

CANADA LYNX HABITAT INVENTORY -
PINE CREEK,
COEUR D'ALENE BASIN, IDAHO

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June 2002

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INTRODUCTION

The Canada lynx (*Lynx canadensis*) is a wide ranging forest carnivore. Large feet and long legs distinguish the medium-sized cat as a species that is highly adapted to travel in deep snow characteristic of the boreal and western montane and subalpine regions of North America. Lynx is a specialized predator and uses environments dominated by coniferous or mixed coniferous-deciduous forest with dense undergrowth, but may also utilize open forest, rocky areas, and tundra to forage for abundant prey (Groves et al. 1997; Ruediger et al. 2000). Washington State Department of Natural Resources (1996) and Quade (1999) identify three primary habitat components for lynx in the Pacific Northwest: (1) foraging habitats that support snowshoe hare and provide hunting cover, (2) denning sites, and (3) dispersal/travel cover.

In Idaho lynx are predicted to occur in montane and subalpine coniferous forest habitats (at generally greater than 4000 feet elevation) as far south in the west as the northern Salmon River and Lemhi mountains and east and south on the Yellowstone Highlands and Caribou Range (McKelvey et al. 2000; Wisdom et al. 2000). Several lynx occurrences are known for the Coeur d'Alene River Basin (Idaho Conservation Data Center 2000). Additional references on the occurrence, ecology, and conservation of lynx in Idaho include Clark et al. (1989), Idaho Conservation Effort (1998), Koehler and Aubry (1994), Koehler and Hornocker (1979), Lewis and Wenger (1998), Rust (1946), and Terra-Berns et al. (2000). Gaines et al. (2000) and Carrol et al. (2001) provide recent insight to issues concerning lynx habitat conservation planning.

Lynx prey primarily on snowshoe hare (*Lepus americanus*). Thus lynx foraging and denning habitat selection is closely tied to the distribution and quality of snowshoe hare cover and forage habitats. Lynx home range size and population densities vary with the abundance of prey. Population densities are usually less than 0.25 lynx per square mile. In western North America home range sizes have been estimated as 15 to 147 square miles (Groves et al. 1997; Ruediger et al. 2000; Ruggiero et al. 2000).

The US Fish and Wildlife Service listed lynx as threatened in March, 2000 (U. S Fish and Wildlife Service 2000 and see U. S. Fish and Wildlife Service 1994; 1997; 1998; 1999). USDI Bureau of Land Management and US Fish and Wildlife Service (2000) and Ruediger et al. (2000) recognize habitat inventory and monitoring as important contributions to the conservation of lynx. The objective of this study is to delineate and describe suitable lynx habitats in the Coeur d'Alene River drainage of northern Idaho. The study is ongoing. In 2000 work was completed in the upper Latour and West Fork Pine Creek drainages (Rust, 2001).

METHODS

The study area encompasses Bureau of Land Management lands within the Latour Creek, Pine Creek, and (to a lesser extent) the Rochat Creek drainages of the Coeur d'Alene River Basin, east of Coeur d'Alene, Idaho. These lands fall within the Latour Creek and Pine Creek Lynx Analysis Units (LAU's)

I conducted lynx habitat field inventory work in stands targeted as suitable using (1) criteria summarized by Washington State Department of Natural Resources (1996), Ruggiero et al. (2000), and Quade (1999) (Box 1) and (2) a vegetation map prepared by Upper Columbia - Salmon Clearwater District (2000). Vegetation covertype mapping units are classified using the system identified by Landscape Analysis Lab (1999) (Table 1).

I used both stand level and fixed area sampling techniques to document the composition and structure of targeted stands. Stand level point observation data are intended to rapidly accumulate a large number of geographically referenced points where knowledge of the vegetation is linked to base (e.g., simple environmental data such as elevation and slope aspect and gradient). On a walking route through an area selected for study, data on the plant association, ecological condition and seral status, and the physical environment are collected. New data are collected as a new plant association is encountered or with any

General definition of lynx habitat: sites capable of maintaining ≥ 180 trees per acre (tpa) or ≥ 70 percent canopy cover of mature trees, with (in either case) tree foliage extending at least 3.3 feet above the mean annual average snow depth.

Lynx habitat components:

Component	Description
Non-Lynx Habitat	Areas generally avoided by lynx. For example, natural openings created by meadows or lakes that are not capable of meeting the general definition of lynx habitat.
Temporary Non-Lynx Habitat	Areas temporarily avoided by lynx. Early- to mid-seral sites that are capable of supporting forest vegetation that meets the general definition of lynx habitat.
Forage Habitat	Habitat where lynx consistently find high densities of snowshoe hare, especially in winter. Stands with at least 40 (but often 75 - 80) percent canopy cover provided by small diameter stems and branches that extend at least 3.3 feet above the mean snow level. Forage habitat provides snowshoe hare with insulating cover, protection from predators, and browse. Snowshoe hare winter browse consists of woody stems (≤ 0.25 inch diameter), bark, and coniferous foliage. Snowshoe hare often prefer to browse on hardwoods (especially willows) over conifers.
Travel Habitat	Forested habitats that provide limited snowshoe hare forage habitat and limited denning habitat. Tree canopies are at least 3.3 feet taller than the average snow depth. Tree canopies provide ≥ 70 percent cover.
Denning Habitat	Habitat where lynx prefer to den. Mid- and late-seral stands with abundant jack-strawed dead and down trees exceeding 6 inches in diameter. Canopy cover is usually ≥ 60 percent. North- to northeast-facing slopes.

Box 1. Classification of Lynx habitats. Lynx habitats identified by Washington Department of Natural Resources (1996), Ruggiero et al. (2000), and Quade (1999) are summarized.

significant change in the environmental parameters (slope, aspect, elevation), structural condition, seral status, or ecological condition. Quantitative composition and structure data were collected on 0.1 acre plots using the methods of Bourgeron et al. (1991) and USDA Forest Service (1992). I used conventions modified from Hall et al. (1995) to classify forest stand structural condition and seral status. Geographical positioning system data were collected for plot locations using a Garmin navigation grade unit.

Table 1. Summary of vegetation covertype classification. Vegetation covertype classes occurring within the Latour and Pine Creek LAUs are listed by map unit code and with approximate percent of occurrence. Covertypes are classified as suitable lynx habitat (S); unsuitable, temporary non-lynx (U); or non-lynx habitat (N). Data are drawn from by Upper Columbia - Salmon Clearwater District (2000) and Landscape Analysis Lab (2000). The covertype classification is modified from Landscape Analysis Lab (2000).

