Appendix

Acknowledgements

Appendix A..... Geology

Appendix B.....Hydrology

Appendix C.....Fish

Appendix D.....Vegetation

Appendix E.....Wildlife

Appendix F.....References

Appendix A -- Geology

Erosion/Mass Wasting Probability and Soil Transfer Rates following Historical Fire Events

LANDFORM BLOCK 1 SIMMONDS-QUARTZ-TIDBITS

ASSUMPTIONS: Fire recurrence interval of 96 years.
Major storm event (10 years+) following fire.

CONDITIONS: Potentially unstable soils on side slopes >70%
Sandy to Clayey Silts overlying tuffs and breccias with <3 ft. depth
SRI Units 201/203/212/21

AREA:	Landform Block:	20,398 acres (82 km^2)
	SRI Soils:	14,419 "
	Slopes >70%:	2,730 "
INTERSECTION:	Soils/Slopes:	1,916 " (409 polygons)

LISA PROBABILITY ANALYSIS

ASSUMPTIONS:

Scenario 1: High intensity wildfire, all biomass removed, natural stand replacement

VARIABLES:	Soil Depth:	1-3 ft.
	Slopes :	70 - 110%
	Surcharge:	0
	Root Cohesion:	0
	Phi:	28-34 degrees
	Soil Cohesion:	0 - 50 pcf
	Unit Weight:	85 pcf std. dev. 1.5
	Moisture:	10%
	Spec. Grav.:	2.5
	Groundwater Ratio:	0 - 0.8

P[FS<=1] = 0.866

(0.866)(1916 ac.) = 1,659 ac. ~ 8% of landform block area
(0.866)(409 polygons) = 354 possible events
(3691 m^3/ac)(1659 ac) = 6,123,369 m^3

Scenario 2: Medium to Low intensity wildfire, crowns and stems burned, root system still intact, natural stand replacement

VARIABLES:

Soil Depth:	1-3 ft.
Slopes :	70 - 110%
Surcharge:	6 - 12 psf
Root Cohesion:	0 - 80 psf
Phi :	28-34 degrees
Soil Cohesion:	0 - 50 pcf
Unit Weight:	85 pcf std. dev. 1.5
Moisture:	10%
Spec. Grav.:	2.5
Groundwater Ratio:	0 - 0.6

P[FS<=1] = 0.214

(0.214)(1916 ac.) = 410 ac. ~ 2% of landform block area
(0.214)(409 polygons) = 88 possible events
(3691 m^3/ac)(410 ac) = 1,513,310 m^3

EROSION RATES by cumulative Area per unit Time (C.A.T.) method

	Period yrs	Frequency events/km^2/yr	Volume/Event m^3	Soil Transfer Rate $m^3/km^2/yr$
1/	96	0.045	17,298	778
2/	96	0.011	17,197	189

1/ High intensity burn

Frequency 354 events/82km^2/96yrs = 0.045
Volume 6,123,369 m^3/354 events = 17,298 m^3/event

2/ Med-Low intensity burn

Frequency 88 events/82km^2/96yrs = 0.011
Volume 1,513,310m^3/88 events = 17,197

LANDFORM BLOCK 3 WOLF-MANN BLUE RIVER

	Period yrs	Frequency events/km^2/yr	Volume/Event m^3	Soil Transfer Rate m^3/km^2/yr
1/	96	0.0164	13,185	216
2/	96	0.004	13,033	52

1/ High intensity burn

P[FS<=1] = 0.866

(0.866)(83 polygons) = 72 possible events
(.866)(3691 m^3/ac)(297 ac) = 979,323 m^3
Frequency 72 events/46km^2/96yrs = 0.0164
Volume 979,323 m^3/72 events = 13,185 m^3/event

2/ Med-Low intensity burn

P[FS<=1] = 0.214

(0.214)(83 polygons) = 18 possible events
(0.214)(3691 m^3/ac)(297 ac) = 234,593 m^3
Frequency 18 events/46km^2/96yrs = 0.004
Volume 234,593m^3/18 events = 13,033

LANDFORM BLOCK 3 MARION THESIS

	Period yrs	Frequency events/km^2/yr	Volume/Event m^3	Soil Transfer Rate m^3/km^2/yr
1/	22	0.240	2,684	644
2/	34	0.001	3,115	31
3/	25	2.534	1,292	3,274

1/ Clearcut
2/ Forested
3/ Roads

S.R.I. Landtype and stability classification conditions

Unstable: areas which are prone to mass failure under natural conditions (unroaded, unharvested), and where human activities such as road construction and timber harvest are likely to increase landslide distribution in time and space to the point where this change is likely to modify natural geomorphic and hydrologic processes..."FSEIS glossary p. 18. Classified by the Forest S.R.I. as **moderately (several failures observed within a polygon) to very unstable (entire polygon shows evidence of recent and past failures).**

35, 25, &
251 to 256: Cohesive residual and colluvial soil, Sandy Silt with some Clay and rock fragments overlying pyroclastic bedrock on 20 to 40% slopes.

334 to 336: Cohesive residual and colluvial soil, Clayey Silt to Silty Clay with rock fragments overlying pyroclastic bedrock on 20 to 40% slopes.

NOTE: Only landtype 25, 255, and 35 identified in the watershed.

Methods: Frequency analysis for SRI types and air photo interpretation.

Potentially Unstable: Areas which contain conditions of steep geometry, high ground water potential, and soil with low shear strength characteristics that "...considers the probability of landslide-triggering storms within the period of minimum root strength and elevated ground water (as well as slope adjustment to piping changes), and the probability of channel adjustments that trigger streambank and toeslope failures." FEMAT IX-38 These conditions include high intensity fire and clearcut harvesting. Classified by the Forest S.R.I. as **stable or moderately stable to locally unstable.**

3 Rock outcrops of basalt, andesite and pyroclastic material which are prone to differential weathering and stress relief from glacial unloading which produce talus slopes and debris avalanches.

8 Slope deposits over pyroclastic bedrock in deeply dissected valleys.

33 Clayey Silt over pyroclastic bedrock.

55 Sideslope and bench deposits containing glacially derived material in a finer grained matrix of cohesive soil.

133, 143 163, 166	Granular glacial/fluvial deposits on mid-slope and toeslopes.
213, 225, 233, 235,237, 331, 332, 333,	Clayey Silts to Silty Clays overlying pyroclastic bedrock on steep slopes up to 70 %
617	Colluvial granular soil less than 3 feet deep overlying basalt and andesite on slopes up to 90%.

NOTE: Only Landtypes 3, 233, 235 and 8 identified in the watershed. Total of 3,580 acres.

Methods: Air photo interpretation and frequency query for SRI types.

Potentially Unstable on slopes >70% Shallow soils in steep sideslope or valley headwall areas that have a potential for debris avalanche failure. Classified by the Forest S.R.I. as **stable**.

13	Glacial deposits
16	Toe slopes glacial/fluvial deposits
61, 64 610 610U, 614	Glacial till overlying basalt and andesite soil depth 3-6 feet
71	Ridges and cirque headwalls w/ less than 3 feet of granular soil
21,201.203,210u 212,21s,301, 31 310U	Sandy Silt to Clayey Silt overlying Tuffs and Breccias with less than 3 feet of slightly plastic soil.

NOTE: **Only Landtypes 13, 21, 201,203,210u, 212, 21s, 610, 301, and 610, identified in the watershed.**

METHODS: Frequency Query for SRI Types and intersections with slopes >70%

<u>Methods of analysis</u>

Using the Cumulative Area per unit Time Method (Marion,81) and the Level I Stability Analysis Program (Hammond, et.al., 88) to estimate historical soil transfer rates induced by wildfire, the results were compared to results of Marion's 1981 study.
Marion found that the majority of slope failures occurred in S.R.I. soil type 21 on slopes between 30 and 40 degrees.
A Geographic Information System (G.I.S.) frequency query of the number of failures intersecting S.R.I. polygons showed that SRI units 201, 203, 212, and 21 (all SRI type 21 complexes) accounted for over 50% of the landslides. A slope map of the watershed was prepared from a digital elevation model which shows slopes bracketed <30%, 30-50%, 50-70%, and >70%. An intersection querry was then run to obtain the number of polygons and their area in which SRI 21 complexes intersected slopes >70%.

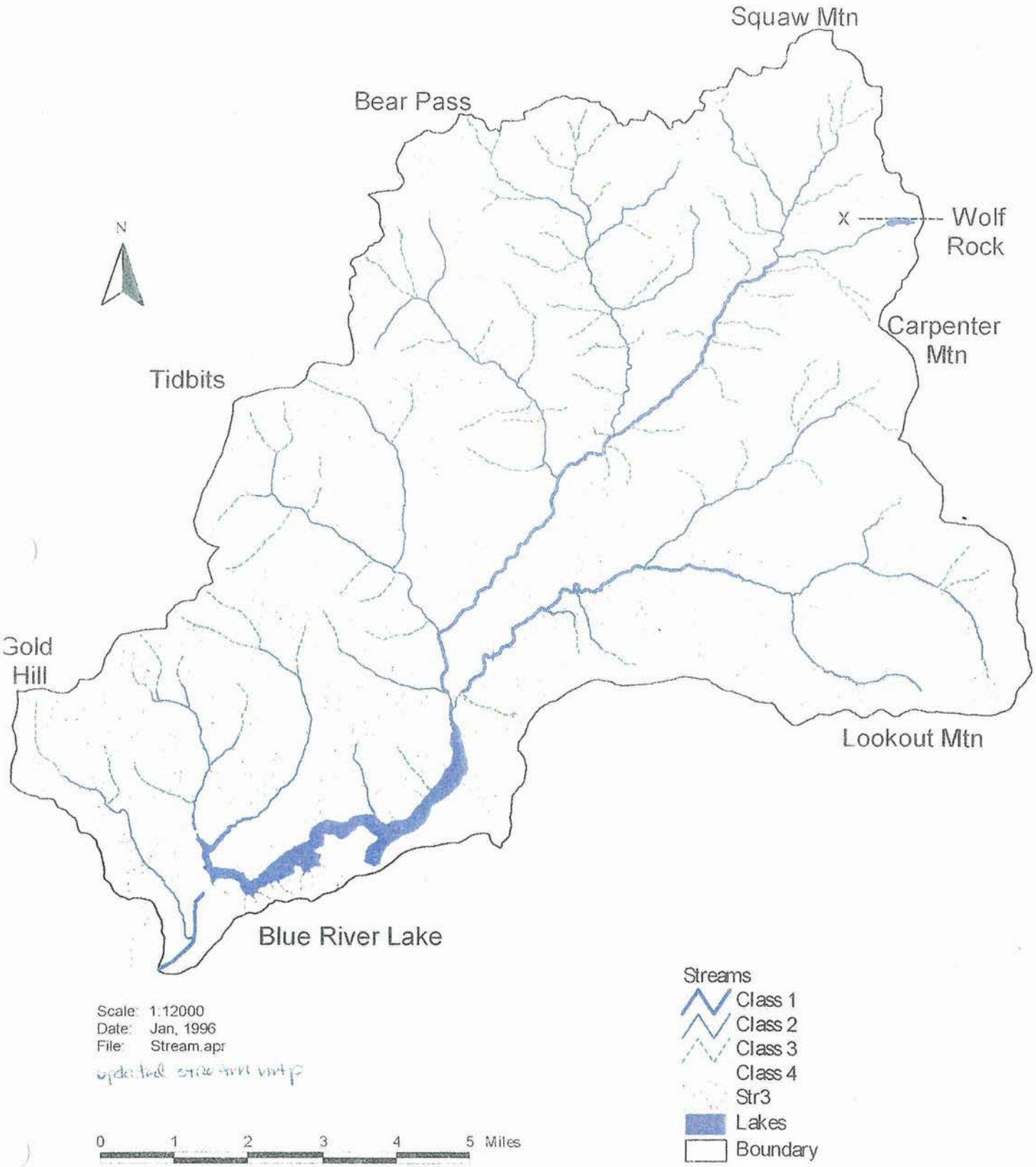
Probability Analysis

A probability analysis was made for these polygons using the Level I Stability Analysis program, LISA (91), developed by the Intermountain Research Station to statistically analyze the probability of failure within these polygons under historical fire return interval conditions coincidantal with normal and extreme precipitation events.

