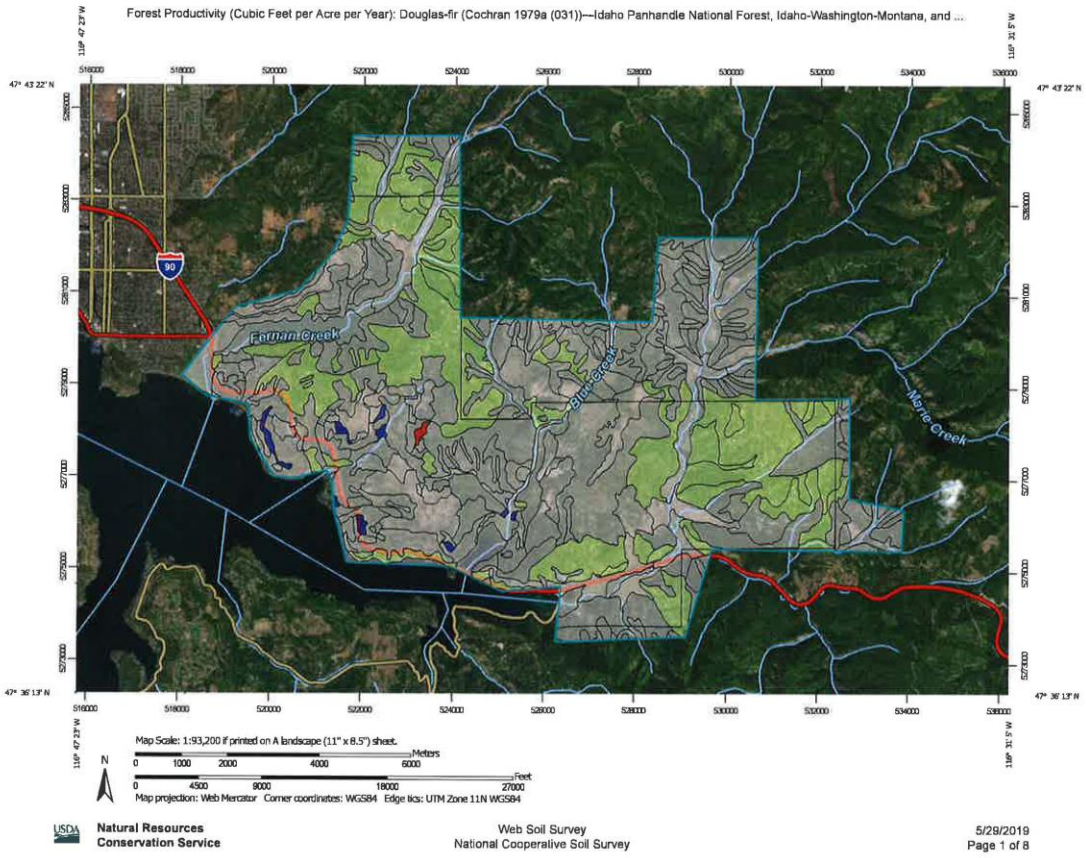
2. Map 2 (Appendix 3)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- <= 100.00
- > 100.00 and <= 121.00
- > 121.00 and <= 157.00
- Not rated or not available

Soil Rating Lines
- <= 100.00
- > 100.00 and <= 121.00
- > 121.00 and <= 157.00
- Not rated or not available

Soil Rating Points
- <= 100.00
- > 100.00 and <= 121.00
- > 121.00 and <= 157.00
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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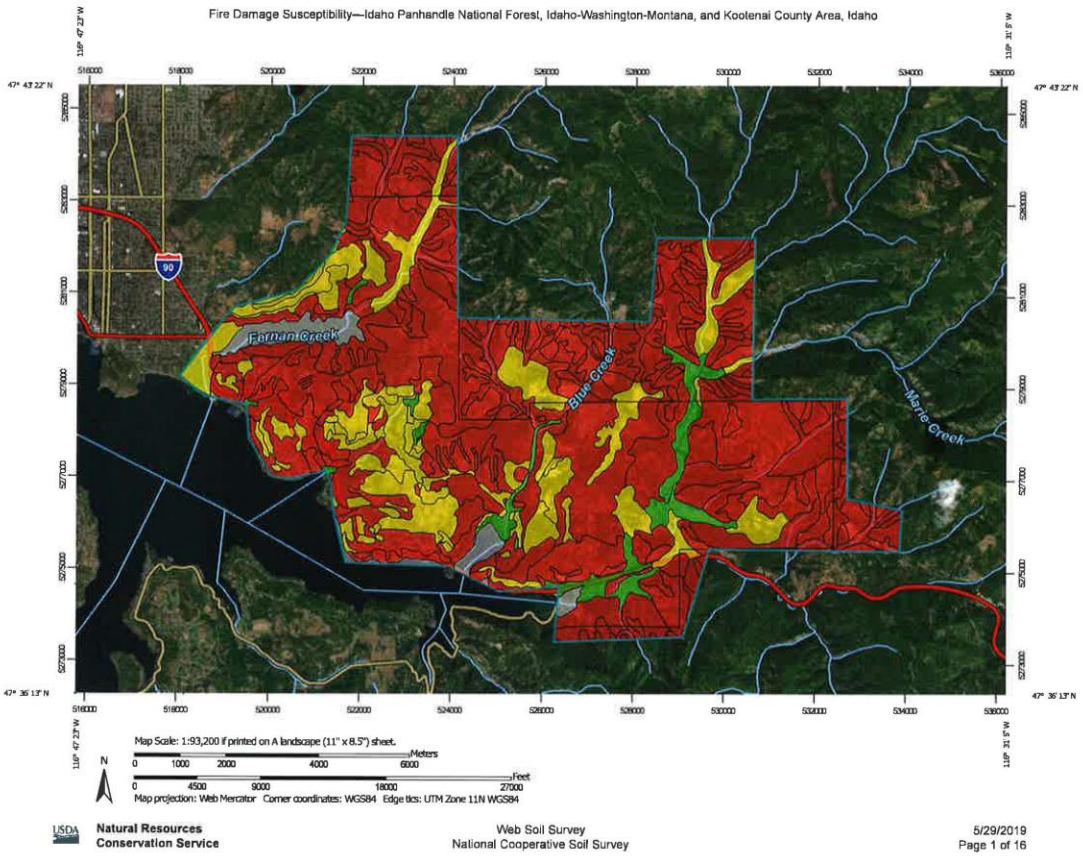
3. Map 3 (Appendix 4)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Highly susceptible
- Moderately susceptible
- Slightly susceptible
- Not rated or not available

Soil Rating Lines
- Highly susceptible
- Moderately susceptible
- Slightly susceptible
- Not rated or not available

Soil Rating Points
- Highly susceptible
- Moderately susceptible
- Slightly susceptible
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Soil Survey Area: Kootenai County Area, Idaho
Survey Area Data: Version 16, Sep 13, 2018

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Date(s) aerial images were photographed: Aug 15, 2010—Nov 4, 2016

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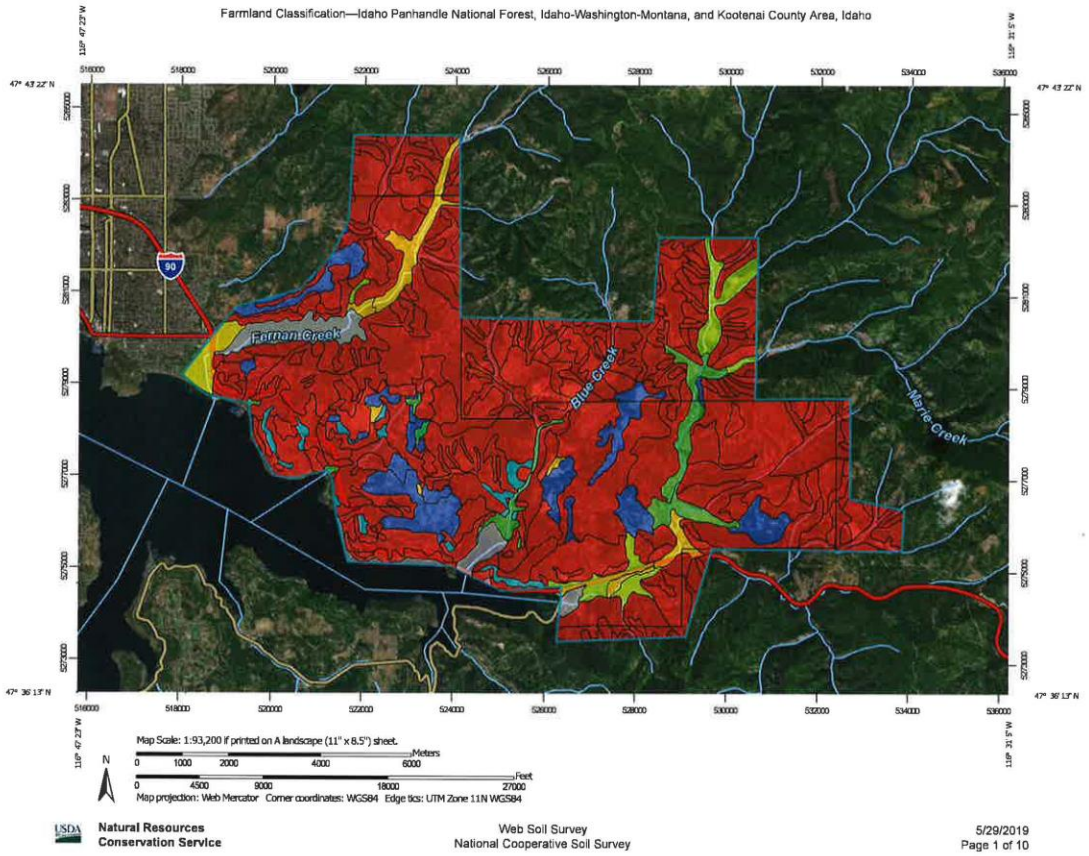
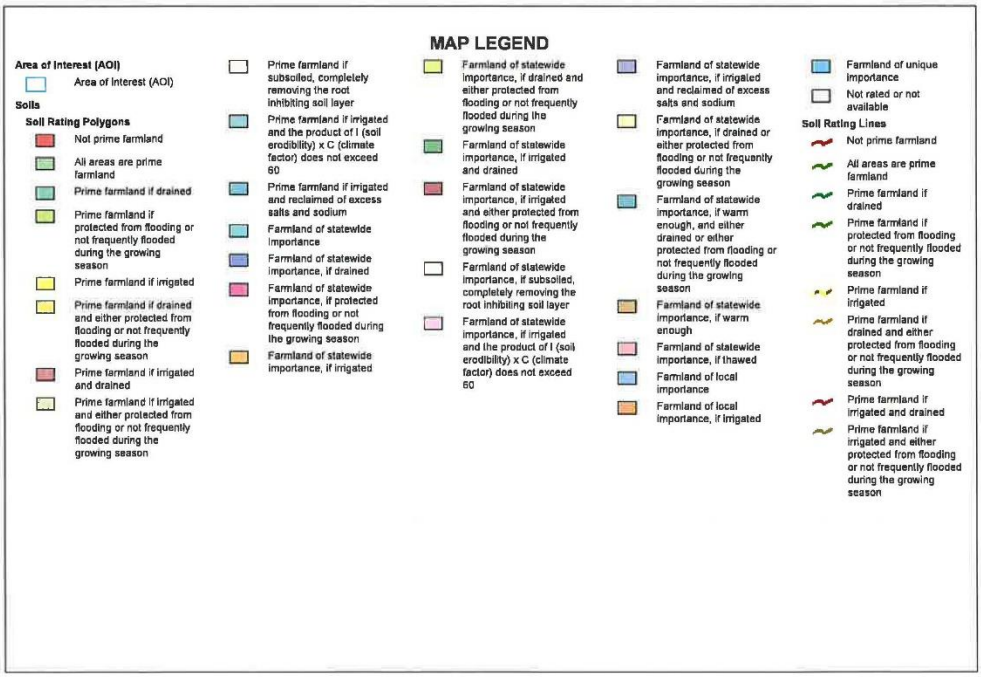
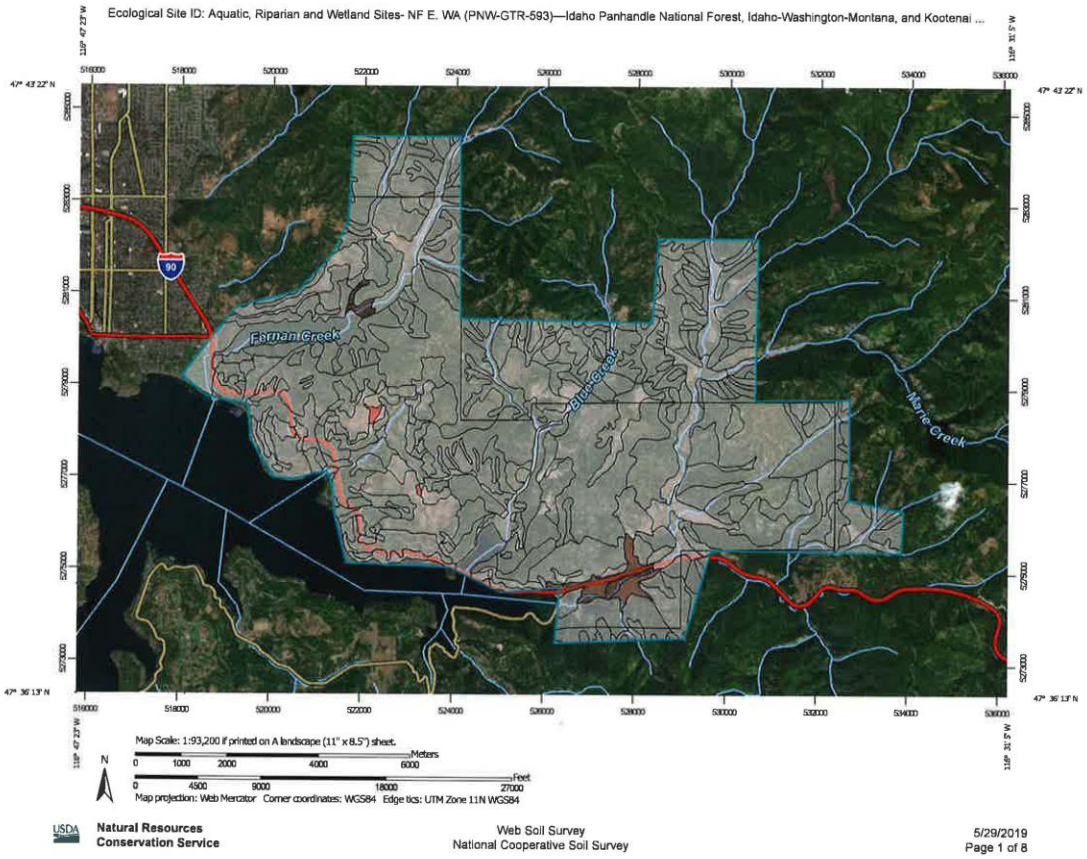
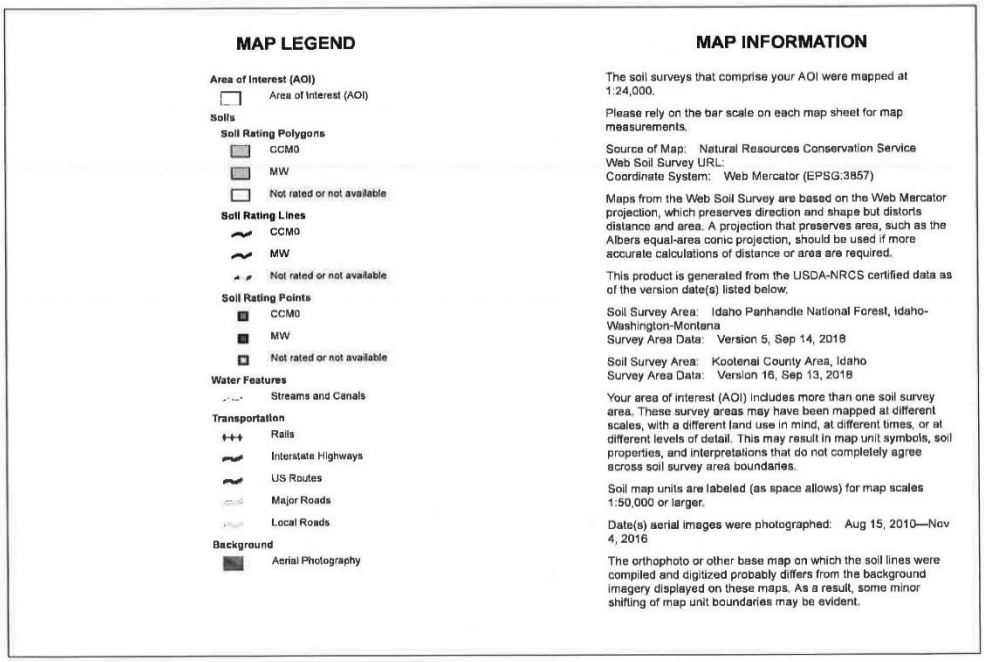
4. Map 4 (Appendix 5)




MAP LEGEND
Area of Interest (AOI)
Area of Interest (AOI)
Soils
Soil Rating Polygons
Not prime farmland
All areas are prime farmland
Prime farmland if drained
Prime farmland if protected from flooding or not frequently flooded during the growing season
Prime farmland if irrigated
Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
Prime farmland if irrigated and drained
Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
Prime farmland if subsoiled, completely removing the root inhibiting soil layer
Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
Prime farmland if irrigated and reclaimed of excess salts and sodium
Farmland of statewide importance
Farmland of statewide importance, if drained
Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if irrigated
Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if irrigated and drained
Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if warm enough
Farmland of statewide importance, if thawed
Farmland of local importance
Farmland of local importance, if irrigated
Farmland of unique importance
Not rated or not available
Soil Rating Lines
Not prime farmland
All areas are prime farmland
Prime farmland if drained
Prime farmland if protected from flooding or not frequently flooded during the growing season
Prime farmland if irrigated
Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
Prime farmland if irrigated and drained
Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

5. Map 5 (Appendix 6)





MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- CCM0
- MW
- Not rated or not available

Soil Rating Lines
- CCM0
- MW
- Not rated or not available

Soil Rating Points
- CCM0
- MW
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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References in Appendix

D. Water Resources

Timing of flows

As described in the Wolf Lodge Creek Watershed Assessment (River Design Group, 2016 with IDEQ), highest discharges for the subject watersheds occur during the spring months March through May, which is driven by the melting snowpack in the headwaters. Larger flow events are likely caused by rain-on-snow events typically seen in the late winter or early spring months. Lower flows persist from June through November until winter rain and snow cause a slight increase in mean daily flows.

a. Water Quality

Background

"The federal Clean Water Act requires states and tribes to restore and maintain the chemical, physical, and biological integrity of the nation's waters and to adopt water quality criteria necessary to protect fish, shellfish, and wildlife while providing for recreation in and on the waters whenever possible (33 USC § 1251.10). Water quality criteria have been established by the Idaho legislature and approved by the U.S. Environmental Protection Agency (EPA). These criteria are designed to protect, restore, and preserve water quality for specific beneficial uses such as cold water aquatic life, agricultural water supply, recreation, and wildlife habitat (IDEQ 2010).

Beneficial uses are protected by a set of water quality criteria, which include narrative criteria for pollutants such as sediment and nutrients and numeric criteria for pollutants such as bacteria, dissolved oxygen, temperature, and turbidity (IDAPA 58.01.02.250).
Narrative criteria for excess nutrients are described in IDAPA 58.01.02.200.06, which states: "Surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses."

The concentration of phosphorus is low in surface water so that algae and aquatics is limited. However, excessive growth of algae often results when phosphorus is introduced from uplands into a stream through increased runoff and stream erosion processes. Phosphorus primarily exists as inorganic phosphate compounds that are very insoluble and not available to plants or as organic compounds that are resistant to mineralization by microorganisms in the soil. However, chemical, physical and biological processes in soil and water can release dissolved orthophosphate into solution — a form easily utilized by plants.

Idaho's water quality standard for sediment is also narrative, "Sediment shall not exceed quantities which impair designated beneficial uses." (IDAPA 58.01.02.200.08). through increased runoff and stream erosion processes. Excessive sedimentation clouds the water, covers fish spawning areas, and clogs the gills of fish. In addition, other pollutants like phosphorus are attached to the sediment and are introduced to the waterbody (IDEQ, 2010)

In 2008-2009, Idaho DEQ conducted instantaneous suspended solids and nutrient monitoring of 13 tributaries to Coeur d'Alene Lake (including Fernan, Blue and Wolf Lodge Creeks) "in an effort to understand nutrient loading of some tributaries to Coeur d'Alene Lake. With this effort, nutrient mitigation efforts can be prioritized according to those streams that have higher loads and greatest opportunity for improvement."

Fernan Creek

Fernan Creek has two significant storm water inputs below Fernan Lake— a City of Coeur d'Alene storm water drain and French Gulch. To better understand the nutrient and suspended sediment inputs from these sources in relation to input from the Fernan Creek watershed, both sources were monitored during select rain-on-snow and runoff events. The City of Coeur d'Alene storm water outfall site is approximately 50 feet upstream of the monitoring site on Fernan Creek. French Gulch is a creek which drains a large developed area into Fernan Creek downstream of the outlet of Fernan Lake.

Fernan Creek is a perennial stream, which drains a 19.1 square mile watershed on the north side of Coeur d'Alene Lake. The headwaters of Fernan Creek are within the Coeur d'Alene National Forest and the lower reaches of the creek flows within private property before flowing into Fernan Lake. From the outlet of Fernan Lake, the creek flows as a third-order stream through a golf course before flowing into Coeur d'Alene Lake. The water quality monitoring site on Fernan Creek was located downstream of the entrance bridge to the golf course.

During the March 3rd rain-on-snow event, the storm drain was not discharging into Fernan Creek. On that day, the TP concentration in Fernan Creek was 0.047 mg/L, and the TN concentration was 0.392 mg/L. The TP concentration in French Gulch was 0.102 mg/L, which was much lower than those observed in February, suggesting the storm drain and French Gulch are likely to be significant sources of nutrients and sediment to Fernan Creek.

Total phosphorus and TN concentrations decreased in Fernan Creek within spring runoff; however, they increased slightly from April to May.

Blue Creek

Blue Creek is a stream that drains a 7.9 square mile watershed on the northeast side of Coeur d'Alene Lake. The headwaters of Blue Creek are within the Coeur d'Alene National Forest. Downstream of the national forest, the creek flows within private property. At its mouth, Blue Creek is a second order stream that flows within Bureau of Land Management (BLM) property, before it flows into Blue Creek Bay. While the channel upstream of the BLM property flows subsurface in early summer, recharge of the channel from the shallow aquifer within the BLM property provides flow in this reach of the channel year-round. Maximum flow observed during monitoring was 130 cfs, during the March 3rd rain-on-snow event.

The water quality monitoring site on Blue Creek was located within the BLM property at the mouth of the Creek. On June 23rd excessive unidentified visible growth was observed in Blue Creek, primarily within the reach flowing through the BLM property.

Wolf Lodge Creek

Wolf Lodge Creek is a 3rd-order perennial stream that drains a 40 square mile watershed into Wolf Lodge Bay on the northeast side of Coeur d'Alene Lake. The headwaters of Wolf Lodge Creek are within the Coeur d'Alene National Forest. Upstream of the confluence with Lonesome Creek it then flows into private property all the way to the mouth. The highest flow measured in Wolf Lodge Creek was 770 cfs runoff.

The water quality monitoring site on Wolf Lodge Creek was from a bridge on Wolf Lodge Creek Road upstream of where Wolf Lodge Creek flows into a grazing/wetland area at the mouth. Nutrient and TSS concentrations were highest during spring runoff.

Suspended sediment and nutrient monitoring of 13 tributaries to Coeur d'Alene Lake during winter rain-on-snow events, spring runoff, and during the summer low-flow season concluded the highest instantaneous suspended sediment and nutrient concentrations were observed during early rain-on-snow events.

Nutrients (Phosphorous)

When prioritizing watersheds for efforts to mitigate phosphorus delivered by tributaries into Coeur d'Alene Lake, the focus should be on watersheds where human activity has resulted in excess pollution. Although total load into Coeur d'Alene Lake is important in determining which tributaries are contributing the most phosphorus, the total load is biased towards large watersheds by their size. Total phosphorus loading occurs in a natural/undisturbed state, and a large natural/undisturbed watershed could have a higher loading than a small highly-disturbed watershed — if total load is the only element of prioritization

The goal for setting priorities for phosphorus restoration efforts was to have the largest benefit for the lowest cost. Therefore, an alternative analysis was performed to evaluate TP loading rate (in lb/mi2/yr) of individual watersheds by using TP load, the number of days in the flow period, and watershed area information. With this information, we were able to make predictions on the load per square mile per day for tributaries that drain into Coeur d'Alene Lake (Table 6).

In terms of Total Phosphorus Priority Schedule for Tributaries to Coeur d'Alene Lake: Fernan Creek was #2, Blue Creek was #1, and Wolf Lodge Creek was #4.

Sediment

The Idaho numeric standard for sediment impairments in streams is specific to turbidity. This standard is most often utilized when assessing sediment pollution from a source on a stream. For example, turbidity levels are measured above and below a feed lot. It seemed reasonable to evaluate for turbidity pollution during the rain on snow events, since turbidity was measured on every stream during each of these events. A comparison was made with individual stream turbidity measurements to the average turbidity of streams in the watershed.

Water quality monitoring for sediment is a challenge at high flows. Results from duplicate samples taken in response to rain on snow events were outside data quality objectives. During such high flow events, more sand-sized sediment is suspended in the water column. With enough data, turbidity/TSS (total suspended sediment) regression curves are a good tool to predict TSS in a stream using just a turbidity meter. Although more data needs to be collected to have relative confidence in such a correlation, initial results show high correlation on a number of the tributaries to Coeur d'Alene Lake. However, given the data quality problems discussed above, this correlation should be generated at lower flows on these streams Although phosphorus-bound sediment is a concern for Coeur d'Alene Lake, further evaluations need to be conducted to evaluate beneficial use impairment due to sedimentation on the tributaries to Coeur d'Alene Lake (IDEQ 2010)

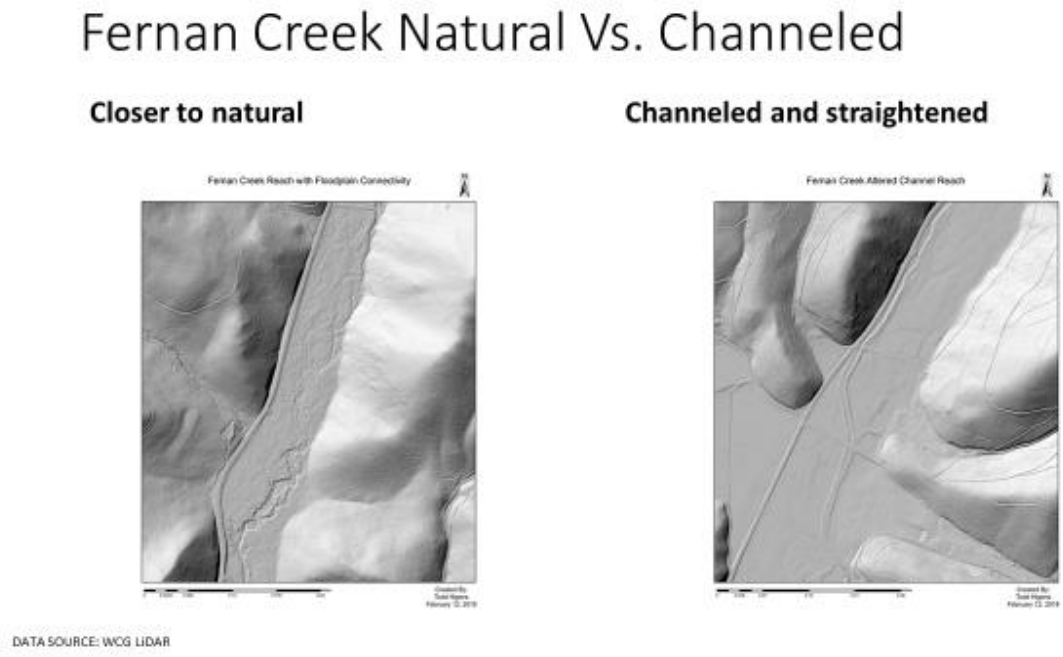
References

Idaho Department of Environmental Quality, Coeur d'Alene Regional Office**.** Final Report Coeur d'Alene Lake Tributaries 2008-2009 Nutrient and Sediment Monitoring. Idaho Department of Environmental Quality, July, 2010.

b. Stream and Riparian Conditions

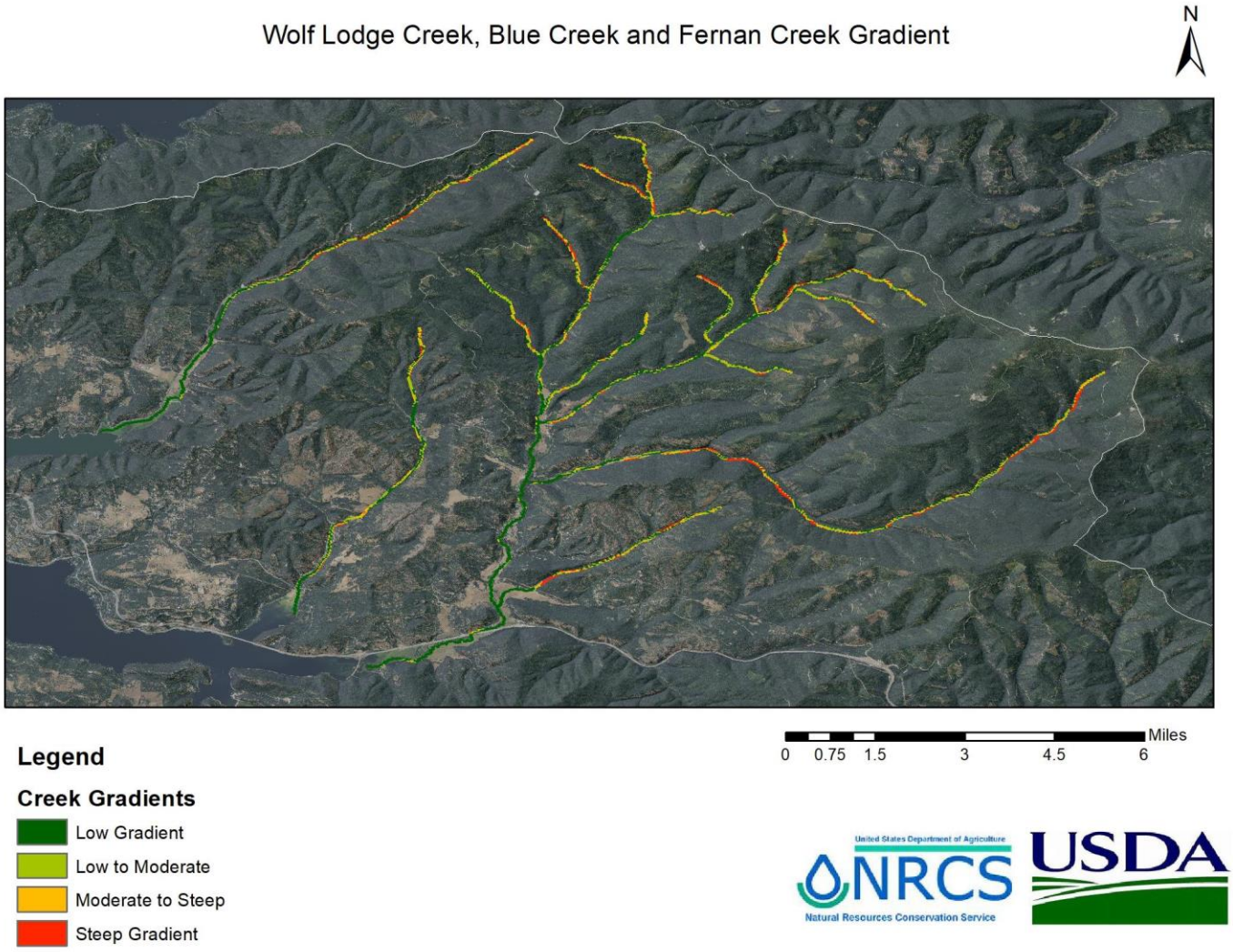
The LiDAR data, once interpreted, is particularly valuable in helping to assess stream conditions, including streambank erosion rates, stream channel sinuosity/channelization, floodplain connectivity and riparian vegetation condition. Examples are shown in the PowerPoint accompanying this report. Again, IDEQ contracted with River Design Group to use this LiDAR and on-the-ground survey work to develop the Wolf Lodge Creek Assessment, to identify site-specific stream conditions. This in-depth survey is available at www.riverdesigngroup.com/projects/Wolf-Lodge-Creek-assessment /. IDEQ and partners have used this River Design Group assessment to identify on-the-ground stream improvement work, find funding (319 Clean Water Act) and complete the improvement work projects. There is also large potential to keep going with stream improvement project work, also seeking Restoration Project funding. There is momentum to conduct similar LiDAR-based stream condition assessments on Blue and Fernan Creeks in the near future.

The value of the LiDAR to show ground level conditions is shown below, where on the left is an example of Fernan Creek up higher where it is not channelized by roads and other land uses, and on the right lower down in the system where it has been channelized.



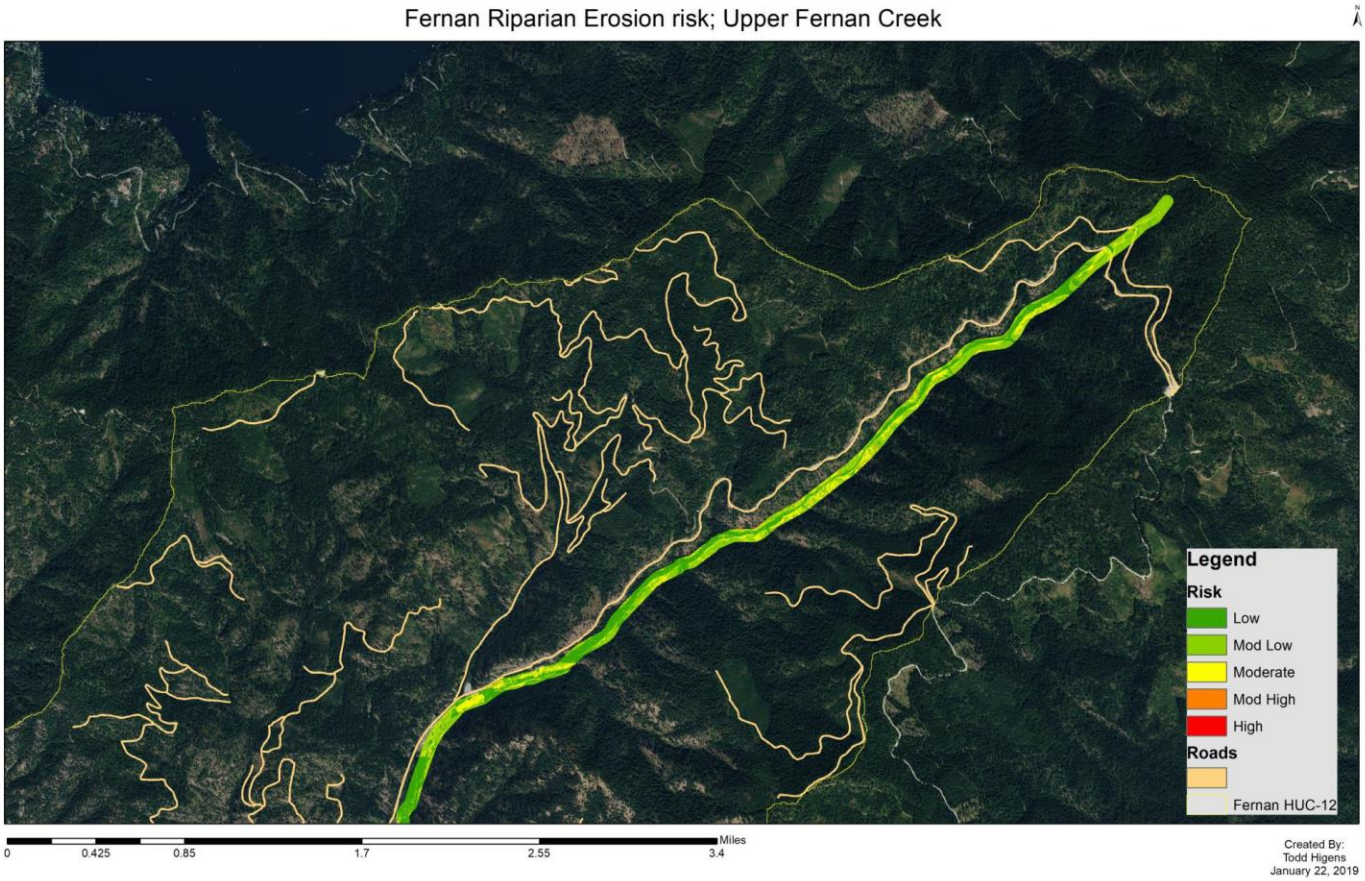
Gradients for each stream system are shown below; from steep, high gradient stream reaches in the headwaters to lower gradient stream reaches in the valley bottoms.