Map Code	Covertype Name	Suitability	Percent
3101	Foothills Grassland	N	0.1
3104	Montane Parklands and Subalpine Meadows	N	3.3
3201	Mesic Upland Shrubland	U	2.1
3202	Warm Mesic Shrubland	U	7.8
3203	Cold Mesic Shrubland	U	3.8
4201	Engelmann Spruce (>66 percent cover)	S	< 0.1
4203	Lodgepole Pine (> 66 percent cover)	S	1.8
4206	Ponderosa Pine (> 66 percent cover)	N	< 0.1
4207	Grand Fir (> 66 percent cover)	S	0.7
4208	Subalpine Fir (> 66 percent cover)	S	5.6
4210	Western Red Cedar (> 66 percent cover)	S	0.6
4211	Western Hemlock (> 66 percent cover)	S	0.1
4212	Douglas-fir (> 66 percent cover)	N	0.8
4215	Western Larch (> 66 percent cover)	N	0.9
4220	Mixed Subalpine Forest (subalpine fir, mountain hemlock, Douglas-fir, Engelmann spruce, lodgepole pine)	S	14.7
4221	Mixed Mesic Forest (western redcedar, western hemlock, Douglas-fir, Engelmann spruce, western larch, grand fir, lodgepole pine, western white pine)	S	24.6
4222	Mixed Xeric Forest (ponderosa pine, Douglas-fir, lodgepole pine)	N	7.8
4223	Douglas Fir-Lodgepole Forest (> 80 percent cover)	S	0.5
4225	Douglas-fir-Grand Fir Forest (> 80 percent cover)	S	9.8
4226	Western Red Cedar-Grand Fir Forest (> 80 percent cover)	S	0.1
4227	Western Red Cedar-Western Hemlock Forest (> 80 percent cover)	S	2.7
4229	Western Larch-Douglas-fir Forest (> 80 percent cover)	S	3.0
4301	Mix Needleleaf/Broadleaf Forest	S	< 0.1
5000	Water	N	< 0.1
5200	Lakes and Ponds	N	< 0.1
6101	Needleleaf Dominated Riparian (> 66 percent relative cover)	S	0.6
6102	Broadleaf Dominated Riparian (> 66 percent relative cover)	N	< 0.1
6103	Needleleaf-Broadleaf Riparian Forest (> 25 percent and < 66 percent broadleaf, > 25 percent and < 66 percent needleleaf relative cover)	S	0.4
6104	Mixed Riparian (forest and non-forest)	S	0.4
6202	Shrub Dominated Riparian	U	0.1
6203	Mixed Non-Forest Riparian	U	< 0.1
7300	Exposed Rock (talus)	N	7.6
7500	Mines, Quarries, and Gravel Pits	N	< 0.1
7800	Mixed Barren Land	N	0.1

RESULTS

Lynx habitat field inventories occurred in the lower Latour, upper Rochat, Highland Creek and Douglas Creek drainages within the Coeur d'Alene River Basin during September, 2001. Forty-two plots (including both stand level point observation and fixed area ecology plots) were located in 41 stands that total (approximately) 2,516 acres. The cumulative extent of stands visited during the 2000 and 2001 field seasons is shown in Figure 1. A detailed summary of 2000 and 2001 field inventory results is provided in Appendix 1.

Additional information on stand composition and structure was acquired through the use of geo-referenced photo-points. Field observations and information provided by Upper Columbia - Salmon Clearwater District (2000) were combined to interpolate the occurrence of lynx habitats within the lower Latour Creek, Rochat Creek, Highland Creek and Douglas Creek drainages. The cumulative extent of lynx habitats interpolated through 2000 and 2001 field work is shown in Figure 2.

Snowshoe hare were not observed during the 2001 field season. Snowshoe hare browse was observed on several plots located within the lower Latour Creek, upper Rochat Creek, Highland Creek and Douglas Creek drainages. Locations where snowshoe hare browse was observed in 2000 and 2001 field seasons are shown in Figure 2. Snowshoe hare winter browse was most frequently observed on *Salix scouleriana* (Scouler willow), but also occurred on *Holodiscus discolor* (ocean spray), and *Acer glabrum* (Rocky Mountain maple).

Vascular plant species observed within the study area during the 2000 and 2001 field seasons are listed in Appendix 2. One population of *Thelypteris nevadensis* (a species considered critically imperiled within the state of Idaho) was located in the lower Latour Creek drainage.

DISCUSSION

Lynx utilize a wide range of different habitats throughout the year. Lynx population dispersal and growth are limited, however, by the availability and quality of winter forage habitat. The value, or functionality, of winter forage habitat is dependent on the availability and proximity of denning habitat. Factors that contribute to the distribution and extent of lynx habitats within the study area include: relatively steep gradients in atmospheric and soil moisture availability and soil temperature; disturbance history, particularly the relatively severe fire season of 1910; the mix of public and private land ownerships; and a history of relatively extensive timber harvesting and mining.

The diversity of forest stand structural and seral conditions present within the study area provide a range of lynx winter forage habitats of varying suitability. Due to the continual change in forest stand composition and structure, the availability of suitable lynx forage habitats is spatially and temporally dynamic. Patterns in the distribution and characteristics of forage habitat observed in the Highland Creek and Douglas Creek drainages were similar to those observed in the upper Latour Creek and West Fork Pine Creek drainages (Rust 2001).

Lynx forage habitats were observed primarily on up-slope positions of major ridges and watershed divides. Stands classified as winter forage habitat are primarily mid-seral and dominated by medium-sized (9.0 - 20.9 inch dbh) trees. These stands are in the stem exclusion and understory re-initiation stages of stand development (using the terminology of Oliver and Larson 1996). Stands in the early stages of stem exclusion typically possess remnant lynx winter forage habitat characteristics (suitable hare forage and understory cover) and are currently progressing toward a less suitable condition. As relatively dense pole-sized trees compete for limited growing space foliage is increasingly more concentrated in the upper portion of the canopy, leaving an open understory of shade tolerant, medium-height shrubs and perennial forbs.

Stands in the late stages of stem exclusion (to early stages of understory re-initiation) are progressing toward more suitable lynx winter forage habitat conditions. The mortality of overstory trees allows increasing understory establishment of conifers (which provide understory hiding cover for hare) and re-initiation of growth of deciduous shrub forage. In many stands bark beetle mortality in lodgepole pine is promoting stand understory re-initiation processes and increasing the availability of lynx winter forage habitat conditions.