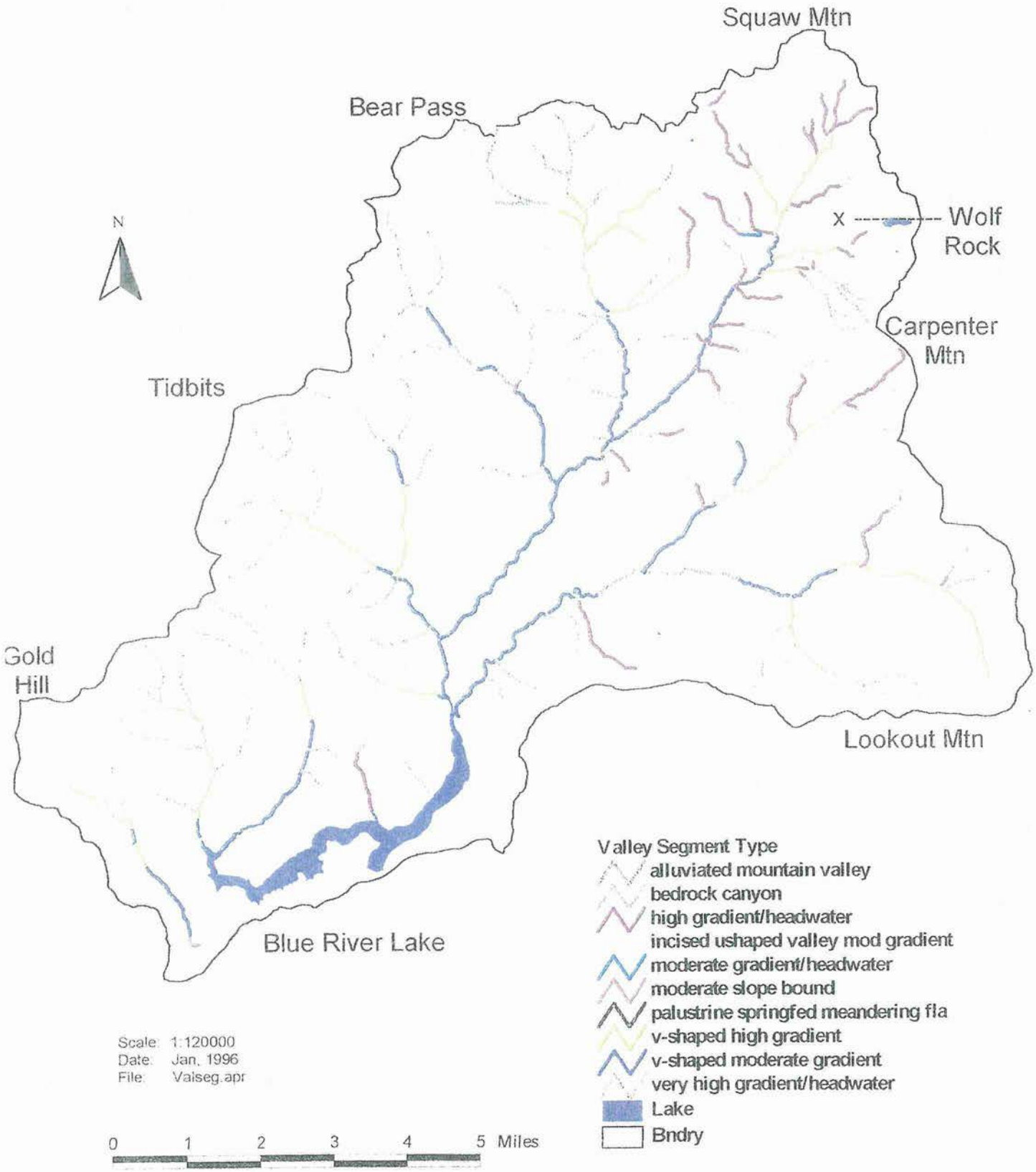
The 1973 S.R.I. database for soil engineering properties was used for assigning ranges for physical variables such as soil depth, soil classification and shear strength. Slope angles were varied as intersections occurred between the S.R.I. layer, and a Slope layer which was created by bracketing slope angles into polygons < 30%, 30-50, 50-70, and >70%. These ranges of values were then entered into LISA which develops cumulative and probability distribution functions for each variable used in the infinite slope equation to calculate a factor of safety. The equation is iterated 1,000 times using a Monte Carlo simulation subroutine to randomly select variables with the ranges and distribution functions defined to solve the equation. A factor of safety frequency histogram is produced along with a Probability of Failure. This can be interpreted as a percent of area within a polygon susceptible to failure, or the relative frequency of events.

Validation studies have been completed in areas of western and eastern Washinton and southwest Oregon by Ristau (88), McHugh (91), and Wooten (88). The results from the LISA analysis were then used to back-calculate soil transfer rate values for Landform Blocks 1 and 3 for what could be used as a reference condition prior to fire supression or human occupation. Landform Block 1 was used as a test to determine if the calulated values for soil transfer rate for reference conditions would be in the same order of magnitude as those calculated for field measured conditions by Marion (81). The results were encouraging, therefore Landform Block 3 was analyzed in the same manner to make a direct comparrison. The results are listed below.

Appendix B -- Hydrology


Squaw Mtn
Bear Pass
Wolf Rock
Carpenter Mtn
Tidbits
Gold Hill
Lookout Mtn
Blue River Lake
N
Scale: 1:12000
Date: Jan, 1996
File: Stream.apr
0 1 2 3 4 5 Miles
Streams
Class 1
Class 2
Class 3
Class 4
Str3
Lakes
Boundary

Valley Segment Types



Appendix C -- Fish

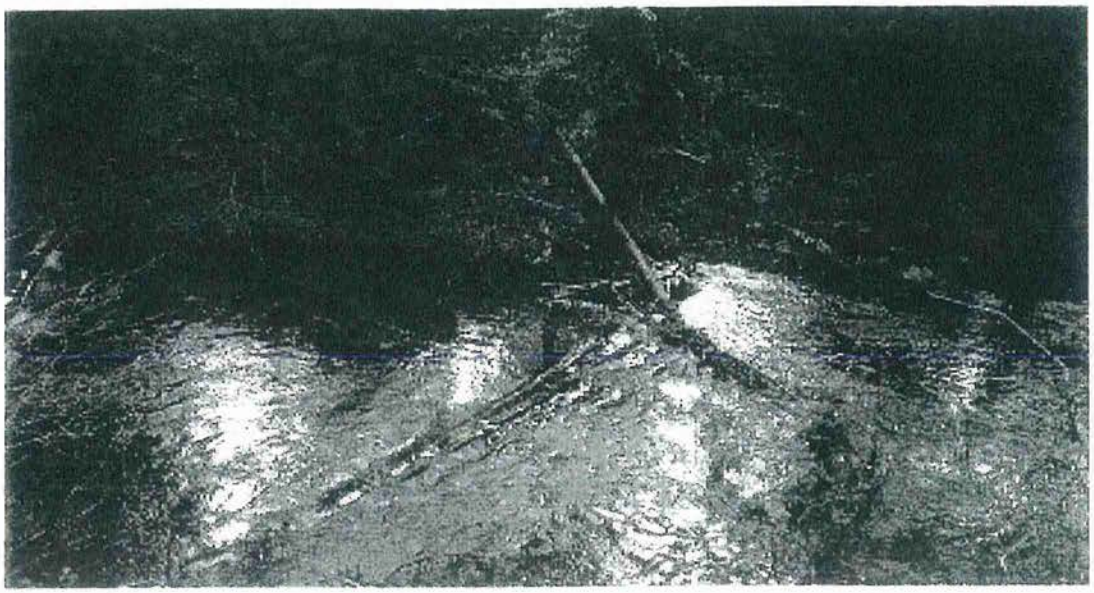
FISH SPECIES KNOWN TO EXIST WITHIN BLUE RIVER WATERSHED

COMMON NAME	SCIENTIFIC NAME	HABITAT
Pacific lamprey	*Entosphenus tridentatus*	River and tributaries below dam
Western brook lamprey	*Lampetra richardsoni*	River and tributaries
Mountain whitefish	*Prosopium williamsoni*	River
Cutthroat trout	*Salmo clarki*	River, tributaries, reservoir
Rainbow trout (wild + hatchery)	*Oncorhynchus gairdneri*	River, tributaries, reservoir
Chinook salmon	*Oncorhynchus tshawytscha*	River, tributaries, reservoir
Redside shiner	*Richardsonius balteatus*	River, tributaries, reservoir
Longnose dace	*Rhinichthys cataractae*	River and tributaries
Speckled dace	*Rhinichthys osculus*	River, tributaries, reservoir
Largescale sucker	*Catostomus macrocheilus*	Reservoir and river near it
Torrent sculpin	*Cottus rhotheus*	River, tributaries, reservoir
Piute sculpin	*Cottus beldingi*	River and tributaries
Mottled sculpin	*Cottus bairdi*	River and tributaries

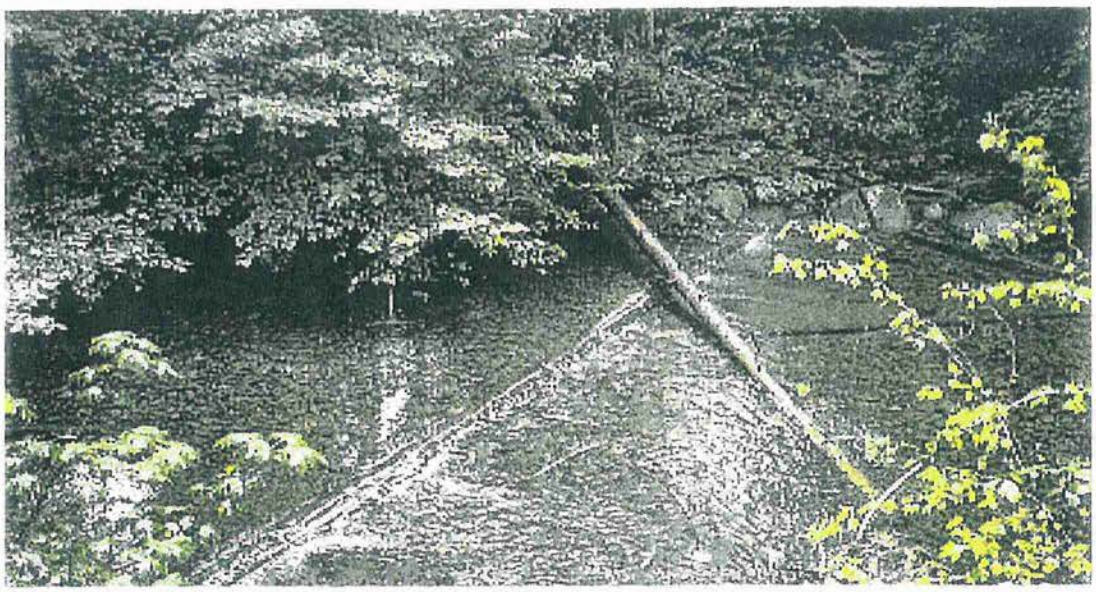
AQUATIC AMPHIBIAN SPECIES KNOWN TO EXIST WITHIN BLUE RIVER WATERSHED

COMMON NAME	SCIENTIFIC NAME	HABITAT
Cascade frog	*Rana cascadae*	Ponds
Red-legged frog	*Rana aurora*	Ponds, river, tributaries
Tree frog	*Hyla regilla*	Ponds
Northwestern salamander	*Ambystoma gracile*	Ponds
Rough-skinned newt	*Taricha granulosa*	Ponds, reservoir, river, tributaries
Western toad	*Bufo boreas*	Ponds
Pacific giant salamander	*Dicamptodon ensatus*	River and tributaries
Tailed frog	*Ascaphus truei*	In or near river and tributaries
Cascade torrent salamander	*Rhyacotriton cascadae*	Near river and tributaries
Dunn's salamander	*Plethodon dunni*	Near river and tributaries