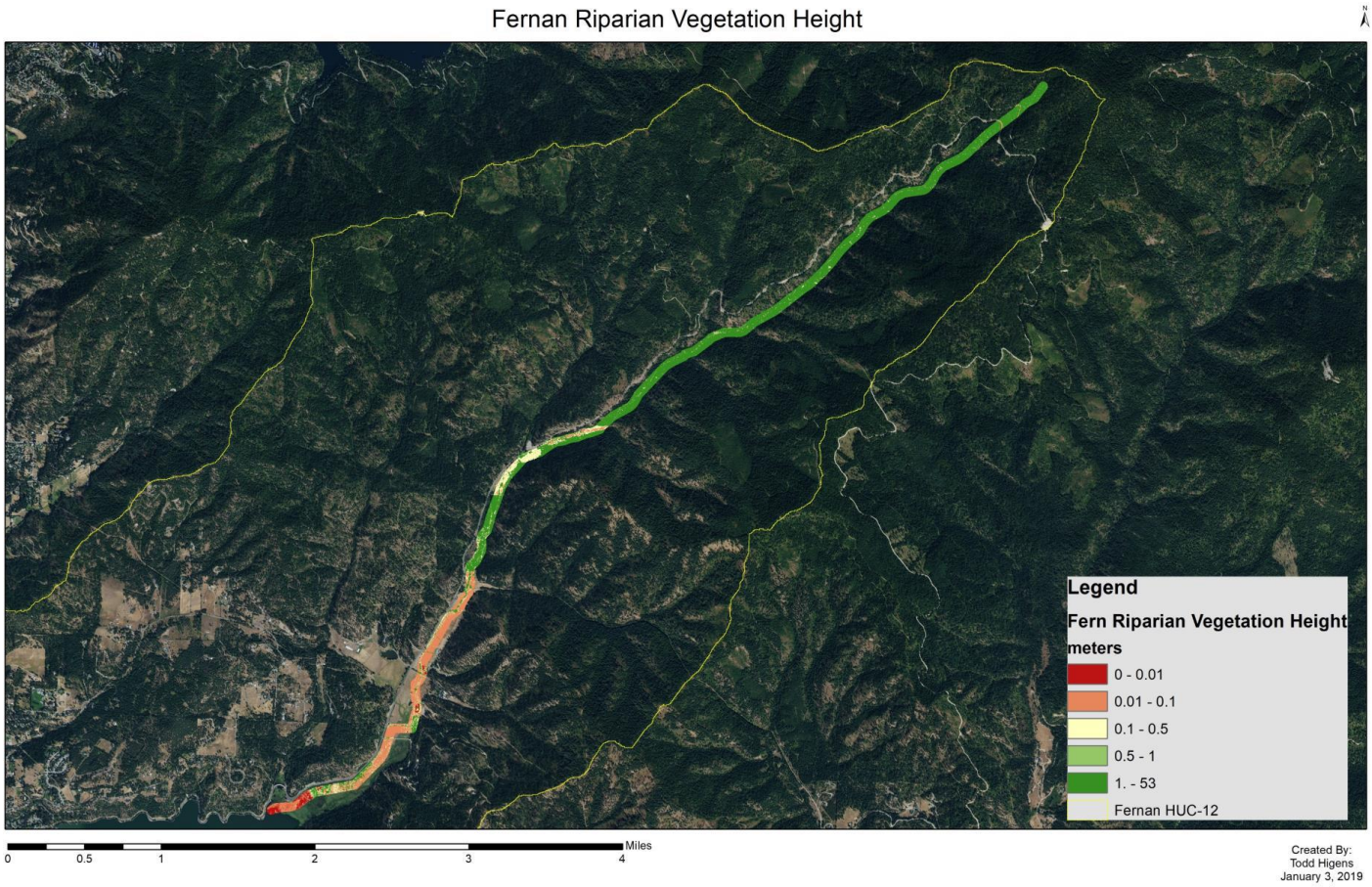
More detailed elevation profiles and 3D models are shown for each stream in the PowerPoint.



The LiDAR shows riparian vegetation height, and is used to show streambank erosion risk.

Fernan Creek: Most of the upper portion of Fernan Creek is in good condition, with fairly healthy riparian and stream functions (below).



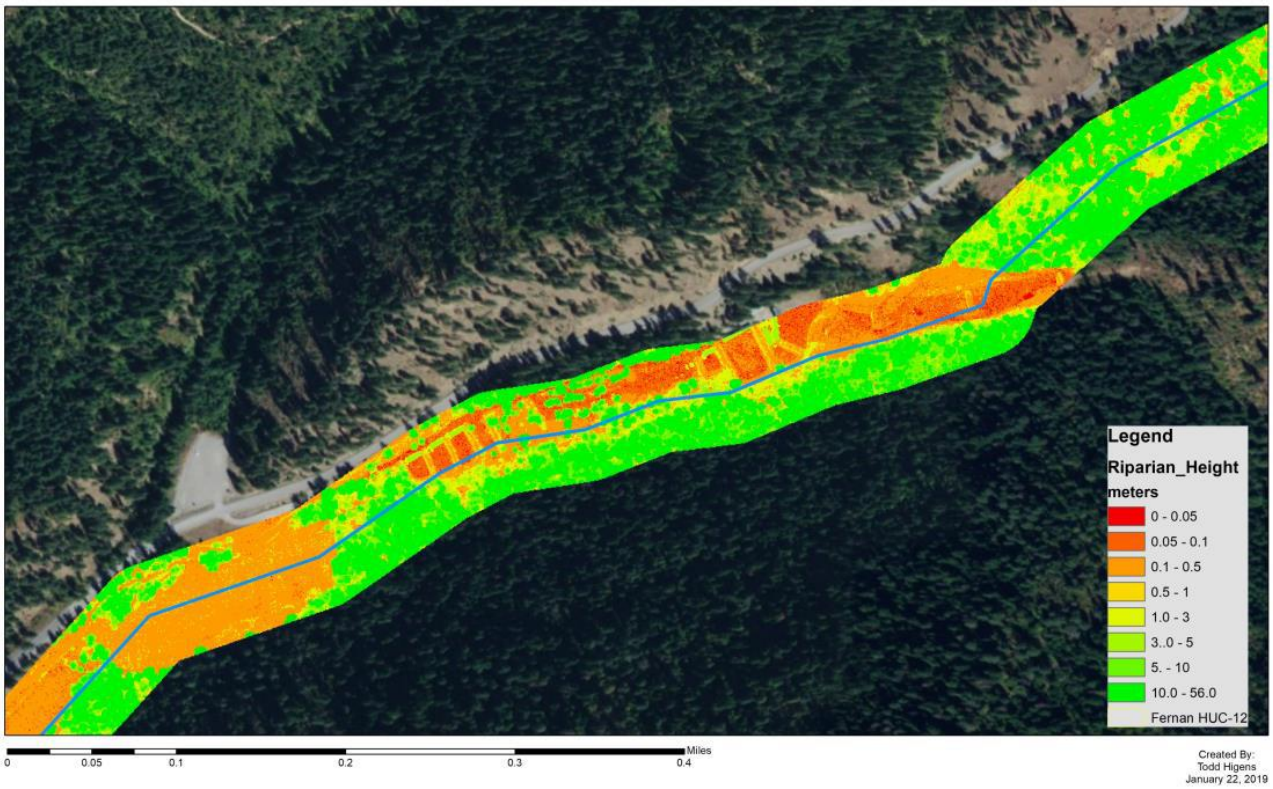


Exceptions are road crossings on the USFS, where vegetation height is low and erosion risk is high, shown below.

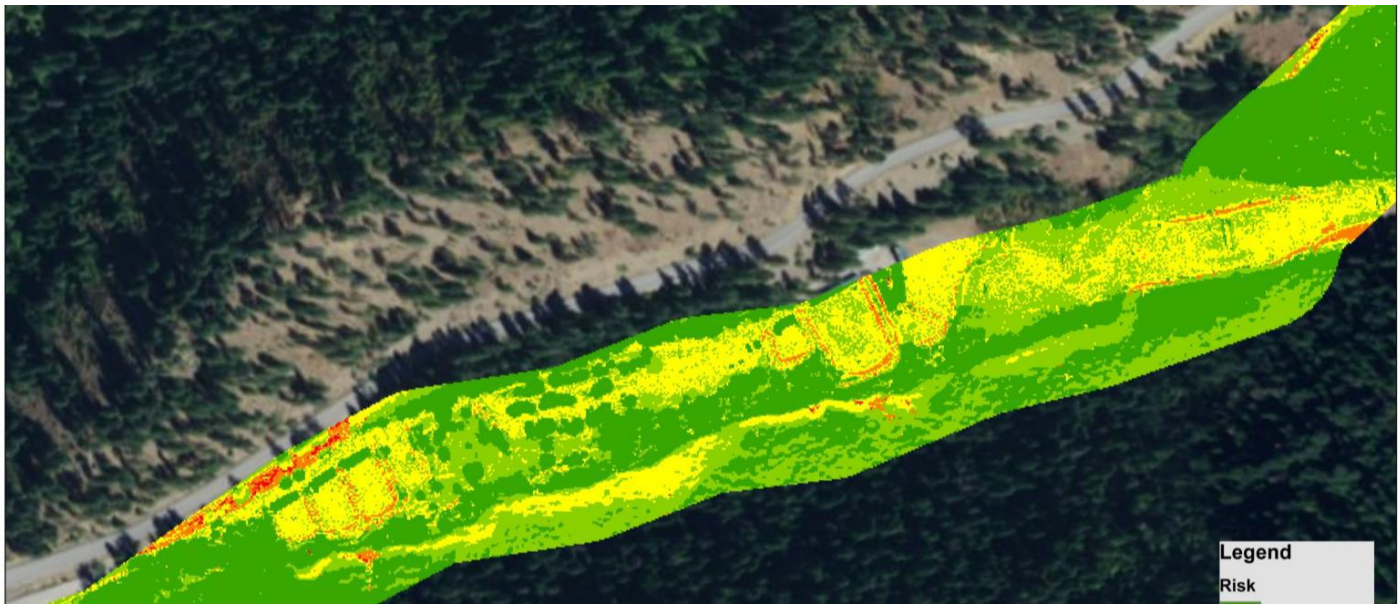
Fernan Riparian Erosion risk; Upper F.S. Road Crossings

Stream conditions become somewhat poorer lower down in the system. Still on USFS, a gun range shows in both the riparian veg height and erosion risk models as a “hotspot” where conditions could be improved (below).

Fernan Riparian Vegetation Height

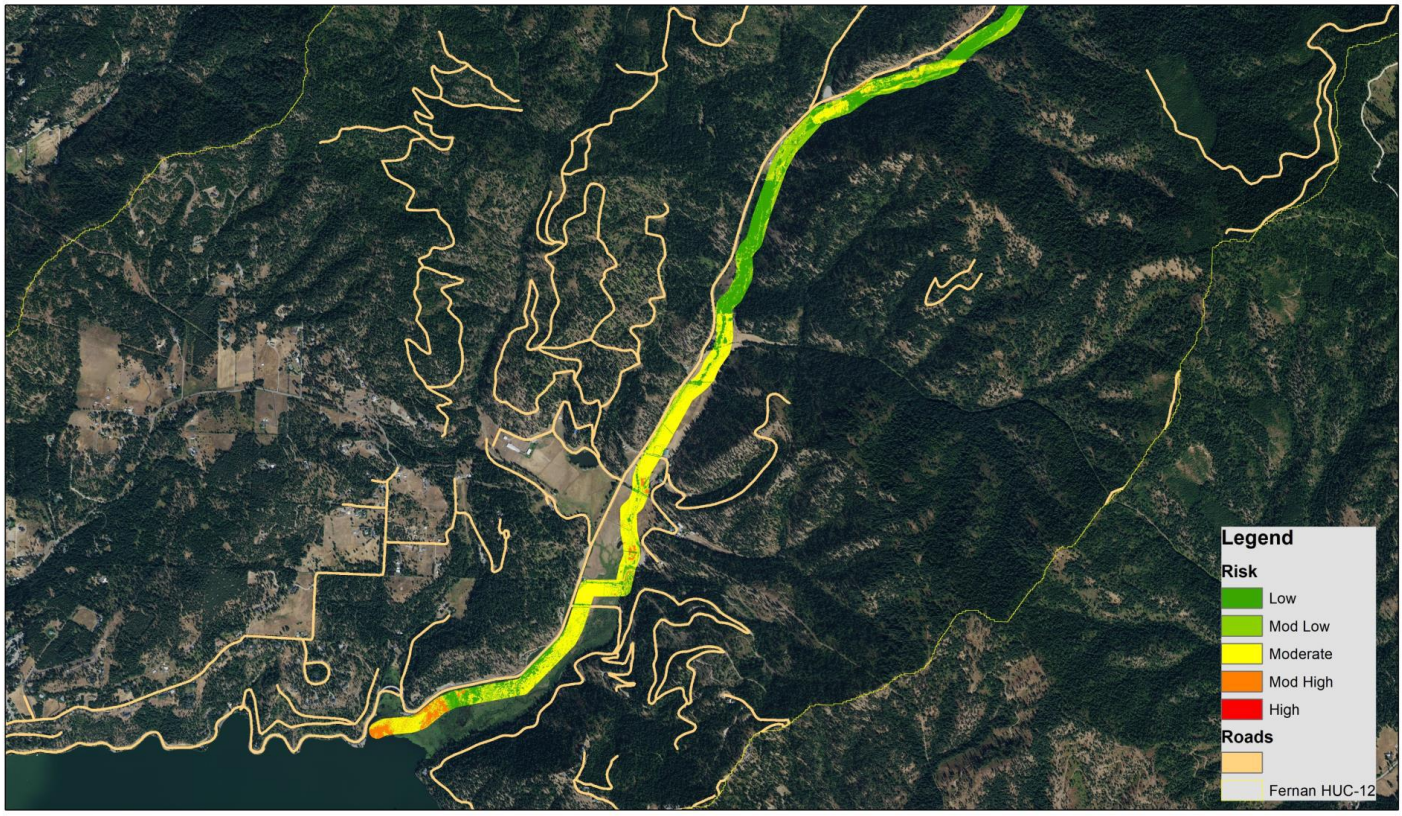


Fernan Streambank Erosion Risk



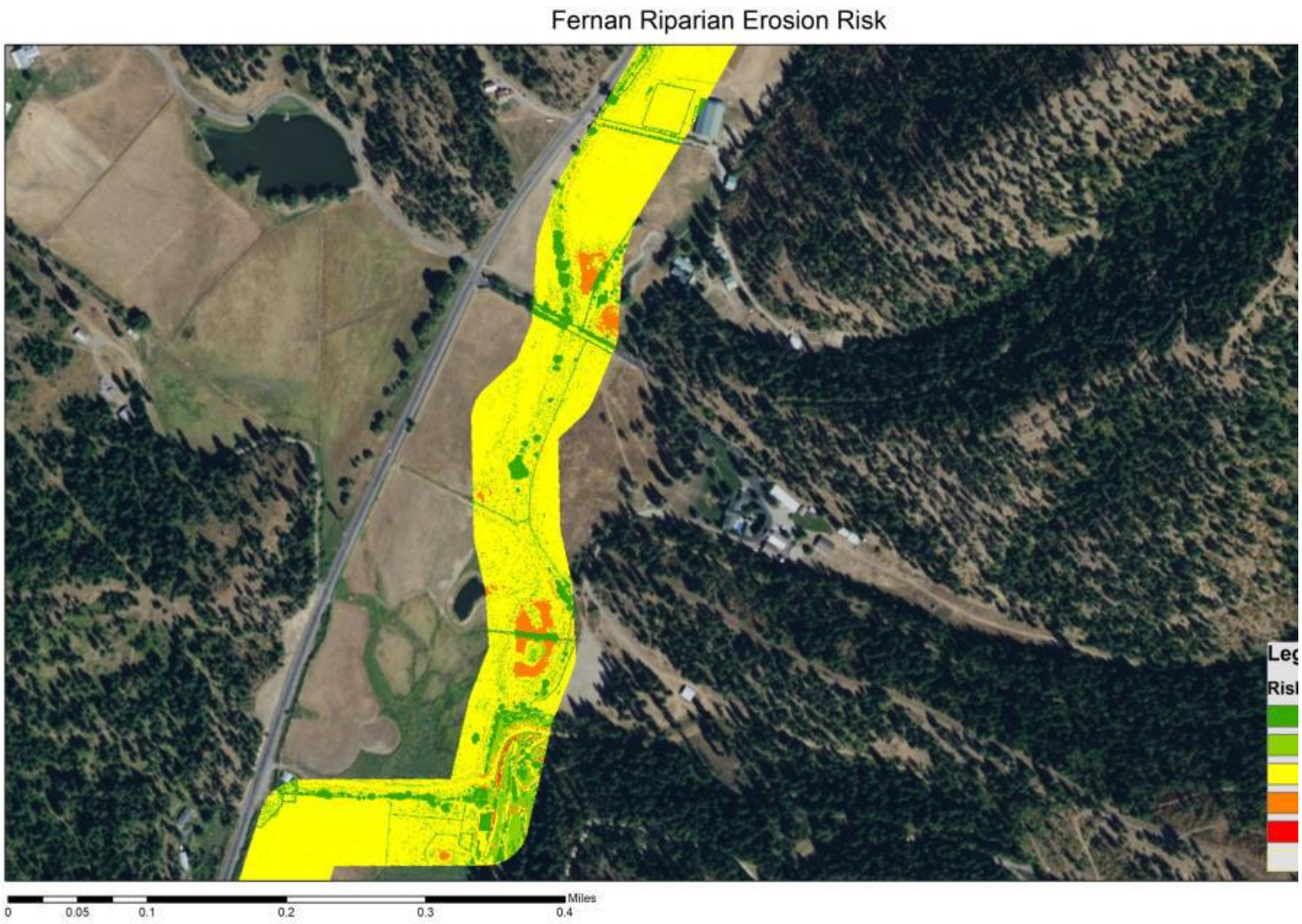
As you get lower down in the Fernan drainage, and onto private land, conflicts with land use, especially development and roads, cause stream conditions to decrease. There is substantial potential to improve stream and riparian area conditions here, working with willing landowners. This could include addressing stream stability, channelization, fish habitat elements, and vegetation improvement. This would decrease sediment and nutrient inputs into Fernan Creek and Lake.

Fernan Riparian Erosion RiskI Lower Fernan Creek



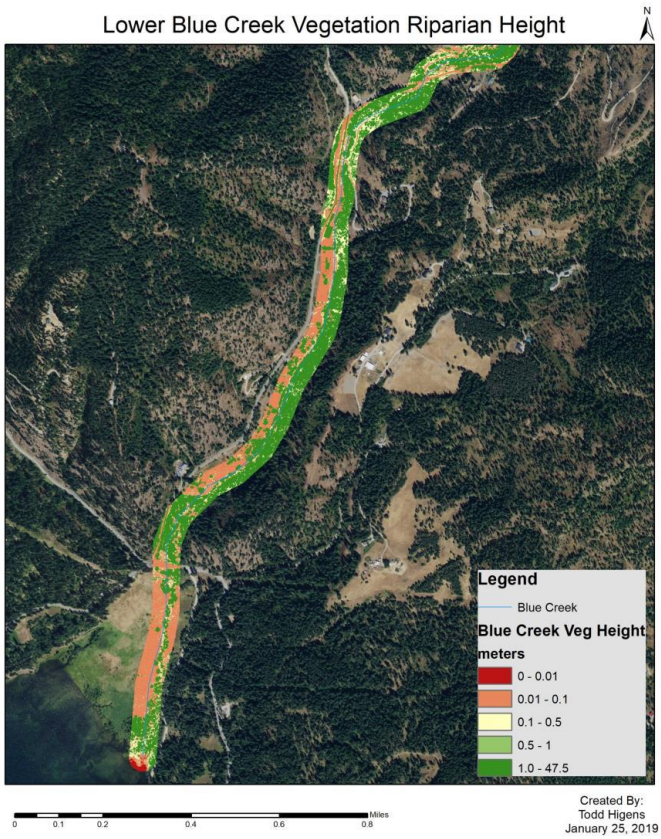
0 0.325 0.65 1.3 1.95 2.6 Miles

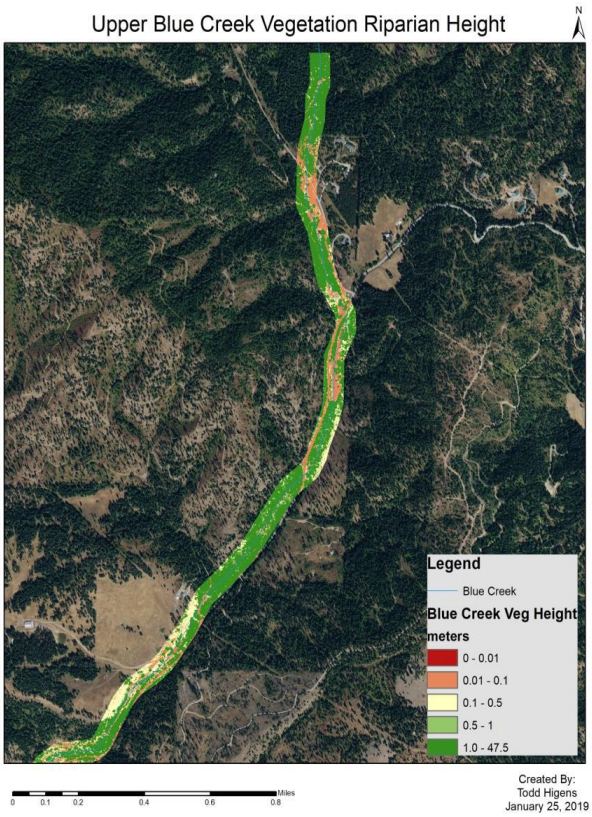
Created By:
Todd Higens
January 22, 2019

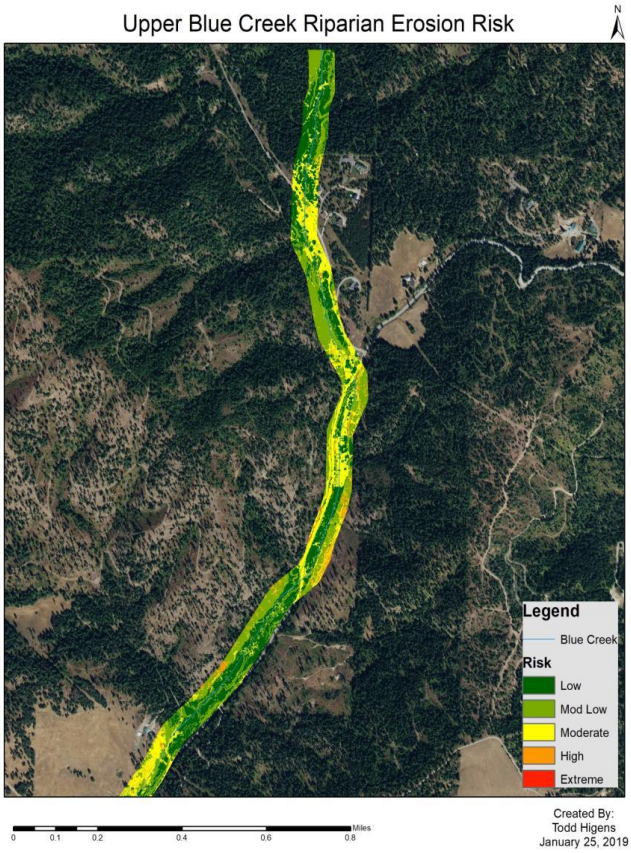


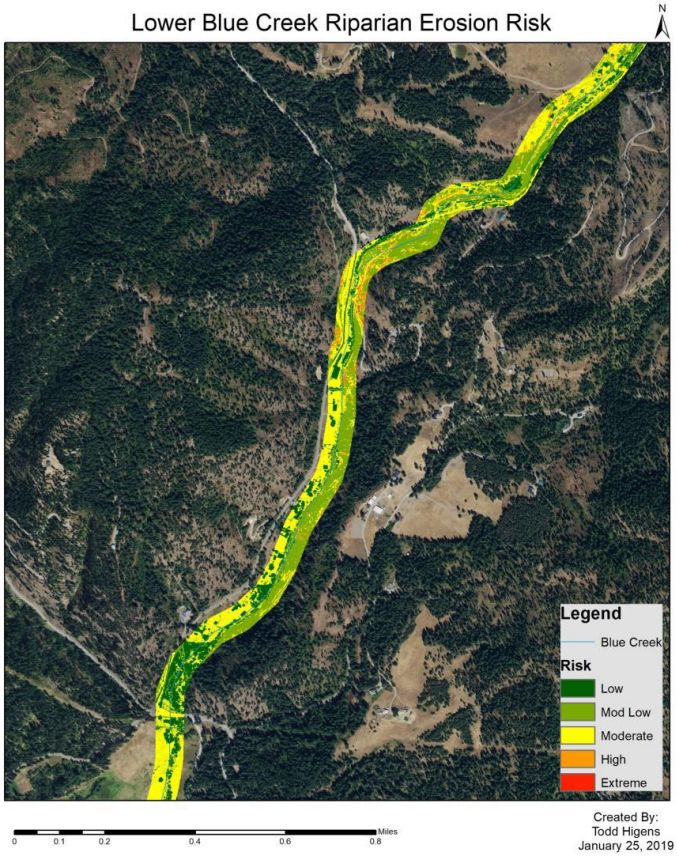
Blue Creek:

Similar to Fernan Creek, Blue Creek stream and riparian area conditions are in better functioning condition higher up in the watershed, on USFS land, in general. As you get down onto private land, especially where there are more roads and development, stream erosion increases and riparian vegetation decreases.


Lower Blue Creek Vegetation Riparian Height
N
Legend
Blue Creek
Blue Creek Veg Height
meters
0 - 0.01
0.01 - 0.1
0.1 - 0.5
0.5 - 1
1.0 - 47.5
0 0.1 0.2 0.4 0.6 0.8
Miles
Created By:
Todd Higens
January 25, 2019


Upper Blue Creek Vegetation Riparian Height
N
Legend
Blue Creek
Blue Creek Veg Height
meters
0 - 0.01
0.01 - 0.1
0.1 - 0.5
0.5 - 1
1.0 - 47.5
0 0.1 0.2 0.4 0.6 0.8
Miles
Created By:
Todd Higens
January 25, 2019


Upper Blue Creek Riparian Erosion Risk
N
Legend
Blue Creek
Risk
Low
Mod Low
Moderate
High
Extreme
0 0.1 0.2 0.4 0.6 0.8
Miles
Created By:
Todd Higens
January 25, 2019


Lower Blue Creek Riparian Erosion Risk
N
Legend
Blue Creek
Risk
Low
Mod Low
Moderate
High
Extreme
0 0.1 0.2 0.4 0.6 0.8
Miles
Created By:
Todd Higens
January 25, 2019

Much of Blue Creek is a narrower valley, creating conditions where the county road is very close to the stream. This limits stream and riparian vegetation function, and somewhat the potential for improvement, without major road relocation. There are sections where improvement projects to improve stream and riparian function, similar to those on Fernan Creek, could be undertaken. This would help reduce sediment and nutrient inputs into Blue Creek and Blue Ck Bay on Lake Coeur d'Alene. The LiDAR also shows where Blue Creek could be realigned back into its original channel, just above its crossing on Yellowstone Road, close to where it enters Blue Ck Bay.

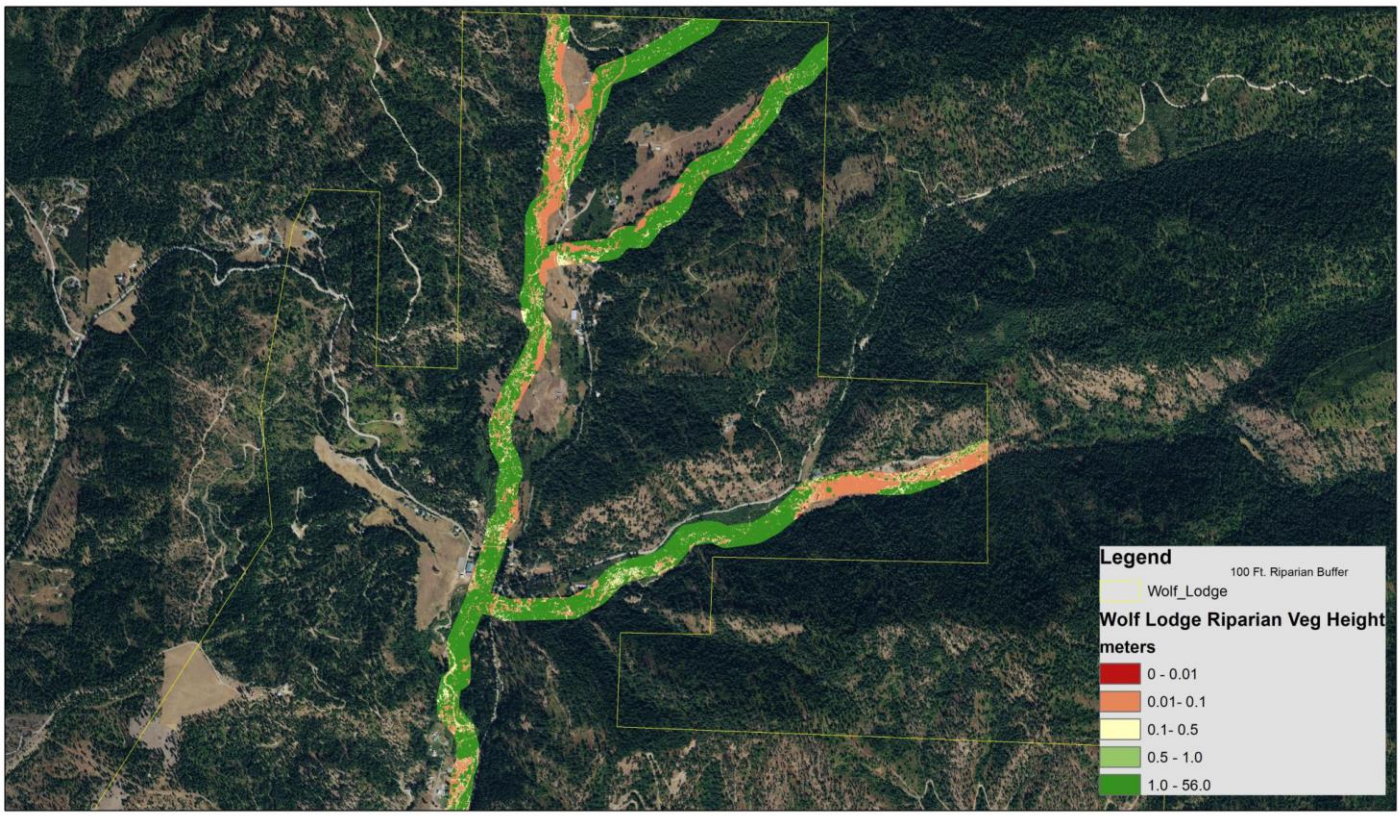
Wolf Lodge Creek:

Wolf Lodge Creek is quite a bit larger than Fernan and Blue Creeks, and includes several significant tributaries of Stella, Marie, and Alder Creeks. In addition to the concerns in common with Fernan and Blue Creeks, Wolf Lodge also has a large amount of bedload moving down through the system. Again, better stream and riparian conditions are found up in the higher reaches of Wolf Lodge Creek and its tributaries. Decades ago, sediment traps were put in on USFS land. Differing opinions exist on what should be done with these sediment traps; since they are on USFS property this will be a USFS decision.

As you move down lower in the stream system, and onto private land, again both road densities and developments increase. Riparian vegetation and stream function conditions tend to decrease, although there are notable exceptions.

Much more detailed analysis is in the River Design Group assessment of Wolf Lodge Creek. There is significant potential for improvements, both in-stream and in the riparian areas and floodplains. Some of this work has already begun, several Stewardship Plans have been completed, and future work identified.