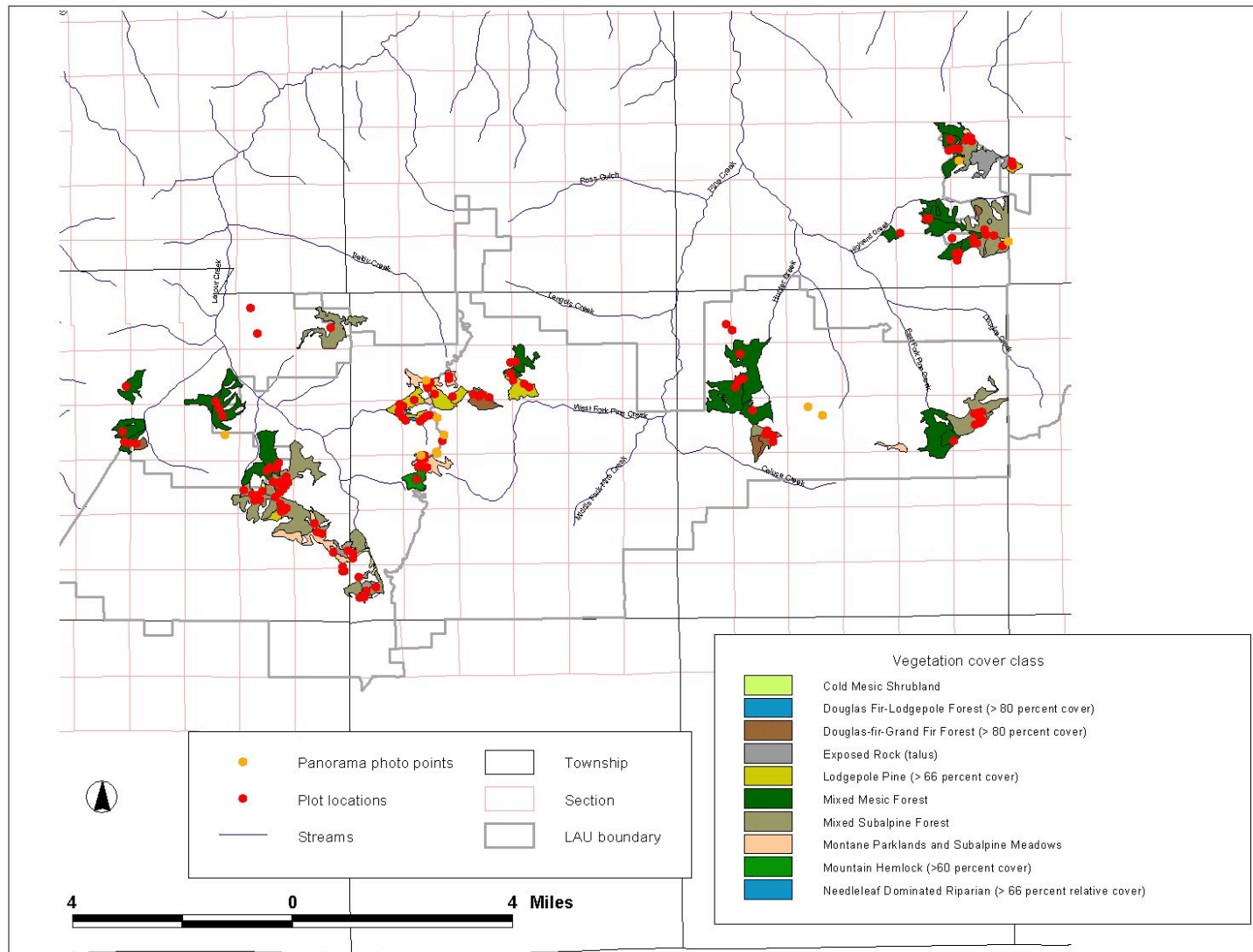


Figure 1. Summary of lynx habitat inventories within Latour Creek and Pine Creek LAU's. The locations of 2000 and 2001 field season sample plots, panoramic photo points, and sampled stands are shown.

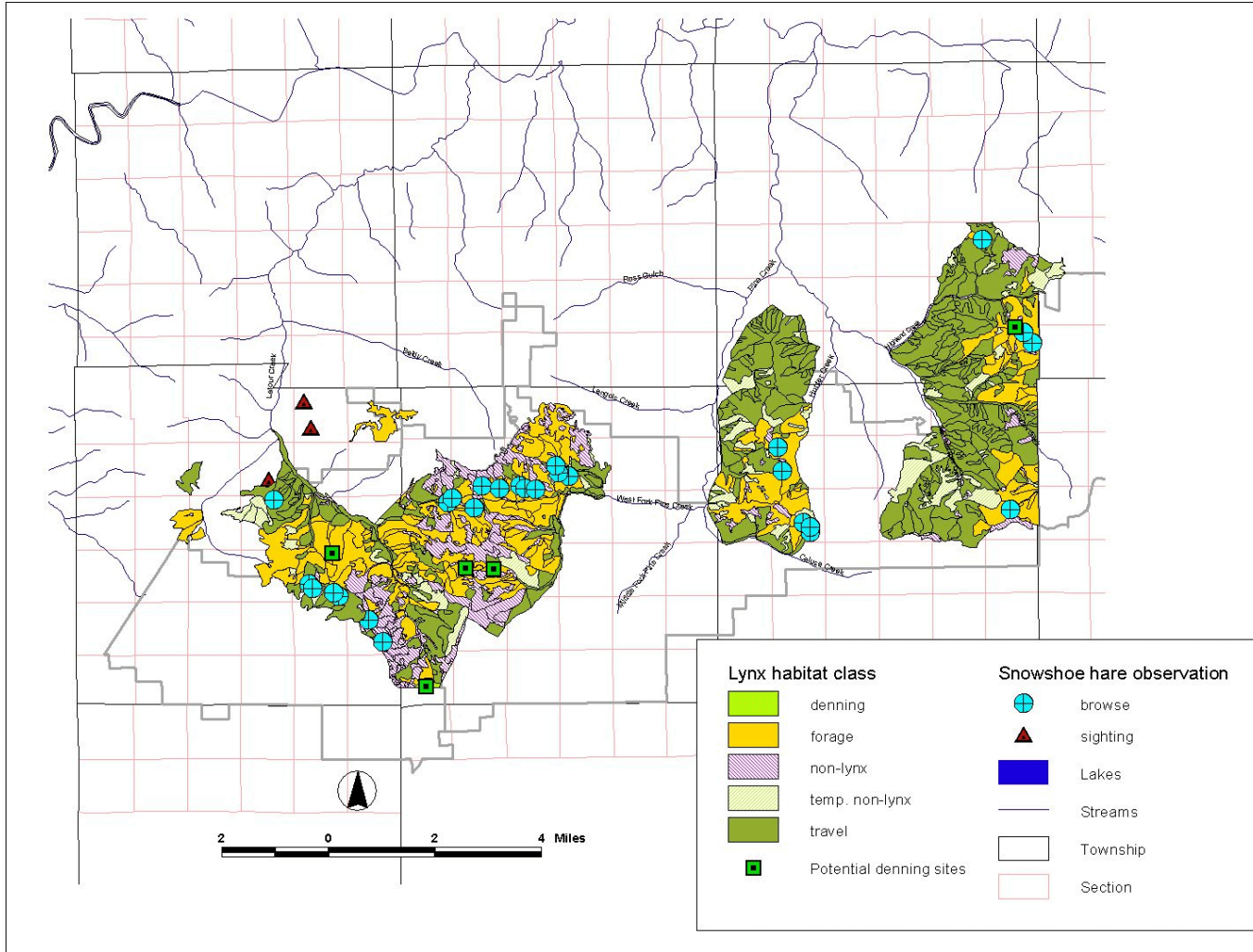


Figure 2. Lynx habitats within the Latour Creek and Pine Creek LAU's. Lynx habitat classes are interpolated from 2000 and 2001 field observations. Stands actually sampled are shown in Figure 1. Snowshoe hare and small potential denning site observation points are shown in relation to observed and interpolated lynx habitat.

CONCLUSION

Lynx are specialized predators adapted to life in deep snow characteristic of mountainous regions of western North America. Lynx are known to occur in the Coeur d'Alene River Basin. The objective of this study is to delineate potential lynx habitats in the Coeur d'Alene Basin. Lynx forage, denning, and travel habitats and a snowshoe hare prey base were observed and documented in Highland Creek and Douglas Creek drainages. The diversity of forest stand structural and seral conditions present within the study area appear complementary and may provide an optimal range of lynx winter forage habitat.