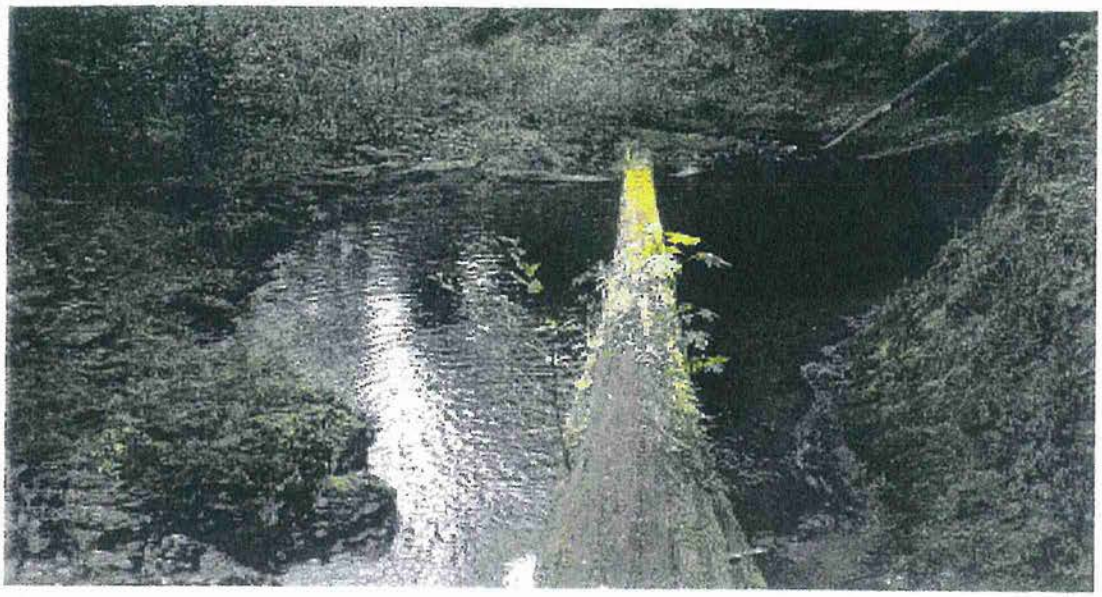
Appendix D -- Vegetation



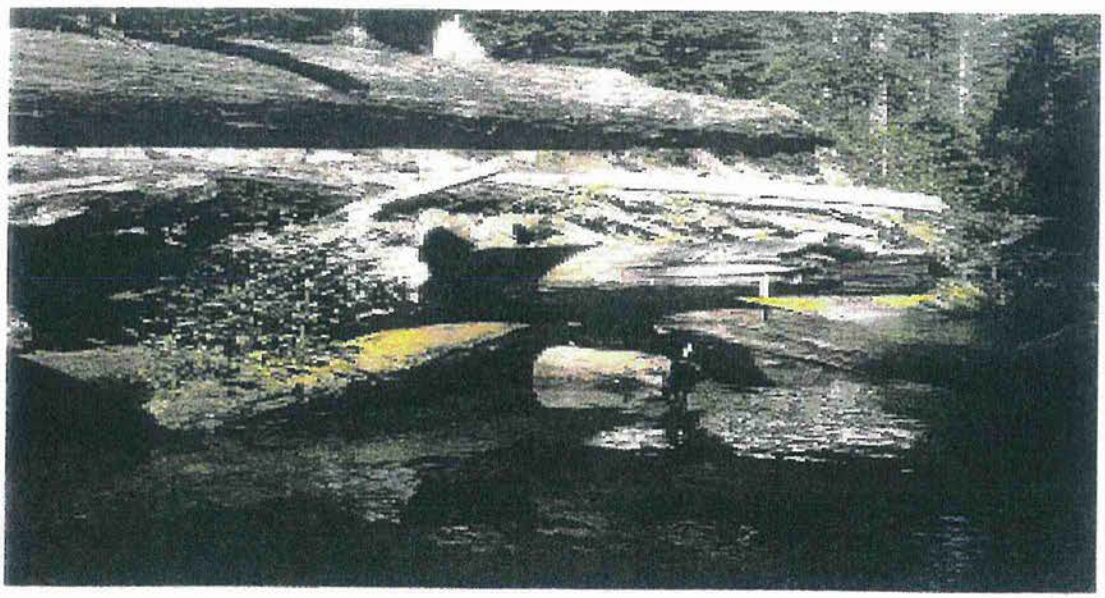
Blue River aquatic ecosystem restoration project photopoint monitoring. Photopoint 2 taken autumn 1993. Notice logs attached to bare bedrock. The wood was placed on bedrock in summer 1993.



Blue River aquatic ecosystem restoration project photopoint monitoring. Photopoint 2 taken summer 1995. Notice recruitment of gravels on once bare bedrock.

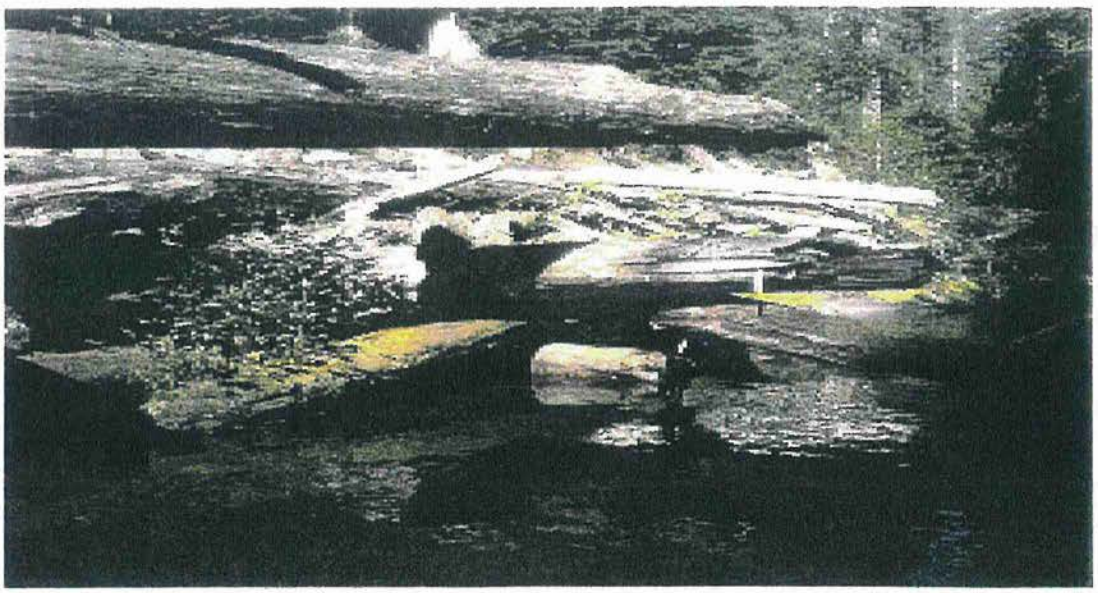


Bedrock controlled pool in Lower Quentin Creek, October 1994.



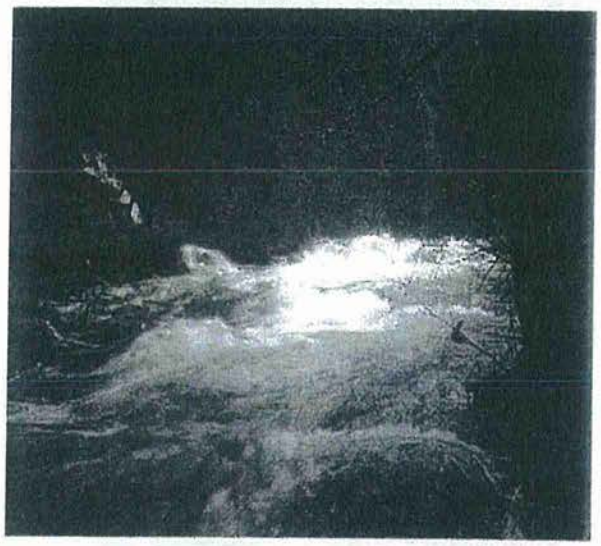
Large wood in pool of lower Quentin Creek, October 1994.

Bedrock controlled pool in Lower Quentin Creek, October 1994.



Large wood in pool of lower Quentin Creek, October 1994.

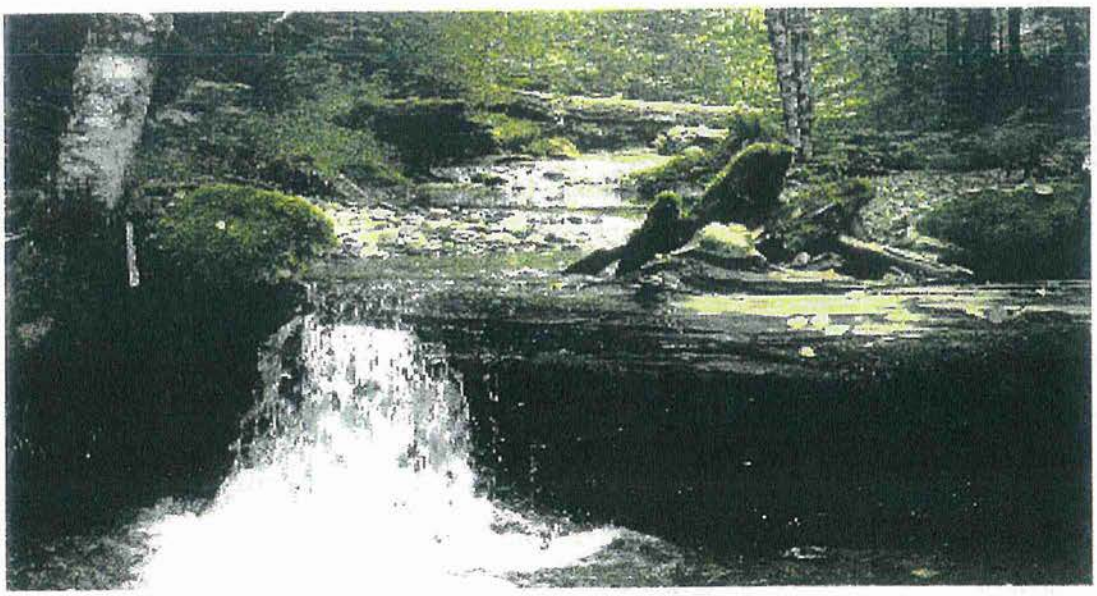
Pool 4011 of the Pool Complexity Study at Tidbits Creek. Photo taken in the autumn after the installation of the large wood complexes.



Pool 4011 of the Pool Complexity Study at Tidbits Creek. Photo taken in the winter after the installation of the large wood complexes.

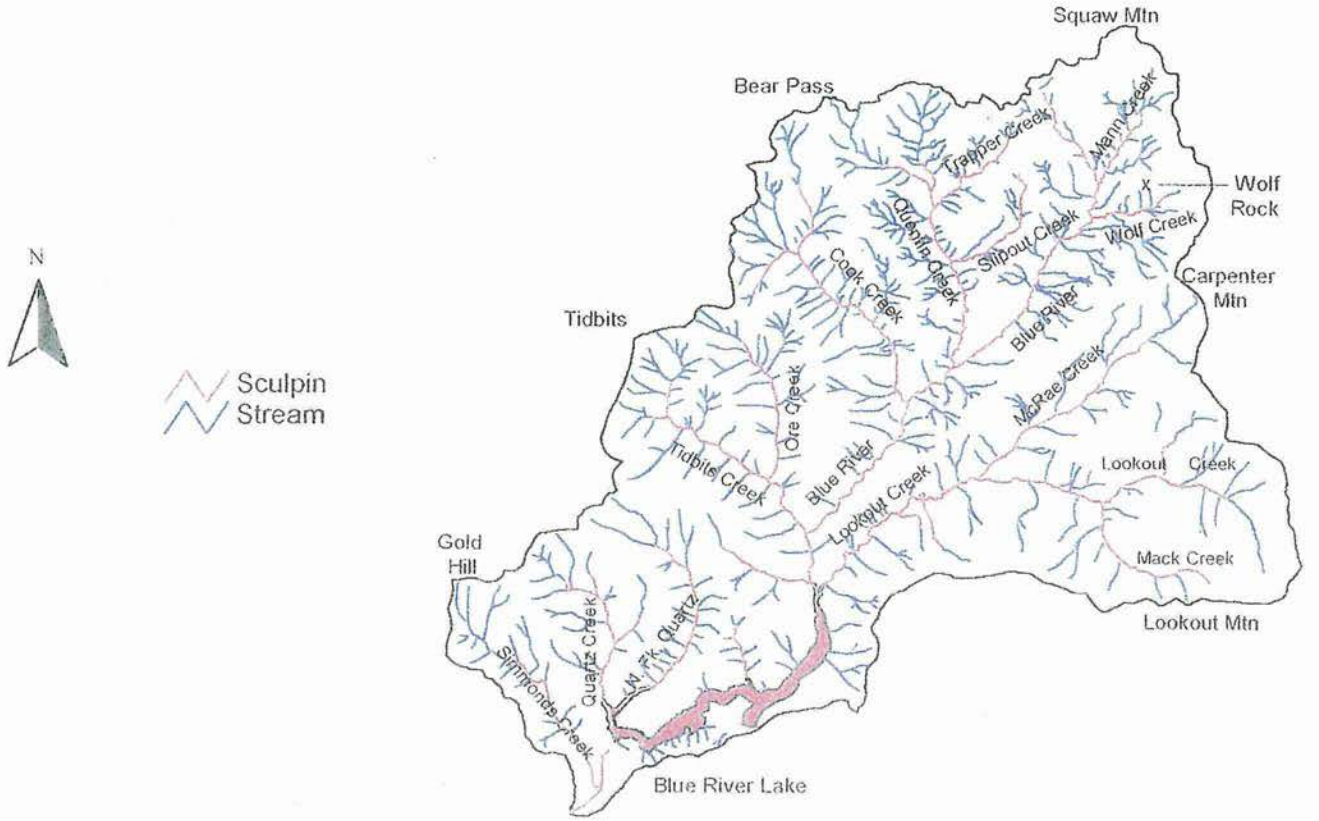
Pool 4011 of the Pool Complexity Study at Tidbits Creek. Photo taken in the spring after the installation of the large wood complexes.