Upper Wolf Lodge Creek Riparian Veg Height



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January 22, 2019

Upper Middle Wolf Lodge Creek Riparian Veg Height

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Middle Wolf Lodge Creek Riparian Veg Height

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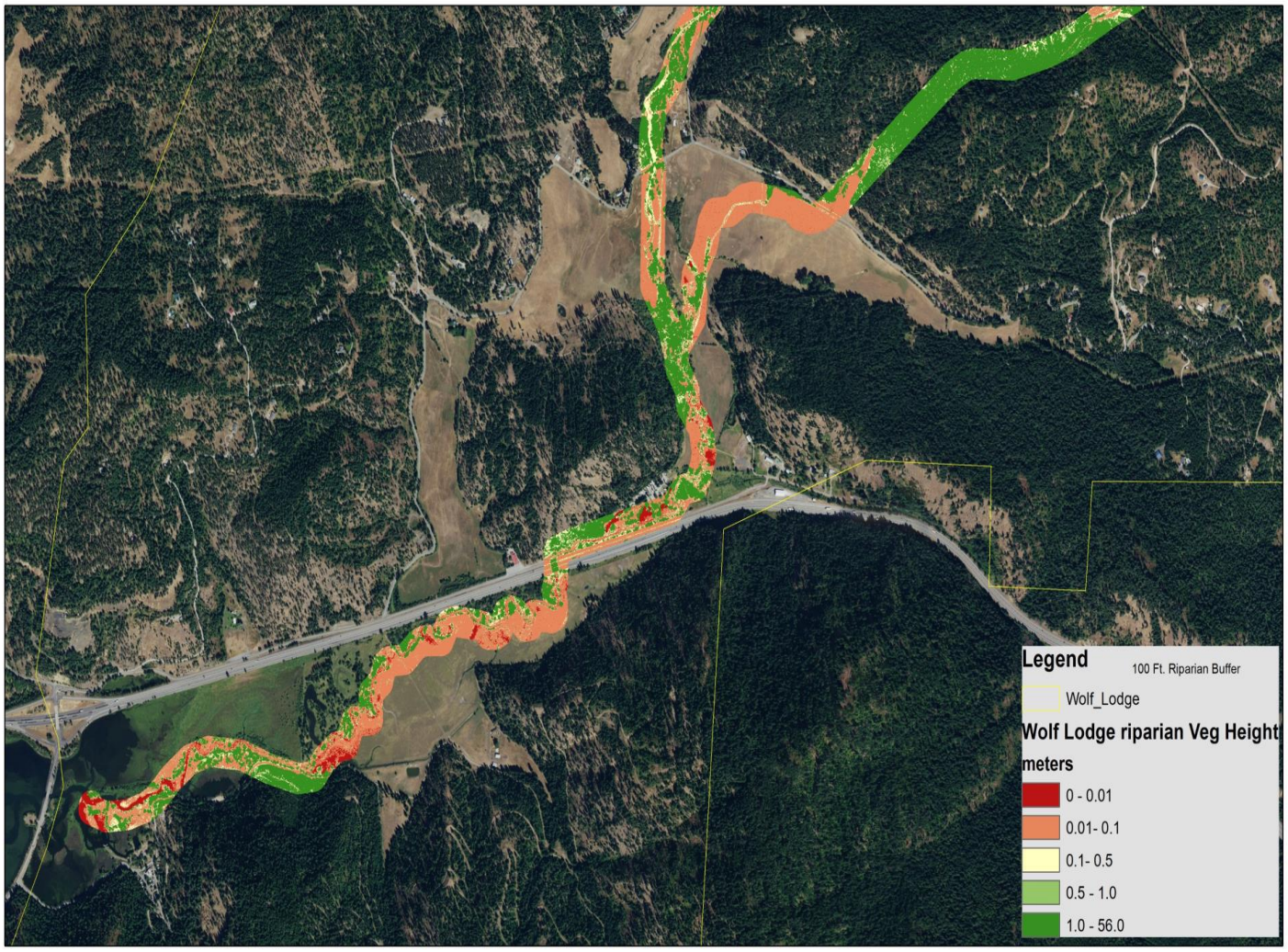
January 22, 2019

Lower Wolf Lodge Creek Riparian Veg Height



0 0.2 0.4 0.8 1.2 1.6 Miles

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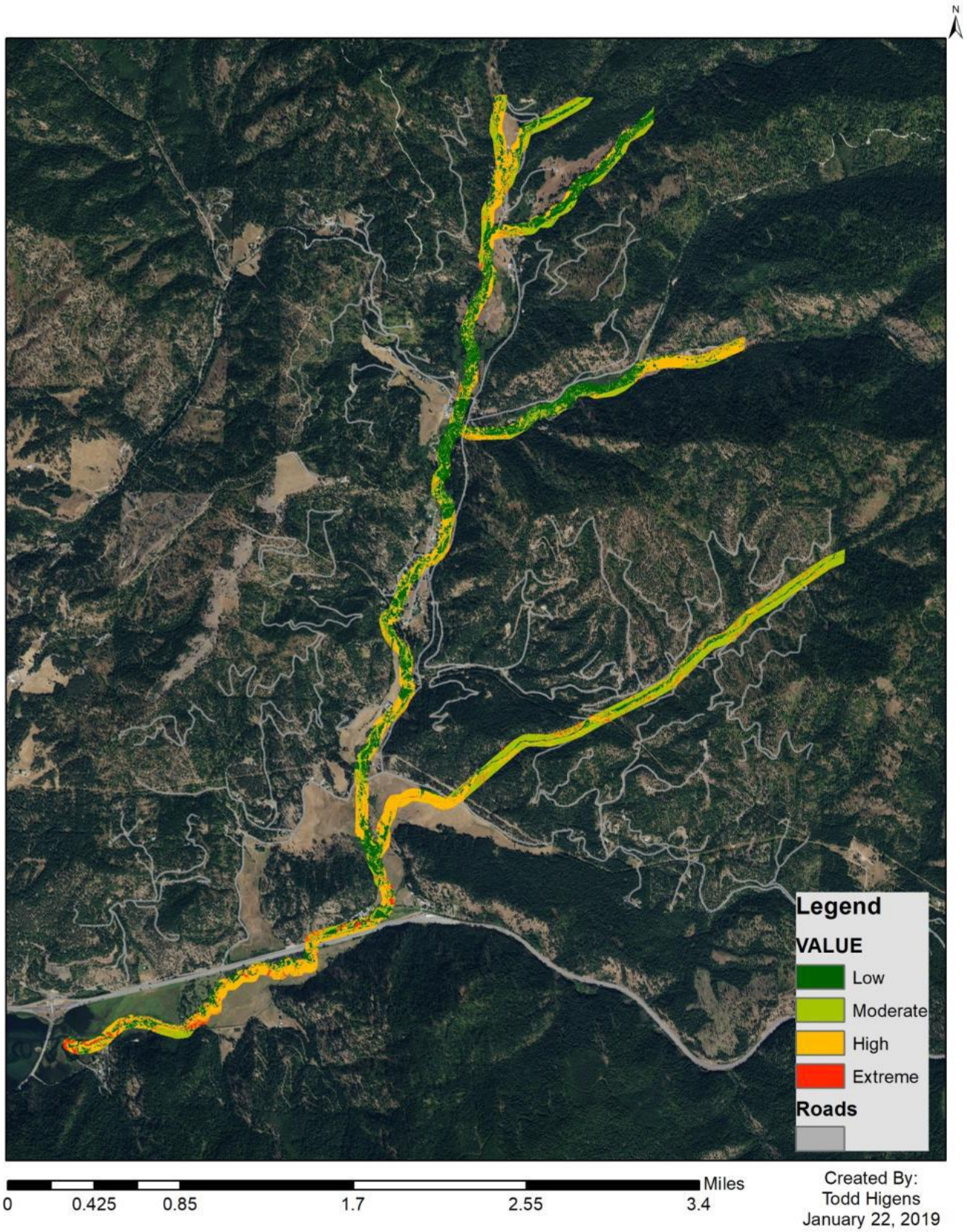
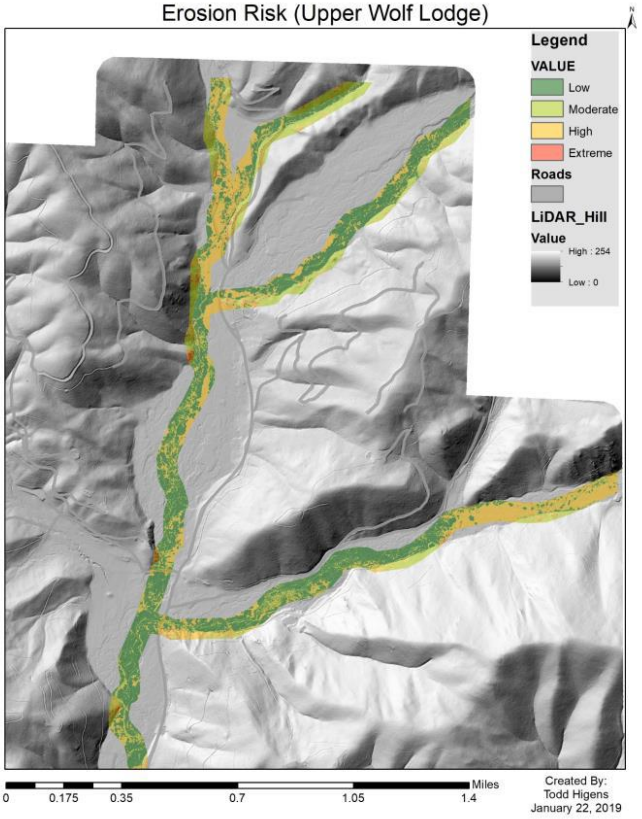
Todd Higens
January 22, 2019

Wolf Lodge Erosion Risk



Erosion Risk (Upper Wolf Lodge)



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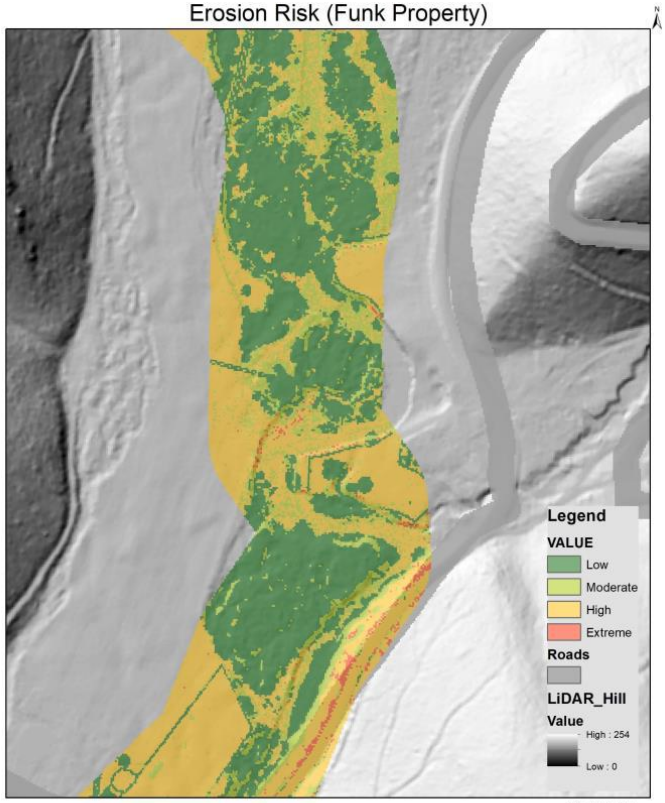
Erosion Risk (Funk Property)



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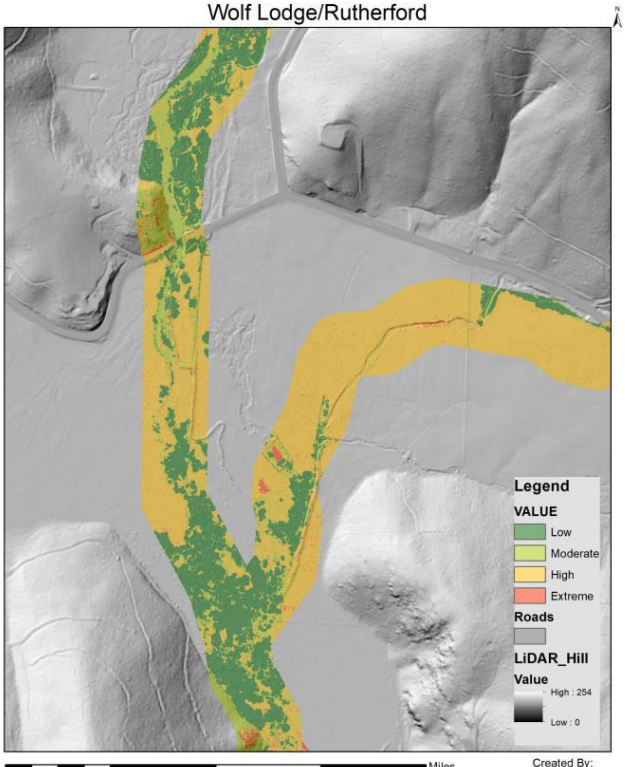
Wolf Lodge/Rutherford



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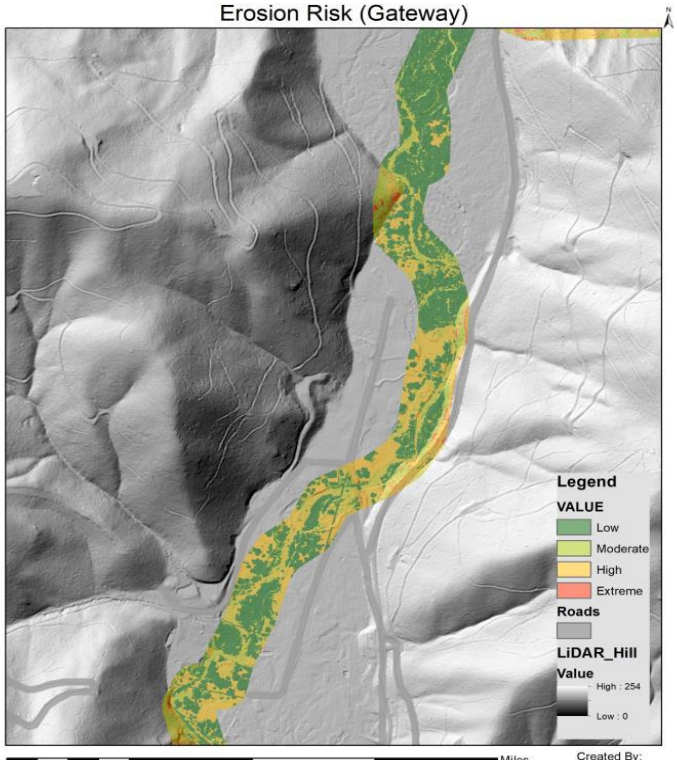
Erosion Risk (Gateway)



Created By:
Todd Higens
January 22, 2019

c. Forest Description and History

The character of the forests in this watershed is the result of events that have taken place over a long period of time, including glaciations, volcanic activity, subsequent erosion (which influenced the terrain features and soil characteristics), river flow patterns, flooding, periodic wildfires and past management practices such as logging and roadbuilding. Very old stumps, charred wood, and more recent stumps and other evidence (soil displacement for example) found throughout the watershed provide evidence of these past events.

Prior to European settlement, fire was the most influential force on forest development. Fire history in this area consisted mostly of frequent low-intensity fires, with occasional less frequent but higher-intensity stand replacement fires. Whether caused by lightning or set by Native Americans to manipulate vegetation, the frequent low intensity fires maintained a more open forest than what we see today, with more seral species such as the pines and larch. Pre-settlement forests in this area contained larger, older fire-resistant trees and a plant community adapted to these frequent low intensity fires.

In the late 1800s and early 1900s, timber harvest began in earnest, with the most marketable trees removed, usually larger white pine and ponderosa pine. Wildfire suppression also began, and interrupted the regimes that previously shaped the local forests. This interruption of natural fire cycles, combined with insect and disease impacts and subsequent human activities, created the forest structure we see today.

As recent wildland fire activity in the West has reminded us, fires will continue to burn across western landscapes, even with vastly improved fire suppression technology. This history requires consideration of wildfire, not only as a threat to personal safety, homes, and surrounding watersheds, but also to the ecological resources and plant communities of the watershed.

d. Forest Cover

The soil survey shows a range of forest habitat types from the drier ponderosa pine/Idaho fescue to the wettest, deepest soils where western hemlock/queencup beadlily habitat types are found. Habitat types are used to measure potential productivity, and show what forest habitat type would be on the site if there were no disturbance over a very long period of time. These habitat types are the climax species in the series of succession, where after the initial disturbance, such as stand replacing wildfire, a pioneer species initially colonizes the site. These pioneer species, such as ponderosa pine and western larch, are more sun tolerant and will not grow well under the canopy of other trees. These seral, or early and mid-successional species eventually provide enough shade that other later successional species, which are more shade tolerant, come in under the canopy and eventually dominate the site. These later successional species include western hemlock, grand fir, western red cedar, and sometimes Douglas fir. Habitat types show what the last successional species would be for the site, generally the most shade tolerant. Shallower, drier and usually southern aspect soils will not support the same species of the deeper, moister and generally more northern aspects. South facing slopes, and lower elevations with shallow soils may only be able to grow ponderosa pine. North facing slopes with deeper soils holding more moisture and stream bottoms may be able to grow western red cedar, western hemlock and grand fir.

Habitat types show what the last successional stage would grow on the site, again usually the most shade tolerant species. This does not mean these species will be the healthiest for the site. For example, much of North Idaho has some level of different root rot pathogens, which the more shade tolerant species, such as hemlock and grand fir (except for cedar), are the most susceptible towards and tend to both succumb to mortality and spread the root rot to other trees before they die.

The other issue with some late successional habitat types is the density of trees become overstocked for their diameter and site. This can create situations where the trees are more susceptible to insect infestations, especially under drought conditions and with bark beetles. This situation can also occur in early successional stages, especially in the pines, where they naturally seed in at very dense spacing after a site disturbance. Some tree species, through competition between individual trees, are able to control stand densities to remain in relatively vigorous and healthy condition. Other tree species do not; while they remain alive, their growth becomes very slow and stand health suffers as they become more susceptible to insect, disease and uncharacteristic wildfire due to fuel buildup.

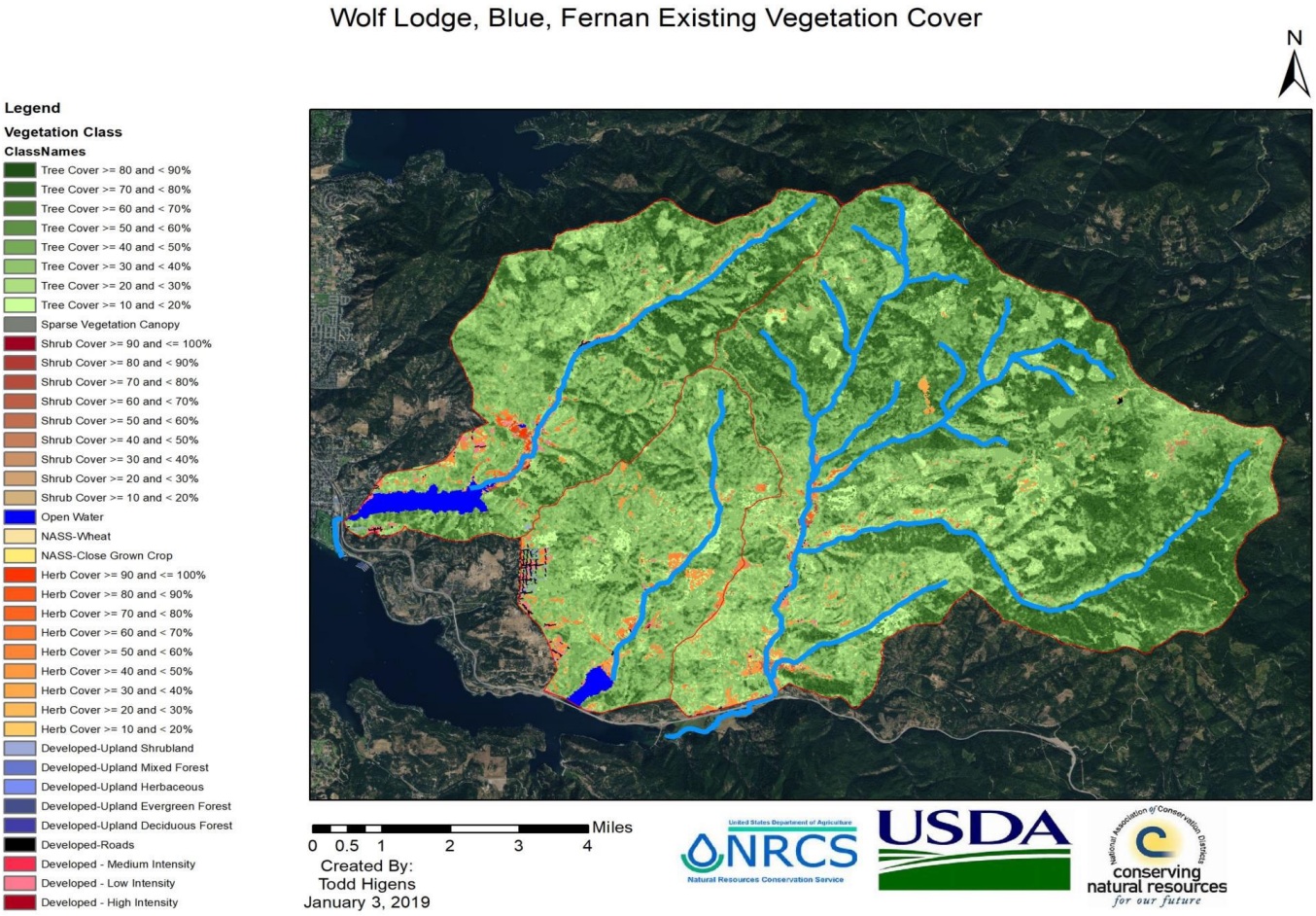
Within the site capabilities, there is a natural range of variability of species mix, density, size and other stand characteristics. Especially in the absence of disturbance such as wildfire, the forest stand can move outside this natural range of variability, becoming more susceptible to drought, insect and disease, and uncharacteristic wildfire.

Diversity within this natural range of variability for the site is generally the most successful strategy for long-term forest health, and resulting health of the watershed. This diversity is best when it is within forest stands as well as between stands, and includes diversity of species, sizes, ages, densities, and understory conditions, along with other components such as snags. This diversity results in higher quality wildlife habitat, better long range forest health, and improved watershed function. Forested watersheds are critical to healthy watershed function, and should provide for the capture, storage and slow release of precipitation with a minimum of sediment input. Healthy, vigorous forests with a mosaic of diversity across the landscape are best able to provide this watershed function.

This watershed, due to many factors such as wildfire and management history, multiple ownerships, topography and site conditions, has a mosaic of forest diversity, some of which is within the natural range of diversity and some with forest conditions that fall outside the natural range of diversity.

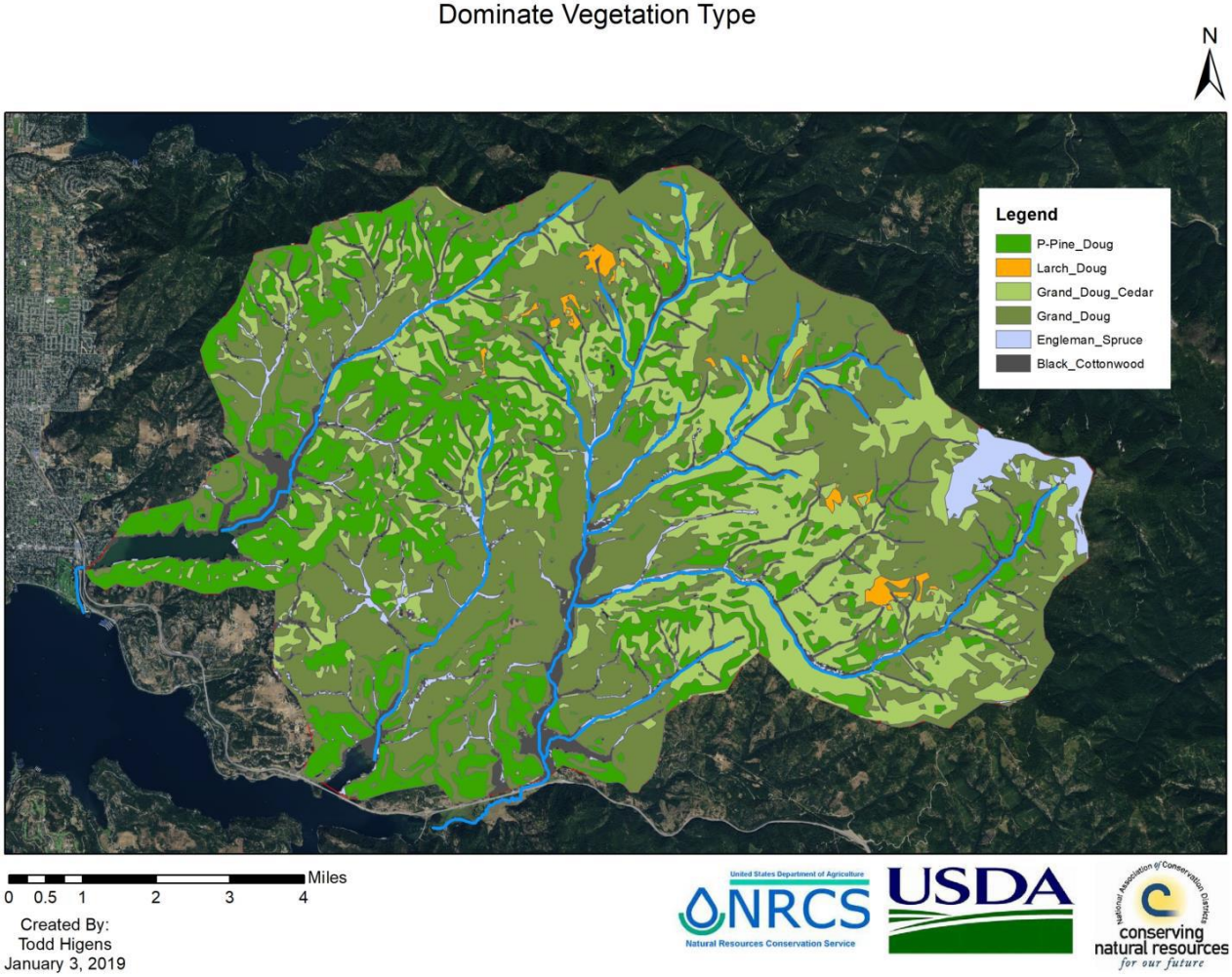
Tree species range from single specie stands of early seral species such as ponderosa pine, lodgepole pine, and western larch to mixed species stands of late successional species such as western red cedar/western hemlock/grand fir. Ages and sizes are also a diverse mosaic, from openings and areas of very young, small trees where recent disturbance such as timber harvest or wildfire has occurred, up to very old stands of larger trees with varying densities due to the effects of natural events such as windstorms and root rot disease.

Below is a composite map of general existing vegetation cover types by density in the watershed:



Data Source: WCG LiDAR, LANDFIRE

Dominate Vegetation Type



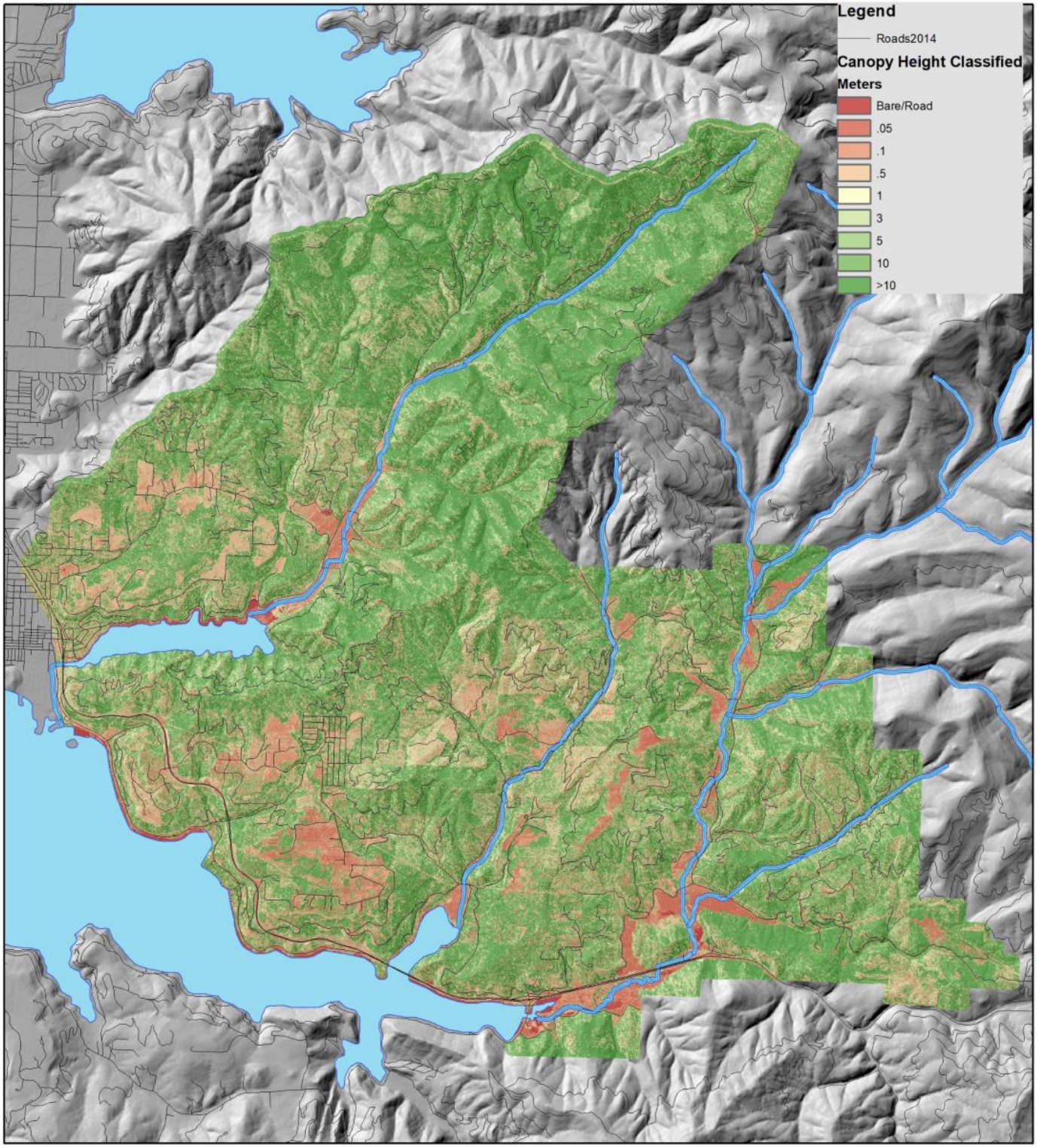
Existing Vegetation by Acreage:

- Grand Fir/Douglas Fir 19,381 ac
- Black Cottonwood 2,751 ac
- Western Larch/Doug 359 ac
- Engelman Spruce 1,522 ac
- Ponderosa/ Doug 11,246 ac
- Grand/Doug/Cedar 11,589 ac

Data Sources: WCG LiDAR, LANDFIRE

The canopy height of the forest shows a similar mosaic of variety, generally higher on the more productive north aspects and higher elevations:

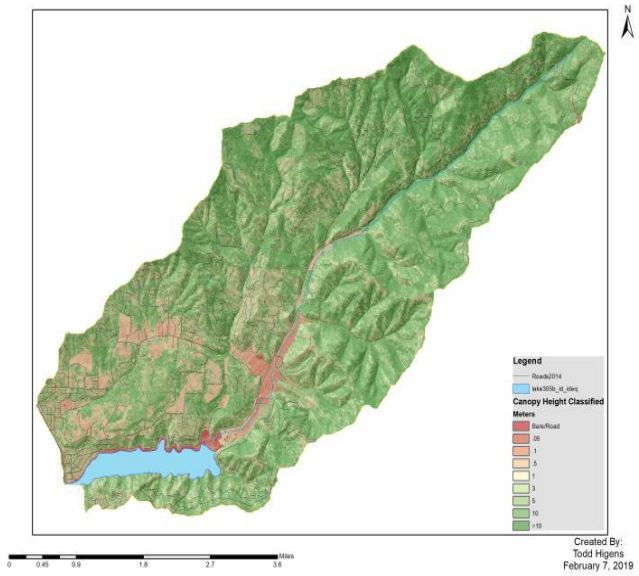
Canopy Height



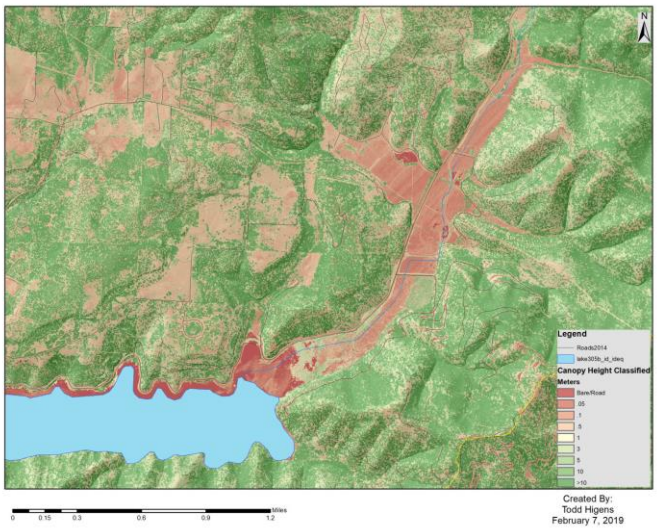
Created By:
Todd Higens
February 7, 2019

Canopy height imagery by individual watershed shows more detail, and again individual sites may be examined in much greater detail by zooming closer on the LiDAR data.