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Table 1. Summary of vegetation coverytype classification. Vegetation coverytype classes occurring within the Latour and Pine Creek LAUs are listed by map unit code and with approximate percent of occurrence. Coverytypes are classified as suitable lynx habitat (S); unsuitable, temporary non-lynx (U); or non-lynx habitat (N). Data are drawn from by Upper Columbia - Salmon Clearwater District (2000) and Landscape Analysis Lab (2000). The coverytype classification is modified from Landscape Analysis Lab (2000).

Map Code	Covertype Name	Suitability	Percent
3101	Foothills Grassland	n	0.1
3104	Montane Parklands and Subalpine Meadows	n	3.3
3201	Mesic Upland Shrubland	u	2.1
3202	Warm Mesic Shrubland	u	7.8
3203	Cold Mesic Shrubland	u	3.8
4201	Engelmann Spruce (>66 percent cover)	s	< 0.1
4203	Lodgepole Pine (> 66 percent cover)	s	1.8
4206	Ponderosa Pine (> 66 percent cover)	n	< 0.1
4207	Grand Fir (> 66 percent cover)	s	0.7
4208	Subalpine Fir (> 66 percent cover)	s	5.6
4210	Western Red Cedar (> 66 percent cover)	s	0.6
4211	Western Hemlock (> 66 percent cover)	s	0.1
4212	Douglas-fir (> 66 percent cover)	n	0.8
4215	Western Larch (> 66 percent cover)	n	0.9
4220	Mixed Subalpine Forest (subalpine fir, mountain hemlock, Douglas-fir, Engelmann spruce, lodgepole pine)	s	14.7
4221	Mixed Mesic Forest (western redcedar, western hemlock, Douglas-fir, Engelmann spruce, western larch, grand fir, lodgepole pine, western white pine)	s	24.6
4222	Mixed Xeric Forest (ponderosa pine, Douglas-fir, lodgepole pine)	n	7.8
4223	Douglas Fir-Lodgepole Forest (> 80 percent cover)	s	0.5
4225	Douglas-fir-Grand Fir Forest (> 80 percent cover)	s	9.8
4226	Western Red Cedar-Grand Fir Forest (> 80 percent cover)	s	0.1
4227	Western Red Cedar-Western Hemlock Forest (> 80 percent cover)	s	2.7
4229	Western Larch-Douglas-fir Forest (> 80 percent cover)	s	3.0
4301	Mix Needleleaf/Broadleaf Forest	s	< 0.1
5000	Water	n	< 0.1
5200	Lakes and Ponds	n	< 0.1
6101	Needleleaf Dominated Riparian (> 66 percent relative cover)	s	0.6
6102	Broadleaf Dominated Riparian (> 66 percent relative cover)	n	< 0.1
6103	Needleleaf-Broadleaf Riparian Forest (> 25 percent and < 66 percent broadleaf, > 25 percent and < 66 percent needleleaf relative cover)	s	0.4
6104	Mixed Riparian (forest and non-forest)	s	0.4
6202	Shrub Dominated Riparian	u	0.1
6203	Mixed Non-Forest Riparian	u	< 0.1
7300	Exposed Rock (talus)	n	7.6
7500	Mines, Quarries, and Gravel Pits	n	< 0.1
7800	Mixed Barren Land	n	0.1

Appendix 1. Detailed summary of field inventory results. Selected data collected on ecology plots during the 2000 and 2001 field seasons are listed with data for spatially associated vegetation map polygons. Data for the *polygon label* and *assigned cover class* are from Upper Columbia - Salmon Clearwater District (2000). Cover class codes correspond to Table 1. Plant association codes and classification follows Cooper et al. (1991). The plant community nomenclature applied here is: plant association refers to the potential natural vegetation that occupies a habitat type. Keys to structural and ecological condition codes are given at the end of the table.

Plot id	Plant Association	Series	Seral status	Structural condition	Ecological condition	Polygon label	Lynx habitat class	Assigned cover class	Observed cover class
000728-1051	TSME/MEFE, XETE		mid	mt	A	ROP417	non-lynx	7300	7300
000728-1135	TSME/MEFE, XETE		early mid	tbdæ	A	ROP418	non-lynx	7300	7300
000728-1216	TSME/MEFE, MEFE		mid	mt	A	ROP948	non-lynx	3203	3203
000728-1322	TSME/STAM, MEFE		mid	mt	A	ROP488	travel	4208	4220
000728-1520	TSME/MEFE, LUHI		mid	mt	A	ROP500	forage	4208	4220
000728-1713	TSME/XETE, LUHI		late	lt	A	ROP490	non-lynx	7300	3104
000728-1734	TSME/MEFE, LUHI		late	lt	A	ROP985	forage	4220	4220
000728-1808	TSME/XETE, LUHI		late	lt	A	ROP984	non-lynx	3104	3104
000731-1532	ABGR/COOC		mid	mt	AB	ROP199	travel	4221	4221
000731-1655	THPL/CLUN, CLUN		mid	mt	A	ROP808	forage	4208	4221
000731-1735	TSME/CLUN, MEFE		mid- to late	lt	A	ROP810	forage	4221	4221
000731-1818	TSME/CLUN, MEFE		mid- to late	lt	A	ROP810	forage	4221	4221
000731-1909	ABGR/COOC		mid	mt	A	ROP813	forage	4225	4225
000801-1722	TSME/CLUN, MEFE		mid	mt	A	ROP830a	forage	4220	4220
000801-1848		XETE	late	hedæ	A	ROP401	non-lynx	3104	3104
000801-1946	CAAQ		late	hedæ	A	ROP401	non-lynx	3104	3104
000801-2017	TSME/MEFE, XETE		mid	po	A	ROP405	forage	4220	4220
000802-0931	TSME/XETE, XETE		mid	mt	A	ROP399	forage	4220	4220
000802-1051	TSME/XETE		early to mid	tbdau	A	ROP837	non-lynx	3203	3203
000802-1131	TSME/MEFE, XETE		mid	mt	A	ROP399	forage	4220	4220
000802-1157	TSME/MEFE, LUHI		mid	mt	A	ROP900	forage	4208	4220
000802-1225	TSME/MEFE, LUHI		mid	mt	A	ROP325a	forage	4220	4220
000802-1415	TSME/XETE, LUHI		mid	mt	A	ROP325a	forage	4220	4220
000802-1443	TSME/CLUN, XETE		mid	mt	A	ROP839	forage	4220	4220