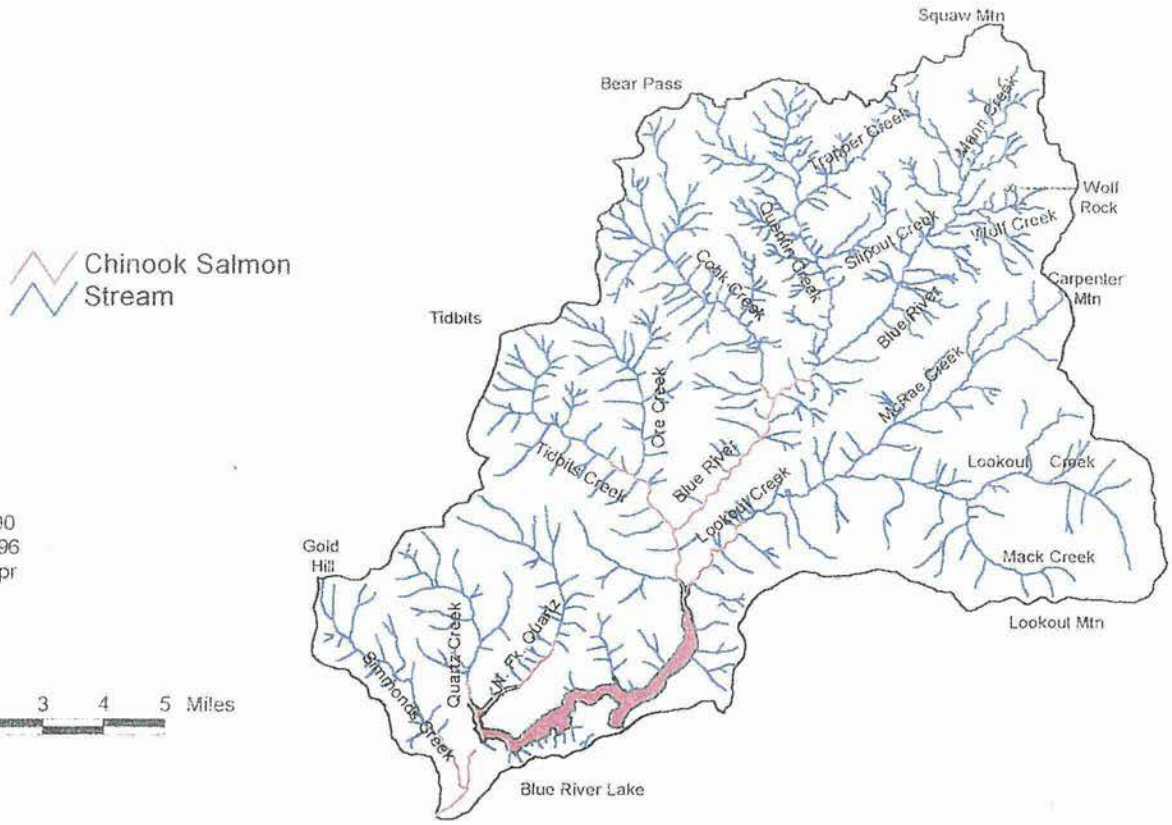
Exposed bedrock as stream substrate in Simmonds Creek, July 1993.



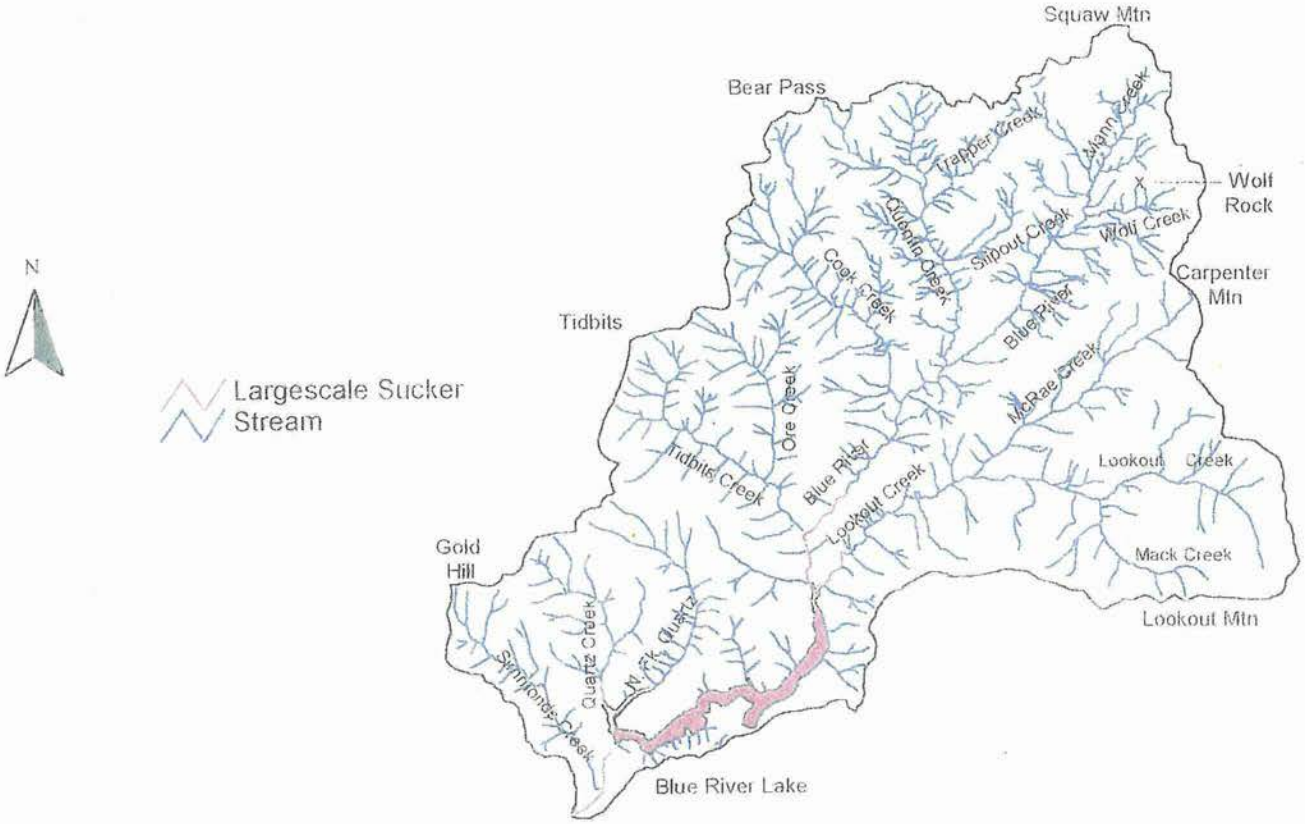
Water plunges over an embedded log in North Fork Quartz Creek, August 1993.