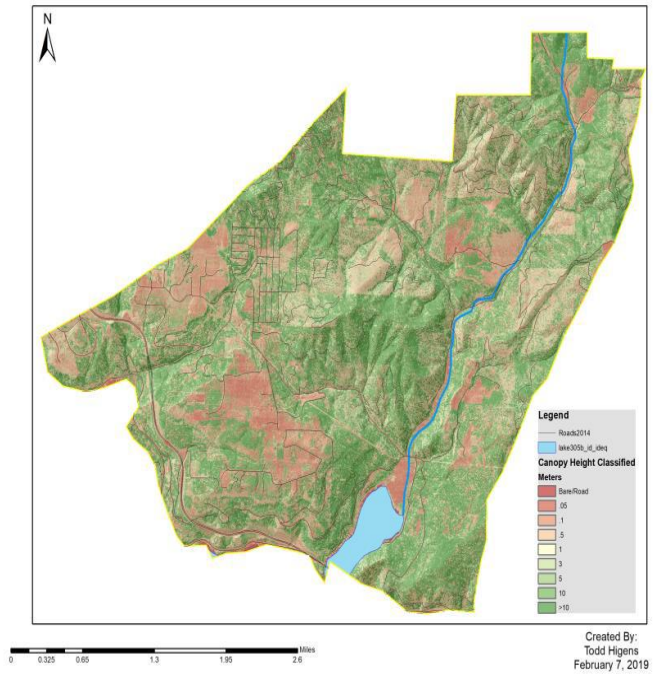
Fernan Canopy Height:



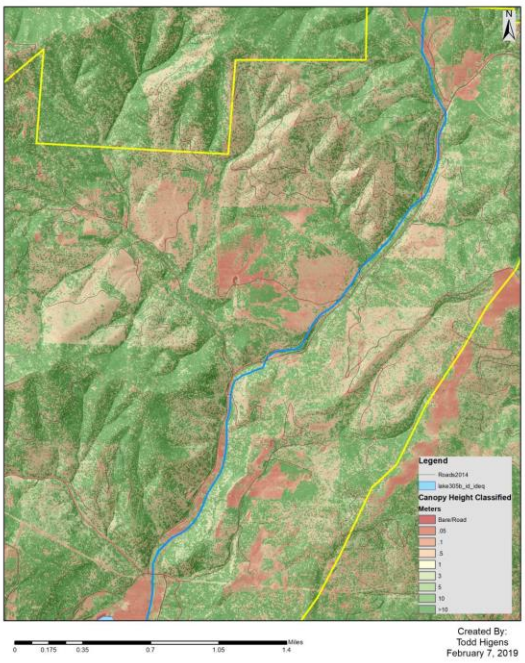
Fernan closer up:



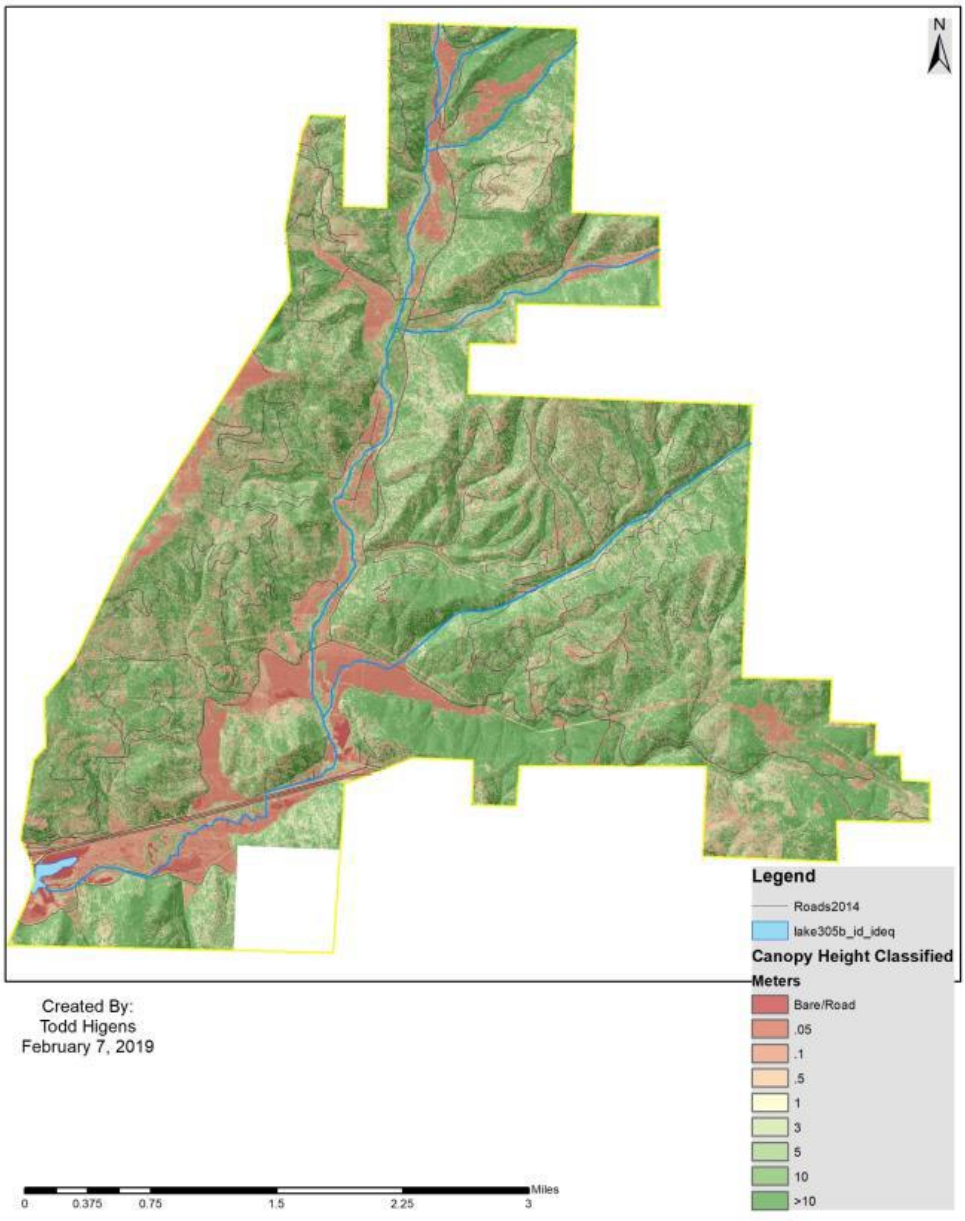
Blue Creek Canopy Height

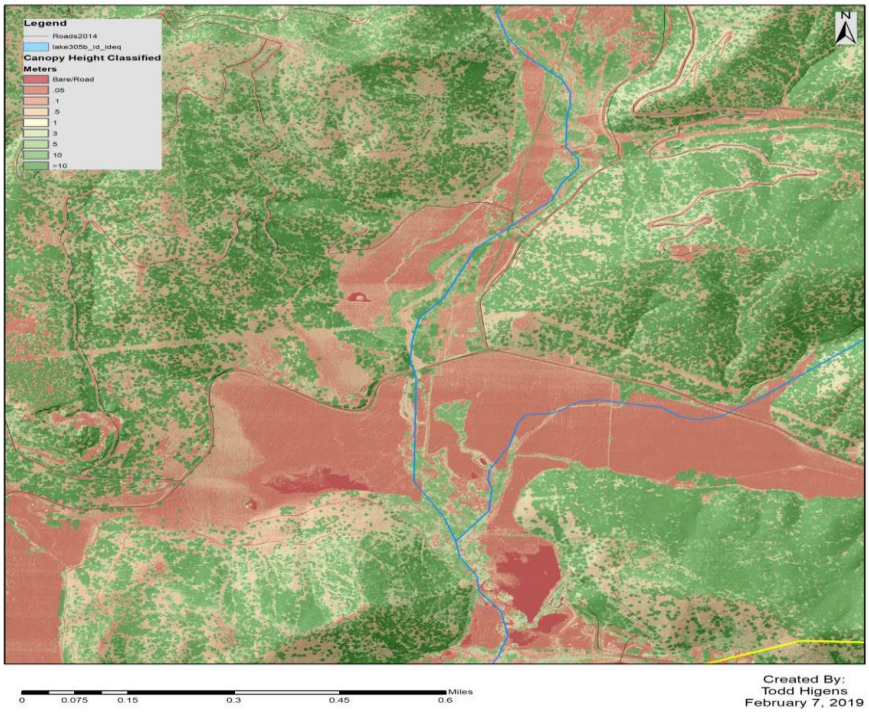


Blue Creek closer up



Wolf Lodge Canopy Height



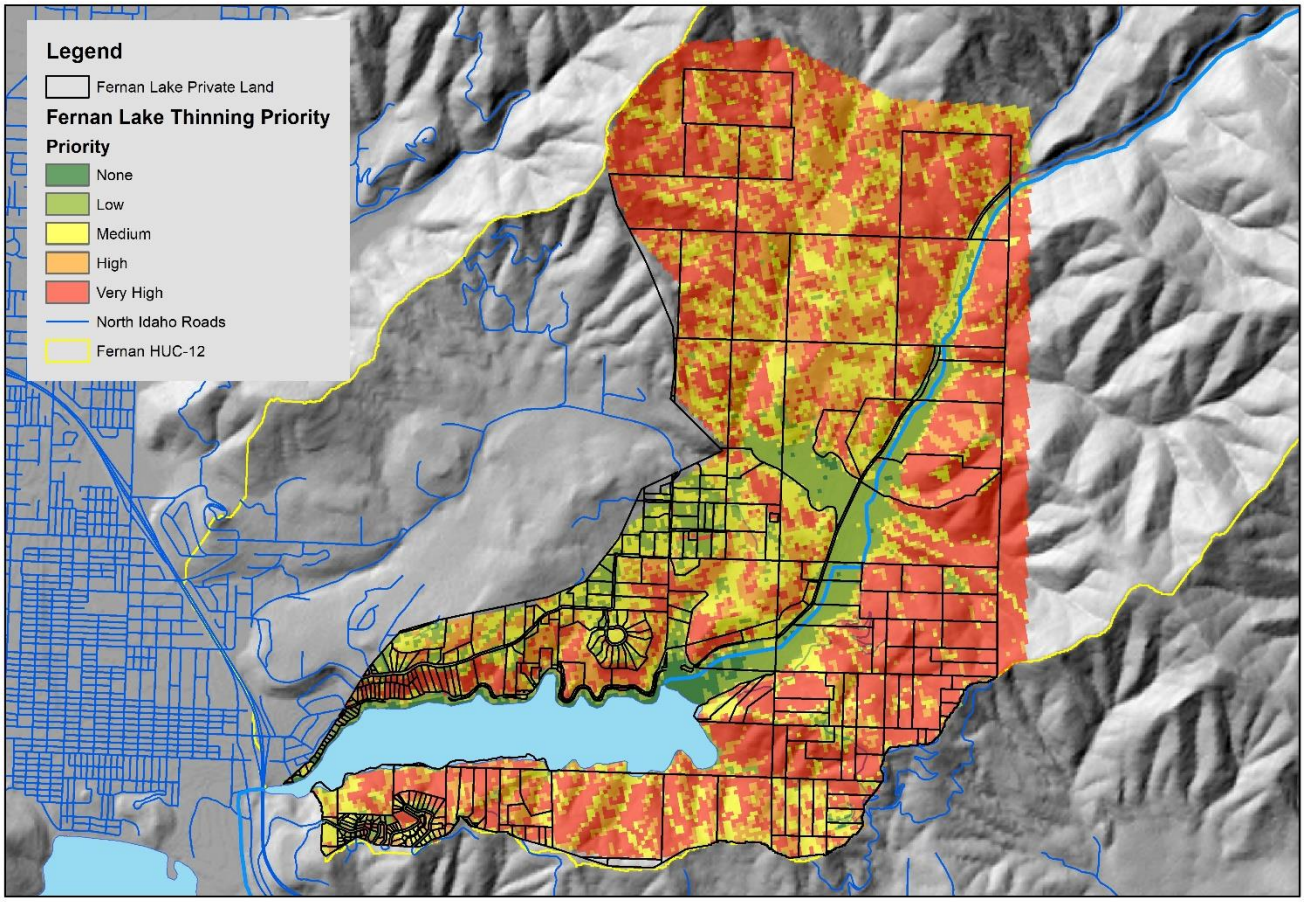


Wolf Lodge closer up

Using this data for species composition, density, and other criteria we can classify the landscape into priority areas for tools to help move these forest stands back into the range of natural variability.

For example, where some forest stands are most dense, especially with the bark beetle susceptible species such as ponderosa and lodgepole pine, priority maps have been developed for areas where thinning would help return densities to more resilient, vigorous and bark beetle resistant stand conditions.

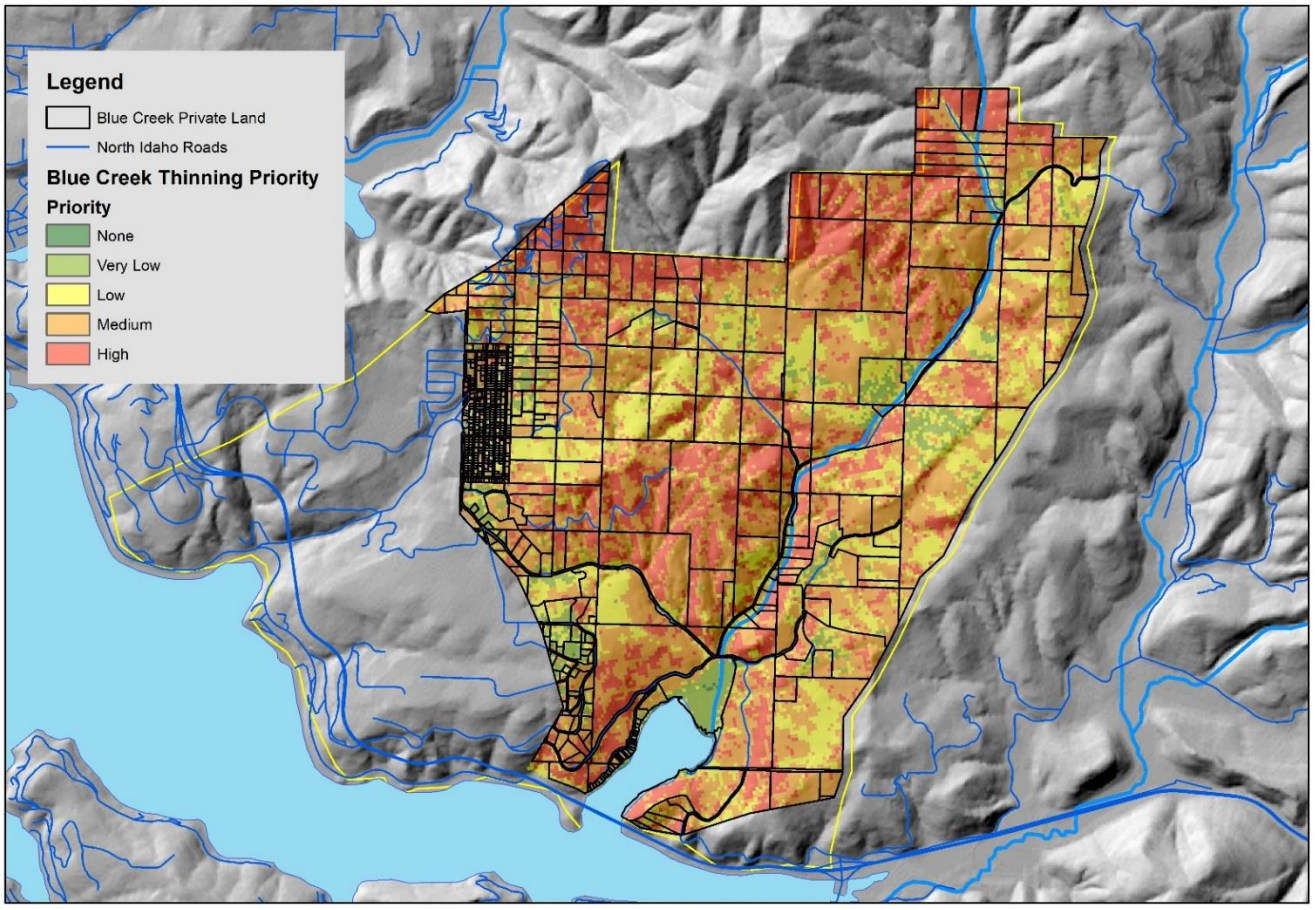
Fernan Lake Pre-Commercial Thinning Priority Areas For Private Lands



- Low 311.1 ac.
- Moderate 406.2 ac.
- High 1754.6 ac.
- Very High 2734.3 ac.

Derived from vegetation density, disease and pest risk data

Blue Creek Pre-Commercial Thinning Priority Areas For Private Lands

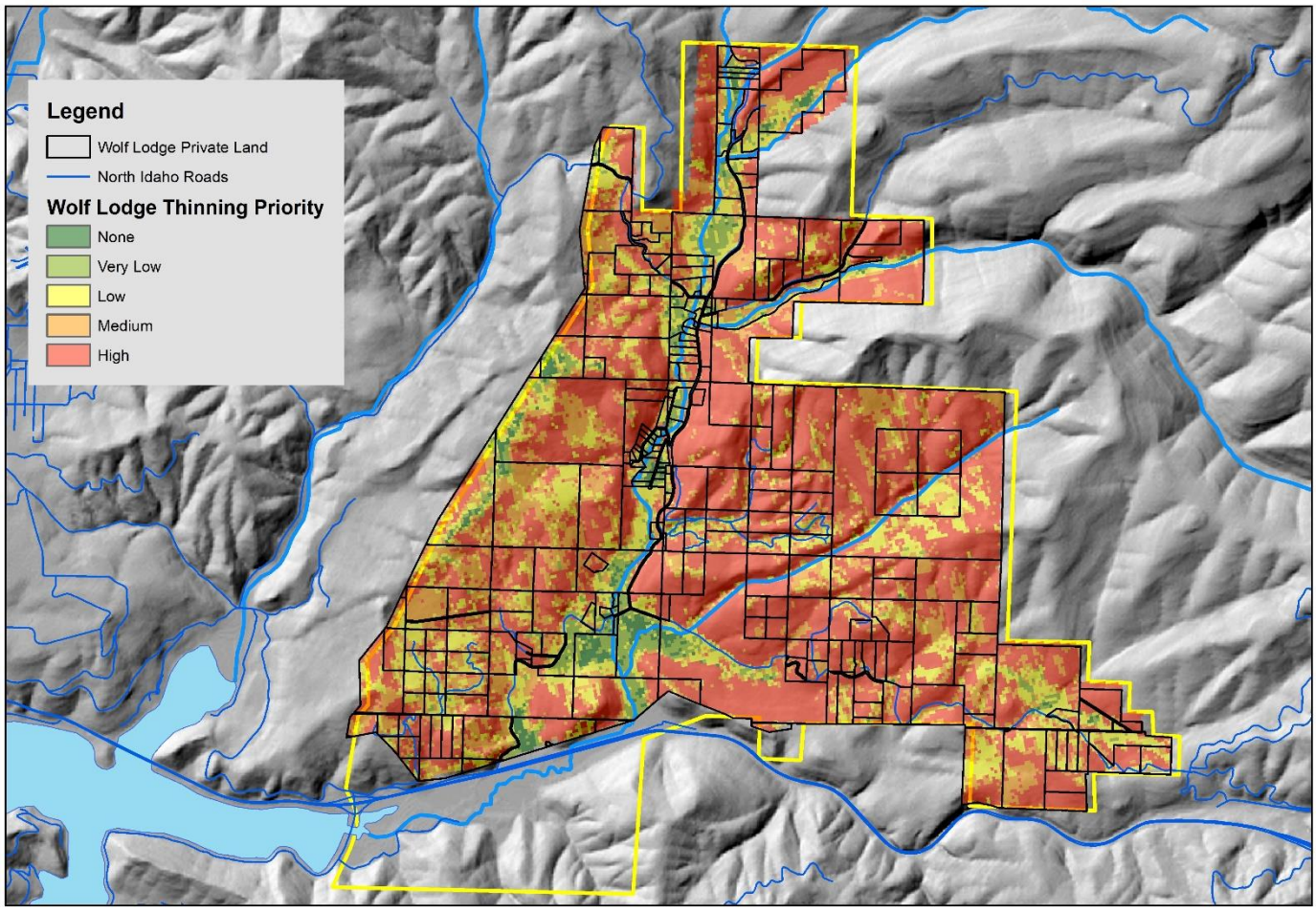


Created By:
Todd Higens
April 6, 2019

- Low 317.7 ac.
- Moderate 1,171.9 ac.
- High 3,836.4 ac.
- Very High 2,609.7 ac.

Derived from vegetation density, disease and pest risk data

Wolf Lodge Creek Pre-Commercial Thinning Priority Areas For Private Lands



Created By:
Todd Higens
April 6, 2019

- Low 399.1 ac.
- Moderate 1,286.9 ac.
- High 4469.9 ac.
- Very High 1813.4 ac.

Derived from vegetation density, disease and pest risk data

Desired Future Conditions:

The desired future conditions for forest stands in this watershed are diverse, as the mosaic of site conditions discussed above prescribes. In general, these desired future conditions are described as diversity as appropriate for site-specific conditions, with forest stands within the natural range of variability. Species mixes and densities appropriate for resilient, vigorous forest stands of various sizes and ages will provide healthy watershed function. Earlier seral species that are more fire, insect, disease, and drought resistant will predominate the species composition mix across the landscape. Later successional forest types will grow on appropriate sites where they are well adapted. A variety of sizes, ages, canopy heights, and components such as large woody debris and snags will provide diverse structure to these forests.

Climate resiliency: The desired future conditions described above, especially with emphasis on diversity and early seral conditions, will provide the most resiliency to climate change. If climate changes tend towards warmer, drier environmental conditions, the earlier seral species will be the more adaptable species. Lower densities, within the natural range of variability, and wider spacing between trees will also provide greater climate change resiliency.

e. Forest Health

As discussed above, healthy vigorous forests of diverse species and stand structure suited to the site provide crucial elements to healthy watershed function. Impacts on forest health come from a variety of agents, many of which change over time, but all of which can impact growth, vigor, structure, mortality and fuel buildup in the forest.

There are a number of forest pests which impact forest health, including pathogens, defoliators, bark beetles. Their impacts depend on host species, tree conditions, site conditions and population dynamics. Some pests are native to Northern Idaho, while others have been introduced.

Dwarf mistletoe: Dwarf mistletoes are parasitic plants with pressurized seed pods. In the fall time, seeds shoot out of the pod at up to 60 miles per hour, and rain down on understory trees and those further down wind and downslope. Dwarf mistletoes grow under the bark of branches and sometimes the stem of the tree, causing swelling and “brooming” or clumping of the branches. Over time the dwarf mistletoe slowly strangles the tree, causing decline in growth and vigor and eventually mortality. Dwarf mistletoe is species-specific, meaning the dwarf mistletoe in western larch for example will not infect ponderosa pine. Where there is a current mistletoe infection, especially in the overstory and high in the trees, either those trees may be removed, or they may be left for seed trees and removed before the new young trees reach 5 to 6 feet in height, if the new growth is of the same host (tree) species. Otherwise, a tree species conversion is advised. In this watershed, there are pockets of dwarf mistletoe in various stands of douglas fir, ponderosa pine, and western larch. It is not a high risk threat to the forest, but should be tended to over time.

Aspen/Cottonwood Decline: In the forest cover type, there is about 2,000 acres of black cottonwood identified. Generally, cottonwood and quaking aspen grow in wet draw bottoms and wet lowlands (cottonwood) and moist, spring areas (aspen). The 2013-2027 National Insect and disease Risk Maps show a few pockets of low levels of aspen/cottonwood decline in this watershed, with cottonwood decline in the lower private lands. Cottonwood decline is not well understood, and seems to have to do with older, over mature cottonwood declining in health. Recommended actions would be to regenerate cottonwood in decline especially where it is playing a crucial role in riparian areas and wetlands.

White pine blister rust: An introduced pathogen, this rust has an intermediate host of ribes, or currant shrub. White pine blister rust has been a serious problem in Northern Idaho for decades, causing serious mortality in once large and widespread stands of white pine. Forest seed orchard breeding is producing white pine seedlings resistant to white pine blister rust. Any white pine planted in this watershed should be blister rust resistant, mature white pine with blister rust symptoms should be selected out of stands. Young white pine may be pruned of lower branches to reduce spread of white pine blister rust.

Defoliators: Insects which defoliate conifer trees have caused large impacts on North Idaho forests, especially when there is an outbreak, or sudden rise in the population of the defoliating insect. These outbreaks tend to occur in trends over the years, and monitoring for population outbreaks is done by both the USFS and IDL. Host tree species type is important to defoliator impacts. The two biggest defoliating forest insect outbreaks in this watershed have been the western spruce budworm, which feeds on Douglas fir and grand fir needles, and the Douglas fir tussock moth, which causes the more severe mortality. Current predictions are we may see another Douglas fir tussock moth outbreak in this watershed in the next 5 to 6 years. The balsam wooly adelgid is another defoliator, however it mostly feeds on sub-alpine fir, which is not present in a large amount on the private land in this watershed. It is becoming a serious problem in the higher elevations on the USFS. Western larch also has both larch casebearer, a defoliator, larch needlecast and larch needleblight, pathogens, which all destroy larch needles. However, since larch grows new needles each year these usually do not cause significant growth loss or mortality.

Bark Beetles: In all likelihood bark beetles are the second highest cause of tree mortality in this watershed, with root rot disease being the first. Bark beetles are somewhat species-specific. Douglas fir bark beetle feeds on Douglas fir, Fir engraver or Scolytus bark beetle feeds on grand fir, and ponderosa pine has four different bark beetles, some of which also attack lodgepole pine. Especially with the pines, appropriate tree density or spacing for the site and size of trees is the best prevention for bark beetle risk. For the pine engraver beetle, Ips, it is also important not to create green pine slash between January and August, unless it is promptly treated, to prevent Ips population outbreaks which cause mortality in surround pine stands. Pine bark beetle risk maps follow for each sub-watershed. Recommended actions include thinning, both commercial and pre-commercial size pines, to recommended site-specific spacings to reduce bark beetle risk by improving tree growth and vigor. Slash generated by these thinnings should be promptly treated.

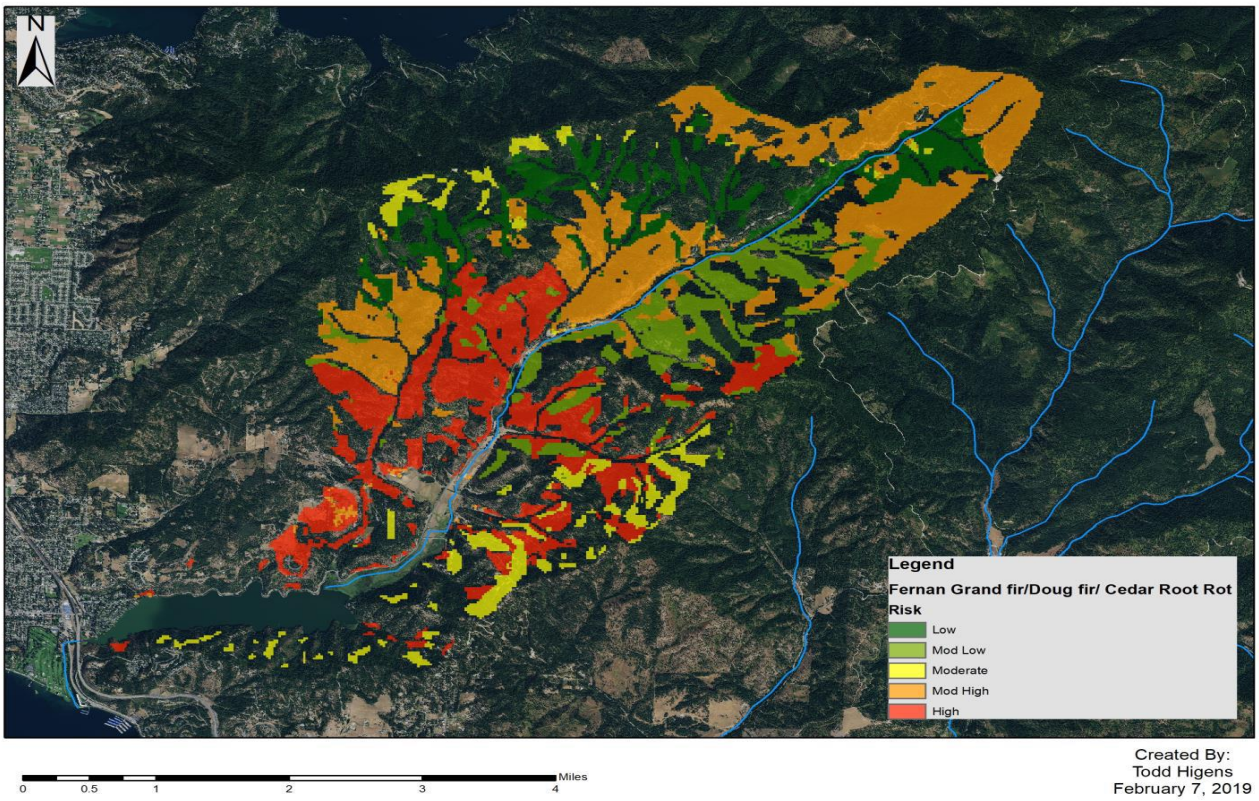
Root Diseases: Root rot disease is one of the greatest impacts on tree health, and biggest threats, yet it is sometimes difficult to assess since it is not readily visible. Root diseases are spread from root to root through the grafting of tree roots underground. Root diseases do have fruiting bodies, which may be mushrooms that produce spores, however the main way root rots spread is through tree roots. One infected tree connects roots with an uninfected tree, infects it, and the root rot spreads out in a pocket, with dead trees near the middle and declining trees around them. There are different susceptibility levels to root rot disease by tree species. Hemlock and grand fir tend to be the most susceptible, with Douglas fir close behind. The pines and western larch are much more resistant to root rots. Because root rot pathogens may survive in roots and stumps for a very long time, up to a hundred years or more, leaving susceptible species near known infected stumps and trees will only continue the spread. Recommended actions are to diagnose and identify root rot infected areas, remove susceptible host species, and plant if needed more resistant species.

This watershed shows overall a high threat of root disease risk. Following are maps by sub-watershed identifying root disease risk.

Data Sources: WCG LiDAR, LANDFIRE

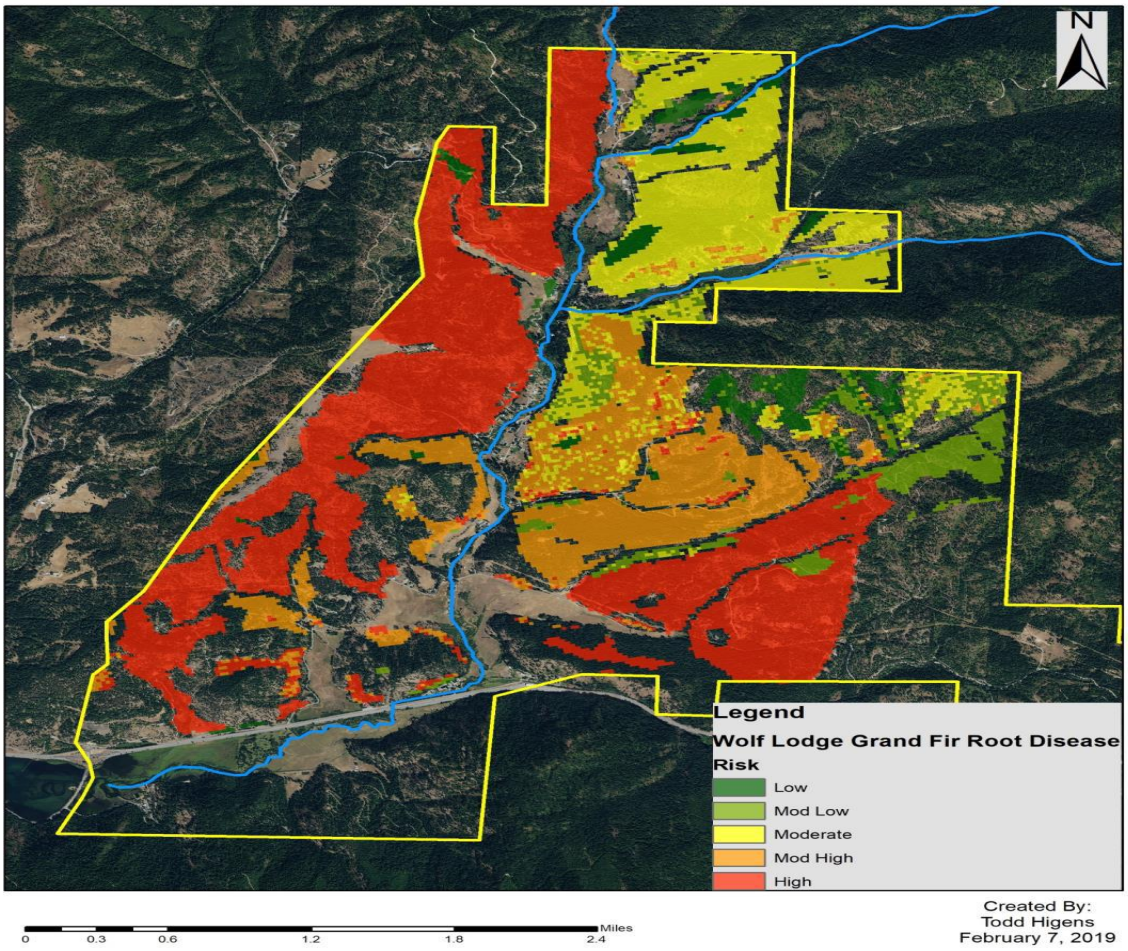
Based on Grand/Doug fir Community, Canopy density and Canopy height

Fernan Root Disease for Private Land



- Low Risk 117.5 ac.
- Mod Low 160.8 ac.
- Moderate 204.0 ac.
- Mod High 381.2 ac.
- High Risk 1236.6 ac.

Wolf Lodge Root Disease Risk for Private Land



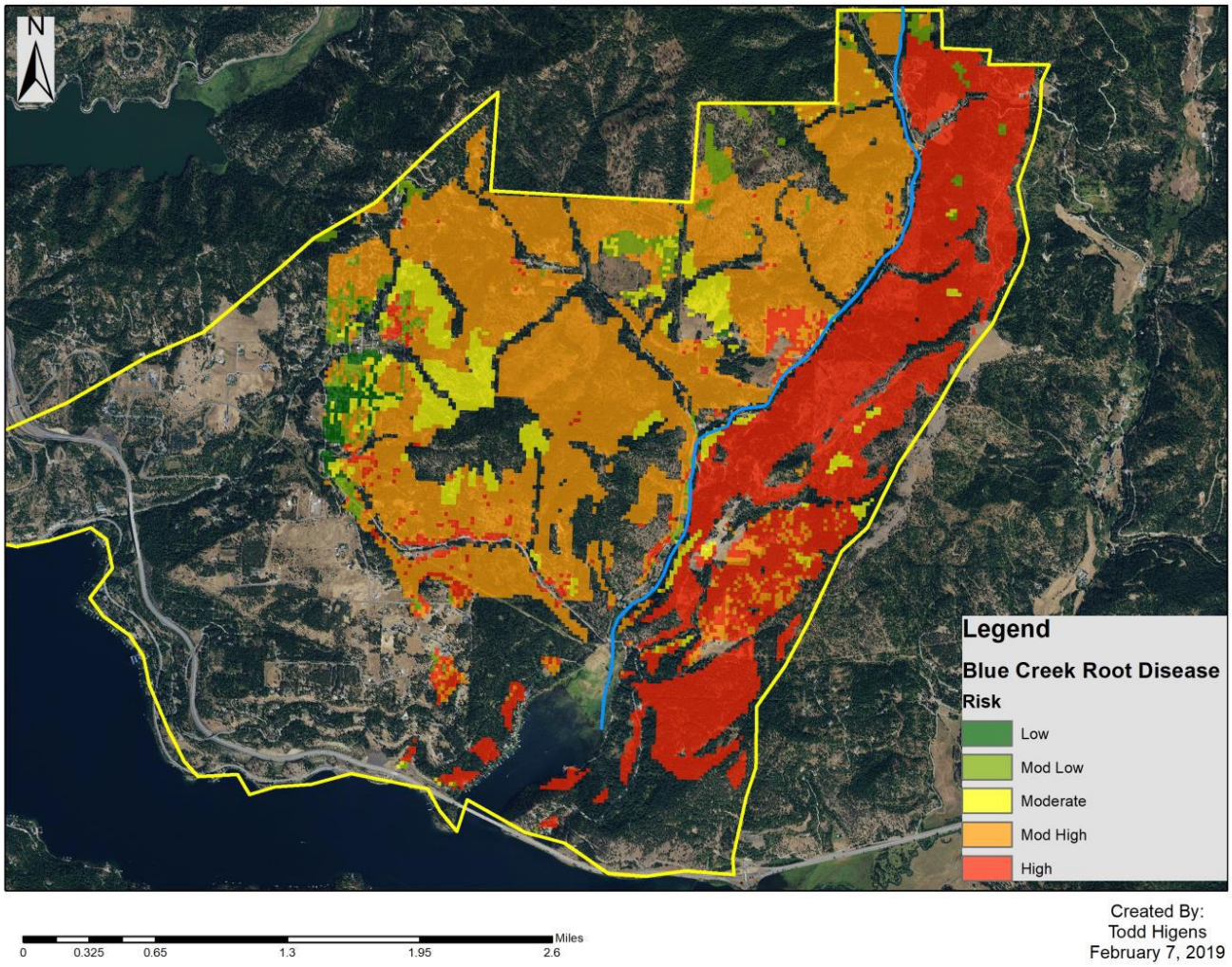
- Low Risk 172.0 ac.
- Mod Low 242.0 ac.
- Moderate 724.3 ac.
- Mod High 769.2 ac
- High risk 1716.2 ac.