Plot id	Plant Association	Series	Seral status	Structural condition	Ecological condition	Polygon label	Lynx habitat class	Assigned cover class	Observed cover class
000802-1550		ANSI	late	tbdac	A	ROP839	forage	4220	4220
000802-1636	TSHE/CLUN, MEFE		mid	mt	A	ROP838	forage	4220	4220
000802-1719	TSHE/CLUN, MEFE		mid	mt	A	ROP830b	forage	4220	4221
000802-1759	TSHE/GYDR		mid	lt	A	ROP830b	forage	4220	4221
000802-1818	TSHE/CLUN, CLUN		mid	mt	A	ROP325b	forage	4220	4221
000802-1848	THPL/CLUN, XETE		mid	mt	A	ROP325b	forage	4220	4221
000802-1919	TSHE/CLUN, CLUN		mid-late	mt	A	ROP325b	forage	4220	4221
000802-1951	TSME/MEFE, XETE		mid	mt	A	ROP325a	forage	4220	4220
000802-2008	TSME/XETE, LUHI		mid	mt	A	ROP325a	forage	4220	4220
000803-1619	TSME/MEFE, XETE		late	lt	A	ROP187	forage	4229	4220
000803-1920		XETE	late	hedae	A	TWI293	non-lynx	3104	3104
000803-1956		FEVI	late	hedae	A	TWI293	non-lynx	3104	3104
000804-1255	TSME/LUHI		pnc	lt	A	TWI324	non-lynx	3104	3104
000804-1349	TSME/XETE, XETE		late	mt	A	TWI324	non-lynx	3104	3104
000804-1359	ABLA/XETE, VASC		mid	lt	A	TWI324	non-lynx	3104	3104
000804-1436	TSME/XETE, XETE		late	lt	A	TWI794	forage	4208	4204
000804-1532	TSME/XETE, XETE		late	lt	A	TWI794	forage	4208	4204
000804-1654		FEVI	late	hedae	A	TWI324	non-lynx	3104	3104
000804-1747		XETE	late	hedae	A	TWI324	non-lynx	3104	3104
000804-1848		XETE	late	hedae	A	TWI324	non-lynx	3104	3104
000823-1040	TSME/XETE, LUHI		mid	mt	A	TWI317	forage	4220	4203
000823-1250	TSME/XETE, XETE		mid	mt	A	TWI317	forage	4220	4203
000823-1315	TSME/XETE, XETE		mid to late	mt	A	TWI317	forage	4220	4203
000823-1350	TSME/MEFE, MEFE		late	lt	A	TWI316	forage	6101	6101
000823-1515	TSME/MEFE, XETE		mid	po	A	TWI332	forage	4208	4208
000823-1540	TSHE/GYDR		late	lt	A	TWI316	forage	6101	6101
000823-1645	TSME/CLUN, XETE		early-mid	mt	A	TWI316	forage	6101	6101
000823-1720	TSME/XETE, XETE		early	mt	A	TWI314	forage	4220	4203

Plot id	Plant Association	Series	Seral status	Structural condition	Ecological condition	Polygon label	Lynx habitat class	Assigned cover class	Observed cover class
000823-1745	TSME/CLUN, MEFE		early mid	mt	A	TWI314	forage	4220	4203
000823-1830	TSME/CLUN, XETE		early mid	mt	A	TWI314	forage	4220	4203
000823-1930	TSME/XETE, XETE		early mid	mt	A	TWI314	forage	4220	4203
000824-0925	TSME/XETE, VASC		late mid	mt	AB	TWI711	forage	4220	4203
000824-1005	TSME/XETE, XETE		early mid	mt	AB	TWI290	forage	4220	4203
000824-1200	TSME/XETE, XETE		early mid	mt	A	TWI290	forage	4220	4203
000824-1305	TSME/XETE, XETE		early mid	mt	B	TWI748	forage	4203	4225
000824-1335	TSME/CLUN, CLUN		mid	lt	A	TWI294	forage	4220	4223
000824-1405	TSME/CLUN, CLUN		early mid	mt	A	TWI748	forage	3203	3203
000824-1605	TSHE/CLUN, CLUN		early mid	mt	A	TWI310	forage	4203	4225
000824-1650	TSNE/CLUN, CLUN		early mid	mt	A	TWI310	forage	4221	4203
000824-1735	ABGR/CLUN, XETE		early mid	mt	A	TWI310	forage	4221	4203
000824-1815	ABGR/CLUN, CLUN		late	lt	A	TWI717	forage	4221	4221
000824-1855	TSME/CLUN, MEFE		early late	lt	A	TWI302	forage	4221	4221
000824-1930	TSHE/CLUN, XETE		late	lt	B	TWI251	forage	4221	4221
000825-0845		XETE	late	hedae	A	TWI289	non-lynx	7300	3104
000825-0935		FEVI	late	hedae	A	TWI289	non-lynx	7300	3104
000825-1020		CAGE	late	hedae	A	TWI289	non-lynx	7300	3104
000825-1130		FEVI	late	hedae	A	TWI709	non-lynx	3104	3104
000825-1450	TSHE/ASCA, ASCA		late mid	mt	AB	MAS240	travel	4221	4221
000825-1525	TSHE/CLUN, CLUN		mid	mt	B	MAS191	travel	4221	4221
000825-1615	ABGR/CLUN, PHMA		late mid	mt	AB	MAS243	forage	4221	4221
000825-1700	TSHE/CLUN, CLUN		early mid	mt	A	MAS255	forage	4221	4221
000825-1730	THPL/CLUN, CLUN		mid	mt	A	MAS243	forage	4221	4221
000825-1800	TSHE/ASCA, ASCA		early mid	mt	B	MAS255	forage	4221	4221
000825-1900	TSHE/CLUN, MEFE		mid	mt	B	MAS264	forage	4221	4221
000825-1935	TSME/XETE, MEFE		mid	po	A	MAS804a	forage	4225	4220
000826-0655	TSME/XETE, MEFE		mid	po	B	MAS804a	forage	4225	4220

Plot id	Plant Association	Series	Seral status	Structural condition	Ecological condition	Polygon label	Lynx habitat class	Assigned cover class	Observed cover class
000826-0720	ABGR/ACGL, ACGL		early	tbdau	C	MAS752	temp. non-lynx	3203	3203
000826-0755	ABGR/ACGL, ACGL		mid	mt	A	MAS265b	forage	4225	4225
000826-0825	TSME/XETE, MEFE		mid	mt	B	MAS804a	forage	4225	4220
010912-1447	TSHE/CLUN, CLUN		mid	mtdae	AB	ROP239	travel	4221	4221
010912-1539	TSHE/CLUN, CLUN		mid	mtmbu	AB	ROP239	travel	4221	4221
010912-1618	TSHE/CLUN, CLUN		mid	mtmbu	AB	ROP239	forage	4221	4221
010913-0945	TSME/XETE, XETE		mid	mtmbe	AB	ROP399	forage	4220	3203
010913-1006	TSME/XETE, XETE		mid	mtmbe	AB	ROP399	forage	4220	3203
010913-1103	TSME/XETE, XETE		mid	mtmbe	AB	ROP399	travel	4220	3203
010913-1121	TSME/XETE, XETE		mid	mtmbe	AB	ROP399	travel	4220	3203
010913-1508	ABLA/XETE, XETE		mid	mtmbe	A	MAS077	travel	4220	4220
010913-1528	ABLA/PHMA		mid	mtdae	A	MAS077	travel	4220	4220
010913-1551	TSME/XETE, XETE		mid	mtmbe	AB	MAS077	travel	4220	4220
010913-1657	TSME/XETE, VASC		mid	mtdae	B	MAS083	travel	4208	4302
010914-1149	ABGR/ACGL, PHMA		mid	mtdae	AB	MAS077	travel	4220	4220
010914-1246	ABGR/ACGL, PHMA		mid	ltdae	AB	MAS033	forage	4220	4221
010914-1323	ABLA/PHMA		mid	ltdae	AB	MAS033	travel	4220	4221
010914-1349	ABGR/ACGL, PHMA		mid	ltmau	AB	MAS056	forage	4222	4222
010914-1503	THPL/SHUN, MEFE		mid	ltdae	AB	MAS070	travel	4221	4221
010914-1614	PSME/PHMA, PIPO		mid	ltmau	AB	MAS068	forage	4222	4222
010914-1633	ABGR/COOC		mid	mtmbe	B	MAS101	travel	4221	4221
010914-1656	ABGR/ACGL, PHMA		mid	mtmbu	AB	MAS104	forage	4222	4222
010914-1723	TSME/XETE, XETE		mid	mtmbu	AB	MAS101	forage	4221	4220
010914-1745	ABLA/XETE, VAGL		mid to late	mtmbu	B	MAS676	forage	4222	4220
010914-1814	TSME/XETE, XETE		mid to late	mtmbu	A	MAS654	forage	4220	4220
010914-1850	TSME/XETE, XETE		mid to late	mtmbu	B	MAS654	forage	4220	4220
010915-1025	ABLA/XETE, XETE		mid	pombe	AB	MAS114	forage	4220	4220
010915-1539	TSME/MEFE, XETE		mid to late	mtmbu	A	MAS717	forage	4220	4220