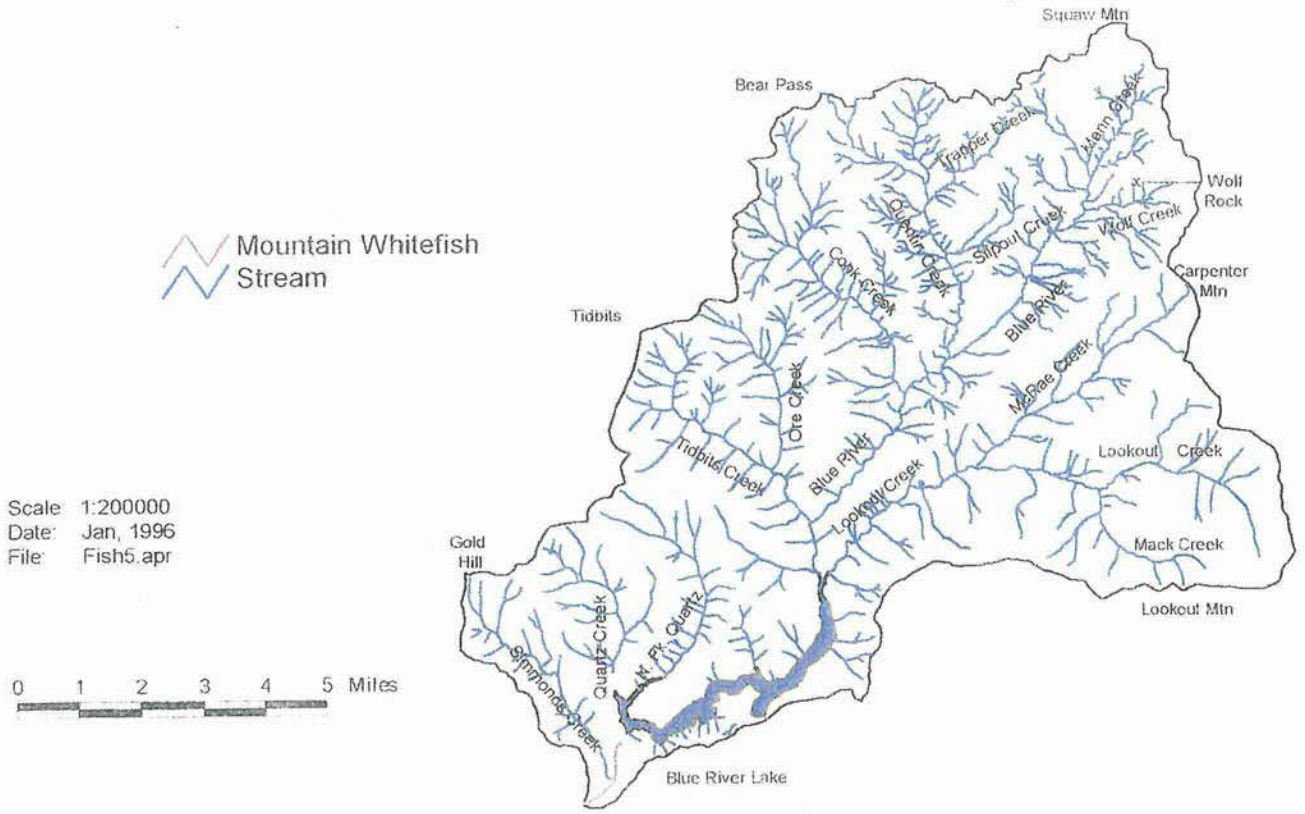
Sculpin and Chinook Salmon Distribution



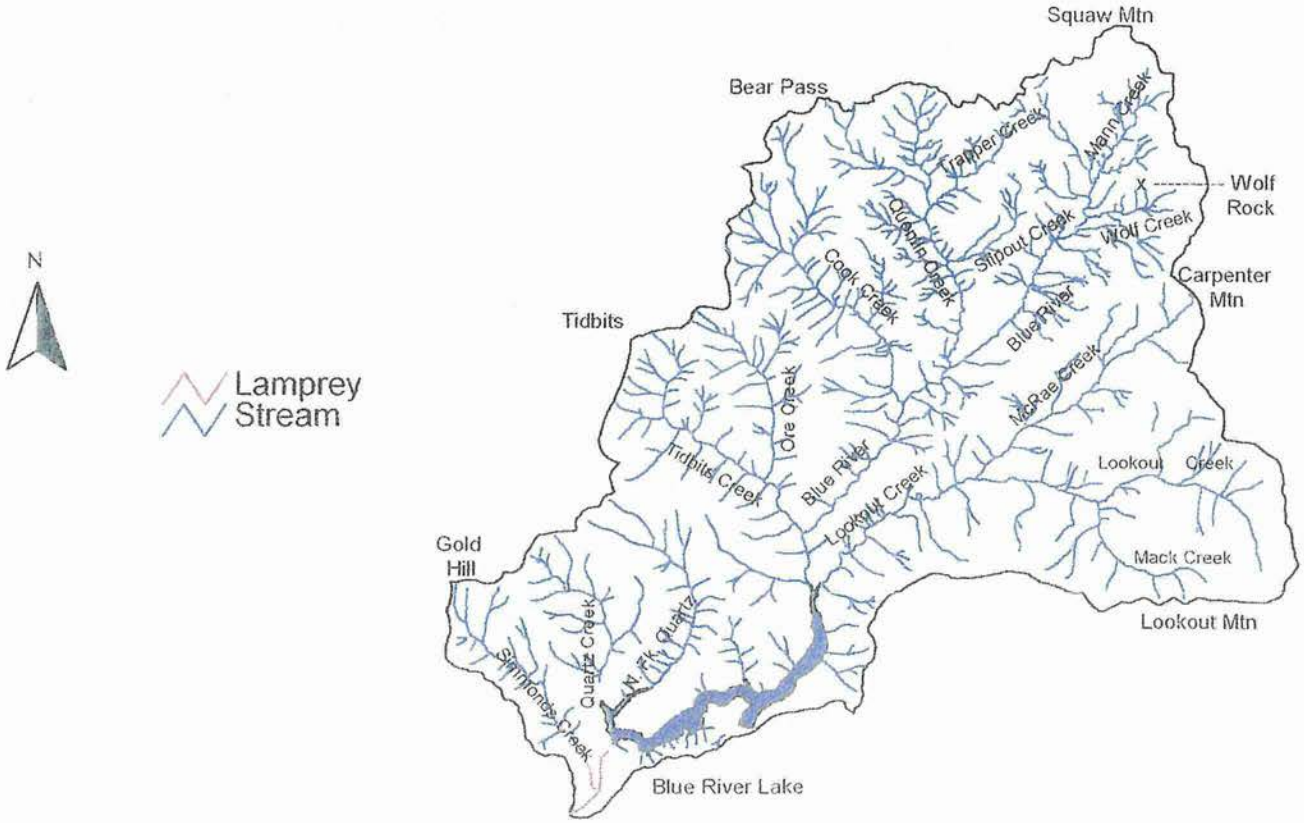


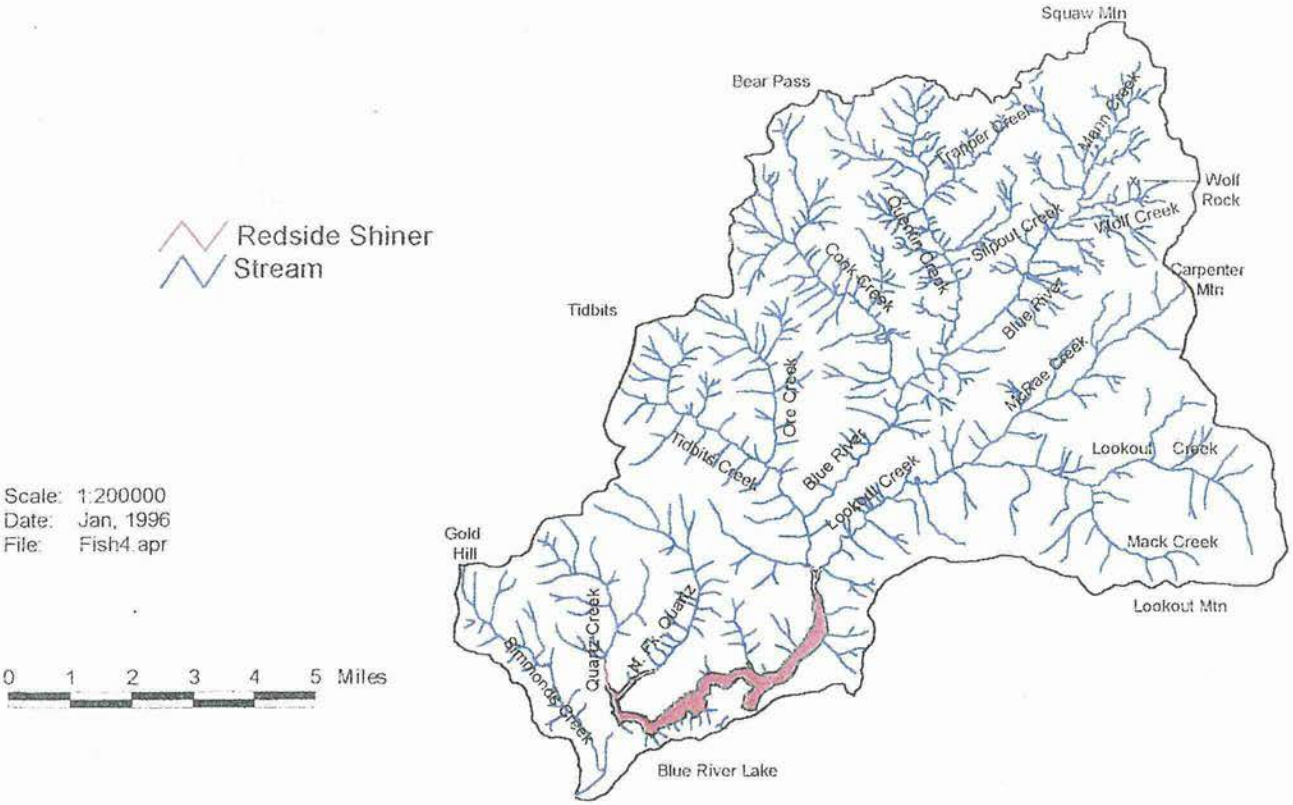
Largescale Sucker and Mountain Whitefish Distribution





Lamprey and Redside Shiner Distribution





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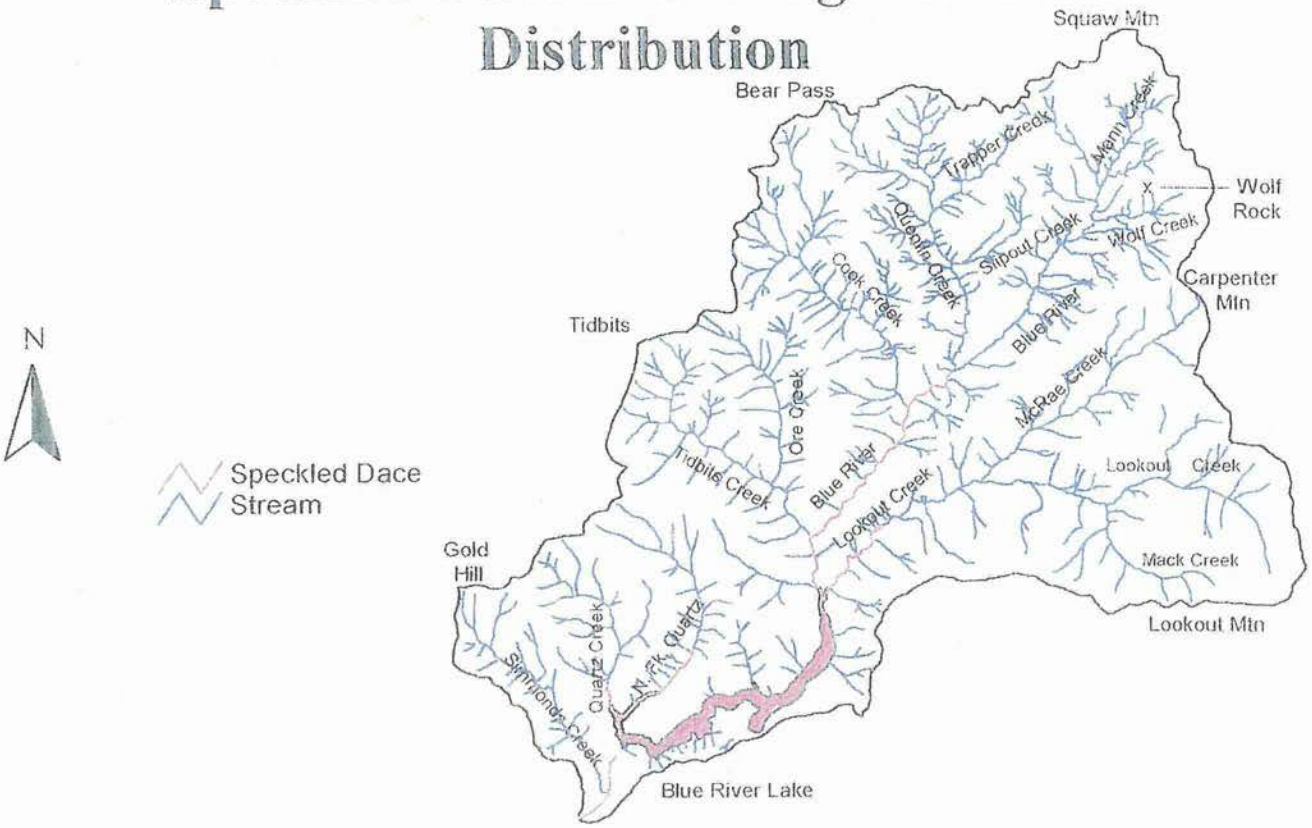
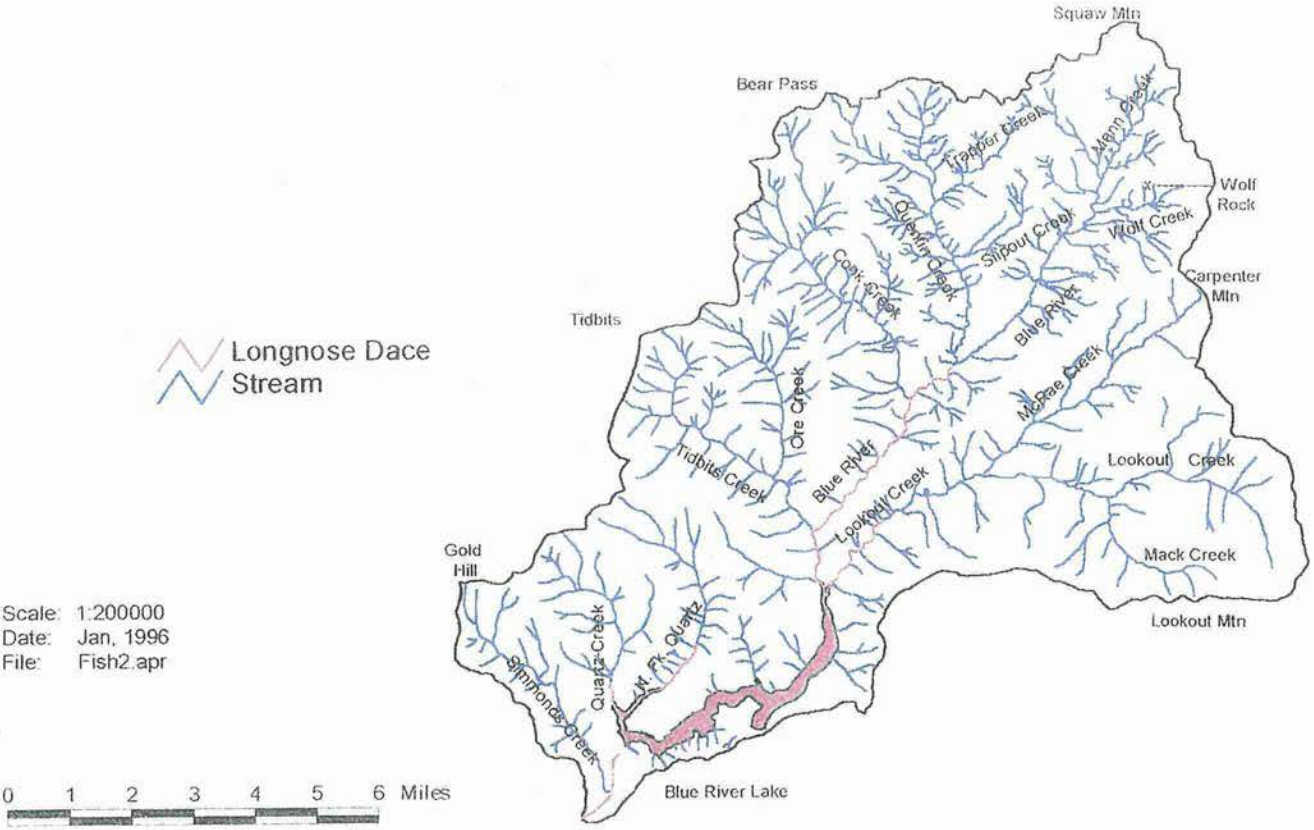
Speckled Dace and Longnose Dace Distribution