Pine Bark Beetle Risk

Based on Ponderosa Pine Community and Canopy Density

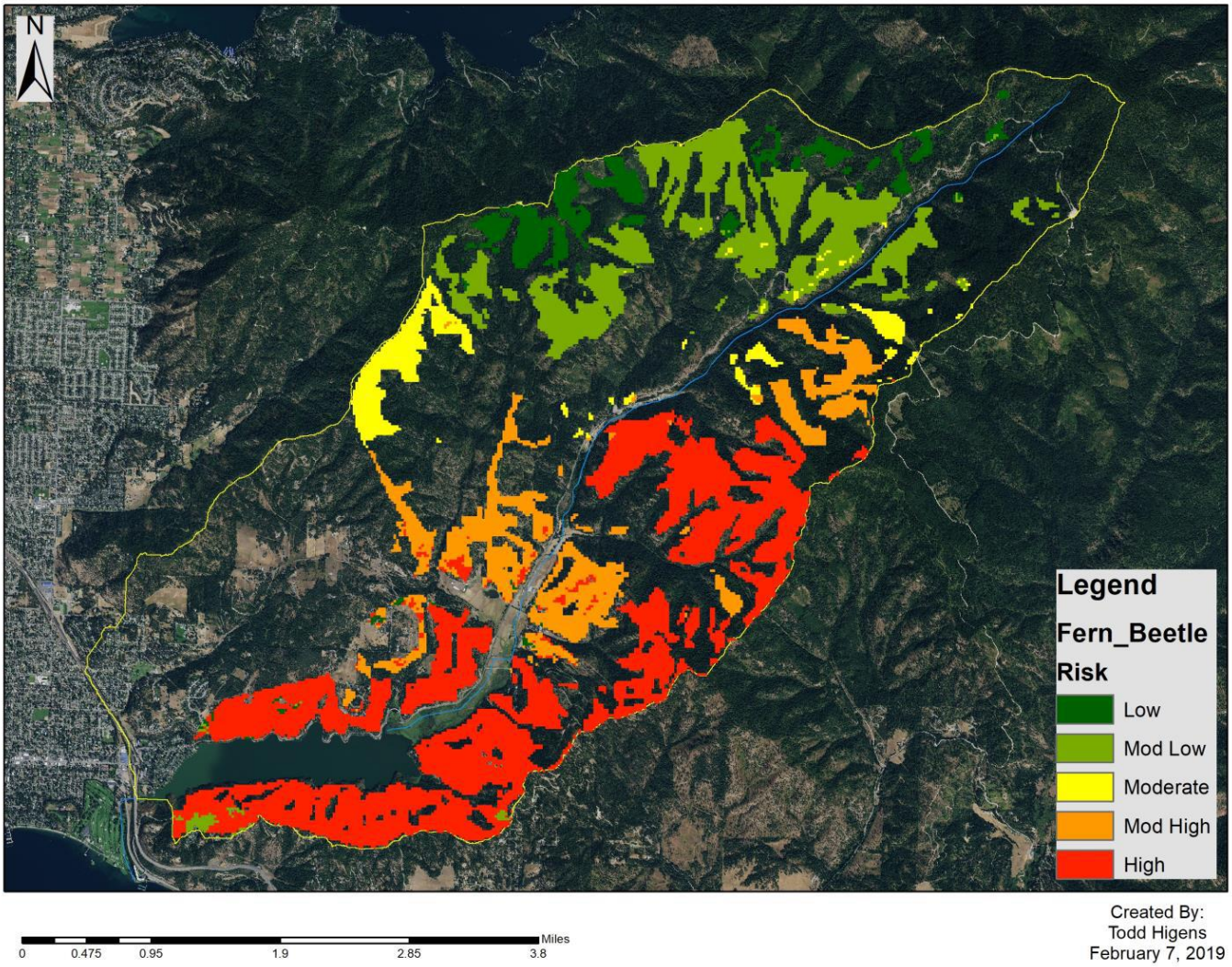
Data Sources : WCG LiDAR, LANDFIRE

Blue Creek Root Disease Risk for Private Land



- Low Risk 41.9 ac.
- Mod Low 131.2 ac.
- Moderate 258.9 ac.
- Mod High 1834.7 ac.
- High Risk 1297.3 ac.

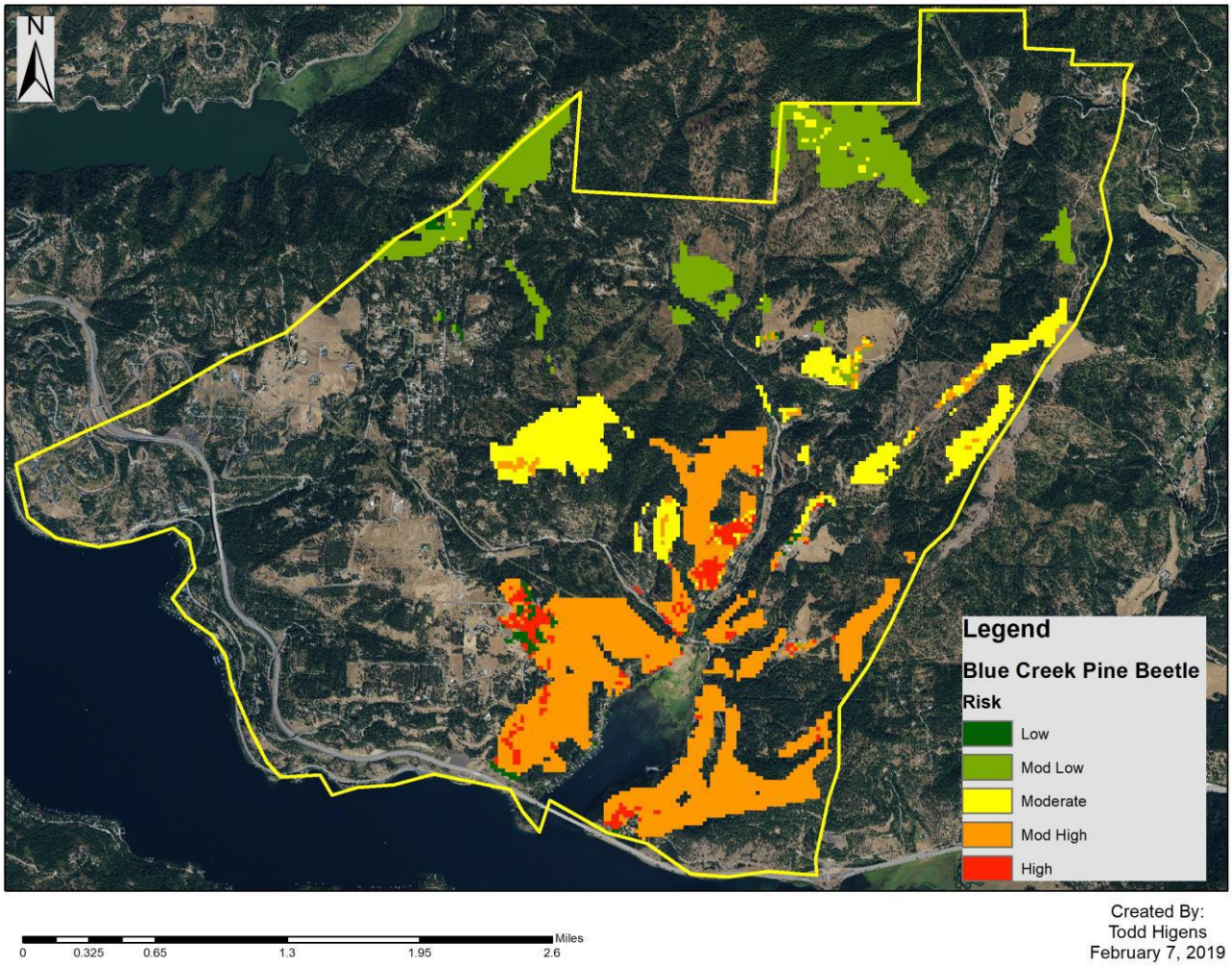
Fernan Pine Beetle Risk



Based on Ponderosa Pine Community an Canopy Density

Data Source: WCG LiDAR, Landfire

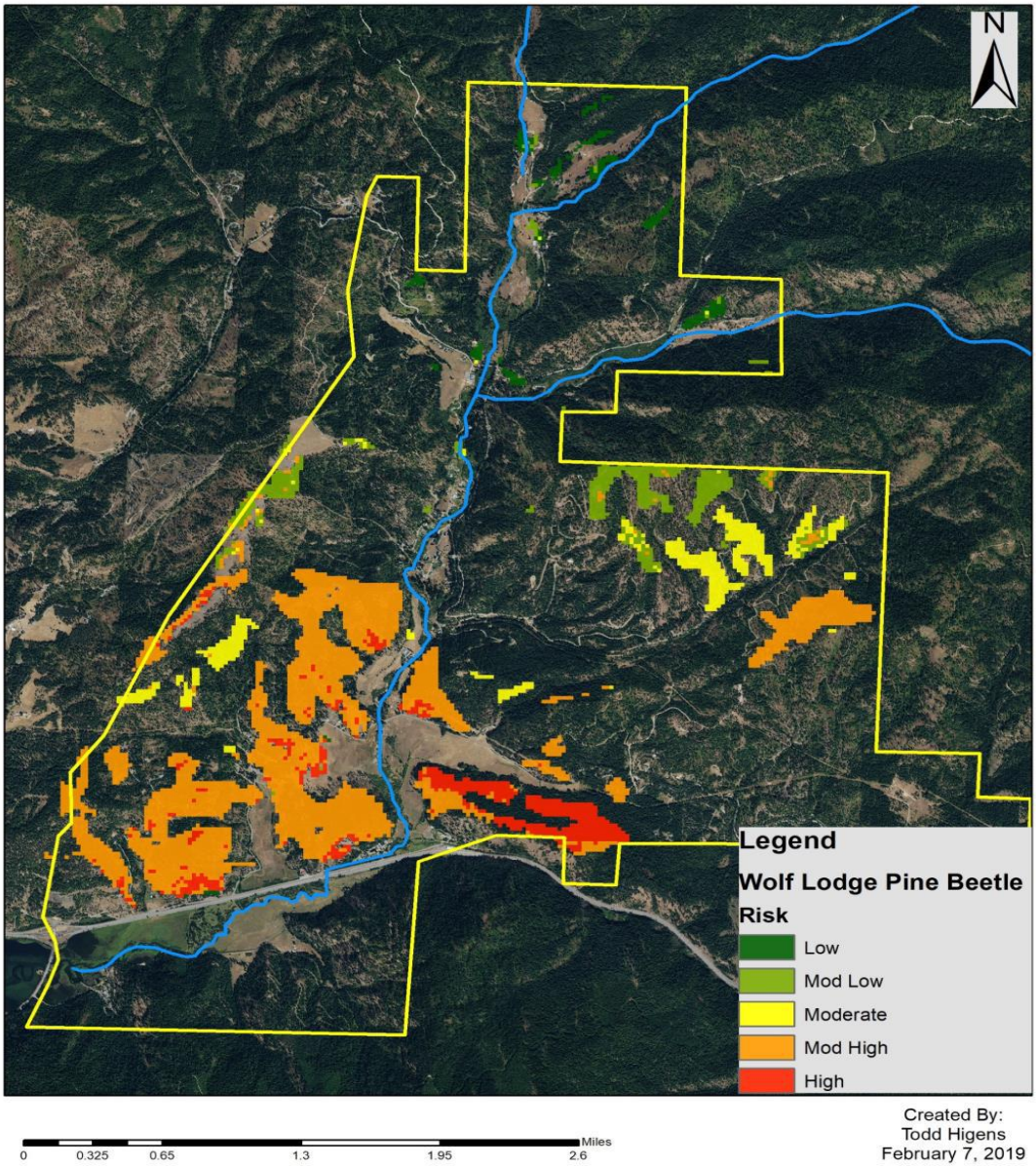
Blue Creek Pine Beetle Risk



f.

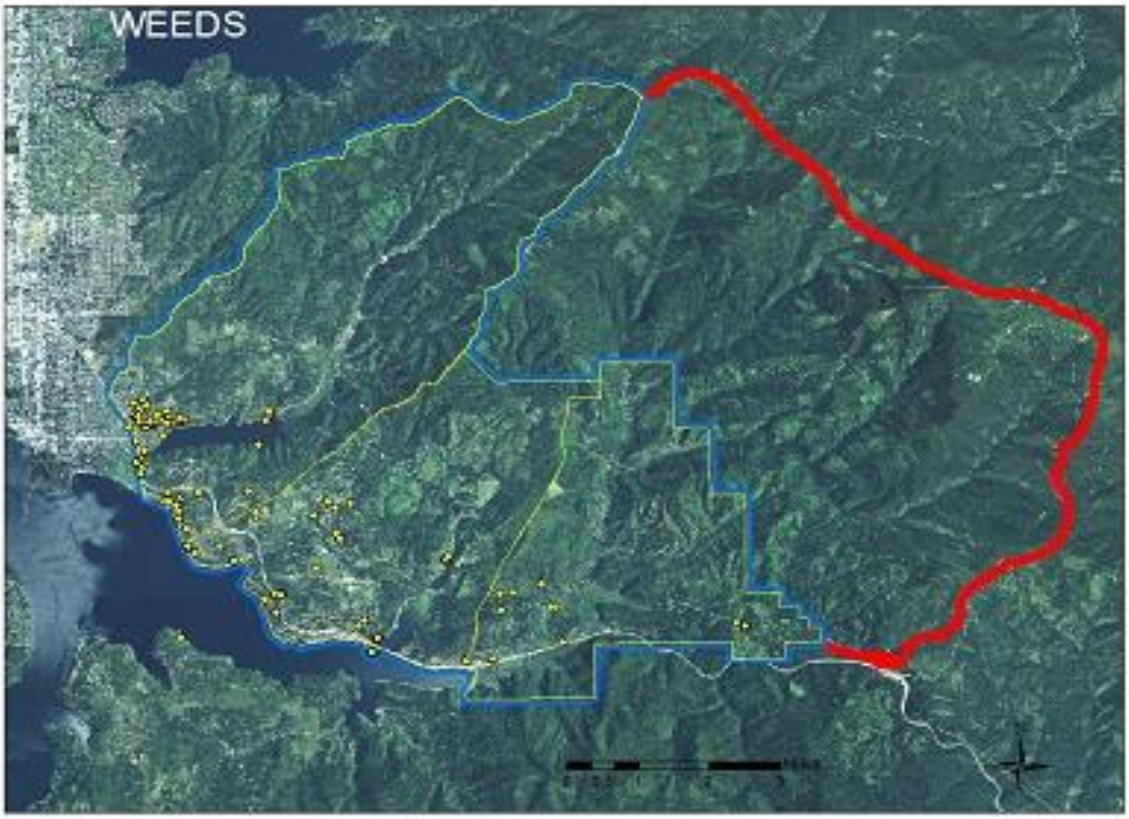
- Low 21.8 ac.
- Mod Low 300.5 ac.
- Moderate 242.6ac.
- Mod High 629.8 ac.
- High 63.8ac.

Wolf Lodge Pine Beetle Risk



- Low 42.3 ac.
- ModLow113.6ac.
- Moderate29.6ac.
- Mod High 693.0 ac.
- High128.5ac.

f. Invasive Weeds



Kootenai County Noxious Weeds (KCNW) conducted a weed survey throughout the watershed. Most of the weeds appear to be concentrated in the populated areas, although various noxious and other weeds of concern can be found by the most casual observation. Spotted knapweed was observed at relatively high elevations during spot survey exercises for the LiDAR ground truthing. Weed populations in undeveloped areas are rarely found in the high concentrations found in heavily populated and heavily recreated areas. A variety of expected and unexpected weeds were observed:

Scotch Broom	Vipers Bugloss	Houndstongue
Japanese Knotweed	Common Bugloss	Orange Hawkweed
Bohemian Knotweed	Small Bugloss	Yellow Hawkweed
Giant Knotweed	Spotted Knapweed	Dalmatian Toadflax
Poison Hemlock	Canada Thistle	Yellow Flag Iris
Blueweed	Common Tansy	

No Yellow Starthistle was discovered, which comes as a relief to all. The KCNW survey does not include known populations of St. John's Wort, which technically is not a noxious weed, but certainly can be considered obnoxious and invasive.

E. Wild Fire Hazard

a. Wildfire Risk on the Landscape

As described in the History section, plant communities and forest fire fuel loads have been shaped by past wildfire frequency and intensity. How a wildfire will behave depends on weather, topography, and fuels; these three factors are commonly known as the Fire Behavior Triangle. Weather and topography may not be controlled, so fuel management and fire suppression tactics must be used to manage fire behavior.

Fuels: Forest vegetative fuels determine fire spread and intensity through their size, horizontal and vertical arrangement, density, species, and moisture content. Fuels range in size from "fine" fuels less than ¼ inch in diameter up to large logs and trees over 12 inches in diameter. Surface fuels, including grass and leaf/needle litter occur on or close to the ground. Ladder fuels occur above the surface fuels, including especially dead branches, and provide a ladder to the forest canopy fuels above.

The amount and type of these fuels will determine the rate of spread and intensity of a fire, as well as how difficult it will be to control. For example, a fire is typically easiest to control in a forest having an open canopy and light surface fuels. Fires are much harder to control when ladder fuels allow flames to climb up trees and launch embers capable of starting distant fires, or "spotting." Once in a dense canopy, a fire can spread rapidly through the tree crowns, and especially when pushed by wind, become very difficult to control.

In addition, in areas of lighter fuel loads, a fire may actually benefit the site by consuming fuels and stimulating growth and reproduction of fire dependent species. These were the more characteristic fires of the past, frequent and lower intensity. Higher fuel loads, with accumulations of dead material and concentrated needle duff, lead to more resource damage where higher intensity and longer duration of heat leads to damaging or destroying organic soil layers, tree roots typically insulated by the soil, and older trees whose thick bark would normally protect them. Some older tree species are much more resistant to and adapted to wildfire, such as ponderosa pine and western larch. Others, such as grand fir and hemlock, do not survive wildfire very well due to their thinner bark. Wildfire in heavy fuels, with higher intensity and duration, tend to be "stand replacement" fires, killing most of the older trees and starting the forest stand over again. These intense stand replacement wildfires have significant impacts on watershed function, and can be significant sources of sediment due to erosion depending on timing/intensity of precipitation after the fire, especially on steep erosive slopes.

Decades of fire suppression have allowed fuel to accumulate in some forest communities, creating potential for wildfire to seriously damage the site's resources and ecological processes. Large fires burning in these fuels, hotter and longer than historical fires in the area, create uncharacteristic wildfire conditions, damaging the site. Impacts to watersheds can be severe.

Certain forest management tools can create forests that are more fire resilient, including thinning, good slash cleanup, promoting fire resilient species and densities adapted to the site, and prescribed burning to mimic the historical frequent, low intensity fire regimes of the past. Creating vigorous, healthy forest conditions will also help reduce mortality due to insects and disease, reducing fuels loads resulting from that mortality. Overcrowded stands with species not well adapted to the site are at highest risk and those undergoing high insect and disease mortality are at highest risk. Although we can never completely replicate historical fire

effects on plant communities, nor eliminate fire from the landscape, we can work to create more fire-resilient landscapes through management techniques that mimic these natural processes.

Historic fire regimes have been grouped into classifications (Barrett et al 2010):

Fire Regime Group	Frequency	Description
I	0-35 years	Low severity fires replacing <25% of overstory, can include mixed-severity that replace up to 75%
II	0-35 years	High severity fires replacing >75% of the overstory
III	35-200 yrs	Mixed severity, can also include low severity
IV	35-200 yrs	High severity fires
V	200+ years	Replacement severity, can include any severity in this frequency range

Most of this watershed falls into Fire Regime Group III, with smaller portions in Groups I and IV. These are presumed historical fire regimes based on interactions between vegetation dynamics, fire spread, fire effects, and spatial context.

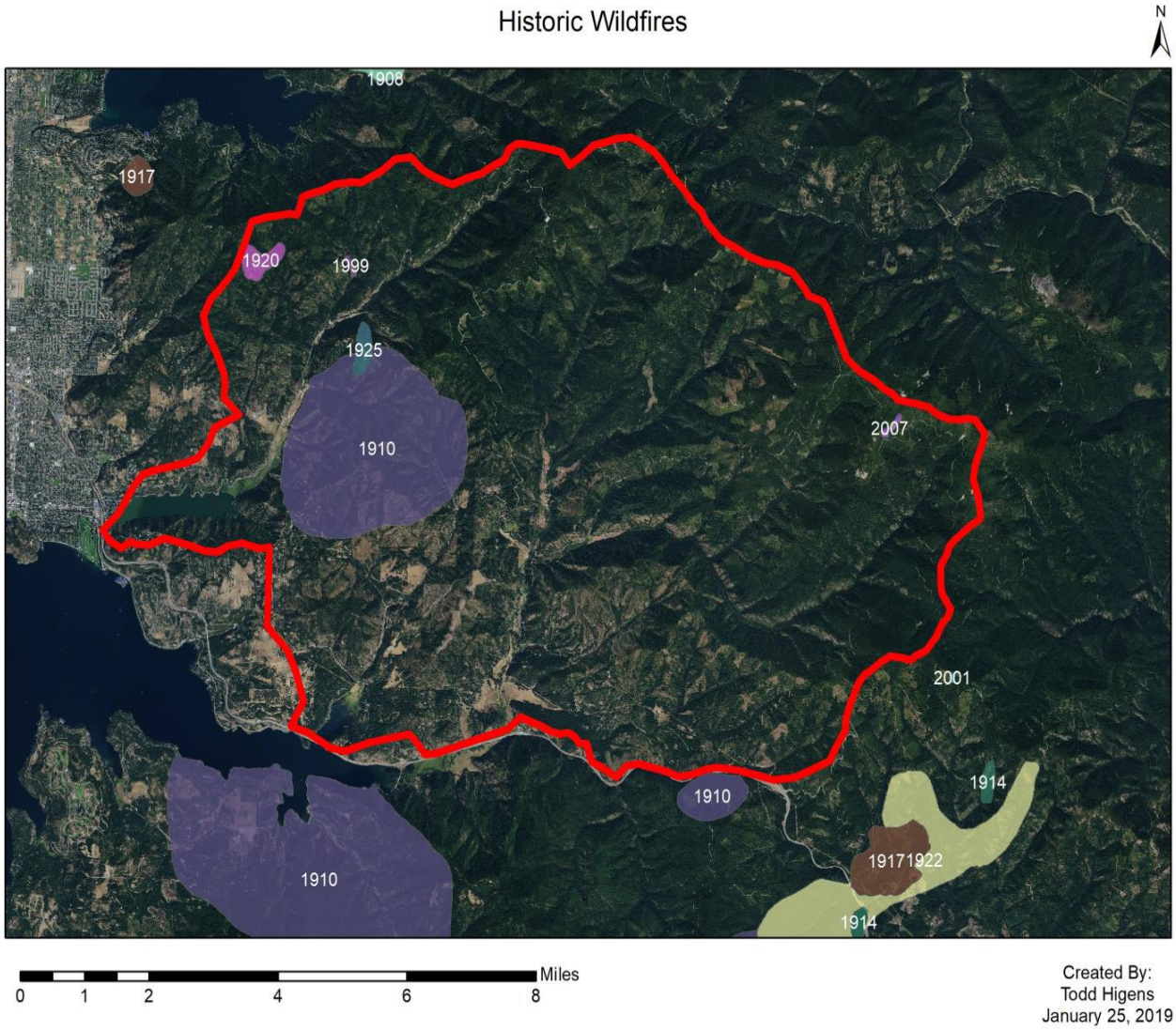
Vegetation Condition Class is a derivative of vegetation departure from historical natural range of variability. Most of this watershed, on private lands, falls in the moderate to high vegetative departure class, meaning it is out of the natural range of variability at a moderate to high rate. Smaller portions are in the high to very high departure class, while other portions are in the moderate to low departure class (closer to natural range of variability).

Wildland fire behavior may be predicted using, in part, fuel models. There are 13 Fire Behavior fuel models, on this watershed the predominant Fire Behavior Fuel Models are:

Fire Behavior Fuel Model	Description
1 Grass Group	Fire spread is in fine herbaceous fuels that have cured, fires move rapidly through cured grass. Grasslands with very little shrub or timber present
2 Grass Group	Fire spread is through fine herbaceous fuels, curing or dead. Open shrub lands and pine stands
5 Shrub Group	Fire is carried in surface fuels, shrubs are young and green, not much dead material, fires are not very intense, shrubs nearly cover the area
8 Timber Group	Slow burning ground fires, closed canopy stands of short needle conifers, represented by white pines, lodgepole pine, spruce, fir and larch.
9 Timber Group	Fire spreads faster than FM 8, higher flame height, long needle conifer, closed stands of ponderosa pine, heavy loads of down dead woody material
10 Timber Group	Fire burns in ground fuels with greater intensity than FM 8 and 9, dead down fuels of greater than 3 inch and larger create a large load of dead material, result of overmaturity or insect/disease mortality, windthrow, aged slash

The first map below shows an overall fire risk rating for this watershed, with individual maps for each streamshed following. These maps were created from LiDAR and LANDFIRE rasters. The determining factors for wildfire risk are the density of the vegetation, vegetation type, slope, aspect, and location in the Wildland Urban Interface. These composite maps show a much higher acreage in the Extreme and High Fire risk ratings,

due in large part to the pressure of development in the wildland urban interface, and refinement of fuel loading from the LiDAR data.

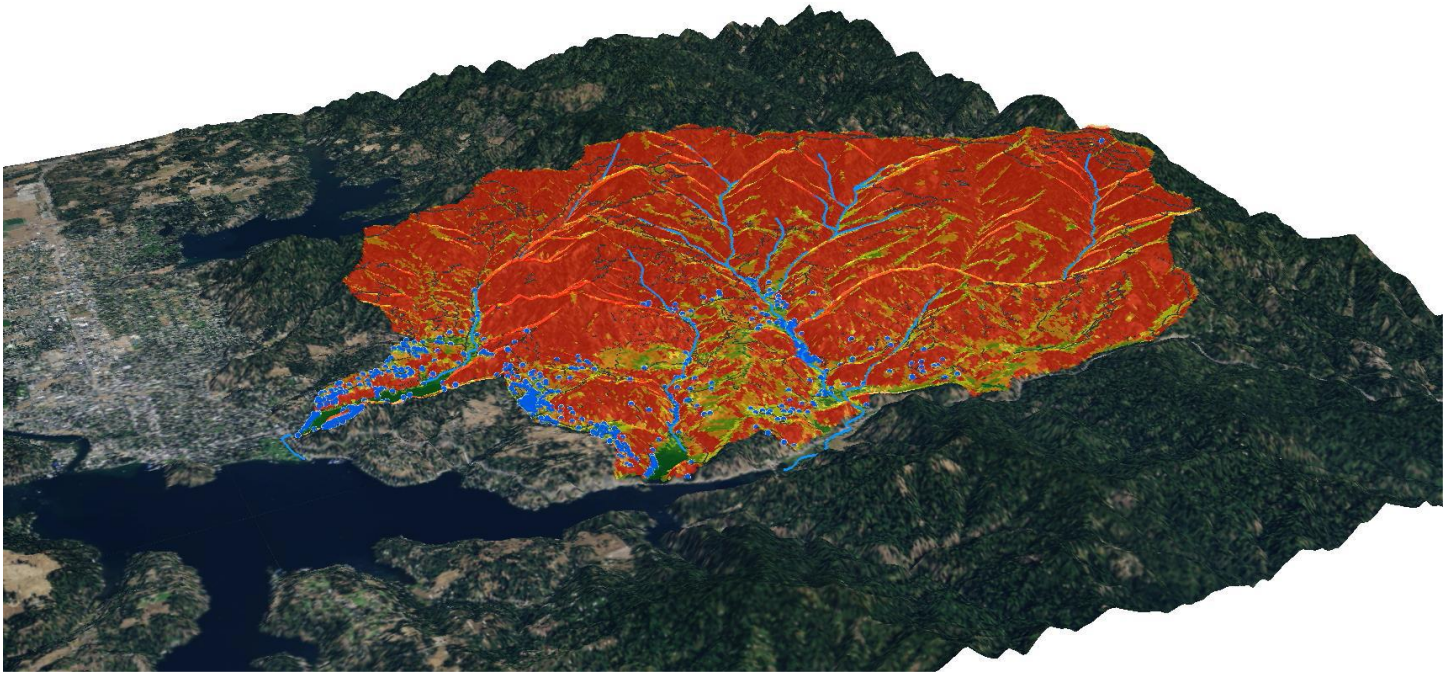


Summary of Wildfire Risk acres by watershed

Watershed	None	Low	Moderate	High	Extreme
Fernan Ck	82 acres	132	795	1,855	3,843
Blue Creek	181	361	723	1,626	1,928
Wolf Lodge Ck	121	453	453	982	5,744
TOTAL	384	946	1,971	4,463	**11,515**

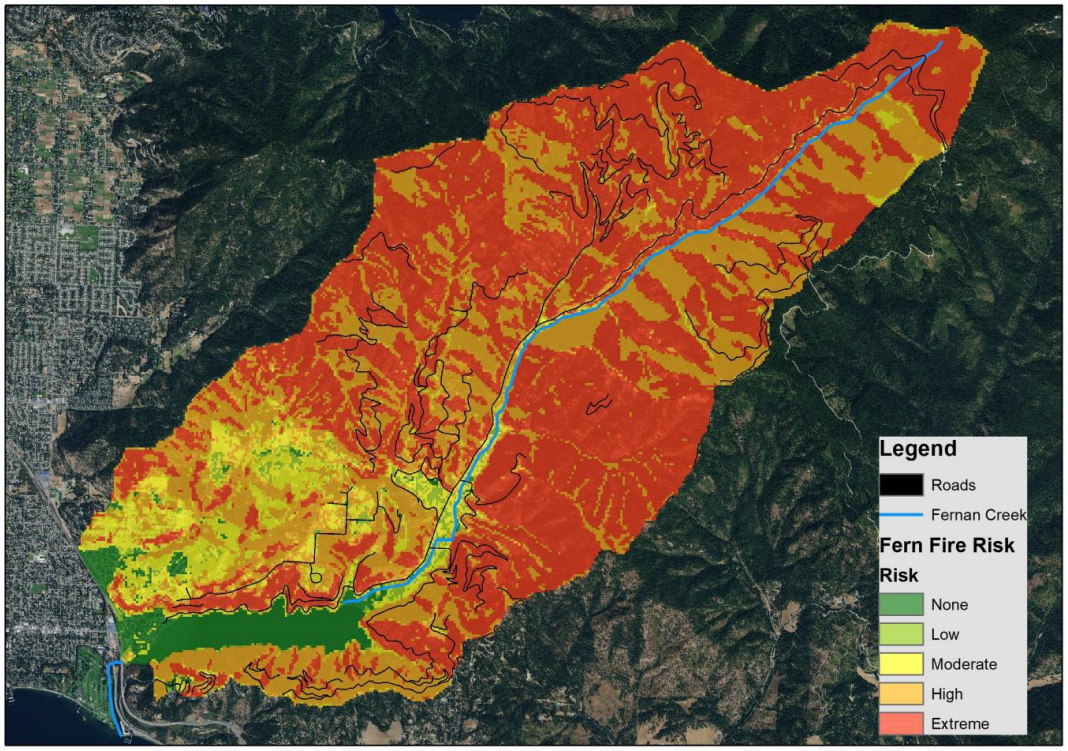
Several fuel breaks have been completed on this landscape as demonstrations of what shaded fuel breaks look like and how they function, as part of this LSR grant. Shaded fuel breaks have been completed in each of the three sub-watersheds. Each of these landowners is very pleased with their fuel break, and host neighbors to show the work, building interest and momentum. NRCS with RCPP funding has plans for several more fuel breaks. Kootenai County Office of Emergency Services has implemented several grants in the Fire wise program to install fuel breaks and defensible space around structures on portions of this landscape. Both the Bureau of Land Management and the USDA Forest Service have completed some fuel break work on their forestlands in this landscape. By using a combination of commercial timber sales, pre-commercial thinning, prescribed fire and brush reduction tactics these portions of the landscape are at a much more reduced risk from high intensity wildfires. There is potential to work with neighboring private landowners and adjoining federal land to continue shaded fuel breaks across the landscape in strategic locations. Shaded fuel breaks are a high priority for future work, on both private and federal lands, in priority areas on this landscape to further protect the landscape and provide for safer firefighting if needed.