Plot id	Plant Association	Series	Seral status	Structural condition	Ecological condition	Polygon label	Lynx habitat class	Assigned cover class	Observed cover class
010915-1620	TSME/MEFE, XETE		mid	mtmbu	A	MAS573	forage	4220	4220
010915-1659	TSME/XETE, XETE		mid	mtmbu	A	MAS163	travel	4220	4220
010915-1800	TSME/XETE, XETE		mid	mtdau	A	MAS408	forage	4221	4221
010913-0946	TSME/XETE, XETE		mid-late	mtmbu	A	ROP399	travel	4220	3203
010915-1030	TSME/XETE, XETE		mid	pombe	A	ROP899	travel	3203	4302
010913-1105	TSME/XETE, XETE		mid	mtmbe	A	ROP399	travel	4220	3203
010913-1500	TSME/XETE, XETE		mid	mtmae	A	MAS077	forage	4220	4220
010913-1700	TSME/XETE, XETE		mid	mtmbe	A	MAS083	travel	4208	4302
010914-1445		PSME	mid	mtmbe	A	MAS052	travel	4221	4221
010914-1520	ABGR/ACGL, PHMA		mid	ltmbu	A	MAS070	travel	4221	4221
010914-1640	ABIGRA SERIES		mid	mtdau	A	MAS101	forage	4221	4221
010914-1730	TSME/XETE		mid	mtdau	A	MAS101	forage	4221	4220
010914-1810	TSME/XETE, XETE		mid	mtdau	A	MAS101	forage	4221	4220
010915-1500	TSME/MEFE, MEFE		mid	mtmbu	A	MAS163	forage	4220	4220
010915-1535	TSME/MEFE, MEFE		mid	pombu	AB	MAS163	forage	4220	4220
010915-1621	TSME/XETE		early-mid	mtmbu	A	MAS573	forage	4220	4220
010915-1715	TSME/XETE, XETE		mid	missing	A	MAS163	forage	4220	4220

Structural Condition

A five character string incorporating code for height, canopy cover, and canopy layering (strata) is given as follows:

	Code	Description
Height classes:		
Herbland	he	herbland. Grasses and herbs are the only lifeform present.
Shrubland	ls	low shrub. Shrubs are 0 - 1.5 feet tall.
	ma	medium shrub. Shrubs are 1.6 - 2.5 feet tall.
	mb	medium tall shrub. Shrubs are 2.6 - 4.0 feet tall.
	ta	tall shrub. Shrubs are 4 - 6.5 feet tall.
	tb	very tall shrub. Shrubs are ≥ 6.5 (and < 16.5) feet tall.
Forest	--	trees, if present, are < 1 inch diameter at breast height (dbh); grasses, herbs, or shrubs may be dominant (refer to previous classes).
	sa	sapling tree. 20 trees per acre 1 - 4.9 inches dbh. ¹

¹ This applies to the largest trees present. A class is determined by the average dbh of the number of trees per acre indicated.

	po	pole tree. 15 trees per acre 5 - 8.9 inches dbh.
	mt	medium tree. 10 trees per acre 9 - 20.9 inches dbh.
	lt	large tree. 10 trees per acre 21 - 31.9 inches dbh.
	vt	giant tree. 5 trees per acre > 31.9 inches dbh.
Cover classes:	na	< 10 percent canopy cover.
	oa	≥ 10 and < 15 percent canopy cover.
	ob	≥ 15 and ≤ 25 percent canopy cover.
	ma	> 25 and ≤ 40 percent canopy cover.
	mb	> 40 and ≤ 66 percent canopy cover.
Shrub strata	da	> 66 percent cover.
	n	no strata.
	e	one stratum with < 30 percent difference in height.
	u	Two or more strata (of the same life form) with > 30 percent difference in height. If shrubland, a second shrub strata must have ≥ 25 percent cover. If herbland or grassland, a second herb or grass strata must have ≥ 10 percent cover (including cryptograms).

Ecological Condition

Code	Description
A	Pristine condition. Evidence of post-industrial human-caused disturbance is absent. Exotic species are absent.
B	Little evidence of post-industrial human-caused disturbance is present. Stand composition and structure is predominantly natural. Exotic species are only common (≤ one percent cover).
C	Post-industrial human-caused disturbance is apparent. Stand composition and structure is altered. Exotic species are well represented to abundant (5 - 25 percent cover).
D	Evidence of post-industrial human-caused disturbance is prevalent. Stand composition and structure is altered. Native species are present, but are in peril of loss. Increasers dominate the stand. Invader species are a significant compositional component.
F	Native stand composition, structure, and function are significantly altered. Re-establishment of native stand composition, structure, and function will require large energy inputs.

Appendix 2. Vascular plant species observed during the 2000 and 2001 field seasons within Latour Creek and Pine Creek drainages. Species are listed alphabetically by life form. Distribution within the study area is indicated by study site. Nomenclature follows Hitchcock and Cronquist (1973).