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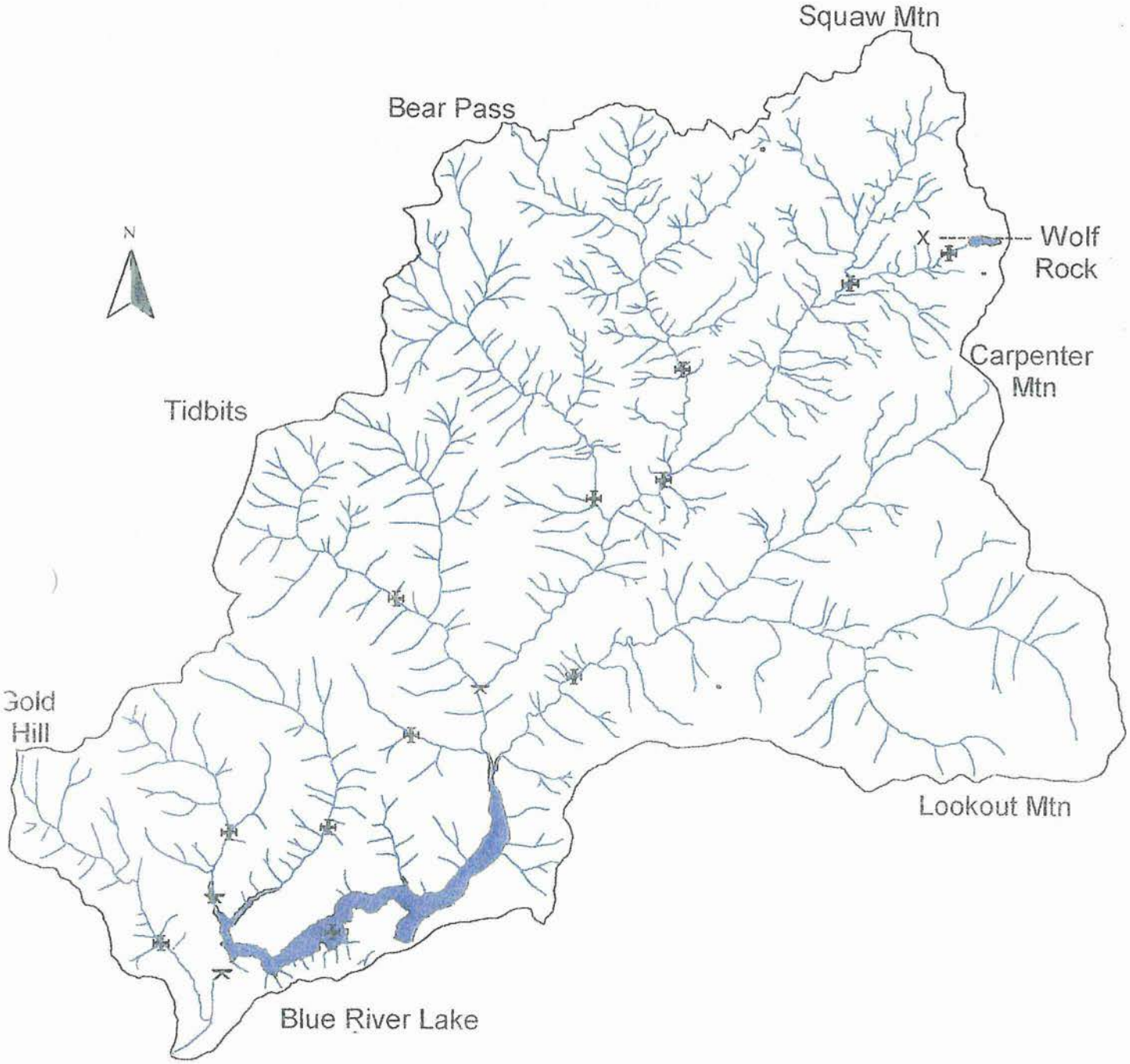
Significant Upstream Migration Barriers



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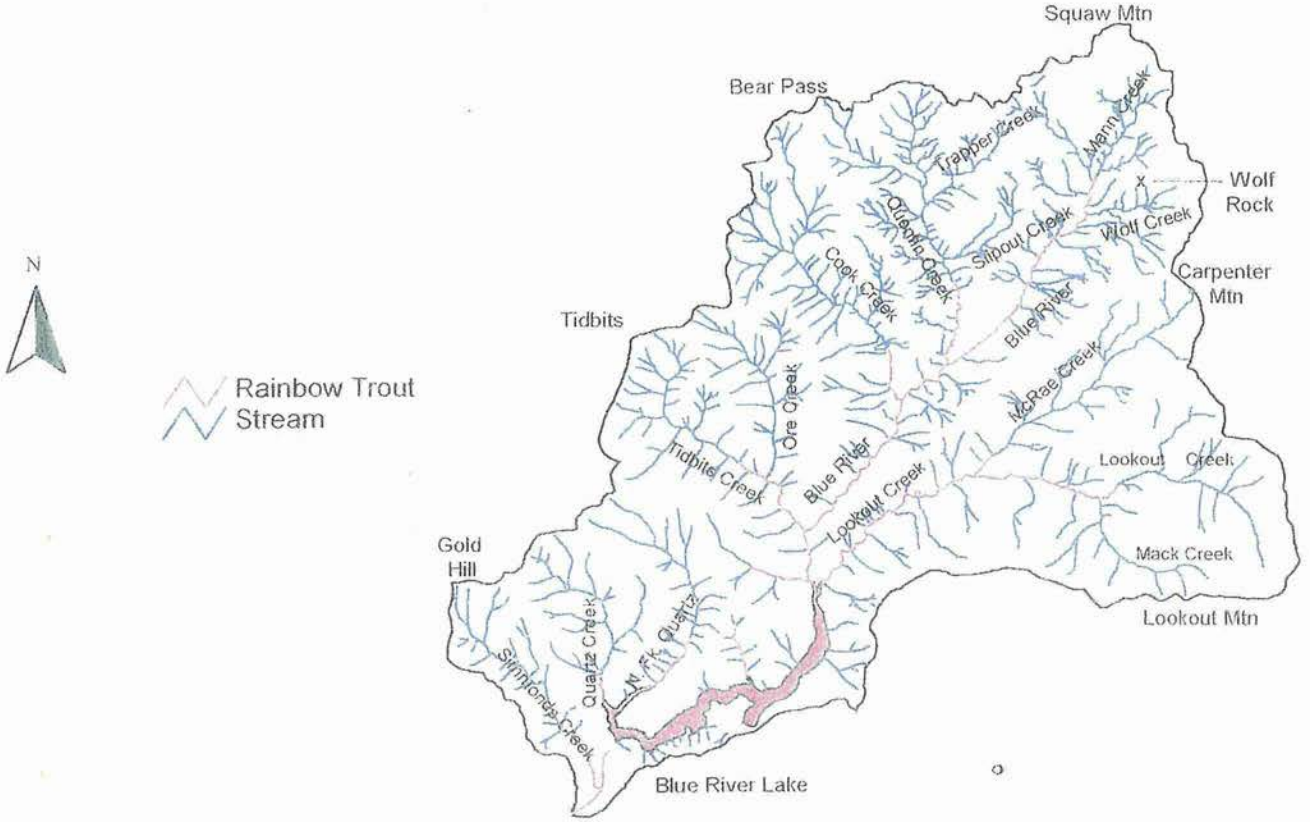
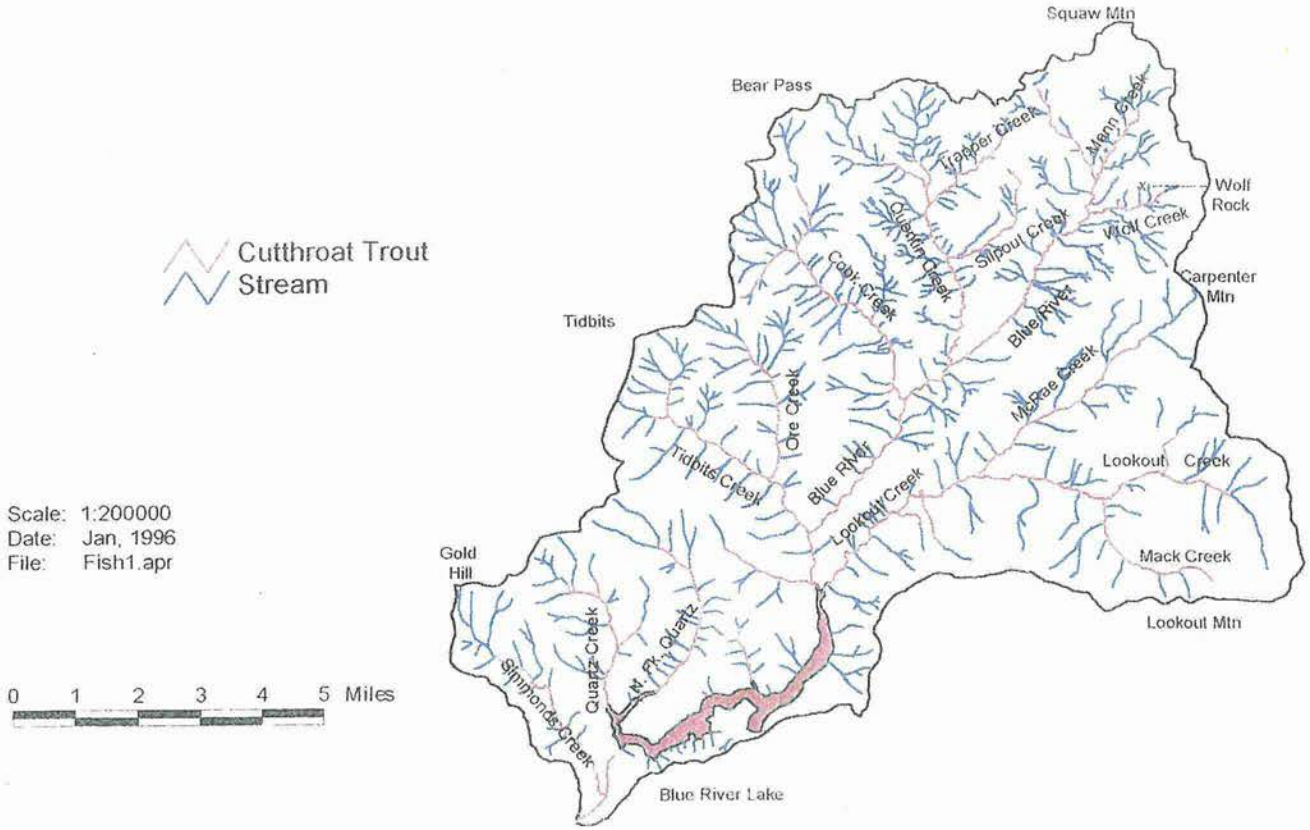
0 1 2 3 4 5 Miles

human barrier

natural barrier

Rainbow Trout and Cutthroat Trout Distribution





Appendix Survey & Manage Species: Bryophytes, Fungi, Lichen, & Vascular Plants

BRYOPHYTE

Species	Rating	Survey Strategies	Seral Stage	Habitat	Elevation
Ptilidium californicum	1	1, 2	LS/OG	LDD, M/W	high
Antitrichia curtipendula	1	4	LS/OG	RZ, M/W	low
Douinia ovata	1	4	LS/OG	RZ, M/W, RO	low to mid
Kurzia makinoana	3	1, 2	LS/OG	RZ, LDD, M/W	low
Marsupella emarginata var. aquatica	3	1, 2		RZ	mid to high
Tritomaria exsectiformis	3	1, 2	LS/OG	RZ, RO	low to high
Plagiochila satori	3	1, 3	LS/OG	LDD, RO	low
Tetraphis geniculata	3	1, 3	LS/OG	LDD, M/W	low to mid
Tritomaria quinquedentata	3	1, 3	LS/OG	RO	
Scouleria marginata	3	4		RZ	
Bartramiopsis lescurii	4	1, 3	LS/OG	LDD	
Encalypta brevicolla ssp. crumiana	4	1, 3	LS/OG	M/W, RO	

FUNGI - Mycorrhizal

Species	Rating	Survey Strategies	Seral Stage	Habitat	Elevation
Destuntzia fusca	1	1, 3	LS/OG		low
Leucogaster microsporus	1	1, 3	LS/OG	LDD	mid
Boletus piperatus	1	3		LDD	low to mid
Gomphus clavatus	1	3	LS/OG		
Gomphus floccosus	1	3	LS/OG		
Hydnum repandum	1	3	LS/OG, 2G		
Rhizopogon truncatus	1	3	LS/OG		high
Cantharellus cibarius	1	3, 4	LS/OG, 2G	LDD	
Cantharellus subalbidus	1	3, 4	LS/OG, 2G	LDD	
Choiromyces venosus	2	1, 3	LS/OG		
Ramaria rubrievanescens	2	1, 3	LS/OG	LDD	
Rhizopogon inquinatus	2	1, 3	LS/OG, 2G	LDD	
Alpova alexsmithii	3	1, 3	LS/OG		mid to high
Arcangeliella crassa	3	1, 3	LS/OG	LDD	mid to high
Boletus haematinus	3	1, 3			high
Boletus pulcherrimus	3	1, 3	LS/OG		low to mid
Cantharellus formosus	3	1, 3	LS/OG	LDD	
Choiromyces alveolatus	3	1, 3	LS/OG	LDD	mid to high
Cortinarius boulderensis	3	1, 3	LS/OG		low to high
Cortinarius magnivelatus	3	1, 3	LS/OG		low to high

Appendix Survey & Manage Species: Bryophytes, Fungi, Lichen, & Vascular Plants

BRYOPHYTE

Species	Rating	Survey Strategies	Seral Stage	Habitat	Elevation
Ptilidium californicum	1	1, 2	LS/OG	LDD, M/W	high
Antitrichia curtipendula	1	4	LS/OG	RZ, M/W	low
Douinia ovata	1	4	LS/OG	RZ, M/W, RO	low to mid
Kurzia makinoana	3	1, 2	LS/OG	RZ, LDD, M/W	low
Marsupella emarginata var. aquatica	3	1, 2		RZ	mid to high
Tritomaria exsectiformis	3	1, 2	LS/OG	RZ, RO	low to high
Plagiochila satori	3	1, 3	LS/OG	LDD, RO	low
Tetraphis geniculata	3	1, 3	LS/OG	LDD, M/W	low to mid
Tritomaria quinquedentata	3	1, 3	LS/OG	RO	
Scouleria marginata	3	4		RZ	
Bartramiopsis lescurii	4	1, 3	LS/OG	LDD	
Encalypta brevicolla ssp. crumiana	4	1, 3	LS/OG	M/W, RO	