Current Wildfire Risk Map 3D

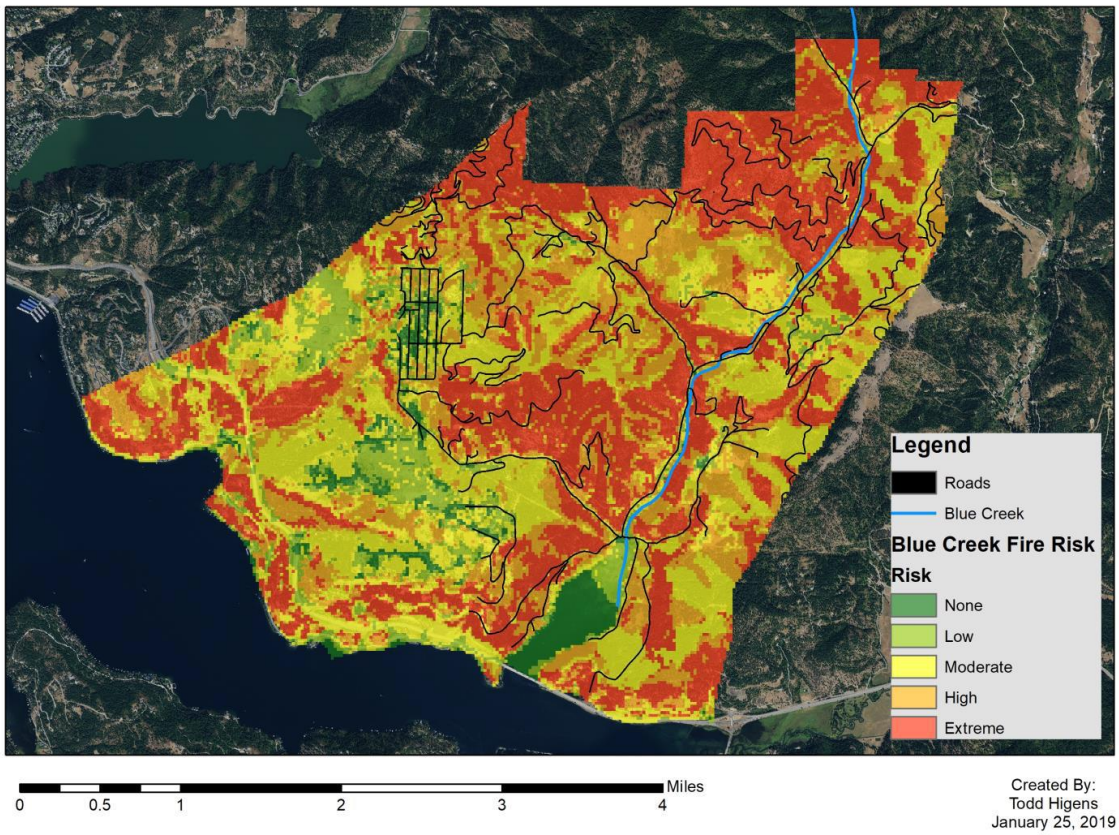


Fire Risk Model derived from WCG LiDAR, IDL, USFS and LANDFIRE Data Sources

Fernan Creek HUC-12 Fire Risk

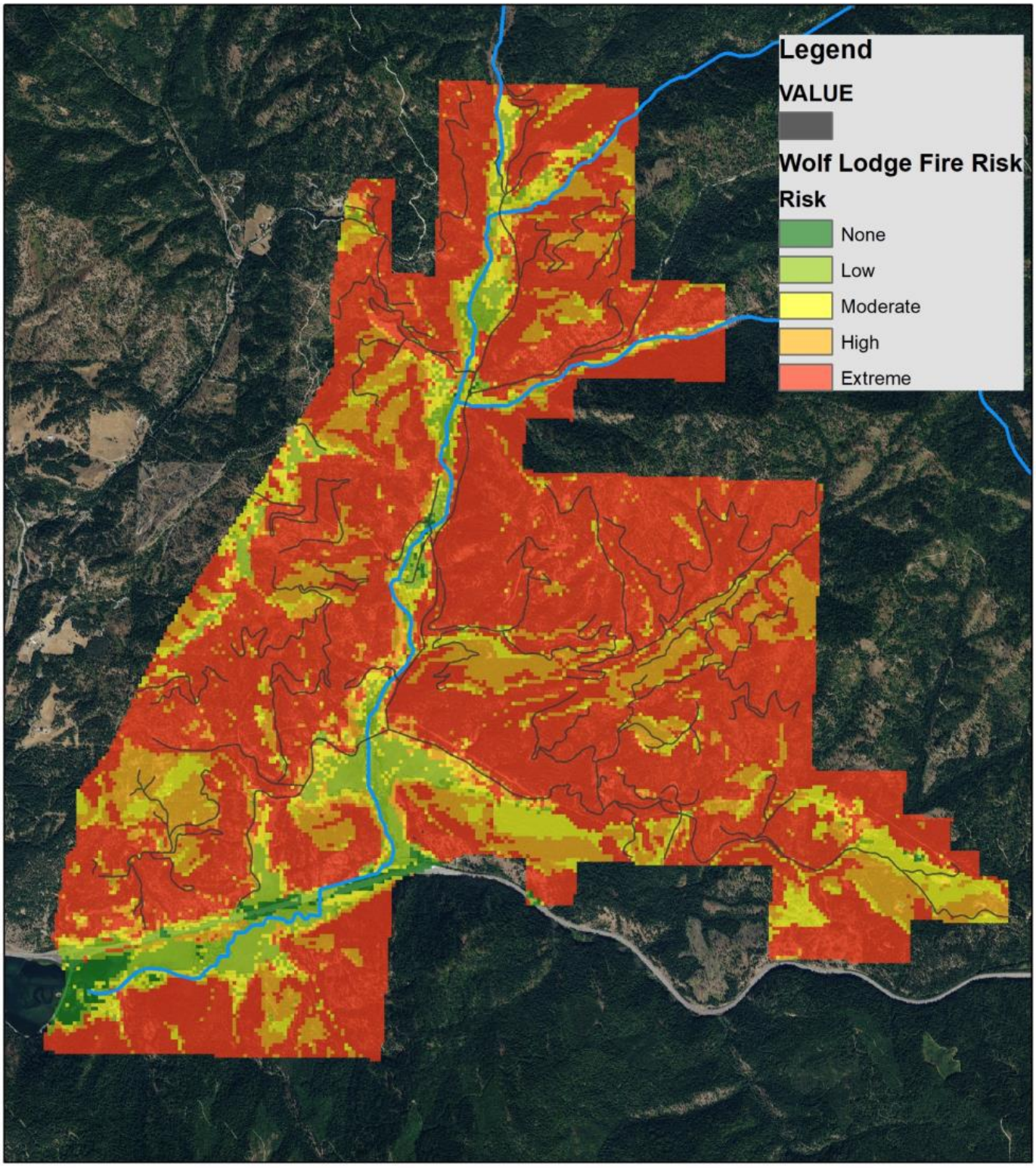


Blue Creek Fire Risk



Created By:
Todd Higens
January 25, 2019

Wolf Lodge Creek Fire Risk

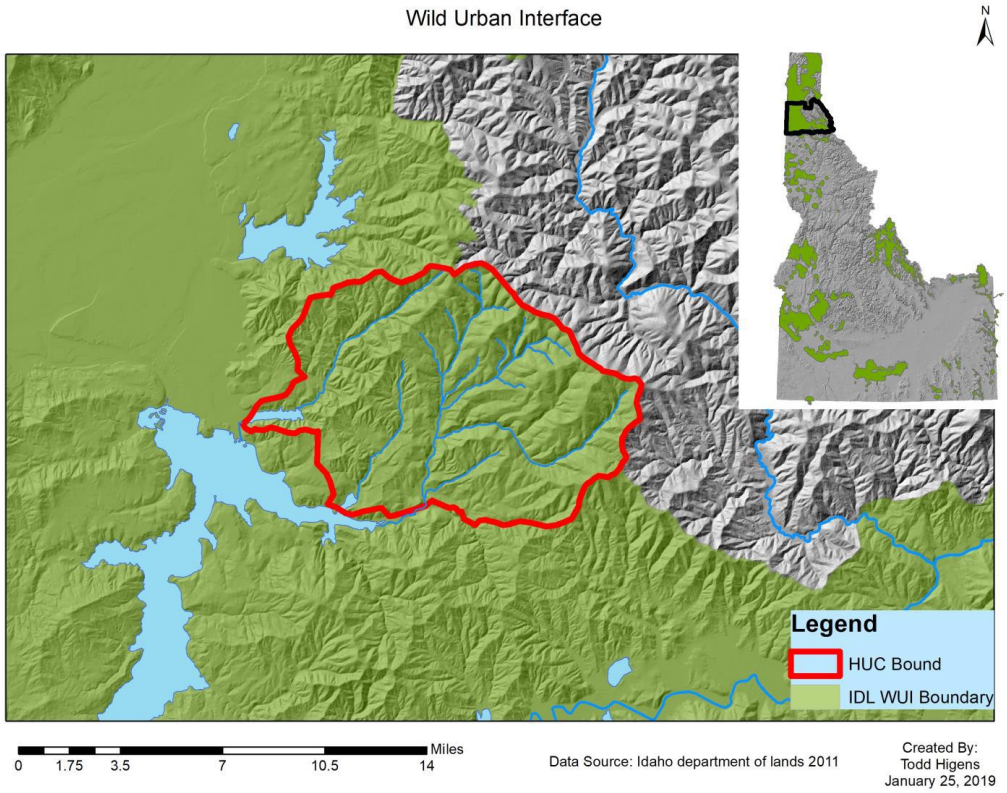


0 0.475 0.95 1.9 2.85 3.8 Miles

Created By:
Todd Higens
January 25, 2019

b. Wildland Urban Interface:

The entire watershed is considered within the Wildland Urban Interface by Idaho Department of Lands.

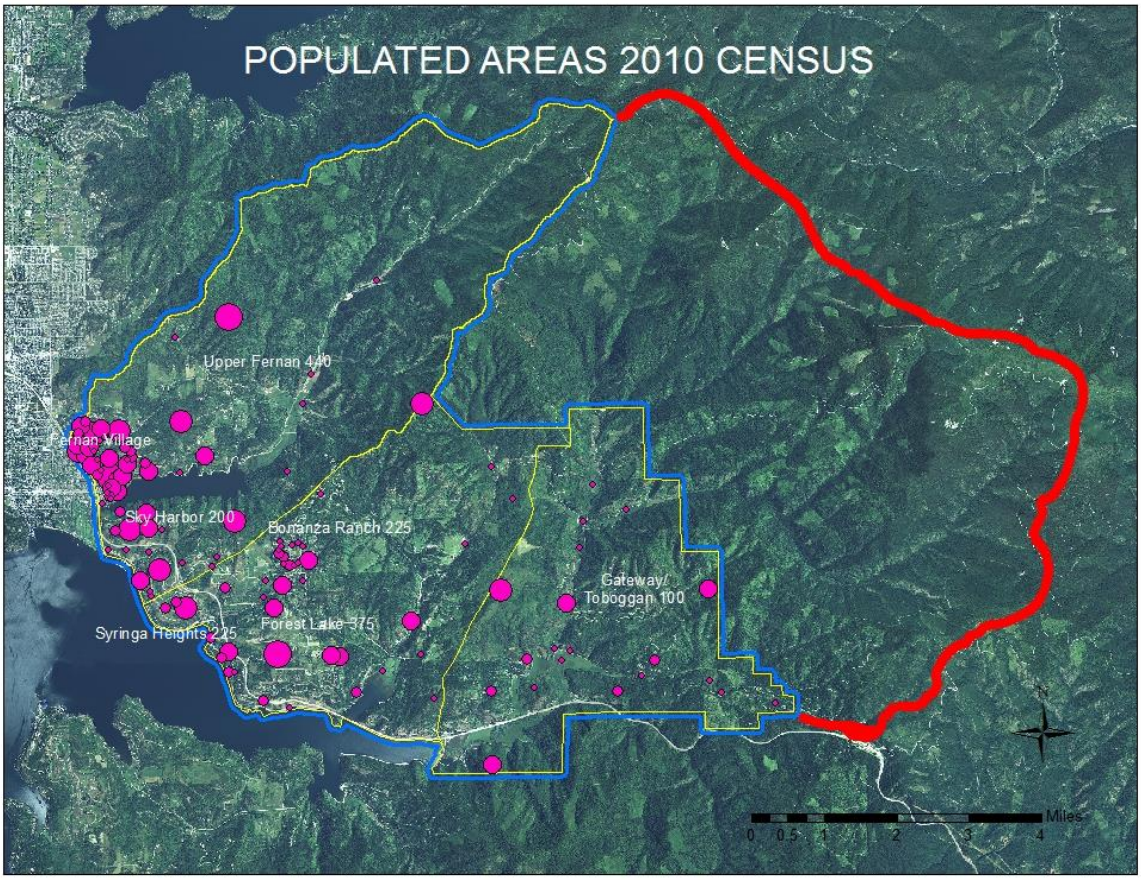


This watershed lies within Kootenai County, Idaho and borders the City of Couer d'Alene, population 45,000. Kootenai County has been growing in population at a faster rate each since the last economic slowdown, and is projected to grow in 2019 at 2.93%. It also contains the fastest growing city in Idaho, Post Falls at 28,600 which is about 15 miles from this watershed. In addition, the city of Spokane, Washington (population 300,000) is less than 30 miles away and projected to grow 22% in the next 25 years.

In addition, parcelization has increased at a faster pace, especially since the last economic slow-down (about 2014). Some larger parcels once owned by forest industry have been transferred to development companies, about 660 acres.

These high rates of population growth, parcelization and development are projected to continue for at least the next 20 years.

CADASTRAL


POPULATED AREAS 2010 CENSUS
Upper Fernan 440
Fernan Village
Sky Harbor 200
Bonanza Ranch 225
Gateway/
Toboggan 100
Forest Lake 375
Syringa Heights 225
Miles
0 0.5 1 2 3 4

The highest concentration of human development is the **Fernan Village** community. There are some 1650 people living in that area (2010 census). Since that community adjoins the city of Coeur d'Alene, and since it is so highly developed, we did not analyze that area for potential forest health or wildfire prevention. Our efforts are better concentrated in the less developed and forested areas of the watersheds.

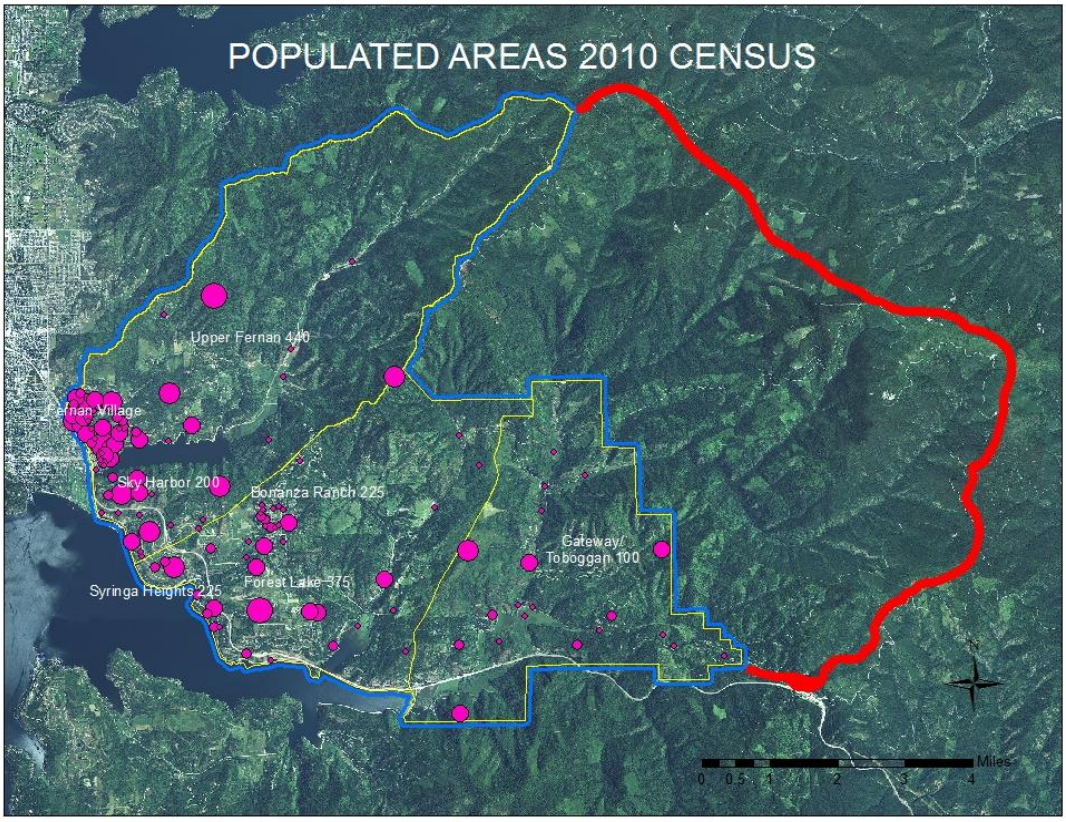
The **Upper Fernan** watershed has a surprising number of residents, at 440. These homes are quite sparse, but many more than anyone imagined. Most of these homes are quite close to Idaho Panhandle National Forest. It is also in an area of intermittently dense forest.

Forest Lake community, in the Mullan Trail/Sunnyside area, houses some 375 residents, with fairly recent development expansion. This area would be a prime target for forest health and wildfire prevention education.

Nearby **Bonanza Ranch**, with some 225 residents, is an older community bordered on all sides by fairly dense forest. It appears to be at least somewhat managed for forest health.

Syringa Heights is a rather upscale neighborhood on the west side of Interstate 90 has some 225 residents, mostly overlooking Lake Coeur d'Alene.

Sky Harbor, on the southern side of Fernan Lake, is not particularly dense, with 200 residents. Access is fairly limited in case of wildfire.

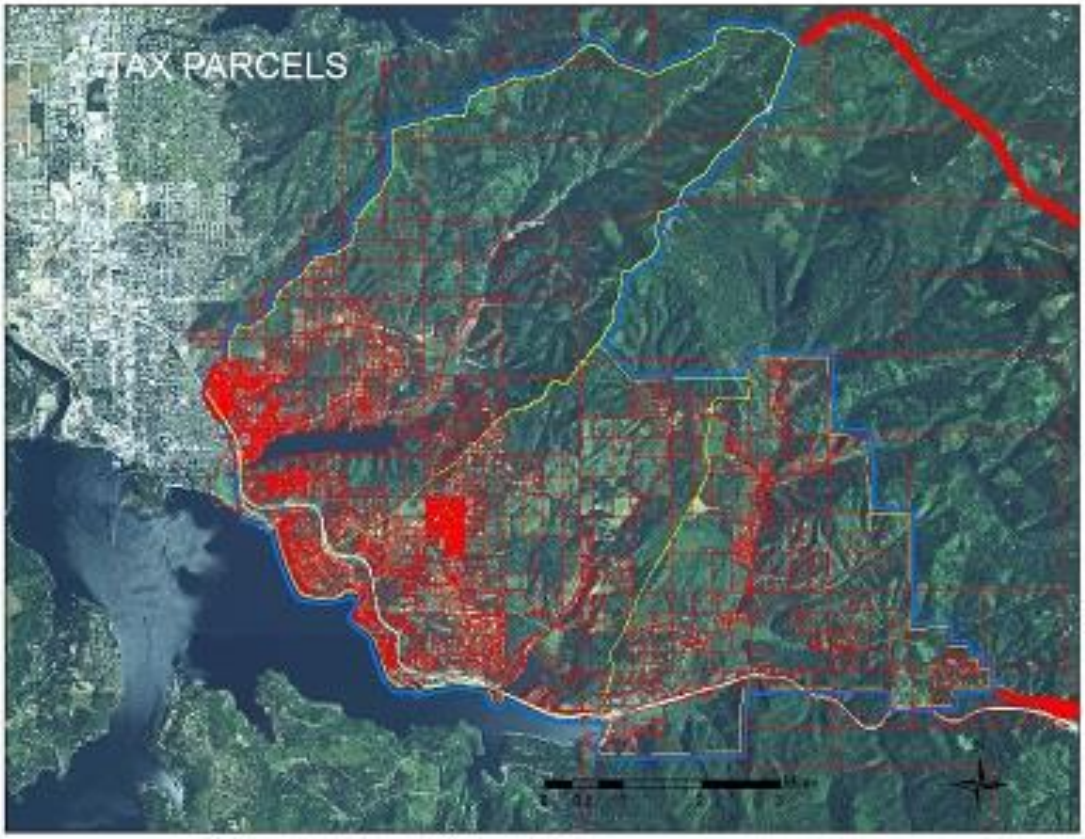


Gateway Ranch is a community along Wolf Lodge Creek surrounded by both industrial and non-industrial private forests, managed with some intensity. Forest health appear generally good overall. 2010 census lists 35 residents, although the suspected population could be somewhat higher. The Gateway residents

are generally more concerned with water quality as it pertains to Wolf Lodge Creek than with forest health, although the upper watersheds directly affect runoff and erosion.

Toboggan Road is just to the east of Gateway Ranch. Some new development has occurred since the 2010 census. It also lists 35 residents, and I suspect the population is higher. The new roads constructed are high quality, well designed, with adequate relief (culverts). When this project began, we suspected that this development could be a major sediment contributor but found quite the opposite was true.

It does appear that increased development contributes to decreased water quality in the watersheds. Forest health is generally decreased and wildfire danger is increased as development increases. For more in-depth analysis, the data has been sent to the Kootenai County GIS department for the County Office of Emergency Services to help interpret.



The Tax Parcels layer corresponds fairly well with the census data layer. The Fernan Village, Sky Harbor, and Bonanza Ranch show dense, small parcels at this scale.

Working with landowners

The high rate of population growth and parcelization on private land in this watershed creates a challenge to implementing a watershed action plan. The average length forest ownership for non-industrial forest land owners in Idaho is only about nine years and may be significantly shorter in this watershed due to its fast rate of development. This creates significant change in a short amount of time, with new land owners coming in to the watershed needing outreach and education. One way to mitigate for this challenge is to find a few key, long term landowners willing to be demonstration areas who are well respected in the neighborhood to work with on watershed improvement projects and outreach events. We have been fortunate to have a few key landowners located in each watershed who have one improvement projects from forest stewardship plan to road improvement work, fuel breaks, pre-commercial thinning, root rot area tree plantings, and even a larch seed orchard. These key landowners have initiated contact with their neighbors and others in the watershed, hosting barbeque and tours to show off their work, and attending workshops such as IdaH2O for water quality monitoring and events to explain this LSR project. There are some well developed community groups such as Friends of Fernan Lake and the Blue Wolf Community Group, which has a great meeting place at their community center on Blue Creek. This will greatly assist our outreach efforts in implementing this watershed action plan if we continue to lean on these key landowners/leaders for contacts in the neighborhood.

F. Fish and Wildlife

N.E. Coeur d'Alene Lake Fish & Wildlife

North Idaho is known for an abundance of fish and wildlife and the area of Northeast Coeur d'Alene Lake is no exception. In this area people can recreate and live in an area that is teaming with wildlife and feels like a remote out of the way location when the reality is it is only minutes away from Coeur d'Alene, Idaho. If a person goes for a drive in this region they can enjoy beautiful scenery and the odds witnessing deer, elk, moose, eagles or ospreys are very high. However, the wildlife in the Wolf Lodge Creek, Blue Creek and Fernan Creek watersheds still face many challenges from past and present land uses that impact the aquatic and terrestrial biota of the region. Forestry, recreation, agriculture and sub-urban expansion all impact most forms of wildlife in the north eastern portion of the lake.

Historically the most common fish observed in these creeks were the iconic native Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*) and the non-gamefish of sculpin (*Cottus spp*.). Over time the numbers of Cutthroat Trout have been severely reduced in these three watersheds as the result of spawning habitat degradation from channel alterations, sedimentation of the cobble substrate needed for cutthroat spawning, higher water temperatures as a result of riparian vegetation removal and the introduction of the non-native salmonids Brook Trout (*Salvelinus fontinalis*) and Rainbow Trout (*Oncorhynchus mykiss*) that displace and outcompete native fish in these waters (River design Group 2016).

The location of Fernan lake near the City of Coeur d'Alene and Interstate 90 makes this lake a popular destination for fishing and recreation. The fish currently stocked in Fernan Lake are a mix of sport fish that is typical for small North Idaho lakes. This includes bass, perch, crappie, sun fish, Brook Trout and the heavily stocked Rainbow Trout (Idaho fish & Game 2019). The lake is fed by Fernan Creek which has one small order main channel at only 8.2 miles in length with only small non-fish bearing intermittent Class one tributaries.

Even though it is listed as a perennial stream Fernan Creek does often go dry during the summer months. Fish surveys completed early in the summer with flowing water did observe Cutthroat Trout and Brook trout early in the summer (IDEQ Integrated Report 2014). Fernan Creek is 303_d as impaired for sediment and temperature and much of the channel has been altered as a result of residential, agricultural and forestry activities in the basin (IDEQ Integrated Report 2014).

Blue Creek is one watershed east of Fernan Creek/Fernan Lake basin and it is very similar to Fernan Creek in channel morphology with one 5.5-mile-long main channel fed by small intermittent class one streams. This creek will most likely have Cutthroat Trout, Brook trout and sculpin present but unlike Fernan Creek (IDFG, Fish Planner 2019), Blue creek has not been assessed to determine if the creek supports its designated beneficial uses and there is no available Idaho DEQ fish survey information (IDEQ Integrated Report 2014; Idaho Fish and Game 2019). Most of the creek channel has been altered, with the lower gradient portion of the creek being channeled by residential homes and the upper headwater reach being channeled by Blue Creek Road.

Wolf Lodge Creek is a much larger watershed further to the east. Wolf Lodge Creek has two large perennial tributaries of Marie Creek and Stella Creek. This watershed has many issues caused by past and current land uses that negatively impacted the fish populations in this watershed. This drainage once boasted a very healthy Cutthroat Trout population according to locals who have lived on the creek over the last forty years. In the summer of 1983, the Yellowstone Pipeline ruptured spilling approximately 24,000 gallons of unleaded gasoline into Wolf Lodge Creek leading to a massive fish kill in the whole drainage (Graves 1985). Once the cutthroat trout were eliminated the introduced and much more pollution tolerant Brook Trout were able to take over the watershed and displace any surviving native trout (Sigler and Zaroban 2017).

Along with the Keystone spill much of the cutthroat trout habitat loss was compounded by massive stream channel alterations in the entire watershed because of residential, agricultural and forestry land uses (river design group 2016). To minimize sedimentation problems ineffective sediment traps were created on Marie Creek and Stella Creek altering the natural channels and blocking fish passage (River Design Group 2016). In many other areas the creek channel had been straightened or ditched and much of the riparian vegetation was removed. The result was a loss of floodplain connectivity and cutthroat trout spawning habitat (River Design Group 2016). The loss of cutthroat was exasperated by reduced migration from ad fluvial cutthroat attempting to swim up Wolf Lodge Creek to spawn in the spring. The migratory cutthroat entering wolf Lodge Creek from the lake are exposed to predation from spring spawning Northern Pike (*Esox Lucius*) in Wolf Lodge Bay. Once in the creek the migrating cutthroat that do survive are outcompeted for spawning territory and food by the resident Brook Trout (River Design Group 2016).

Cutthroat trout have recently been observed in Wolf Lodge Creek along with some Brook Trout, Rainbow Trout and an abundance of Sculpin over the last five years (IDEQ Integrated Report 2014). This creek is also spawning grounds for the introduced Chinook (*Onchorhynchus tshawytscha*) and native Kokanee Salmon (*Onchorhynchus nerka*). The presence of sculpin is a positive sign of water quality as their benthic resident behavior and sensitivity to metals, pollutants and sedimentation makes them a good indicator of water quality (Sigler and Zaroban 2017).

These three watersheds have a few amphibians and reptiles in the lakes, streams and wetland areas. Typical examples are small snakes, turtles, frogs, toads and salamanders. This area is known habitat for the rare Coeur d'Alene Salamander (*Plethodon idahoensis*); these colorful salamanders with a distinctive yellow dorsal stripe have been observed in the Wolf Lodge Watershed. The Couer d'Alene Salamander is listed as "Species of Special Concern" by the State of Idaho and the population and health of this unique amphibian species is uncertain at this time (IDFG, Wildlife Plan 2015).

The big game found in the area are the typical of North Idaho. Whitetail Deer (*Odocoileus virginianus*), Rocky Mountain Elk (*Cervus canadensis nelson*) and Moose (*Alces alces*) can be seen often in all three drainages. Black Bear (*Ursus americanus*), Bobcats (*Lynx rufus)* and Cougars (*Puma concolor*) are also common but not encountered nearly as often. The area is not designated as Critical Habitat for any animals listed under the Endangers Species Act (ESA) but there may be a rare occurrence of a Wolverine (*Gulo gulo*) or Canadian lynx (*Lynx canadensis*). Many birds can be observed including grouse, geese, Ospreys, hawks, herons, and turkeys. There is an extremely heavy presence of Bald Eagles (*Haliaeetus leucocephalus*) in the spring when the Kokanee are spawning in Wolf Lodge, Beauty and Blue bays on Lake Coeur d'Alene.

References in Appendix

Threatened and Endangered Species *(Address rare, threatened and endangered species.)* The following table lists the rare, threatened or endangered species known to occur in Kootenai County, Idaho; their listing codes, and how likely they are to occur on this particular landscape. Some of these species have been observed on this landscape and portions of the habitat may support their existence. If any others are found, they will be protected as required by law.

Common Name	Scientific Name	Idaho Listing	Federal Listing	Likelyhood to Occur on Landscape
Yellow-billed cuckoo	*Coccyzus americanus*	C	T	Unlikely
Canada Lynx	*Lynx canadensis*	T	T	Some
North American wolverine	*Gulo gulo luscus*		PT	Some
Spalding's catchfly (plant)	*Silene spaldingii*	T	T	Unlikely
Water howellia (plant)	*Howellia aquarilis*	T	T	Unlikely
Coeur d'Alene salamander	*Plethodonidahoensis*	SC	SC	Wolf Lodge watershed-seen
Grizzly bear	*Ursus arctos horribilis*	T	T	Unlikely

C=Candidate T=Threatened R=Recovered PT=Potential Threatened

SC= Species of Special Concern (Idaho)

G. Recreation

With private land in the valley floor, the upper mountainous elevations are mostly public land that is managed, primarily, by the US Forest Service.

Recreation uses within these watersheds include, but are not limited to; camping, fishing, hiking, horseback riding, hunting, OHV riding, picnicking, and winter sports. With the proximity of this area to Coeur d'Alene residents, and out of state residents, including Spokane WA, and Missoula MT, the area is very popular for recreational outdoor activities, whether it be summer or winter. Frequently, camping spots are full every weekend in the summer, and when the huckleberries are ripe for picking, you see numerous families out picking berries and enjoying the outdoors. In the winter, snowmobiles, snow-shoers, and cross-country skiers can be seen enjoying the fresh snow and plowing new trails.

Fernan, Blue Lake and Wolf Lodge Bay also provide an excellent opportunity for small boats both motor and non-motorized along with paddleboarders to enjoy its waters. These waters are a popular destination for fishing

in the summer and winter, because of its easy and quick access. Its shores are frequented by many fishermen alike. Idaho Department of Fish and Game as well as USDA Bureau of Land Management provide boat ramps, parking areas, and some boat and fishing docks.

The US Forest Service has numerous trail heads and parking areas for recreational use. Some, such as Canfield Mountain, are adjacent to private land, and the trail systems are heavily used by both motorized sports (dirt bike and OHVs) and non-motorized recreationists (hikers, mountain bike riders, horseback riders). There are some private business also providing recreational activities such as trail riding, wagon rides, and outside events.

This water shed is heavily used by hunters primarily in the fall months. Elk, deer, moose, and bear are large game that are hunted by thousands of citizens, local and out of state, every year. There is also upland game bird, and water fowl hunting opportunities.

There are some organized user groups along with interest groups involved with these recreational activities. These groups provide potential outreach avenues for education to improve watershed conditions while encouraging recreation valves.

The high pressures of recreation on these areas also contribute to some of the priorities of this action plan.

Recreational Pressure from OHV's

Using the model developed by IDL for the Idaho Forestry Action Plan, incorporating Census data for population density, number of OHV registrations by county, TIGER 2000-based streets, and preferred travel distances, recreation pressure for OHVs can be predicted. OHV pressure is important due to its impact, especially unauthorized use, as a potential sediment source, invasive weed spread, and damage to natural resources including stream banks. This is identified as one of the US Forest Services "Four threats "and is also considered a critical issue on state, industrial and private lands. Managing the areas where impact or potential impact is the greatest, creating and maintain designated OHV use areas and providing education to OHV users will help alleviate this threat.

This water shed due largely to its proximity to Couer d'Alene/Spokane urban areas, rates in the high threat category for OHV use pressure.

H. Roads and Culverts

Roads and skid trails, especially those that are poorly drained or have crossings on streams which are not functioning properly, may be common sediment sources into streams and surface water. An inventory of roads by surface type was done using a variety of remote sensing images, including the LiDAR data, and a summary map is on the next page.

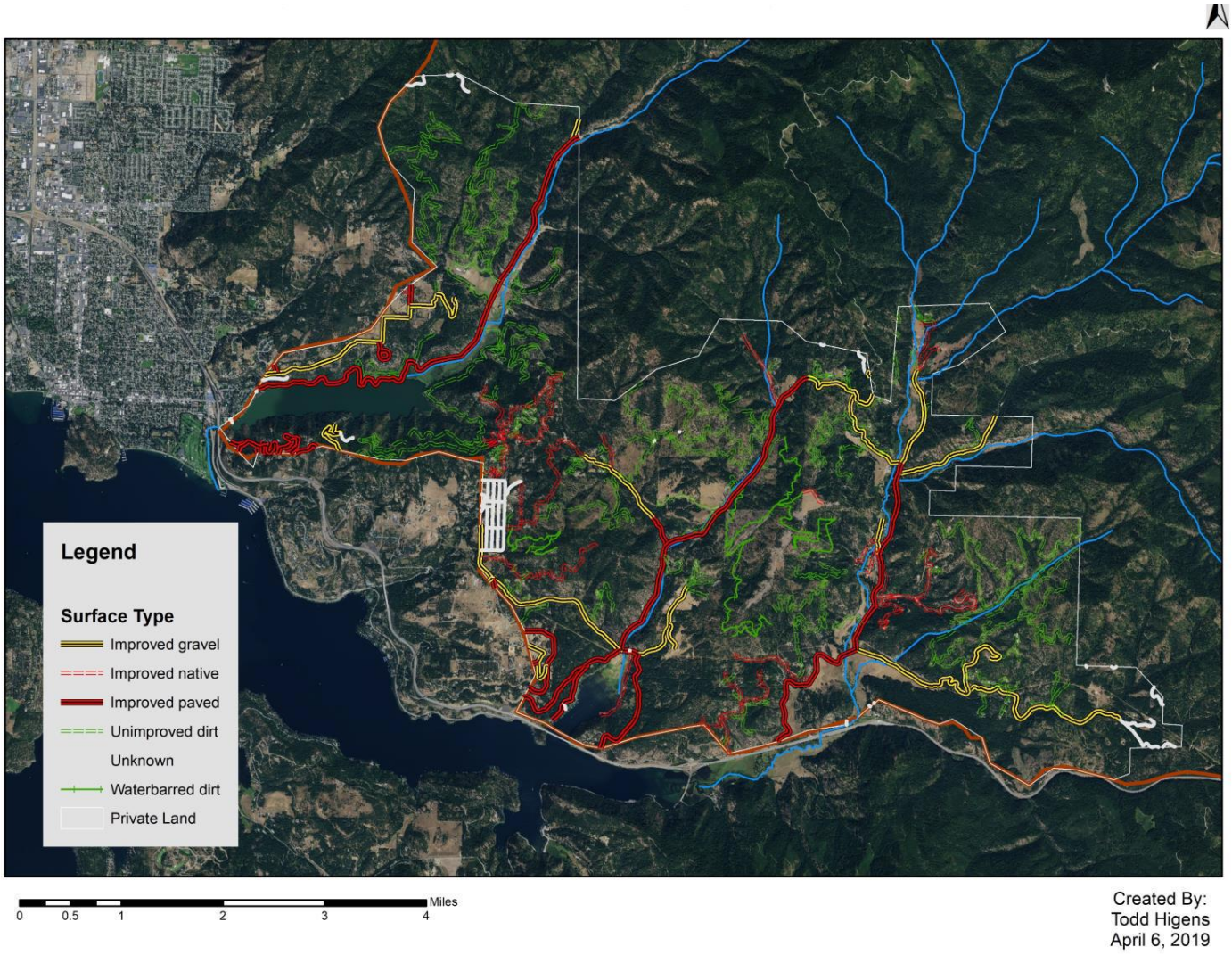
Generally, paved surface roads in this watershed are well drained and not a significant source of sediment into streams. There was concern a few years ago regarding potential nutrient loads into local surface water from winter time de-icing on the freeway (I90 runs through this watershed). However, a monitoring study in the ditches and nearby streams by IDEQ did not detect substantially increased levels of nutrients or other pollutants from wintertime de-icing of the freeway.

There were no mass failures on or from roads detected from a cursory overview of the LiDAR. There are about 105 miles of dirt and native surface roads on private lands within this watershed. Some of these are in draw bottoms, sometimes very close to streams. Relocating or at least improving these draw bottom roads is one of the best ways to reduce sediment going into streams, although it is usually not very cheap. One successful road project on private land has been

completed in the Fernan Creek drainage, using NRCS RCPP funds, to raise and spot rock a section of road that is very close to a stream, with substantially reduced sediment into that stream. In addition, the landowner is so pleased with the road project he plans to continue to rock the road to further reduce sediment and improve access. Further opportunities to work with willing landowners to improve roads to reduce sediment loads will be actively sought out, using available RCPP, EQIP and other potential (Restoration Partnership, DEQ 319) funding.

Another opportunity to reduce sediment loads from roads is to control public access, especially seasonally, using road control devices such as well-designed gates and barriers. These should be considered at key control points for both vehicles and OHVs.

Roads on Private Land: Paved- 27.9 miles Dirt- 86.2 miles Unknown- 7.0 miles
Gravel- 17.4 miles Native- 19.3 miles



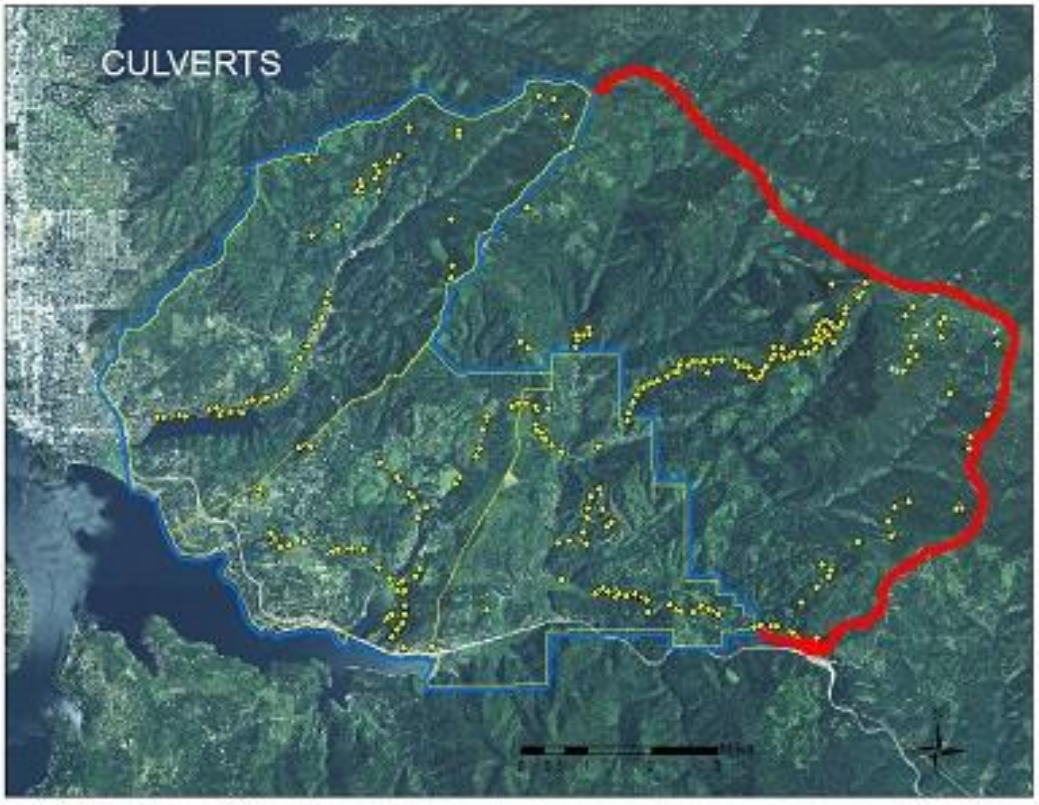
Culvert Survey

Stream crossings on roads are another potential significant source of sediment. It was determined that an on-the-ground survey was needed; since culvert, bridge and other stream crossing conditions are not very obtainable from remote sensing. KSSWCD and Soil & Water Conservation Commission staff drove the myriad county roads, as well as several private roads, within the study area to inspect and inventory culverts as they currently exist. These culverts were not inventoried by East Side Highway District (ESHD), although ESHD was well-aware of the locations just from practical experience. KSSWCD provided ESHD with the inventory for their use. We were precluded from inspecting the culverts on USFS property due to the conflict of using federal funds to inspect or work on federal property.