Species	Butler Creek	Latour Peak	Point 6168	Rochat Peak	Upper Hunter Creek	West Fork Pine Creek	Highland & Douglas Creeks
Trees							
<i>Abies grandis</i>	✓				✓	✓	✓
<i>Abies lasiocarpa</i>	✓	✓	✓	✓	✓	✓	✓
<i>Betula papyrifera</i>							✓
<i>Larix occidentalis</i>	✓	✓		✓	✓	✓	✓
<i>Picea engelmannii</i>		✓		✓		✓	✓
<i>Pinus contorta</i>	✓	✓	✓			✓	✓
<i>Pinus monticola</i>	✓	✓		✓	✓	✓	✓
<i>Pinus ponderosa</i>				✓		✓	✓
<i>Populus tremuloides</i>				✓			✓
<i>Populus trichocarpus</i>							✓
<i>Pseudotsuga menziesii</i>	✓	✓	✓	✓	✓	✓	✓
<i>Rhamnus purshiana</i>				✓			
<i>Taxus brevifolia</i>					✓	✓	
<i>Thuja plicata</i>	✓			✓	✓	✓	✓
<i>Tsuga heterophylla</i>		✓		✓	✓	✓	✓
<i>Tsuga mertensiana</i>	✓	✓	✓	✓	✓	✓	✓
Shrubs							
<i>Acer glabrum</i>	✓	✓	✓	✓	✓	✓	✓
<i>Alnus sinuata</i>	✓	✓		✓	✓	✓	✓
<i>Amelanchier alnifolia</i>	✓	✓	✓	✓	✓	✓	✓
<i>Berberis repens</i>						✓	✓
<i>Ceanothus velutinus</i>			✓		✓		✓
<i>Holodiscus discolor</i>	✓	✓		✓	✓	✓	✓
<i>Juniperus communis</i>				✓			
<i>Lonicera ciliosa</i>							✓
<i>Lonicera utahensis</i>	✓	✓	✓	✓	✓	✓	✓
<i>Menziesia ferruginea</i>	✓	✓		✓	✓	✓	✓
<i>Pachistima myrsinites</i>	✓	✓		✓	✓	✓	✓
<i>Philadelphus lewisii</i>				✓			✓
<i>Phyllodoce empetrifomis</i>			✓				
<i>Physocarpus malvaceus</i>	✓				✓		✓
<i>Prunus emarginata</i>			✓	✓			✓
<i>Ribes lacustre</i>		✓		✓			
<i>Ribes viscosissimum viscosissimum</i>	✓	✓				✓	✓
<i>Rosa gymnocarpa</i>	✓	✓		✓	✓	✓	✓
<i>Rubus parviflorus</i>	✓	✓		✓	✓	✓	✓
<i>Salix scouleriana</i>	✓	✓		✓	✓	✓	✓
<i>Sambucus cerulea</i>				✓			
<i>Sambucus racemosa</i>	✓			✓	✓		
<i>Sorbus scopulina</i>	✓	✓	✓	✓	✓	✓	✓

Species	Butler Creek	Latour Peak	Point 6168	Rochat Peak	Upper Hunter Creek	West Fork Pine Creek	Highland & Douglas Creeks
<i>Sorbus sitchensis</i>		✓	✓	✓			
<i>Spiraea betulifolia</i>	✓	✓	✓	✓	✓	✓	✓
<i>Spiraea densiflora</i>			✓	✓			
<i>Symphoricarpos albus</i>							✓
<i>Vaccinium globulare</i>	✓	✓	✓	✓	✓	✓	✓
<i>Vaccinium membranaceum</i>	✓	✓	✓	✓	✓	✓	✓
<i>Vaccinium myrtilus</i>		✓	✓	✓			
<i>Vaccinium scoparium</i>		✓	✓	✓		✓	✓
Herbs							
<i>Achillea millefolium</i>		✓	✓	✓	✓		✓
<i>Aconitum columbianum</i>				✓			
<i>Actaea rubra</i>	✓			✓	✓		
<i>Adenocaulon bicolor</i>	✓				✓	✓	✓
<i>Agoseris aurantiaca</i>				✓			
<i>Agoseris retrorsa</i>		✓	✓	✓			
<i>Anaphalis margaritacea</i>	✓	✓		✓			✓
<i>Anemone oregana</i>	✓	✓		✓	✓	✓	
<i>Anemone piperi</i>	✓			✓	✓	✓	✓
<i>Antennaria microphylla</i>	✓	✓	✓	✓			
<i>Antennaria racemosa</i>	✓			✓			✓
<i>Apocynum androsaemifolium</i>				✓		✓	✓
<i>Aquilegia flavescens</i>				✓			
<i>Arenaria capillaris</i>		✓	✓	✓			
<i>Arenaria congesta</i>		✓	✓	✓			
<i>Arenaria macrophylla</i>	✓	✓		✓	✓		✓
<i>Arnica cordifolia</i>	✓	✓	✓	✓	✓	✓	✓
<i>Asarum caudatum</i>	✓	✓		✓	✓	✓	
<i>Aster foliaceus</i>				✓			
<i>Aster integrifolius</i>				✓			
<i>Aster spp.</i>			✓				
<i>Brickellia grandiflora</i>			✓	✓			
<i>Calochortus elegans</i>		✓	✓	✓			
<i>Campanula rotundifolia</i>	✓	✓	✓	✓			
<i>Castilleja hispida acuta</i>				✓			
<i>Castilleja miniata miniata</i>	✓	✓		✓			✓
<i>Centaurea diffusa</i>					✓		
<i>Centaurea maculosa</i>							✓
<i>Chimaphila menziesii</i>	✓				✓	✓	✓
<i>Chimaphila umbellata</i>	✓	✓	✓		✓	✓	✓
<i>Corallorhiza mertensiana</i>	✓						
<i>Corallorhiza maculata</i>							✓
<i>Chrysanthemum leucanthemum</i>	✓						✓
<i>Circaea alpina</i>	✓						
<i>Cirsium arvense</i>							✓

Species	Butler Creek	Latour Peak	Point 6168	Rochat Peak	Upper Hunter Creek	West Fork Pine Creek	Highland & Douglas Creeks
<i>Clintonia uniflora</i>	✓	✓		✓	✓	✓	✓
<i>Coptis occidentalis</i>	✓	✓		✓	✓	✓	✓
<i>Corallorhiza maculata</i>	✓						✓
<i>Corallorhiza mertensiana</i>		✓				✓	
<i>Dicentra formosa</i>				✓			
<i>Disporum hookeri</i>	✓	✓		✓	✓	✓	
<i>Epilobium angustifolium</i>	✓	✓	✓	✓	✓		✓
<i>Epilobium glaberrimum</i>				✓			
<i>Epilobium spp.</i>			✓				
<i>Eriogonum umbellatum subalpinum</i>		✓	✓	✓			
<i>Erythronium grandiflorum</i>		✓	✓	✓			✓
<i>Fragaria vesca</i>					✓		✓
<i>Frasera spp.</i>				✓			
<i>Galium triflorum</i>	✓	✓		✓	✓	✓	✓
<i>Gentiana calycosa calycosa</i>				✓			
<i>Geum macrophyllum</i>	✓						
<i>Goodyera oblongifolia</i>	✓	✓		✓	✓	✓	✓
<i>Habenaria saccata</i>				✓			
<i>Habenaria unalascensis</i>				✓			
<i>Hedysarum occidentale</i>		✓				✓	
<i>Helianthella uniflora</i>		✓		✓		✓	✓
<i>Heuchera cylindrica glabella</i>				✓			✓
<i>Hieracium albiflorum</i>	✓	✓	✓	✓	✓	✓	✓
<i>Hieracium cynoglossoides</i>		✓	✓	✓			
<i>Hieracium gracile</i>		✓	✓	✓			
<i>Hieracium pratense</i>	✓						
<i>Hypericum formosum scouleri</i>		✓	✓	✓			
<i>Hypericum perforatum</i>	✓						✓
<i>Hypopitys monotropa</i>					✓		✓
<i>Ligusticum canbyi</i>		✓		✓			
<i>Linnaea borealis</i>					✓	✓	✓
<i>Listera convallarioides</i>	✓						
<i>Lomatium dissectum</i>				✓			
<i>Lomatium spp.</i>		✓	✓				
<i>Lupinus argenteus argenteus</i>				✓			
<i>Lupinus polyphyllus burkei</i>		✓		✓			✓
<i>Lupinus spp.</i>		✓	✓	✓			✓
<i>Microseris nutans</i>		✓	✓	✓			
<i>Microseris troximoides</i>		✓					
<i>Mitella pentandra</i>		✓		✓	✓		✓
<i>Mitella stauropetala</i>	✓			✓			
<i>Montia cordifolia</i>		✓		✓			
<i>Osmorhiza chilensis</i>	✓	✓		✓	✓		✓
<i>Osmorhiza purpurea</i>		✓	✓				