FUNGI - Mycorrhizal

Species	Rating	Survey Strategies	Seral Stage	Habitat	Elevation
Destuntzia fusca	1	1, 3	LS/OG		low
Leucogaster microsporus	1	1, 3	LS/OG	LDD	mid
Boletus piperatus	1	3		LDD	low to mid
Gomphus clavatus	1	3	LS/OG		
Gomphus floccosus	1	3	LS/OG		
Hydnum repandum	1	3	LS/OG, 2G		
Rhizopogon truncatus	1	3	LS/OG		high
Cantharellus cibarius	1	3, 4	LS/OG, 2G	LDD	
Cantharellus subalbidus	1	3, 4	LS/OG, 2G	LDD	
Choiromyces venosus	2	1, 3	LS/OG		
Ramaria rubrievanescens	2	1, 3	LS/OG	LDD	
Rhizopogon inquinatus	2	1, 3	LS/OG, 2G	LDD	
Alpova alexsmithii	3	1, 3	LS/OG		mid to high
Arcangeliella crassa	3	1, 3	LS/OG	LDD	mid to high
Boletus haematinus	3	1, 3			high
Boletus pulcherrimus	3	1, 3	LS/OG		low to mid
Cantharellus formosus	3	1, 3	LS/OG	LDD	
Choiromyces alveolatus	3	1, 3	LS/OG	LDD	mid to high
Cortinarius boulderensis	3	1, 3	LS/OG		low to high
Cortinarius magnivelatus	3	1, 3	LS/OG		low to high

Appendix Survey & Manage Species: Bryophytes, Fungi, Lichen, & Vascular Plants

FUNGI - Mycorrhizal

Species	Rating	Survey Strategies	Seral Stage	Habitat	Elevation
Dermocybe humboldtensis	3	1, 3	LS/OG		low
Gastroboletus ruber	3	1, 3	LS/OG	LDD	mid to high
Gautieria magnicellaris	3	1, 3	LS/OG		high
Hebeloma olympiana	3	1, 3	LS/OG		low to high
Hygrophorus caeruleus	3	1, 3	LS/OG		low to high
Hygrophorus vernalis	3	1, 3	LS/OG		low to high
Leucogaster citrinus	3	1, 3	LS/OG	LDD	low to high
Martellia idahoensis	3	1, 3	LS/OG		mid to high
Martellia monticola	3	1, 3	LS/OG	LDD	mid to high
Phaeocollybia californica	3	1, 3	LS/OG	M/W	low to high
Phaeocollybia carmanahensis	3	1, 3	LS/OG	M/W	low to high
Phaeocollybia dissiliens	3	1, 3	LS/OG	M/W	low to high
Phaeocollybia gregaria	3	1, 3	LS/OG	M/W	low to high
Phaeocollybia kauffmanii	3	1, 3	LS/OG	M/W	low to high
Phaeocollybia oregonenis	3	1, 3	LS/OG	M/W	low to high
Phaeocollybia piceae	3	1, 3	LS/OG	M/W	low to high
Phaeocollybia scatesiae	3	1, 3	LS/OG	M/W	low to high
Phaeocollybia sipei	3	1, 3	LS/OG	M/W	low to high
Ramaria abietina	3	1, 3	LS/OG	LDD	
Ramaria amyloidea	3	1, 3	LS/OG	LDD	
Ramaria araiospora	3	1, 3	LS/OG	LDD	
Ramaria aurantiisiccescens	3	1, 3	LS/OG	LDD	
Ramaria botryis var. aurantiiramosa	3	1, 3	LS/OG	LDD	
Ramaria celerivirescens	3	1, 3	LS/OG	LDD	
Ramaria claviramulata	3	1, 3	LS/OG	LDD	
Ramaria concolor f. marri	3	1, 3	LS/OG	LDD	
Ramaria concolor f. tsugina	3	1, 3	LS/OG	LDD	
Ramaria coulterae	3	1, 3	LS/OG	LDD	
Ramaria cyaneigranosa	3	1, 3	LS/OG	LDD	
Ramaria fasciculata var. sparsiramosa	3	1, 3	LS/OG	LDD	
Ramaria gelatiniaurantia	3	1, 3	LS/OG	LDD	
Ramaria gracilis	3	1, 3	LS/OG	LDD	
Ramaria hilaris var. olympiana	3	1, 3	LS/OG	LDD	
Ramaria largentii	3	1, 3	LS/OG	LDD	
Ramaria lorithamnus	3	1, 3	LS/OG	LDD	
Ramaria maculatipes	3	1, 3	LS/OG	LDD	
Ramaria rainierensis	3	1, 3	LS/OG	LDD	
Ramaria rubella var. blanda	3	1, 3	LS/OG	LDD	

Appendix Survey & Manage Species: Bryophytes, Fungi, Lichen, & Vascular Plants

FUNGI - Mycorrhizal

Species	Rating	Survey Strategies	Seral Stage	Habitat	Elevation
Ramaria rubribrunnescens	3	1, 3	LS/OG	LDD	
Ramaria rubripermanens	3	1, 3	LS/OG	LDD	
Ramaria spinulosa	3	1, 3	LS/OG	LDD	
Ramaria stuntzii	3	1, 3	LS/OG	LDD	
Ramaria suecica	3	1, 3	LS/OG	LDD	
Ramaria thiersii	3	1, 3	LS/OG	LDD	
Ramaria verlotensis	3	1, 3	LS/OG	LDD	
Rhizopogon brunneiniger	3	1, 3	LS/OG		low to high
Rhizopogon exiguus	3	1, 3	LS/OG		low
Catathelasma ventricosa	3	3	LS/OG		low to mid
Cortinarius azureus	3	3	LS/OG		low to high
Cortinarius cyanites	3	3	LS/OG		low to high
Cortinarius spilomius	3	3	LS/OG		low to high
Cortinarius tabularis	3	3	LS/OG		low to high
Cortinarius valgus	3	3	LS/OG		low to high
Gomphus bonarii	3	3	LS/OG		
Gomphus kauffmanii	3	3	LS/OG		
Hydnum umbilicatum	3	3	LS/OG, 2G		
Hygrophorus karstenii	3	3	LS/OG		low to high
Phaeocollybia attenuata	3	3	LS/OG	M/W	low to high
Phaeocollybia fallax	3	3	LS/OG	M/W	low to high
Phaeocollybia olivacea	3	3	LS/OG	M/W	low to high
Phaeocollybia pseudofestiva	3	3	LS/OG	M/W	low to high
Phaeocollybia spadicea	3	3	LS/OG	M/W	low to high
Phellodon atratum	3	3	LS/OG, 2G		
Rhizopogon atroviolaceus	3	3	LS/OG		high
Russula mustelina	3	3	LS/OG		low to mid
Sarcodon fuscoindicum	3	3	LS/OG, 2G		
Sarcodon imbricatus	3	3	LS/OG, 2G		
Thaxterogaster pingue	3	3		LDD	mid to high
Cantharellus tubaeformis	3	3, 4	LS/OG	LDD	
Albatrellus avellaneus	4	1, 3	LS/OG		
Cortinarius canabarba	4	1, 3	LS/OG	LDD	
Cortinarius rainierensis	4	1, 3	LS/OG	LDD	
Cortinarius variipes	4	1, 3	LS/OG	LDD	
Nivatogastrium nubigenum	4	1, 3	LS/OG	LDD, D	mid to high
Sedecula pulvinata	4	1, 3	LS/OG	LDD	mid to high
Tricholoma venenatum	4	1, 3	LS/OG	LDD	low to mid

Appendix Survey & Manage Species: Bryophytes, Fungi, Lichen, & Vascular Plants

FUNGI - Mycorrhizal

Species	Rating	Survey Strategies	Seral Stage	Habitat	Elevation
Albatrellus ellisii	4	3	LS/OG		
Albatrellus flettii	4	3	LS/OG		
Rhizopogon abietis	4	3	LS/OG		high

FUNGI - Saprobe

Species	Rating	Survey Strategies	Seral Stage	Habitat	Elevation
Sparassis crispa	1	3	LS/OG		low to mid
Clavariadelphus ligula	1	3, 4	LS/OG	LDD, M/W	
Aleurodiscus farlowii	2	1, 3	LS/OG	LDD	
Plectania melastoma	2	3	LS/OG	LDD	
Bondarzewia montana	3	1, 2, 3	LS/OG	LDD	high
Oxyporus nobilissimus	3	1, 2, 3	LS/OG	LDD	
Clitocybe senilis	3	1, 3	LS/OG	LDD, M/W	low to mid
Clitocybe subditopoda	3	1, 3	LS/OG	LDD, M/W	low to mid
Collybia bakerensis	3	1, 3	LS/OG	LDD	low to mid
Dichostereum granulosum	3	1, 3	LS/OG	LDD	
Gelatindiscus flavidus	3	1, 3	LS/OG		
Gymnopilus puntifolius	3	1, 3	LS/OG	LDD	low to mid
Helvella compressa	3	1, 3	LS/OG	RZ, M/W	low to mid
Helvella crassitunicata	3	1, 3	LS/OG	RZ, M/W	low to mid
Helvella elastica	3	1, 3	LS/OG	RZ, M/W	low to mid
Helvella maculata	3	1, 3	LS/OG	RZ, M/W	low to mid
Marasmius applanatipes	3	1, 3	LS/OG	LDD	low to mid
Mycena hudsoniana	3	1, 3	LS/OG	RZ, LDD	low to mid
Mycena monticola	3	1, 3	LS/OG	RZ, LDD	low to mid
Mycena overholtzii	3	1, 3	LS/OG	RZ, LDD	low to mid
Mycena quinaultensis	3	1, 3	LS/OG	RZ, LDD	low to mid
Neournula pouchetii	3	1, 3	LS/OG	LDD	
Otidea smithii	3	1, 3	LS/OG	LDD, M/W	low to mid
Pholiota albivelata	3	1, 3	LS/OG	RZ, LDD	low to mid
Pithya vulgaris	3	1, 3			high
Plectania latahensis	3	1, 3	LS/OG	LDD	high
Plectania milleri	3	1, 3		LDD	high
Asterophora lycoperdoides	3	3	LS/OG	LDD	
Asterophora parasitica	3	3	LS/OG	LDD	

Appendix Survey & Manage Species: Bryophytes, Fungi, Lichen, & Vascular Plants

FUNGI - Saprobe

Species	Rating	Survey Strategies	Seral Stage	Habitat	Elevation
Baeospora myriadophylla	3	3	LS/OG	LDD	low to mid
Chrysomphalina grossula	3	3	LS/OG	LDD	low to mid
Clavicorona avellanea	3	3	LS/OG	LDD, M/W	low to mid
Cordycepys capitata	3	3	LS/OG	LDD	
Cordycepys ophioglossoides	3	3	LS/OG	LDD	
Cudonia monticola	3	3	LS/OG	LDD	
Cyphellostereum laeve	3	3	LS/OG	M/W	
Fayodia gracilipes (rainierensis)	3	3	LS/OG	LDD	low to mid
Gallerina atkinsoniana	3	3	LS/OG	M/W	
Gallerina cerina	3	3	LS/OG	M/W	
Gallerina heterocystis	3	3	LS/OG	M/W	
Gallerina sphagnicola	3	3	LS/OG	RZ, M/W	
Gallerina vaittaeformis	3	3	LS/OG	M/W	
Hypomyces luteovirens	3	3	LS/OG	LDD	
Mycena lilacifolia	3	3	LS/OG	RZ, LDD	low to mid
Mycena marginella	3	3	LS/OG	RZ, LDD	low to mid
Mycena tenax	3	3	LS/OG	RZ, LDD	low to mid
Mythicomyces corneipes	3	3	LS/OG	LDD	low to mid
Otidea leporina	3	3	LS/OG	LDD, M/W	low to mid
Otidea onotica	3	3	LS/OG	LDD, M/W	low to mid
Podostroma alutaceum	3	3	LS/OG	LDD	
Rickenella setipes	3	3	LS/OG	RZ, M/W	
Sarcosphaera eximia	3	3		D	
Spathularia flavida	3	3	LS/OG	LDD	
Stagnicola perplexa	3	3	LS/OG	LDD	low to mid
Clavariadelphus borealis	3	3, 4	LS/OG	LDD, M/W	
Clavariadelphus lovejoyae	3	3, 4	LS/OG	LDD, M/W	
Clavariadelphus pistilaris	3	3, 4	LS/OG	LDD, M/W	
Clavariadelphus sachalinensis	3	3, 4	LS/OG	LDD, M/W	
Clavariadelphus subfastigiatus	3	3, 4	LS/OG	LDD, M/W	
Clavariadelphus truncatus	3	3, 4	LS/OG	LDD, M/W	
Clavulina cinerea	3	3, 4	LS/OG, 2G	LDD	
Clavulina cristata	3	3, 4	LS/OG, 2G	LDD	
Clavulina ornatipes	3	3, 4	LS/OG, 2G	LDD	
Gyromitra californica	3	3, 4		RZ, LDD	
Gyromitra esculenta	3	3, 4	2G	LDD	
Gyromitra infula	3	3, 4		LDD	
Gyromitra melaleucoides	3	3, 4		LDD	