USFS provided KSSWCD with layers of their roads and culverts, which we included in the spreadsheet. However, the USFS data did not include most of the parameters which were used in the physical inspections. It did, however, include size and location, which is useful.

The abridged spreadsheet is attached as Appendix 1. The complete worksheet can be obtained from Kootenai-Shoshone SWCD at the office or by email at ksswcd@yahoo.com.

CULVERTS



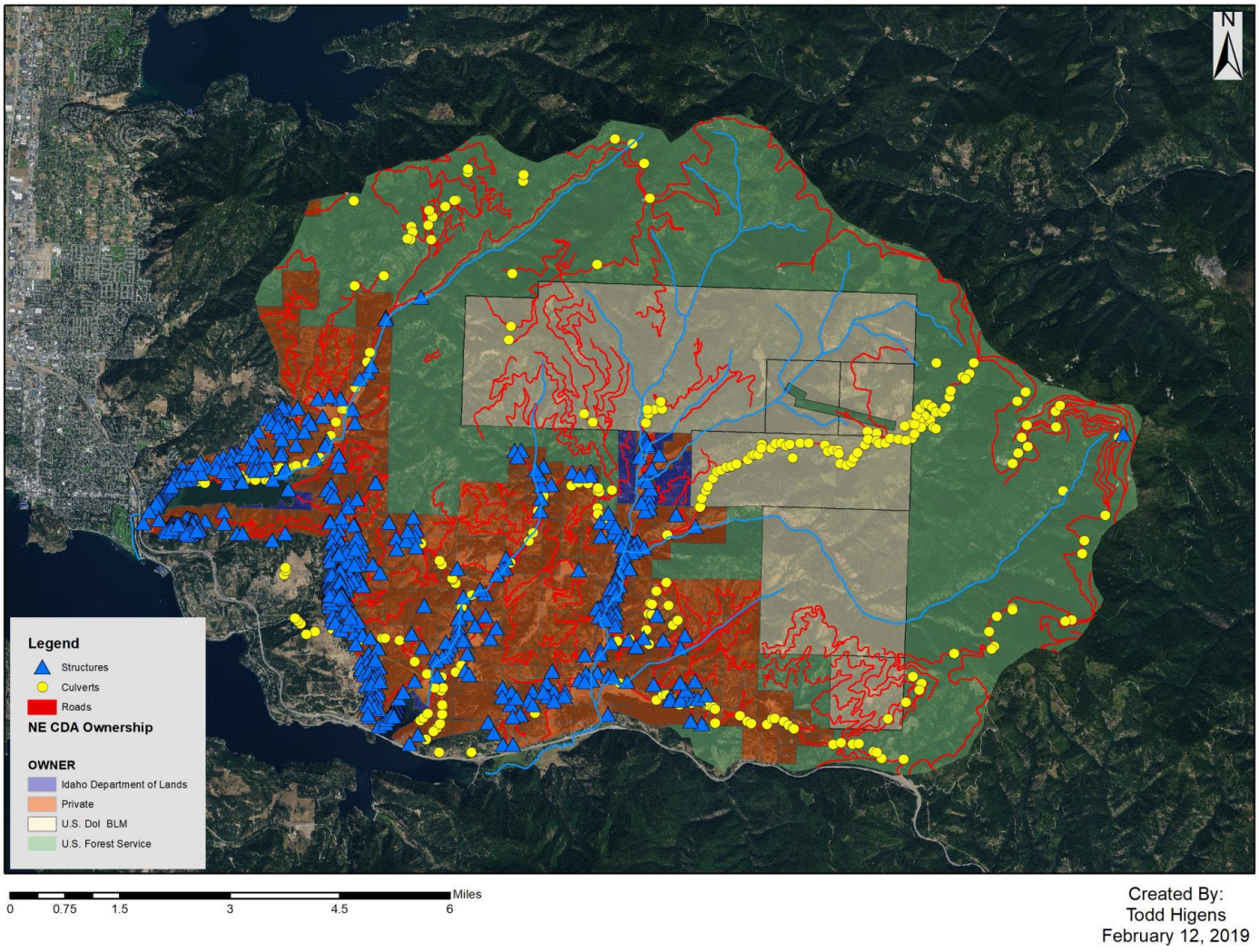
Of the 298 culverts inventoried, these general conclusions were reached:

- 14 definitely need replacement (4.7%)
- 25 recommended for consideration for replacement (8.4%)
- 146 need maintenance or replacement (48.9%)

- 36 need erosion protection above or below the culvert (12.1%)
- 17 present a safety hazard (5.7%)
- 93 are blocked or plugged (31.2%)
- 127 need cleaning (42.6%)
- 122 had no data in the "needs maintenance" column (40.9%). Many of these were included in data received from USFS, and that was not data they collected. Of the private culverts inspected, some of the culverts were inaccessible, including 2 culverts that had an aggressive dog nearby, which the inspectors were unwilling to confront. 17 of these USFS culverts were last inspected in 1999 and 4 others last inspected in 2004.
- 11 were identified as not needing any maintenance (3.7%)

An abridged summary worksheet is attached as Appendix 1. The entire electronic worksheet can be obtained directly from the Conservation District as an Excel file. A copy of the worksheet and the layer were sent to East Side Highway District and to USFS.

ROADS, STRUCTURES, CULVERTS & OWNERSHIP



III. Watershed Action Plan

ACTION PLAN

TIME SPAN FOR PLAN: 10 YEARS

RECOMMENDATIONS:

WHAT PRIORITY WHO WHENPotential Funding

1. STREAMS
   a. Continue DEQ-led TMDL process for each of Wolf Lodge, Fernan and initiate on Blue Creek.
   b. Continue and increase monitoring for water quality on each stream. DEQ/UI Master Water Stewards/Schools
   c. Implement findings/recommendations of Wolf Lodge Creek Assessment by River Design Group, led by DEQ, use 319 and Restoration Partnership grants, seek additional funding
   d. Identify opportunities on private land in Wolf Lodge, Blue and Fernan for stream stabilization, riparian enhancement, implement projects SWCD, NRCS, use EQIP, RCPP, 319,
   e. Work with BLM and East Side Highway District to re-align Blue Creek back to its channel just above its crossing Yellowstone Road.
   f. Wetlands: Treat as in c and d above 319/Restoration Partnership

2. ROADS AND CULVERTS
   a. Using the culvert inventory, work with East Side Highway District, Fernan Ranger District, and Bureau of Land Management to address in priority order. Seek funding: agency budgets, RCPP EQIP,

Priority	Need	Number	
Highest	Safety hazard	17	
	Definite replace	14	
	Blocked or plugged	93	
	Maintain or replace	146	
	Clean	127	
	Erosion protection	36	
Lower	Consider replace	25	

   b. Identify opportunities to improve roads, especially draw bottom and roads very close to streams. Use LiDAR ground layer with stream and road layer, work with willing landowners. SWCD, NRCS, IDL, East Side Highway District
   c. Identify culverts and other structures which block fish passage, work to address, prioritize by position on drainage and potential fish species. IDF&G, IDL, SWCD, NRCS, Eastside Highway
   d. Identify strategic road and skid trail closures for access control with private landowners to prevent erosion issues, for both OHVs and vehicles. Prioritize and provide incentives for gates and other control structures. IDL, NRCS, landowners

3. INVASIVE WEEDS

a. Continue to monitor and work with Kootenai County weed control, encourage landowners to control invasive weeds. Provide cost-share on priority basis. SWCD, NRCS
b. Continue education programs with Kootenai County weed control, provide handouts and brochures for recognition and control. Consider field day workshops. SWCD, NRCS, Kootenai county Weed control

4. FOREST LANDOWNER STEWARDSHIP/MANAGEMENT and RANGE/AG PLANS
   a. Work with willing forest landowners to develop individual forest management/stewardship plans for their properties; use to identify specific forest and watershed improvement projects, cost-share NRCS/IDL/Landowners/Consultants; EQIP and other
   b. Range/agricultural pasture plans: same as above

5. CONSERVATION EASEMENTS
   a. Provide outreach information to interested landowners on Conservation Easements, to help conserve working landscapes and help offset rates of development. Assist in finding funding, and assist in process. Current interest from at least three landowners. NRCS, IDL, SWCD, Inland Northwest Land Trust. Healthy Forest Reserve, Forest Legacy, Restoration Partnership?

6. COMMUNITY FIRESMART/DEFENSIBLE SPACE/FUELBREAKS
   a. Continue to work with Kootenai County of Emergency Services and the Community Wildfire Protection Plan to identify, apply for funding, and implement community/individual defensible space and fuelbreaks. Coordinate with USFS and BLM.

Priority	Community	Approx Homes	Proximity to USFS	Demo Fuelbreak
Very high	Upper Fernan	440	Quite close	Yes
	Forest Lake	375	Not so close	
	Bonanza	225	Closer	
	Syringa Heights	225	Not so close	
	Sky Harbor	200	Closer	
	Gateway Ranch	35	Not so close	
	Toboggan Road	35	Closer	Yes

7. LANDSCAPE AND FUEL BREAKS/ FOREST THINNING
   a. Continue to work with local USFS and BLM staff to identify strategic landscape fuelbreaks, where fuels are treated on both sides of the property lines to provide effective fuelbreaks. Several of our demo fuelbreaks are along USFS property lines, high priority would be to extend along willing landowners'. The USFS may be able to roll some of the work on their side into the current Honey Badger project in the Blue Ck and Fernan Ck basins. The USFS did extensive work in their Blue Alder project,;Kootenai County did some fuelbreak work on private land; another high priority would be to work with additional landowners in that area. Estimate Approx. **12.5 miles of Fuelbreaks** on Private lands NRCS/IDL/Kootenai County/landowners/consultants. EQIP, RCPP, Joint Chiefs

8. FOREST STAND IMPROVEMENT
    a. Address current and potential forest health concerns with active management to bring forest stands and fuel loads back into the range of natural variability and desired future conditions: appropriate species mixes and tree spacing for the site.
    b. Salvage harvest and commercial thin where viable, designed to move to future desired conditions for the site. Identify in Stewardship Plans.
    c. Convert species mix in root rot pockets to more seral species, patch cut and plant.
    d. Pre-commercial thin and treat slash, again for desired future condition of species and spacing appropriate for the site. Provide bark beetle resistance with site-specific spacing, greater growth and vigor.
    e. Address wildlife habitat when designing projects, retain snags and shrubs where appropriate.

Potential Thinning Acres Summarized by Watershed

Watershed	**Low priority**	**Moderate**	**High**	**Very High**
Fernan Creek	311 acres	406	1,755	2,734
Blue Creek	318	1,172	3,836	2,610
Wolf Lodge Creek	399	1,287	4,470	1,813
TOTALS	1,028	**2,865**	**10,061**	**7,157**

Recommend: Target High and Very High acres for thinning: approx. 17,000 acres

Potential Root Rot Risk Acres Summarized by Watershed

Watershed	**Low Risk**	**Mod Low**	**Moderate**	**Mod High**	**High**
Fernan Creek	117	161	204	381	1,237
Blue Creek	42	131	259	1,835	1,297
Wolf Lodge Ck	172	242	724	769	1,716
TOTALS	**331**	**534**	**1,187**	**2,985**	**4,250**

Recommend: Target Moderate, Mod High and High root rot risk acres for species conversion treatment: approx. 8,422 acres

9. OUTREACH AND EDUCATION/SOCIAL
    a. Continue working with UI Extension Forestry and Water to provide workshops and education opportunities to landowners, public, and schools.
    b. Continue to build monitoring program with IdaH2O, Friends of Fernan Lake, and DEQ.
    c. Continue to work with Friends of Fernan Lake, KEA, Coeur d'Alene Tribe

IV. Addendum for Landscape Forest Stewardship Plan

NE LAKE CDA (FERNAN, BLUE, WOLF LODGE CREEKS)

ADDENDUM 6/5/2019

The following addendum has been developed to address the sections required to bring this Landscape Forest Stewardship Plan up to 2017 LSF Program standards.

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This is a Landscape Scale Community Forest Stewardship Plan, as described in the "**Focus"** section on page 3**.**

Rules and policies governing the Protection of Personally Identifiable Information, under Federal information-protection laws including the Privacy Act and Section 1619 of the Food, Conservation and Energy Act of 2008 (2008 Farm Bill and reauthorizations) preclude identifying individual landowners or otherwise releasing Personally Identifiable Information for individual landowners. This Landscape Forest Stewardship Plan is an aggregation of land and landowner information, and the identity of individual landowners should not be identifiable without their written consent.

All recommended actions within this Landscape Forest Stewardship are totally voluntary on the part of landowners and cooperators.

Special Sites (archeological, cultural and historic sites)

Almost all landowners have sites on their property which are special to them, for a wide variety of reasons from scenic to historical to sentimental to "character" trees and pet burial grounds. Each of these sites will be protected or enhanced by individual landowners under their individual objectives, as identified in individual Forest Stewardship Plans.

"Significant" archeological, cultural and historic sites have specific definitions and protections under Federal and State law. Their specific locations and descriptions are confidential and kept at the State Historic Information Protection Office. When federal funds such as EQIP are used for on-the-ground projects, qualified archeologists review individual project maps to determine whether significant archeological, cultural, and historic sites may be present within the proposed project. If one of these sites is identified or discovered, it is protected under State and Federal Law. If mitigation is needed to continue the project, it is worked through between the funding agency and landowner. For example, a project boundary may be moved enough to preserve a historically significant site.

Within this watershed, there is quite a bit of history and cultural use, although much of it must be inferred due to lack of documentation. Indigenous peoples were known to use this area for sustenance and living, especially along the more gentle valley bottoms where food and water was readily available. Early European-descent explorers travelled through, then fur trappers and miners explored the watershed for potential commercial opportunities. There is not much remaining evidence of mining, it was much more prevalent East of this watershed, in the Silver Valley and up towards Mullan. Eventually, farmers and ranchers settled in the gentle valley bottoms. Timber harvest began in the late 1880s.

Portions of the Mullan Trail, pioneered by John Mullan, run through the southern part of the watershed, around Alder Creek. Some of these are on private property and are known to long time locals. Further to the east, the USFS has a historical interpretative site at the old "Mullan Tree" close to Fourth of July pass.
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Conservation-based Estate/Legacy Planning or Land Transfer

Today, one of the biggest drivers of landscape change are the decisions that landowners make about future use and ownership of their land. To maximize all the tangible and intangible benefits this forest provides and to protect it into the future, it is very important to pair estate planning with forest management because silvicultural recommendations can require multi-year or even multi-decade timeframes to accomplish.

Landowners on this landscape are encouraged to attend a "Ties to the Land" workshop, to help their families plan to ensure the long term sustainability of this landscape. These workshops are offered periodically through University of Idaho Extension, past participants remark on how useful this workshop is, to farm owners as well as forest landowners.

Recommendations (Time frames are ongoing unless indicated otherwise):

1. The following websites offer additional information and resources:
    - Estate Planning Options http://www.na.fs.fed.us/stewardship/estate/estate.shtml
    - Conservation Easements, such as the Natural Resource Conservation Service Healthy Forest Reserve and the Idaho Forest Legacy Program https://www.idl.idaho.gov/forestry/forest-legacy/

Forests of Recognized Importance

Forests of Recognized Importance (FORIs) are recognized at the landscape level, rather than a stand level, for their unique combination of social, cultural, biodiversity and environmental values. A FORI generally has a high concentration of exceptional attributes, such as rare or sensitive forest ecosystems, e.g. riparian areas and wetlands, critical habitats of multiple threatened or endangered species, large-scale archeological sites, or unique geologic features.

In the United States, the concept of FORIs is relatively new, and no single organization or agency is responsible for their designation and conservation.

Currently the only known FORI in Idaho is the Greater Yellowstone Ecosystem, which is over 300 miles away and not influenced by this landscape. This landscape does have unique and valuable resources for the multiple owners.

Agroforestry/Silvopasture

This is the combined production of trees and pasture and/or agriculture. For example, shaded fuelbreaks may be grazed to keep the grasses down and produce livestock or horses. Some private forestlands within the watershed are grazed, mostly by cattle, which is beneficial for keeping the grasses and fuels down, and allows income production. Some fields within this landscape are used for hay, however they are separate from the forest land. Other fields are pastures for horses and livestock, these are also separate from the forested lands for the most part. Individual landowners may choose to develop range, farm and pasture management plans with NRCS, SWCD and qualified Technical Service Providers to optimize production and resource conservation. There are some existing individual plans which do this.

Aesthetic Quality (scenic quality and visually sensitive areas)

Much of this watershed is visible from Interstate 90, along with towns and settlements such as Fernan Village, Bonanza, Armstrong Park, and other neighborhoods. This area is a very scenic part of Idaho, with a diverse mix of topography, tree and plant species, land uses, lakes and streams, and biodiverse

fish and wildlife. There are high ridges and mountains in this watershed which offer great views of the surrounding area, both on public and private land. Lake Coeur d'Alene, Fernan Lake, and Blue Bay are intermixed with a forested landscape, wetlands and riparian areas, all providing very high qualityaesthestics.

The overall strategy of this Landscape Stewardship Plan, to encourage site-specific biodiversity with healthy vigorous forests, combined with healthy stream and riparian conditions, will continue to provide high quality aesthetics and scenery. Short-term disturbances, such as forest harvest, thinnings and fuelbreaks will be needed to offset the potential for larger impacts from uncharacteristic wildfire, insect and disease outbreaks and other disasters.

Biodiversity

Biological diversity or ***biodiversity*** refers to the variety of creatures and plants that inhabit an ecosystem, and the variability of their characteristics. Biodiversity may be measured by many factors, including species, sizes, ages, range of genetic variability, vegetation structure (e.g. layers) and form, soil types, terrain, and wildlife.

Biodiversity can be increased or decreased through various management activities. Maximizing biodiversity appropriate for the site is usually desirable because, in general, the greater the diversity of a forest or ecosystem, the more resilient and healthy it will be (e.g. having multiple tree species in a forest helps reduce the risk of devastating insect and disease outbreaks because most pathogens are specific to some tree species and not others). Forest management strategies resulting in multiple stages or layers of vegetative development (***successional*** or ***seral stages***) help to increase age, structural, and species biodiversity.

Management Goal

To maintain or improve vegetative, structural, genetic, and/or species diversity.

Recommendations (time frame is ongoing unless otherwise specified):

1. The University of Idaho Pitkin Forest Nursery sells conifer and hardwood tree seedlings as well as many native shrubs and forbs. They also offer information and guidance regarding what, where, when, and how to plant. They can be reached at 208-885-3888, seedlings@uidaho.edu, or Pitkin Forest Nursery, College of Natural Resources, 875 Perimeter Dr. MS 1137, Moscow, ID 83844-1137.

2. **Plants of the Wild Nursery** at 123 Stateline Road, Tekoa WA 99033 phone 509-284-2848 and http://www.plantsofthewild.com/ also sells a variety of native and non-native shrubs, groundcovers, wildflowers, and trees. They also offer information and advice.

3. Idaho maintains a current list of "at-risk" species and threatened ecosystems through the **Natural Heritage Program**, which covers five areas: **Zoology**, **Botany**, **Biodiversity**, **Spatial Ecology**, and **Data Management**. For more information, visit:

   https://idfg.idaho.gov/conservation/natural-heritage-program

4. For more information on managing for biological diversity:
   http://www.fs.fed.us/ecosystemservices/biodiversity.shtml
   http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/contact/local/http://www.forestfoundation.org/

Carbon Sequestration

As a tree grows, it takes carbon dioxide (CO_2) out of the air. The tree stores, or sequesters, much of the carbon in its stem, branches, roots, and leaves while releasing both carbon dioxide and oxygen back into the atmosphere. Carbon is sequestered when the tree's intake of carbon exceeds the losses through respiration and other causes. Therefore, forests can effectively utilize CO_2 to store carbon. Forests also store carbon in dead wood, litter on forest floor and organic matter in the soil. This carbon is slowly released back into the atmosphere through decay and decomposition.

In brief, forests sequester carbon in growing trees and release it as they die. Young, vigorous trees with higher rates of respiration store carbon at higher rates than old trees. But older trees serve as carbon "sinks" and store greater quantities than young trees.

Forest management practices influence the rate in which forests either store or release carbon. Tree planting greatly increases carbon sequestration. Timber Stand Improvement (TSI) practices such as pre-commercial thinning initially release carbon as excess trees are cut to reduce overcrowding. However, it tends to have a long-term positive effect as the remaining trees increase in growth and vigor and are able to store additional amounts of carbon.

Hazardous Fuels Treatment practices generally provide a positive effect in sequestering carbon as they reduce the risk of wildfires that can release substantial amounts of CO_2 in a very brief period of time.

Timber harvesting also triggers the release of carbon. On one hand, solid wood products, such as lumber, can store carbon for up to several decades as a piece of furniture or framing in a building. On the other hand, wood used to generate energy - typically electricity or steam – releases CO_2 back into the atmosphere. However, this use of biomass is somewhat carbon-neutral since it displaces carbon that would have likely been released by burning nonrenewable fossil fuels such as oil, natural gas or coal.

Carbon emitters, such as a coal-powered electric generation facility, may choose to purchase carbon credits to offset their CO_2 emissions. Carbon credits are tracked through a market-based, emission registry and trading system such as the Chicago Climate Exchange. Certain forest management practices, especially afforestation (planting previously unforested areas) and reforestation, may qualify the landowner for financial compensation to offset or reduce global CO_2 emissions by planting trees.

Both global and local strategies to capture the carbon sequestration benefits of forests are quickly evolving. Landowners should "stay tuned" for up-to-date recommendations to apply on their forests. The following web sites may have additional information to use:

- http://www.fs.fed.us/ecosystemservices/carbon.shtml
- http://www.forestactionplans.org/about-action-plans/forest-trends/climate-change-carbon-sequestration-and-biomass-energy
- http://www.southernforests.org/services/carbon-sequestration-faqs
- http://www.northeasternforests.org/FRPC/

Fire Hazard

Fire is a significant factor in the ecology of Inland Northwest forests and can pose a threat to private property. The cool, moist climatic conditions normally present in this area reduce the chances of wildfire in all but the driest times of the year. Any outdoor activities during dry periods should involve extreme caution and preventative measures should be practiced at all times.

The lower portions of this landscape are located in the Kootenai County Fire and Rescue District for structural fire control. Initial attack on wildland fires is provided by the Fernan Ranger District of the USDA

Forest Service, with the Idaho Department of Lands providing additional assistance as needed. Response time is estimated at 15-45+ minutes. ***Call 911 to report a wildfire.***

Several fuelbreaks have been completed on this landscape as demonstrations of what shaded fuelbreaks look like and how they function. Shaded fuelbreaks have been completed in each of the three sub-watersheds. NRCS with RCPP funding also has plans for several more fuelbreaks. Kootenai County Office of Emergency Services has implemented several grants in the Firewise program to install fuelbreaks and defensible space around structures on portions of this landscape. Both the Bureau of Land Management and the USDA Forest Service have completed some fuelbreak work on their forestlands in this landscape. By using a combination of commercial timber sales, pre-commercial thinning, prescribed fire and brush reduction tactics these portions of the landscape are at a much reduced risk from high intensity wildfires. There is potential to work with neighboring private landowners and adjoining federal land to continue shaded fuelbreaks across the landscape in strategic locations. Shaded fuelbreaks are a high priority for future work, on both private and federal lands, in priority areas on this landscape to further protect the landscape and provide for safer firefighting if needed.

About the fire safety burn permit - A fire safety burn permit is required under Idaho law for any burning (including crop residue burning and excluding campfires) outside city limits statewide from May 10 to October 20. Slash burning (or any other kind of burning) may be limited based on current fire hazard and restrictions.

The fire safety burn permit system informs fire managers where burning activities are occurring, reducing the number of false runs to fires and saving firefighting resources for instances in which they are truly needed. It also enables fire managers to respond more quickly to fires that escape, potentially reducing the liability of the burner if their fire escapes.

A fire safety burn permit is free and is good for 10 days after it is issued. Fire safety burn permits can be obtained online at http://www.burnpermits.idaho.gov or in person at IDL offices statewide. Permits issued through the self service web site are available seven days a week, issued immediately, and valid immediately.

What is permitted: It is ok to burn any type of natural vegetation such as grass, leaves, needles, woody materials (e.g. logging/thinning slash, shrubs, tree branches), garden and some household waste (paper and cardboard). Most of these materials could also be composted, which doesn't pollute the air with smoke or rapidly release their CO2 content. Do NOT burn (or dump in the woods) petroleum products, plastics, rubber, paint, railroad ties or other treated lumber, vehicles or vehicle parts. Recycle these products, if possible, or dispose of them properly.

Ongoing forest management activities generally reduce the threat of catastrophic fire by increasing the space between trees, reducing ladder fuels, and removing dead and downed trees.

Recommendations (time frame is ongoing unless otherwise specified):

1. Create and maintain defensible space around the home site and any outbuildings.

2. Creating and maintaining a trail system can provide an effective fuel break as well as allowing access for fire-fighting vehicles, should a fire occur. Keep existing trails clear to provide access to the property and potential fire breaks.

3. When planning to burn, determine the current wildfire risk and to obtain a burning permit (free of charge) from the nearest Idaho Dept. of Lands office (Coeur d'Alene) or online at http://burnpermits.idaho.gov/Home.aspx and check with your local fire department for other restrictions that may be in place.

4. Compliance with air quality regulations is also required at the time of burning. Before starting to burn, you can check air quality conditions online (https://deq.idaho.gov) or call the DEQ office in Coeur d'Alene (208-769-1422 or toll free 877-370-0017).

5. Burn slash in the late fall or winter. Slash piles can be covered to keep them dry for burning in wet weather or when snow is on the ground. Slash piles should be located well away from live trees, brush, buildings, power lines, etc.

6. Landowners are responsible and liable for suppression costs of any fire started on their property. Have water or a fire extinguisher and other suppression tools (e.g. shovels, axes) on hand and never leave a fire unattended. Monitor fires until they are completely out.

7. Plan at least one alternative escape route in case the main driveway is blocked by a fire. Post emergency phone numbers and directions to the property next to the home phone. Keep track of nearby wildfires through the USFS Incident Website (www.inciweb.com) and/or register with Nixle (http:\\local.nixle.com \register or Google "NIXLE") to receive local emergency alerts via cell phone, texts, etc.

If a wildfire is imminent, collect the "***6 P's***" to take with you in an emergency evacuation: ***People***, ***Pets***, ***Papers*** (e.g. important documents such as drivers licenses, birth certificates, and passports), ***Pills*** (Prescriptions), ***Pictures***, and ***PCs***. *Time frame:*

V. Appendices

Appendix 1 – Lidar Overview

LIDAR Overview

Light detection and ranging systems (LIDAR) use laser light to measure distances. They are used in many ways, from estimating atmospheric aerosols by shooting a laser skyward to catching speeders in freeway traffic with a handheld laser-speed detector. Airborne laser-scanning technology is a specialized, aircraft-based type of LIDAR that provides extremely accurate, detailed 3-D measurements of the ground, vegetation, and buildings. Developed in just the last 15 years, one of LIDAR's first commercial uses in the United States was to survey power line corridors to identify encroaching vegetation. Additional uses include mapping landforms and coastal areas. In open, flat areas, ground contours can be recorded from an aircraft flying overhead providing accuracy within 6 inches of actual elevation. In steep, forested areas accuracy is typically in the range of 1 to 2 feet and depends on many factors, including density of canopy cover and the spacing of laser shots. The speed and accuracy of LIDAR made it feasible to map large areas with the kind of detail that before had only been possible with time-consuming and expensive ground survey crews.

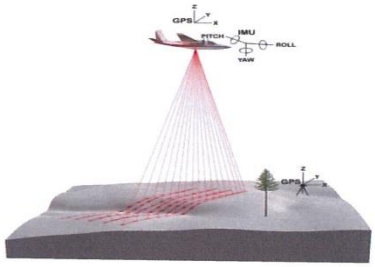

Figure 1. Schematic of an airborne laser scanning system.

Federal agencies such as the Federal Emergency Management Administration (FEMA) and U.S. Geological Survey (USGS), along with county and state agencies, began using LIDAR to map the terrain in flood plains and earthquake hazard zones. The Puget Sound LIDAR Consortium, an informal group of agencies, used LIDAR in the Puget Sound area and found previously undetected earthquake faults and large, deep-seated, old landslides. In other parts of the country, LIDAR was used to map highly detailed contours across large flood plains, which could be used to pinpoint areas of high risk. In some areas, entire states have been flown with LIDAR to produce more accurate digital terrain data for emergency planning and response. LIDAR mapping of terrain uses a technique called "bare-earth filtering." Laser scan data about trees and buildings are stripped away, leaving just the bare-ground data. Fortunately for foresters and other natural resource specialists, the data being "thrown away" by geologists provide detailed information describing vegetation conditions and structure.

b. Appendix 2 Soil Map Site Index Description

Forest Productivity (Tree Site Index): Douglas-fir (Cochran 1979a (031))—Idaho Panhandle National Forest, Idaho-Washington-Montana, and Kootenai County Area, Idaho

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
472	Hugus-Honeyjones-Goshawk families, complex, weathered belts, lower sideslopes toeslopes and stream bottoms of drainages in uplands, south aspects		514.4	2.4%
473	Hugus-Goshawk-Minaloosa families, complex, weakly to moderately weathered belt geology, dissected rolling uplands, south aspects		921.3	4.3%
477	Honeyjones family, weakly weathered metasedimentary belt geology, stream breaklands, north aspects		149.4	0.7%
478	Typic Vitrixerands family-Rock outcrop-Lotuspoint family, complex, weakly weathered metasedimentary belt geology, stream breaklands, south aspects, dry		111.7	0.5%
480	Bouldercreek-Humic Udivitrands families, complex, weakly weathered metasedimentary belt geology, dissected stream breaklands, north aspects		196.7	0.9%
483	Typic Vitrixerands-Ahrs families, complex, weakly weathered metasedimentary belt geology, stream breaklands, south aspects		80.9	0.4%
488	Timberbutte family-Rock outcrop complex, weakly weathered metasedimentary belt geology, dissected stream breaklands, south aspects, dry		92.8	0.4%

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
462	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain slopes, north aspects		523.8	2.4%
463	Hugus-Bouldercreek-Humic Udivitrands families, complex, moderately weathered belts, lower sideslopes toeslopes and stream bottoms of incised drainages, north aspects		95.1	0.4%
464	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain slopes, south aspects		34.1	0.2%
466	Bouldercreek family, weakly weathered metasedimentary belt geology, mountain slopes, north aspects		57.6	0.3%
467	Bouldercreek-Humic Udivitrands families, complex, weakly weathered belt geology, lower sideslopes toeslopes and stream bottoms of incised drainages along slopes, north aspects		27.3	0.1%
470	Bouldercreek-Ahrs families, complex, weakly weathered metasedimentary belt geology, mountain slopes, south aspects		22.1	0.1%
471	Ahrs family-Rock outcrop-Typic Vitrixerands family, complex, weakly weathered metasedimentary belt geology, mountain slopes, south aspects, dry		315.7	1.5%

Map unit symbol	Map unit name	Rating (feet)	Acres in AOI	Percent of AOI
135	Lacy gravelly loam, very stony-Rock outcrop complex, 5 to 35 percent slopes		62.0	0.3%
136	Lacy-Bobbitt association, 5 to 35 percent slopes, very stony		256.6	1.2%
137	Lacy-Bobbitt association, 35 to 65 percent slopes, very stony		746.3	3.5%
146	McCrosket-Ardenvoir association, 20 to 35 percent slopes	87	1,567.9	7.3%
147	McCrosket-Ardenvoir association, 35 to 65 percent slopes	87	2,498.9	11.7%
148	McCrosket-Tekoa association, 12 to 60 percent slopes	87	2,416.8	11.3%
149	McGuire-Marble association, 0 to 7 percent slopes		186.3	0.9%
151	Mokins silt loam, 5 to 20 percent slopes		201.4	0.9%
152	Mokins silt loam, 20 to 35 percent slopes		49.9	0.2%
154	Mokins-Chatcolet complex, 5 to 20 percent slopes		1,061.4	5.0%
157	Porrett silt loam		23.4	0.1%
159	Pywell muck, 0 to 2 percent slopes, frequently flooded		73.5	0.3%
160	Ramsdell silt loam		316.8	1.5%
165	Santa ashy silt loam, 2 to 8 percent slopes		192.0	0.9%
166	Santa ashy silt loam, 8 to 15 percent slopes		288.1	1.3%
167	Santa ashy silt loam, 15 to 35 percent slopes		16.3	0.1%
186	Taney silt loam, 3 to 7 percent slopes	100	19.3	0.1%
189	Tekoa gravelly silt loam, 5 to 20 percent slopes		25.3	0.1%
205	Water		630.4	2.9%
Subtotals for Soil Survey Area			**15,693.9**	**73.3%**
Totals for Area of Interest			**21,399.9**	**100.0%**

Description

The "site index" is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Rating Options

Units of Measure: feet

Tree: Douglas-fir

Site Index Base: Cochran 1979a (031)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

c. Appendix 3 Soil Map Forest Productivity Description

Forest Productivity (Cubic Feet per Acre per Year): Douglas-fir (Cochran 1979a (031))