Species	Butler Creek	Latour Peak	Point 6168	Rochat Peak	Upper Hunter Creek	West Fork Pine Creek	Highland & Douglas Creeks
<i>Pedicularis bracteosa</i>	✓	✓		✓		✓	✓
<i>Pedicularis contorta</i>	✓	✓		✓		✓	
<i>Pedicularis groenlandica</i>				✓			
<i>Pedicularis racemosa</i>	✓	✓		✓			
<i>Penstemon attenuatus attenuatus</i>	✓	✓	✓	✓			
<i>Penstemon fruticosus</i>			✓	✓			
<i>Penstemon lyallii</i>			✓	✓			
<i>Phacelia hastata</i>							✓
<i>Phlox diffusa</i>		✓	✓				
<i>Plantago major</i>							✓
<i>Polemonium occidentale</i>		✓	✓	✓			
<i>Polygonum bistortoides</i>		✓					
<i>Polygonum phytolaccaefolium</i>		✓	✓	✓			
<i>Prunella vulgaris</i>	✓						✓
<i>Pterospora andromedea</i>				✓			✓
<i>Pyrola asarifolia</i>	✓	✓		✓	✓	✓	✓
<i>Pyrola picta</i>					✓		
<i>Pyrola secunda</i>	✓	✓	✓	✓	✓	✓	✓
<i>Rumex occidentalis</i>	✓						
<i>Saxifraga adscendens</i>				✓			
<i>Saxifraga cernua</i>				✓			
<i>Saxifraga ferruginea</i>				✓			
<i>Sedum lanceolatum</i>				✓			
<i>Selaginella wallacei</i>				✓			
<i>Senecio spp.</i>			✓				
<i>Senecio integerrimus</i>							✓
<i>Senecio triangularis</i>	✓	✓		✓	✓		
<i>Senecio serra</i>							✓
<i>Silene menziesii</i>							✓
<i>Silene parryi</i>		✓	✓	✓			
<i>Smilacina racemosa</i>	✓			✓	✓	✓	✓
<i>Smilacina stellata</i>	✓	✓		✓	✓	✓	✓
<i>Stellaria nitens</i>				✓			
<i>Stenanthium occidentale</i>				✓			
<i>Streptopus amplexifolius</i>		✓		✓			
<i>Synthyris missurica</i>				✓			
<i>Thalictrum fendleri</i>					✓	✓	
<i>Thalictrum occidentale</i>	✓	✓		✓			✓
<i>Tiarella trifoliata unifoliata</i>	✓	✓			✓	✓	
<i>Trautvetteria caroliniensis</i>				✓			
<i>Trifolium longipes</i>	✓						✓
<i>Trifolium repens</i>	✓						✓
<i>Trillium ovatum</i>	✓	✓		✓	✓	✓	
<i>Valeriana sitchensis</i>	✓			✓			✓

Species	Butler Creek	Latour Peak	Point 6168	Rochat Peak	Upper Hunter Creek	West Fork Pine Creek	Highland & Douglas Creeks
<i>Veratrum viride</i>		✓	✓	✓	✓		✓
<i>Veronica americana</i>	✓						
<i>Veronica cusickii</i>			✓	✓			
<i>Viola glabella</i>	✓	✓		✓			
<i>Viola orbiculata</i>		✓	✓	✓	✓		✓
<i>Viola spp.</i>	✓	✓				✓	
<i>Xerophyllum tenax</i>	✓	✓	✓	✓	✓	✓	✓
Grasses, Sedges, and Rushes							
<i>Agropyron spicatum</i>				✓			✓
<i>Agropyron spp.</i>			✓				
<i>Bromus spp.</i>		✓			✓	✓	
<i>Bromus vulgaris vulgaris</i>	✓						✓
<i>Calamagrostis canadensis</i>				✓			
<i>Calamagrostis purpurascens</i>				✓			✓
<i>Calamagrostis rubescens</i>	✓	✓		✓		✓	✓
<i>Calamagrostis tweedyi</i>				✓			✓
<i>Carex aquatilis</i>				✓			
<i>Carex arcta</i>	✓						
<i>Carex concinnoides</i>	✓			✓			✓
<i>Carex geyeri</i>		✓	✓	✓	✓		✓
<i>Carex laeviculmis</i>	✓						
<i>Carex mertensii</i>				✓			
<i>Carex nigricans</i>			✓	✓			
<i>Carex rossii</i>	✓	✓	✓	✓		✓	✓
<i>Carex spp.</i>			✓				
<i>Dactylis glomerata</i>							✓
<i>Danthonia intermedia</i>		✓		✓			
<i>Elymus glaucus</i>				✓			✓
<i>Festuca idahoensis idahoensis</i>		✓		✓			✓
<i>Festuca occidentalis</i>	✓						
<i>Festuca viridula</i>		✓	✓	✓			✓
<i>Juncus ensifolius</i>							✓
<i>Juncus parryi</i>		✓	✓	✓			
<i>Luzula hitchcockii</i>		✓	✓	✓		✓	
<i>Luzula spicata</i>				✓			
<i>Phleum pratense</i>					✓		✓
<i>Poa annua</i>				✓			
<i>Poa secunda</i>				✓			
<i>Trisetum spicatum</i>				✓			

Species	Butler Creek	Latour Peak	Point 6168	Rochat Peak	Upper Hunter Creek	West Fork Pine Creek	Highland & Douglas Creeks
Ferns and Fern Allies							
<i>Cheilanthes feei</i>				✓			
<i>Cheilanthes gracillima</i>			✓	✓			
<i>Cryptogramma crispera</i>				✓			
<i>Dryopteris filix-mas</i>	✓	✓					
<i>Equisetum arvense</i>				✓			
<i>Gymnocarpium dryopteris</i>		✓		✓	✓		
<i>Polystichum lonchitis</i>	✓	✓		✓	✓	✓	
<i>Polystichum munitum munitum</i>	✓	✓		✓	✓		✓
<i>Pteridium aquilinum</i>	✓			✓	✓	✓	✓
<i>Thelypteris nevadensis</i>				✓			