Appendix Survey & Manage Species: Bryophytes, Fungi, Lichen, & Vascular Plants

FUNGI - Saprobe

Species	Rating	Survey Strategies	Seral Stage	Habitat	Elevation
Gyromitra montana (syn. G. gigas)	3	3, 4		LDD	
Phlogoitis helevlloides	3	3, 4	LS/OG	RZ, LDD	
Phytoconis ericetorum	3	3, 4	LS/OG	LDD	

LICHEN

Species	Rating	Survey Strategies	Seral Stage	Habitat	Elevation
Lobaria linita	1	1, 2, 3	LS/OG	RO	mid to high
Pseudocyphellaria rainierensis	1	1, 2, 3	LS/OG		low to mid
Hydrothyria venosa	1	1, 3	LS/OG	RZ	low to mid
Hypogymnia oceanica	1	1, 3	LS/OG		
Leptogium rivale	1	1, 3	LS/OG	RZ, RO	low to mid
Nephroma occultum	1	1, 3	LS/OG		low to mid
Calicium viride	1	4	LS/OG		
Lobaria oregana	1	4	LS/OG	M/W	low to mid
Lobaria pulmonaria	1	4	LS/OG	M/W, RO	low to mid
Lobaria scrobiculata	1	4	LS/OG	M/W, RO	low
Nephroma bellum	1	4	LS/OG	M/W, RO	low
Nephroma helveticum	1	4	LS/OG	M/W, RO	low
Nephroma laevigatum	1	4		M/W, RO	
Nephroma parile	1	4	LS/OG	M/W, RO	low
Nephroma resupinatum	1	4	LS/OG	M/W	low
Peltigera collina	1	4	LS/OG	M/W, RO	low
Pseudocyphellaria anomala	1	4	LS/OG	M/W	low
Pseudocyphellaria anthraspis	1	4	LS/OG	M/W	low
Pseudocyphellaria crocata	1	4	LS/OG	M/W	low
Stenocybe major	1	4	LS/OG		
Sticta beauvoisii	1	4	LS/OG	M/W	low
Sticta fuliginosa	1	4	LS/OG	M/W, RO	low
Sticta limbata	1	4	LS/OG	M/W	low
Dermatocarpon luridum	2	1, 3	LS/OG	RZ	low to mid
Leptogium burnetiae var. hirsutum	2	4		RZ	
Leptogium cyanescens	2	4		RZ	
Usnea longissima	2	4		RZ	low to mid
Dendriscocaulon intricatulum	3	1, 3	LS/OG	RZ, M/W	low to mid
Lobaria hallii	3	1, 3		RZ, M/W	low to mid

Appendix Survey & Manage Species: Bryophytes, Fungi, Lichen, & Vascular Plants

LICHEN

Species	Rating	Survey Strategies	Seral Stage	Habitat	Elevation
Pannaria rubiginosa	3	1, 3	LS/OG		low to mid
Pilophorus nigricaule	3	1, 3	LS/OG	RO	
Tholurna dissimilis	3	1, 3	LS/OG		high
Cladonia norvegica	3	3	LS/OG		
Calicium abietinum	3	4	LS/OG		
Calicium adaequatum	3	4	LS/OG		
Calicium adspersum	3	4	LS/OG		
Calicium glaucellum	3	4	LS/OG		
Cetrelia cetrarioides	3	4		RZ	
Chaenotheca brunneola	3	4	LS/OG		
Chaenotheca chrysocephala	3	4	LS/OG		
Chaenotheca ferruginea	3	4	LS/OG		
Chaenotheca furfuracea	3	4	LS/OG		
Chaenotheca subroscida	3	4	LS/OG		
Chaenothecopis pusilla	3	4	LS/OG		
Collema nigrescens	3	4		RZ	
Cyphelium inquinans	3	4	LS/OG		
Leptogium teretiusculum	3	4		RZ	low to mid
Microcalicium arenarium	3	4	LS/OG		
Mycocalicium subtile	3	4	LS/OG		
Pannaria leucostictoides	3	4	LS/OG	M/W	low
Pannaria mediterranea	3	4	LS/OG	M/W, RO	low
Pannaria saubinetii	3	4	LS/OG	M/W, RO	low to high
Peltigera neckeri	3	4	LS/OG	LDD, M/W, RO	low
Peltigera pacifica	3	4	LS/OG	LDD, M/W	low
Ramalina thrausta	3	4		RZ	
Stenocybe clavata	3	4	LS/OG		
Heterodermia sitchensis	4	3	LS/OG, 2G		
Hygomnia vittata	4	3	LS/OG, 2G		
Hypotrachyna revoluta	4	3	LS/OG		high
Nephroma isidiosum	4	3	LS/OG, 2G	RO	mid

VASCULAR PLANT

Species	Rating	Survey Strategies	Seral Stage	Habitat	Elevation
Allotropa virgata	1	1, 2	LS/OG	LDD, D	low to high

Appendix **Survey & Manage Species: Bryophytes, Fungi, Lichen, & Vascular Plants**

VASCULAR PLANT

Species	Rating	Survey Strategies	Seral Stage	Habitat	Elevation
Botrychium minganense	2	1, 2	LS/OG	RZ, M/W	mid
Botrychium montanum	2	1, 2	LS/OG	LDD, M/W	mid
Corydalis aquae-gelidae	3	1, 2		RZ	low to mid
Cypripedium montanum (west Cascades)	3	1, 2	2G	M/W	low to mid
Habenaria orbiculata	3	1, 2	LS/OG	RZ, LDD, M/W	mid to high

Rating:1=Species present; 2=Species highly probable; 3=Species suspected; 4=Insufficient data on habitat and/or range to determine status.
Survey Stategies:1=Manage known sites, activities implemented must include provisions for known sites; 2=survey prior to activities and manage sites, activites implemented in 1999 or later must have completed surveys; 3=Conduct extensive surveys starting in 1996 and manage sites; 4=Conduct general regional surveys starting in 1996.
Seral Stage:LS/OG=late successional/oldgrowth; 2G=2nd growth.
Habitat:RZ=riparian zones; LDD=litter, down & duff; M/W=mesic/wet; D=dry; RO=rock outcrops, & cliffs.

Appendix E -- Wildlife

Number of Spotted Owl Activity Centers Within the Watershed Above and Below the TakeThreshold

% and Amount of suitable habitat within 1.2 miles of the activity center	Number of activity centers
Greater than 50% (>1478 acres)	30
Greater than 40% (1182-1477 acres)	4
30% to 40% (887-1181 acres)	1
Less than 30% (<886 acres)	2
TOTAL	37

Spotted Owl Pairs in the Blue River Watershed with High Reproductive Rates and Suitable Habitat Acres Within a 1.2 Mile Radius of their Activity Centers

Spotted Owl Pair	Acres of Suitable habitat within a 1.2 mile radius of activity center
Cook Creek	2072
Mack Creek	1872
Lookout Mountain	2038
Upper Lookout Creek	2082
Watershed 2	1639
North Carpenter	1506

Suitable northern spotted owl habitat within a 1.2 mile radius of activity centers within the Central Cascades Adaptive Management Area, Critical Habitat Unit OR-16, and LSRs RO 215 and 217.

MSNO	DIST	NESTING HABITAT (ac)1)	FORAGING HABITAT (ac)1)	TOTAL HABITAT NRF(ac)1)	PAIR STATUS	TAKE 2)	AMA	CHU	LSR 3)
0017 *	BR	848	269	1117	PN	Y	X	X	
0029	BR	1448	194	1642	PN	N	X	X	
0030	BR	1986	207	2093	PN	N	X	X	
0032	BR	1952	125	2077	PN	N	X	X	
0033	BR	1223	719	1942	PN	N	X	X	
0043	BR	1771	216	1987	PN	N	X	X	
0104	BR	742	90	832	PN	Y	X		
0105	BR	902	581	1483	PN	N	X	X	
0106	BR	1552	313	1865	PN	N	X	X	
0107	BR	1210	302	1512	P	N	X	X	
0111	BR	309	1300	1609	PN	N	X	X	
0112	BR			2533	PN	N		X	X
0859	BR	715	1022	1737	PN	N	X	X	
0860	BR	760	1126	1886	PN	N	X	X	
0861	BR			1060	P	Y	X	X	
0870	BR	723	1117	1840	PN	N	X	X	
0871	BR	143	558	701	P	Y	X	X	
1416	BR			1103	PN	Y	X	X	
1817	BR			2135	PN	N	X	X	
2028	BR	1394	137	1531	P	N	X	X	
2029	BR	1741	294	2035	PN	N	X	X	
2030	BR	227	1175	1402	PN	N	X	X	
2032	BR	435	1047	1482	PN	N	X	X	
2033	BR	768	1032	1800	PN	N	X	X	
2036	BR	873	996	1869	PN	N	X	X	
2414	BR			628	P	Y	X	X	
2420	BR			1016	P	Y	X	X	
2422	BR	1477	271	1748	PN	N	X	X	
2426	BR	1462	188	1650	PN	N	X	X	
2430	BR			1022	P	Y	X	X	
2433	BR			1118	PN	Y	X	X	
2434	BR			497	PN	Y	X	X	
2435	BR	767	437	1204	PN	N	X	X	
2436	BR	308	1145	1453	P	N	X	X	
2439	BR	597	917	1514	PN	N	X	X	
2443	BR			na			X	X	
2948	BR	1080	1042	2122	P	N	X	X	
2450	BR			1056	PN	Y	X	X	
2452	BR			na			X	X	
3025	BR	1478	324	1802	PN	N	X	X	
3397	BR	1211	383	1594	PN	N	X	X	
3398	BR	161	1512	1673	PN	N	X	X	
3400	BR	1481	170	1651	P	N	X	X	
3401	BR	502	2011	2513	S	N		X	X
3960	BR	1059	607	1666	P	N	X	X	
4085	BR	514	1130	1644	P	N	X	X	
5066	BR	1082	878	1960	P	N	X	X	

MSNO	DIST	NESTING HABITAT (ac)1)	FORAGING HABITAT (ac)1)	TOTAL HABITAT NRF(ac)1)	PAIR STATUS	TAKE 2)	AMA	CHU	LSR 3)
5070	BR			1499	S	N			X
5071	BR			2630	P	N			X
0152	BLM	498	519	1017	PN	Y	X		
0163	BLM	1214	258	1572	S	N	X		
2126	BLM	765	145	910	P	Y	X		
2133	BLM	252	455	707	P	Y	X		
2134	BLM	326	778	1104	PN	Y	X		
4108	BLM	193	277	470	na	Y	X		
4109	BLM	1539	749	2288	S	N	X		
4110	BLM	176	52	228	S	Y	X		
0011	SH			1675	PN	N			Y
0014	SH			2171	PN	N		X	Y
0619	SH			1320	S	N		X	Y
0641	SH			2497	P	N			Y
0646	SH			2751	P	N			Y
0702	SH			2121	PN	N		X	
0644	SH			na	P	N	X		
0661	SH			295	S	Y	X		
0680	SH			1798	S	N	X		
0687	SH			2195	P	N	X		
0688	SH			1286	PN	N	X		
0697	SH			1317	S	N	X	X	
0698	SH			1222	P	N	X	X	
0702	SH			2121	PN	N	X		
2460	SH			2130	PN	N		X	Y
2956	SH			1673	PN	N			Y
2959	SH			2452	P	N		X	Y
2960	SH			1806	P	N	X		
2962	SH			2142	P	N		X	Y
2963	SH			1588	PN	N	X		
2966	SH			1087	S	Y	X	X	
2967	SH			1805	S	N			Y
2968	SH			1818	S	N			Y
2976	SH			1129	S	Y	X		
2980	SH			1296	P	N	X		
4095	SH			1203	P	N		X	
4098	SH			849	P	Y			Y
4196	SH			1899	P	N			Y
9002	SH			1611	PN	N		X	Y
0828	MK			1340	PN	N	X		
1739	MK			1743	PN	N	X		
1740	MK			1804	PN	N	X		
2034	MK			1009	PN	Y	X		
2035	MK			1176	P	Y	X		
2412	MK			1670	P	N	X		
2417	MK			1646	P	N	X	X	
2836	MK			1275	P	N	X	X	
2837	MK			1304	S	N	X	X	
2839	MK			1404	P	N	X		

* Sites within the Blue River Watershed are in italics.

1) Within 1.2 mile radius of activity center.

2) Take as defined by the U.S. Fish & Wildlife Service is less than 1182 suitable acres within 1.2 miles of the habitat activity center.

3) X=LSR 0217 Y=LSR 0215

Appendix F -- References

References

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