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2nm0	Aquic Xerofluvents, nearly level		113.8	0.5%
2nm4	Blinn loam, 5 to 35 percent slopes, very stony		229.8	1.1%
2nmd	Chatcolet cobbly loam, 25 to 65 percent slopes		32.0	0.1%
2nms	Huckle-Ardenvoir association, 35 to 75 percent slopes		141.7	0.7%
2nng	McCrosket-Ardenvoir association, 20 to 35 percent slopes		231.5	1.1%
2nnq	Mokins-Chatcolet complex, 5 to 20 percent slopes		70.8	0.3%
2nnx	Ramsdell silt loam		64.9	0.3%
2v72b	McCrosket-Tekoa association, 12 to 60 percent slopes	121.00	655.9	3.1%
2v72k	Huckle ashy silt loam, 35 to 75 percent slopes		10.0	0.0%
2v729	McCrosket-Ardenvoir association, 35 to 65 percent slopes	121.00	355.2	1.7%
130	Typic Udivitrands-Typic Humaquepts-Pokey families, complex, broad stream bottoms		279.4	1.3%
448	Hubub-Honeyjones families, complex, moderately weathered belt rock, dissected lower mountain slopes toeslopes and stream bottoms, north aspects		114.7	0.5%
449	Hugus-Honeyjones families, complex, weak to moderately weathered belt rock, dissected mountain slopes, north aspects		126.2	0.6%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
462	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain slopes, north aspects		523.8	2.4%
463	Hugus-Bouldercreek-Humic Udivitrands families, complex, moderately weathered belts, lower sideslopes toeslopes and stream bottoms of incised drainages, north aspects		95.1	0.4%
464	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain slopes, south aspects		34.1	0.2%
466	Bouldercreek family, weakly weathered metasedimentary belt geology, mountain slopes, north aspects		57.6	0.3%
467	Bouldercreek-Humic Udivitrands families, complex, weakly weathered belt geology, lower sideslopes toeslopes and stream bottoms of incised drainages along slopes, north aspects		27.3	0.1%
470	Bouldercreek-Ahrs families, complex, weakly weathered metasedimentary belt geology, mountain slopes, south aspects		22.1	0.1%
471	Ahrs family-Rock outcrop-Typic Vitrixerands family, complex, weakly weathered metasedimentary belt geology, mountain slopes, south aspects, dry		315.7	1.5%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
472	Hugus-Honeyjones-Goshawk families, complex, weathered belts, lower sideslopes toeslopes and stream bottoms of drainages in uplands, south aspects		514.4	2.4%
473	Hugus-Goshawk-Minaloosa families, complex, weakly to moderately weathered belt geology, dissected rolling uplands, south aspects		921.3	4.3%
477	Honeyjones family, weakly weathered metasedimentary belt geology, stream breaklands, north aspects		149.4	0.7%
478	Typic Vitrixerands family-Rock outcrop-Lotuspoint family, complex, weakly weathered metasedimentary belt geology, stream breaklands, south aspects, dry		111.7	0.5%
480	Bouldercreek-Humic Udivitrands families, complex, weakly weathered metasedimentary belt geology, dissected stream breaklands, north aspects		196.7	0.9%
483	Typic Vitrixerands-Ahrs families, complex, weakly weathered metasedimentary belt geology, stream breaklands, south aspects		80.9	0.4%
488	Timberbutte family-Rock outcrop complex, weakly weathered metasedimentary belt geology, dissected stream breaklands, south aspects, dry		92.8	0.4%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
490	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain ridges and upper slopes, north aspects		120.6	0.6%
491	Bouldercreek family, weakly weathered metasedimentary belt geology, mountain ridges and upper slopes, north aspects		16.7	0.1%
Subtotals for Soil Survey Area			**5,706.0**	**26.7%**
Totals for Area of Interest			**21,399.9**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2fgbc	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain ridges and upper slopes, north aspects		20.6	0.1%
2v72k	Huckle ashy silt loam, 35 to 75 percent slopes		246.4	1.2%
101	Aquic Xerofluvents, nearly level		146.0	0.7%
105	Blinn loam, 5 to 35 percent slopes, very stony		639.7	3.0%
106	Blinn loam, 35 to 65 percent slopes, very stony		666.4	3.1%
110	Cald silt loam		314.5	1.5%
112	Chatcolet cobbly loam, 7 to 25 percent slopes		119.3	0.6%
113	Chatcolet cobbly loam, 25 to 65 percent slopes		1,004.8	4.7%
115	Cougarbay silt loam		259.4	1.2%
124	Huckle-Ardenvoir association, 5 to 35 percent slopes		282.9	1.3%
125	Huckle-Ardenvoir association, 35 to 75 percent slopes		1,245.7	5.8%
132	Kruse silt loam, 5 to 20 percent slopes	157.00	115.5	0.5%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
135	Lacy gravelly loam, very stony-Rock outcrop complex, 5 to 35 percent slopes		62.0	0.3%
136	Lacy-Bobbitt association, 5 to 35 percent slopes, very stony		256.6	1.2%
137	Lacy-Bobbitt association, 35 to 65 percent slopes, very stony		746.3	3.5%
146	McCrosket-Ardenvoir association, 20 to 35 percent slopes		1,567.9	7.3%
147	McCrosket-Ardenvoir association, 35 to 65 percent slopes	121.00	2,498.9	11.7%
148	McCrosket-Tekoa association, 12 to 60 percent slopes	121.00	2,416.8	11.3%
149	McGuire-Marble association, 0 to 7 percent slopes		186.3	0.9%
151	Mokins silt loam, 5 to 20 percent slopes		201.4	0.9%
152	Mokins silt loam, 20 to 35 percent slopes		49.9	0.2%
154	Mokins-Chatcolet complex, 5 to 20 percent slopes		1,061.4	5.0%
157	Porrett silt loam		23.4	0.1%
159	Pywell muck, 0 to 2 percent slopes, frequently flooded		73.5	0.3%
160	Ramsdell silt loam		316.8	1.5%
165	Santa ashy silt loam, 2 to 8 percent slopes		192.0	0.9%
166	Santa ashy silt loam, 8 to 15 percent slopes		288.1	1.3%
167	Santa ashy silt loam, 15 to 35 percent slopes		16.3	0.1%
186	Taney silt loam, 3 to 7 percent slopes	100.00	19.3	0.1%
189	Tekoa gravelly silt loam, 5 to 20 percent slopes		25.3	0.1%
205	Water		630.4	2.9%
Subtotals for Soil Survey Area			**15,693.9**	**73.3%**
Totals for Area of Interest			**21,399.9**	**100.0%**

Description

Forest productivity is the volume of wood fiber that is the yield likely to be produced by the most important tree species. This number, expressed as cubic feet per acre per year and calculated at the age of culmination of the mean annual increment (CMAI), indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this attribute, only the representative value is used.

Rating Options

Tree: Douglas-fir

Site Index Base: Cochran 1979a (031)

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: No

d. Appendix 4 Soil Map Fire Damage Descriptions

Fire Damage Susceptibility

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
2nm0	Aquic Xerofluvents, nearly level	Slightly susceptible	Aquic Xerofluvents (75%)		113.8	0.5%
2nm4	Blinn loam, 5 to 35 percent slopes, very stony	Moderately susceptible	Blinn, very stony surface (85%)	Content of sand (0.91)	229.8	1.1%
				Water erosion (0.78)		
2nmd	Chatcolet cobbly loam, 25 to 65 percent slopes	Highly susceptible	Chatcolet (85%)	Water erosion (1.00)	32.0	0.1%
				Content of rock fragments (0.32)		
2nms	Huckle-Ardenvoir association, 35 to 75 percent slopes	Highly susceptible	Huckle (60%)	Water erosion (1.00)	141.7	0.7%
				Wind erosion (1.00)		
				Content of sand (0.91)		
			Ardenvoir (35%)	Water erosion (1.00)		
				Content of sand (0.91)		
2nng	McCrosket-Ardenvoir association, 20 to 35 percent slopes	Highly susceptible	McCrosket (55%)	Water erosion (1.00)	231.5	1.1%
				Content of sand (0.91)		
			Ardenvoir (35%)	Water erosion (1.00)		
				Content of sand (0.91)		
2nnq	Mokins-Chatcolet complex, 5 to 20 percent slopes	Moderately susceptible	Mokins (55%)	Content of sand (0.91)	70.8	0.3%
				Water erosion (0.08)		
			Chatcolet (35%)	Content of rock fragments (0.32)		
2nnx	Ramsdell silt loam	Moderately susceptible	Ramsdell (90%)	Wind erosion (0.99)	64.9	0.3%
2v72b	McCrosket-Tekoa association,	Highly susceptible	McCrosket (59%)	Water erosion (1.00)	655.9	3.1%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
	moderately weathered belt rock, dissected lower mountain slopes toeslopes and stream bottoms, north aspects			Wind erosion (1.00)		
				Content of sand (0.91)		
			Honeyjones (25%)	Water erosion (1.00)		
				Wind erosion (1.00)		
				Content of sand (0.91)		
449	Hugus-Honeyjones families, complex, weak to moderately weathered belt rock, dissected mountain slopes, north aspects	Highly susceptible	Hugus (55%)	Water erosion (1.00)	126.2	0.6%
				Wind erosion (1.00)		
				Content of sand (0.91)		
			Honeyjones (35%)	Water erosion (1.00)		
				Wind erosion (1.00)		
				Content of sand (0.91)		
462	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain slopes, north aspects	Highly susceptible	Hugus (50%)	Water erosion (1.00)	523.8	2.4%
				Wind erosion (1.00)		
				Content of sand (0.91)		
			Honeyjones (35%)	Water erosion (1.00)		
				Wind erosion (1.00)		
				Content of sand (0.91)		
463	Hugus-Bouldercreek-Humic Udivitrands families, complex, moderately weathered belts, lower sideslopes toeslopes and stream bottoms of incised drainages, north aspects	Highly susceptible	Hugus (50%)	Water erosion (1.00)	95.1	0.4%
				Wind erosion (1.00)		
				Content of sand (0.91)		
			Bouldercreek (25%)	Water erosion (1.00)		
				Wind erosion (0.99)		
				Content of sand (0.91)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Humic Udivitrands, loamy subsoil (15%)	Water erosion (1.00)		
				Wind erosion (1.00)		
				Content of sand (0.91)		
464	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain slopes, south aspects	Highly susceptible	Hugus (60%)	Water erosion (1.00)	34.1	0.2%
				Wind erosion (0.99)		
				Content of sand (0.91)		
			Honeyjones (25%)	Water erosion (1.00)		
				Wind erosion (0.99)		
				Content of sand (0.91)		
466	Bouldercreek family, weakly weathered metasedimentary belt geology, mountain slopes, north aspects	Highly susceptible	Bouldercreek (85%)	Water erosion (1.00)	57.6	0.3%
				Wind erosion (0.99)		
				Content of sand (0.91)		
467	Bouldercreek-Humic Udivitrands families, complex, weakly weathered belt geology, lower sideslopes toeslopes and stream bottoms of incised drainages along slopes, north aspects	Highly susceptible	Bouldercreek (50%)	Water erosion (1.00)	27.3	0.1%
				Wind erosion (1.00)		
				Content of sand (0.91)		
			Humic Udivitrands (40%)	Water erosion (1.00)		
				Content of sand (0.91)		
470	Bouldercreek-Ahrs families, complex, weakly weathered metasedimentary belt geology, mountain slopes, south aspects	Highly susceptible	Bouldercreek (70%)	Water erosion (1.00)	22.1	0.1%
				Wind erosion (0.99)		
				Content of sand (0.91)		
			Ahrs (15%)	Water erosion (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Content of sand (0.91)		
471	Ahrs family-Rock outcrop-Typic Vitrixerands family, complex, weakly weathered metasediment ary belt geology, mountain slopes, south aspects, dry	Highly susceptible	Ahrs (45%)	Water erosion (1.00)	315.7	1.5%
				Wind erosion (0.99)		
				Content of sand (0.91)		
			Typic Vitrixerands (20%)	Water erosion (1.00)		
				Wind erosion (0.99)		
				Content of sand (0.91)		
472	Hugus-Honeyjones-Goshawk families, complex, weathered belts, lower sideslopes toeslopes and stream bottoms of drainages in uplands, south aspects	Highly susceptible	Hugus (40%)	Water erosion (1.00)	514.4	2.4%
				Wind erosion (0.99)		
				Content of sand (0.91)		
			Honeyjones (30%)	Water erosion (1.00)		
				Wind erosion (0.99)		
				Content of sand (0.91)		
			Goshawk (20%)	Water erosion (1.00)		
				Wind erosion (0.99)		
				Content of sand (0.91)		
473	Hugus-Goshawk-Minaloosa families, complex, weakly to moderately weathered belt geology, dissected rolling uplands, south aspects	Highly susceptible	Goshawk (35%)	Water erosion (1.00)	921.3	4.3%
				Wind erosion (0.99)		
				Content of sand (0.91)		
			Hugus (35%)	Water erosion (1.00)		
				Wind erosion (0.99)		
				Content of sand (0.91)		
			Minaloosa (15%)	Water erosion (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Content of sand (0.91)		
477	Honeyjones family, weakly weathered metasediment ary belt geology, stream breaklands, north aspects	Highly susceptible	Honeyjones (80%)	Water erosion (1.00)	149.4	0.7%
				Wind erosion (0.99)		
				Content of sand (0.91)		
478	Typic Vitrixerands family-Rock outcrop-Lotuspoint family, complex, weakly weathered metasediment ary belt geology, stream breaklands, south aspects, dry	Highly susceptible	Typic Vitrixerands (50%)	Water erosion (1.00)	111.7	0.5%
				Wind erosion (0.99)		
				Content of sand (0.91)		
			Lotuspoint (15%)	Water erosion (1.00)		
				Content of sand (0.91)		
480	Bouldercreek-Humic Udivitrands families, complex, weakly weathered metasediment ary belt geology, dissected stream breaklands, north aspects	Highly susceptible	Bouldercreek (70%)	Water erosion (1.00)	196.7	0.9%
				Wind erosion (0.99)		
				Content of sand (0.91)		
			Humic Udivitrands (15%)	Water erosion (1.00)		
				Content of sand (0.91)		
483	Typic Vitrixerands-Ahrs families, complex, weakly weathered metasediment ary belt geology, stream breaklands, south aspects	Highly susceptible	Typic Vitrixerands (65%)	Water erosion (1.00)	80.9	0.4%
				Wind erosion (0.99)		
				Content of rock fragments (0.80)		
			Ahrs (25%)	Water erosion (1.00)		
				Wind erosion (0.99)		
				Content of sand (0.91)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
488	Timberbutte family-Rock outcrop complex, weakly weathered metasedimentary belt geology, dissected stream breaklands, south aspects, dry	Highly susceptible	Timberbutte (60%)	Water erosion (1.00)	92.8	0.4%
				Content of sand (0.91)		
490	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain ridges and upper slopes, north aspects	Highly susceptible	Hugus (65%)	Wind erosion (1.00)	120.6	0.6%
				Water erosion (1.00)		
				Content of sand (0.91)		
			Honeyjones (20%)	Wind erosion (1.00)		
				Water erosion (1.00)		
				Content of sand (0.91)		
491	Bouldercreek family, weakly weathered metasedimentary belt geology, mountain ridges and upper slopes, north aspects	Highly susceptible	Bouldercreek (85%)	Wind erosion (1.00)	16.7	0.1%
				Water erosion (1.00)		
				Content of sand (0.91)		
Subtotals for Soil Survey Area					**5,706.0**	**26.7%**
Totals for Area of Interest					**21,399.9**	**100.0%**

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
2lgbc	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain ridges and	Highly susceptible	Hugus (65%)	Wind erosion (1.00)	20.6	0.1%
				Water erosion (1.00)		
				Content of sand (0.91)		
			Honeyjones (20%)	Wind erosion (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
	upper slopes, north aspects			Water erosion (1.00)		
				Content of sand (0.91)		
2v72k	Huckle ashy silt loam, 35 to 75 percent slopes	Highly susceptible	Huckle (80%)	Water erosion (1.00)	246.4	1.2%
				Wind erosion (1.00)		
				Content of sand (0.91)		
101	Aquic Xerofluvents, nearly level	Slightly susceptible	Aquic Xerofluvents (75%)		146.0	0.7%
105	Blinn loam, 5 to 35 percent slopes, very stony	Moderately susceptible	Blinn, very stony surface (85%)	Content of sand (0.91)	639.7	3.0%
				Water erosion (0.78)		
106	Blinn loam, 35 to 65 percent slopes, very stony	Highly susceptible	Blinn, very stony surface (90%)	Water erosion (1.00)	666.4	3.1%
				Content of sand (0.91)		
110	Cald silt loam	Slightly susceptible	Cald (70%)		314.5	1.5%
			Potlatch (5%)			
			Porrett (5%)			
112	Chatcolet cobbly loam, 7 to 25 percent slopes	Moderately susceptible	Chatcolet (90%)	Content of rock fragments (0.32)	119.3	0.6%
				Water erosion (0.01)		
113	Chatcolet cobbly loam, 25 to 65 percent slopes	Highly susceptible	Chatcolet (85%)	Water erosion (1.00)	1,004.8	4.7%
				Content of rock fragments (0.32)		
115	Cougarbay silt loam	Slightly susceptible	Cougarbay (90%)		259.4	1.2%
124	Huckle-Ardenvoir association, 5 to 35 percent slopes	Highly susceptible	Huckle (60%)	Wind erosion (1.00)	282.9	1.3%
				Water erosion (1.00)		
				Content of sand (0.91)		
			Ardenvoir (35%)	Water erosion (1.00)		
				Content of sand (0.91)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
125	Huckle-Ardenvoir association, 35 to 75 percent slopes	Highly susceptible	Huckle (60%)	Water erosion (1.00)	1,245.7	5.8%
				Wind erosion (1.00)		
				Content of sand (0.91)		
			Ardenvoir (35%)	Water erosion (1.00)		
				Content of sand (0.91)		
132	Kruse silt loam, 5 to 20 percent slopes	Moderately susceptible	Kruse (80%)	Wind erosion (0.99)	115.5	0.5%
				Content of sand (0.91)		
				Water erosion (0.08)		
135	Lacy gravelly loam, very stony-Rock outcrop complex, 5 to 35 percent slopes	Moderately susceptible	Lacy, very stony surface (55%)	Content of sand (0.91)	62.0	0.3%
				Water erosion (0.78)		
136	Lacy-Bobbitt association, 5 to 35 percent slopes, very stony	Moderately susceptible	Lacy, very stony surface (55%)	Content of sand (0.91)	256.6	1.2%
				Water erosion (0.78)		
			Bobbitt, very stony surface (35%)	Content of sand (0.91)		
				Water erosion (0.78)		
137	Lacy-Bobbitt association, 35 to 65 percent slopes, very stony	Highly susceptible	Lacy, very stony surface (55%)	Water erosion (1.00)	746.3	3.5%
				Content of sand (0.91)		
			Bobbitt, very stony surface (35%)	Water erosion (1.00)		
				Content of sand (0.91)		
146	McCrosket-Ardenvoir association, 20 to 35 percent slopes	Highly susceptible	McCrosket (55%)	Water erosion (1.00)	1,567.9	7.3%
				Content of sand (0.91)		
			Ardenvoir (35%)	Water erosion (1.00)		
				Content of sand (0.91)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
147	McCrosket-Ardenvoir association, 35 to 65 percent slopes	Highly susceptible	McCrosket (55%)	Water erosion (1.00)	2,498.9	11.7%
				Content of rock fragments (1.00)		
				Content of sand (0.91)		
			Ardenvoir (35%)	Water erosion (1.00)		
				Content of rock fragments (1.00)		
				Content of sand (0.91)		
148	McCrosket-Tekoa association, 12 to 60 percent slopes	Highly susceptible	McCrosket (59%)	Water erosion (1.00)	2,416.8	11.3%
				Content of rock fragments (1.00)		
				Content of sand (0.91)		
			Tekoa (35%)	Water erosion (1.00)		
				Content of rock fragments (1.00)		
				Content of sand (0.91)		
149	McGuire-Marble association, 0 to 7 percent slopes	Moderately susceptible	McGuire (60%)	Content of sand (0.91)	186.3	0.9%
			Marble (30%)	Wind erosion (0.99)		
				Content of sand (0.91)		
151	Mokins silt loam, 5 to 20 percent slopes	Moderately susceptible	Mokins (80%)	Content of sand (0.91)	201.4	0.9%
				Water erosion (0.08)		
152	Mokins silt loam, 20 to 35 percent slopes	Highly susceptible	Mokins (85%)	Water erosion (1.00)	49.9	0.2%
				Content of sand (0.91)		
154	Mokins-Chatcolet complex, 5 to 20 percent slopes	Moderately susceptible	Mokins (55%)	Content of sand (0.91)	1,061.4	5.0%
				Water erosion (0.08)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Chatcolet (35%)	Content of rock fragments (0.32)		
157	Porrett silt loam	Highly susceptible	Porrett (85%)	Wind erosion (1.00)	23.4	0.1%
159	Pywell muck, 0 to 2 percent slopes, frequently flooded	Highly susceptible	Pywell, frequently flooded (80%)	Wind erosion (1.00)	73.5	0.3%
				Content of rock fragments (1.00)		
				Content of sand (0.91)		
160	Ramsdell silt loam	Moderately susceptible	Ramsdell (90%)	Wind erosion (0.99)	316.8	1.5%
165	Santa ashy silt loam, 2 to 8 percent slopes	Moderately susceptible	Santa (85%)	Wind erosion (0.99)	192.0	0.9%
166	Santa ashy silt loam, 8 to 15 percent slopes	Moderately susceptible	Santa (80%)	Wind erosion (0.99)	288.1	1.3%
167	Santa ashy silt loam, 15 to 35 percent slopes	Highly susceptible	Santa (85%)	Content of rock fragments (1.00)	16.3	0.1%
				Wind erosion (0.99)		
				Content of sand (0.91)		
				Water erosion (0.32)		
186	Taney silt loam, 3 to 7 percent slopes	Slightly susceptible	Taney (75%)		19.3	0.1%
189	Tekoa gravelly silt loam, 5 to 20 percent slopes	Moderately susceptible	Tekoa (80%)	Content of sand (0.91)	25.3	0.1%
				Water erosion (0.08)		
205	Water	Not rated	Water (100%)		630.4	2.9%
Subtotals for Soil Survey Area					**15,693.9**	**73.3%**
Totals for Area of Interest					**21,399.9**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Highly susceptible	15,807.0	73.9%
Moderately susceptible	4,109.5	19.2%
Slightly susceptible	853.1	4.0%
Null or Not Rated	630.4	2.9%

Description

Wildfire is a naturally occurring event that has helped maintain ecosystem function in wildlands. Wildfire can be caused by natural ignition such as lightning strike, or by man-caused ignition. Buildup of excess fuel loads can result in high severity fires that damage the soils in the burn area. Prescribed burning is a restoration practice that is primarily designed to help return the natural fire cycle to the landscape. Properly carried out on suitable sites, burning can be a very effective and cost efficient treatment method to help restore the desired composition of plant species in an ecological site, improve livestock access on heavy brush or slash sites, rejuvenate sprouting browse species and stagnant grass plants, release nutrients into the soil, improve palatability and nutrient content of forage, reduce fuel loading, and prepare an ash seedbed for artificial or natural seeding. Burning may be combined with mechanical or chemical rangeland treatments.

Fuel ignition for prescribed burning can be natural or artificial using hand-held drip torches, aerial ignition, and other methods. Fire lines can be established using natural fuel breaks, wet lines, or the removal of fuel by hand or machinery.

The susceptibility to fire damage ratings represent the relative risk of creating a water repellant layer, volatilization of essential soil nutrients, destruction of soil biological activity, and vulnerability to water and wind erosion prior to reestablishing adequate watershed cover on the burned site. The ratings are directly related to burn severity (e.g. a low-moderate severity burn will not result in water repellant layer formation). This rating should be used in conjunction with the rangeland seeding ratings or the soil restoration potential rating depending upon whether seeding or natural regeneration will be utilized on the site.

Sandy soils are more susceptible to formation of a water repellant layer. High rock fragment content increases the rate of heat transfer into the soil. Steep slopes increase the vulnerability to water erosion. Susceptibility to formation of hydrophobic or water repellant layers varies by vegetation type. As an example, pinyon-juniper, Arizona chaparral, and California chaparral vegetation types are more susceptible to hydrophobicity than other shrubland or grassland vegetation types.

The impacts of wildfire to soils of the burn area need to be assessed to prioritize burned area emergency rehabilitation and revegetation efforts.

Prescribed burning should be carefully planned and executed. It should be carried out following a well designed prescription and burn plan under the supervision of a qualified prescribed burning team. Burning objectives should be clearly defined and should be evaluated during post-burn assessments. Minimizing risks to human health, safety, and property damage and containment of the burn are of paramount importance.

Hot, dry south-facing slopes are more susceptible to fire damage than cooler, north-facing slopes. Fire mortality of desirable plants needs to be taken into consideration during wildfire restoration and prescribed burning planning. On-site

investigation is recommended before implementing any wildfire restoration or prescribed burning projects.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect soil damage by fire. "Highly susceptible" indicates that the soil has one or more features that are very favorable for soil damage by fire. "Moderately susceptible" indicates that the soil has features that are moderately favorable for damage to occur. "Slightly susceptible" indicates that the soil has features that generally make it unfavorable for damage to occur.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest impact favoring soil damage by fire (1.00) and the point at which the soil feature is not favorable to damage occurring (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

e. Appendix 5 Soil Map Farmland Classification

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2nm0	Aquic Xerofluvents, nearly level	All areas are prime farmland	113.8	0.5%
2nm4	Blinn loam, 5 to 35 percent slopes, very stony	Not prime farmland	229.8	1.1%
2nmd	Chatcolet cobbly loam, 25 to 65 percent slopes	Not prime farmland	32.0	0.1%
2nms	Huckle-Ardenvoir association, 35 to 75 percent slopes	Not prime farmland	141.7	0.7%
2nng	McCrosket-Ardenvoir association, 20 to 35 percent slopes	Not prime farmland	231.5	1.1%
2nnq	Mokins-Chatcolet complex, 5 to 20 percent slopes	Farmland of statewide importance, if drained	70.8	0.3%
2nnx	Ramsdell silt loam	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	64.9	0.3%
2v72b	McCrosket-Tekoa association, 12 to 60 percent slopes	Not prime farmland	655.9	3.1%
2v72k	Huckle ashy silt loam, 35 to 75 percent slopes	Not prime farmland	10.0	0.0%
2v729	McCrosket-Ardenvoir association, 35 to 65 percent slopes	Not prime farmland	355.2	1.7%
130	Typic Udivitrands-Typic Humaquepts-Pokey families, complex, broad stream bottoms	Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season	279.4	1.3%
448	Hubub-Honeyjones families, complex, moderately weathered belt rock, dissected lower mountain slopes toeslopes and stream bottoms, north aspects	Not prime farmland	114.7	0.5%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
449	Hugus-Honeyjones families, complex, weak to moderately weathered belt rock, dissected mountain slopes, north aspects	Not prime farmland	126.2	0.6%
462	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain slopes, north aspects	Not prime farmland	523.8	2.4%
463	Hugus-Bouldercreek-Humic Udivitrands families, complex, moderately weathered belts, lower sideslopes toeslopes and stream bottoms of incised drainages, north aspects	Not prime farmland	95.1	0.4%
464	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain slopes, south aspects	Not prime farmland	34.1	0.2%
466	Bouldercreek family, weakly weathered metasedimentary belt geology, mountain slopes, north aspects	Not prime farmland	57.6	0.3%
467	Bouldercreek-Humic Udivitrands families, complex, weakly weathered belt geology, lower sideslopes toeslopes and stream bottoms of incised drainages along slopes, north aspects	Not prime farmland	27.3	0.1%
470	Bouldercreek-Ahrs families, complex, weakly weathered metasedimentary belt geology, mountain slopes, south aspects	Not prime farmland	22.1	0.1%
471	Ahrs family-Rock outcrop-Typic Vitrixerands family, complex, weakly weathered metasedimentary belt geology, mountain slopes, south aspects, dry	Not prime farmland	315.7	1.5%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
472	Hugus-Honeyjones-Goshawk families, complex, weathered belts, lower sideslopes toeslopes and stream bottoms of drainages in uplands, south aspects	Not prime farmland	514.4	2.4%
473	Hugus-Goshawk-Minaloosa families, complex, weakly to moderately weathered belt geology, dissected rolling uplands, south aspects	Not prime farmland	921.3	4.3%
477	Honeyjones family, weakly weathered metasedimentary belt geology, stream breaklands, north aspects	Not prime farmland	149.4	0.7%
478	Typic Vitrixerands family-Rock outcrop-Lotuspoint family, complex, weakly weathered metasedimentary belt geology, stream breaklands, south aspects, dry	Not prime farmland	111.7	0.5%
480	Bouldercreek-Humic Udivitrands families, complex, weakly weathered metasedimentary belt geology, dissected stream breaklands, north aspects	Not prime farmland	196.7	0.9%
483	Typic Vitrixerands-Ahrs families, complex, weakly weathered metasedimentary belt geology, stream breaklands, south aspects	Not prime farmland	80.9	0.4%
488	Timberbutte family-Rock outcrop complex, weakly weathered metasedimentary belt geology, dissected stream breaklands, south aspects, dry	Not prime farmland	92.8	0.4%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
490	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain ridges and upper slopes, north aspects	Not prime farmland	120.6	0.6%
491	Bouldercreek family, weakly weathered metasedimentary belt geology, mountain ridges and upper slopes, north aspects	Not prime farmland	16.7	0.1%
Subtotals for Soil Survey Area			**5,706.0**	**26.7%**
Totals for Area of Interest			**21,399.9**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2lgbc	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain ridges and upper slopes, north aspects	Not prime farmland	20.6	0.1%
2v72k	Huckle ashy silt loam, 35 to 75 percent slopes	Not prime farmland	246.4	1.2%
101	Aquic Xerofluvents, nearly level	All areas are prime farmland	146.0	0.7%
105	Blinn loam, 5 to 35 percent slopes, very stony	Not prime farmland	639.7	3.0%
106	Blinn loam, 35 to 65 percent slopes, very stony	Not prime farmland	666.4	3.1%
110	Cald silt loam	All areas are prime farmland	314.5	1.5%
112	Chatcolet cobbly loam, 7 to 25 percent slopes	Farmland of statewide importance	119.3	0.6%
113	Chatcolet cobbly loam, 25 to 65 percent slopes	Not prime farmland	1,004.8	4.7%
115	Cougarbay silt loam	Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season	259.4	1.2%
124	Huckle-Ardenvoir association, 5 to 35 percent slopes	Not prime farmland	282.9	1.3%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
160	Ramsdell silt loam	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	316.8	1.5%
165	Santa ashy silt loam, 2 to 8 percent slopes	Farmland of statewide importance, if drained	192.0	0.9%
166	Santa ashy silt loam, 8 to 15 percent slopes	Not prime farmland	288.1	1.3%
167	Santa ashy silt loam, 15 to 35 percent slopes	Not prime farmland	16.3	0.1%
186	Taney silt loam, 3 to 7 percent slopes	Prime farmland if drained	19.3	0.1%
189	Tekoa gravelly silt loam, 5 to 20 percent slopes	Farmland of statewide importance	25.3	0.1%
205	Water		630.4	2.9%
Subtotals for Soil Survey Area			**15,693.9**	**73.3%**
Totals for Area of Interest			**21,399.9**	**100.0%**

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
125	Huckle-Ardenvoir association, 35 to 75 percent slopes	Not prime farmland	1,245.7	5.8%
132	Kruse silt loam, 5 to 20 percent slopes	Farmland of statewide importance	115.5	0.5%
135	Lacy gravelly loam, very stony-Rock outcrop complex, 5 to 35 percent slopes	Not prime farmland	62.0	0.3%
136	Lacy-Bobbitt association, 5 to 35 percent slopes, very stony	Not prime farmland	256.6	1.2%
137	Lacy-Bobbitt association, 35 to 65 percent slopes, very stony	Not prime farmland	746.3	3.5%
146	McCrosket-Ardenvoir association, 20 to 35 percent slopes	Not prime farmland	1,567.9	7.3%
147	McCrosket-Ardenvoir association, 35 to 65 percent slopes	Not prime farmland	2,498.9	11.7%
148	McCrosket-Tekoa association, 12 to 60 percent slopes	Not prime farmland	2,416.8	11.3%
149	McGuire-Marble association, 0 to 7 percent slopes	Prime farmland if irrigated	186.3	0.9%
151	Mokins silt loam, 5 to 20 percent slopes	Farmland of statewide importance, if drained	201.4	0.9%
152	Mokins silt loam, 20 to 35 percent slopes	Not prime farmland	49.9	0.2%
154	Mokins-Chatcolet complex, 5 to 20 percent slopes	Farmland of statewide importance, if drained	1,061.4	5.0%
157	Porrett silt loam	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	23.4	0.1%
159	Pywell muck, 0 to 2 percent slopes, frequently flooded	Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	73.5	0.3%

f. Appendix 6 Soil Map Aquatic, Riparian, and Wetland Description

Ecological Site ID: Aquatic, Riparian and Wetland Sites- NF E. WA (PNW-GTR-593)—Idaho Panhandle National Forest, Idaho-Washington-Montana, and Kootenai County Area, Idaho

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
462	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain slopes, north aspects		523.8	2.4%
463	Hugus-Bouldercreek-Humic Udivitrands families, complex, moderately weathered belts, lower sideslopes toeslopes and stream bottoms of incised drainages, north aspects		95.1	0.4%
464	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain slopes, south aspects		34.1	0.2%
466	Bouldercreek family, weakly weathered metasedimentary belt geology, mountain slopes, north aspects		57.6	0.3%
467	Bouldercreek-Humic Udivitrands families, complex, weakly weathered belt geology, lower sideslopes toeslopes and stream bottoms of incised drainages along slopes, north aspects		27.3	0.1%
470	Bouldercreek-Ahrs families, complex, weakly weathered metasedimentary belt geology, mountain slopes, south aspects		22.1	0.1%
471	Ahrs family-Rock outcrop-Typic Vitrixerands family, complex, weakly weathered metasedimentary belt geology, mountain slopes, south aspects, dry		315.7	1.5%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
490	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain ridges and upper slopes, north aspects		120.6	0.6%
491	Bouldercreek family, weakly weathered metasedimentary belt geology, mountain ridges and upper slopes, north aspects		16.7	0.1%
Subtotals for Soil Survey Area			**5,706.0**	**26.7%**
Totals for Area of Interest			**21,399.9**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2lgbc	Hugus-Honeyjones families, complex, moderately weathered metasedimentary belt geology, mountain ridges and upper slopes, north aspects		20.6	0.1%
2v72k	Huckle ashy silt loam, 35 to 75 percent slopes		246.4	1.2%
101	Aquic Xerofluvents, nearly level		146.0	0.7%
105	Blinn loam, 5 to 35 percent slopes, very stony		639.7	3.0%
106	Blinn loam, 35 to 65 percent slopes, very stony		666.4	3.1%
110	Cald silt loam		314.5	1.5%
112	Chatcolet cobbly loam, 7 to 25 percent slopes		119.3	0.6%
113	Chatcolet cobbly loam, 25 to 65 percent slopes		1,004.8	4.7%
115	Cougarbay silt loam	MW	259.4	1.2%
124	Huckle-Ardenvoir association, 5 to 35 percent slopes		282.9	1.3%
125	Huckle-Ardenvoir association, 35 to 75 percent slopes		1,245.7	5.8%
132	Kruse silt loam, 5 to 20 percent slopes		115.5	0.5%

Ecological Site ID: Aquatic, Riparian and Wetland Sites- NF E. WA (PNW-GTR-593)—Idaho
Panhandle National Forest, Idaho-Washington-Montana, and Kootenai County Area, Idaho

Description

An "ecological site ID" is the symbol assigned to a particular ecological site. An "ecological site" is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time; a characteristic hydrology, particularly infiltration and runoff, that has developed over time; and a characteristic plant community (kind and amount of vegetation). The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. For example, the hydrology of the site is influenced by development of the soil and plant community. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production. Descriptions of ecological sites are provided in the Field Office Technical Guide, which is available in local offices of the Natural Resources Conservation Service.

Rating Options

Class: Aquatic, Riparian and Wetland Sites- NF E. WA (PNW-GTR-593)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower