

Appendices to the Thunder Mountain Fire Research Project

Contents

- Appendix A. Detailed description of the Thunder Mountain area
- Appendix B. Floristic survey - dates, locations and plant list
- Appendix C. Initial TES plant surveys made for the Forest Service
- Appendix D. List of wetland plants observed in the Okanogan Range
- Appendix E. Transect summary information
- Appendix F. Habitat categories observed along transects
- Appendix G. Photographic log through 1997
- Appendix H. Timeline and record of survey visits, 1994 onward
- Appendix I. Data Dictionary

Appendix A. Detailed description of the Thunder Mountain area

This appendix was developed from a report to the Scientific Panel on Plants for the Interior Columbia Basin Ecosystem Management Project (Wooten, 1994).

Continental glaciated character

The Thunder fire burned the northern tier of the Okanogan Range in north-central Okanogan County, Washington, a plateau characterized by high-elevation topography with gentle slopes. This topography differs from that typical of the adjacent North Cascades mountains which are more highly dissected by alpine and valley glaciation. Presumably, the final phase of glaciation in the Okanogan Range was the melting of the terminus of the Cordilleran ice sheet, which rounded most of the summits and cirques produced in previous alpine glacier phases (Waite, 1972). The region thus lies just north of the margin of the North American continental glaciation, and is characterized by anomalous topographic including glacial erratics, outwash deposits, drumlins, eskers, terraces, and ice-marginal channels carved by ice and/or water (E.C. Pielou, 1991).

Due to the presence of nearby volcanism and ashfalls, combined with the effects of landform shape wrought by glaciation, undescribed, unusual community types occur here that are more similar to those of the true boreal north, with introgressions of certain southern species. Extensive muskeg-like bogs in this area are dotted with regularly-spaced "earth hummocks" which appear to be linked to pleistocene ashfall in permafrost regions (Scotter and Zoltai, 1992).

The boreal landscape does not extend west into the North Cascade Mountains, nor south of the continental glaciation, nor east onto the Columbia Plateau, nor appreciably north of the international border, as the mountain range loses elevation. Because the wet, cold conditions of glaciated regions are relatively intact here, these boreal meadow complexes represent a disjunct ecological province of unmatched biological diversity. The unusual nature of this boreal province is documented in this report. What is enigmatic is how it has managed to remain intact.

Wetlands

The northern Okanogan Range is characterized by an extensive wetland network, which still retains many aspects of its the area's glacial character. The wetlands occupy streams and pockets at high elevation, where perhaps because of the low energy gradients and deep glacial colluvium, the soil rarely dries out. Adding to the wetness are severe summer thunderstorms which travel up the Chewuch River's "fire alley", ultimately to precipitate in this area.

Boreal wetlands have a number of features uncommon in low elevation Washington wetlands, including the presence of earth hummocks, boreal (willow-bog birch) flora, late snow melt (mid-July is typical), short growing season, heavy snow packs, dense, but sometimes shallow peat formation underlain by sandy alluvium deposited by continental glaciation. Sphagnum formations are less common here than in the true boreal north, but occasionally they are dominant. Other moss associations are common around bog margins. Typically, herbaceous flora is dominated by *Carex scopulorum* var. *prionophylla*, *Lupinus polyphyllus* var. *burkei* (= *L. arcticus*), *Trollius laxus*, *Epilobium* spp., *Carex disperma*, *Calamagrostis canadensis*, *Valeriana dioica*, and *Valeriana sitchensis*.

Appendix B. Floristic survey - dates, locations and plant list

Floristic records in this report were compiled during the following field surveys:

06/29/95	Dog Creek, lower end, Forest Service TES plant survey - G. Wooten.
07/06/95,07/07/95	Thirtymile-Twentymile Cr. Saddle, Forest Service TES plant survey - G. Wooten.
07/07/95-07/08/95	Wetland Inventory Workshop, near Thirtymile Meadow, G. Wooten, Coordinator.
07/08/95,07/09/95	Thirtymile Cr., Ridge NW of Thirtymile meadow, Forest Service TES plant survey - G. Wooten.
12/28/95-01/01/96	Tripod Peak winter wildlife tracking survey, M. Poss, A. Gaskill.
02/29/96-03/10/96	Thunder Mountain winter wildlife tracking survey, M. Poss, A. Gaskill.
08/17/96-08/19/96	Thunder Mountain Revegetation study, Mary Poss, Coordinator.
09/06/96-09/09/96	Thunder Mountain Revegetation study, Mary Poss, Coordinator.
09/21/96-09/22/96	Thunder Mountain Birding and Ecology Workshop Hikes, Mary Poss, Coordinator.
09/27/96-09/29/96	Thunder Mountain Birding and Ecology Workshop Hikes, Mary Poss, Coordinator.

Collections of herbarium specimens from the area were taken primarily from floristic surveys predating the fire. Dates of collections made by George Wooten are 6/20/90; 8/11-13,27/91; 9/1,2/91; 5/15,28/92; 6/14,27,28/92; 7/13,15,26,28/92; 8/9,10,16,22-25/92. Most of these collections were taken during surveys for a study of the effects of livestock grazing in high elevation

- Sheep Creeks.
 18:114 9/2/96 Thunder Keyouts.
 20MILE, SHEEP CR KEYOUTS.8.24.96 West face of summit between Twentymile and Sheep Creeks.
 18:116-119 9/21/96 Thirtymile Trip No. 1 with birders & keyouts.
 30MILE - WKSHP.9.21.96
 30MILE - KEYOUTS.9.21.96
 18:120-121 9/26/96 Timber Creek GW & MP.
 TIMBER CR - TIM.CR.9.27.96 Flora list of Timber Creek.
 TIMBER CR - TIM.CR.PLOT Vegetation plot on Timber Creek.
 18:122 9/29/96 Thirtymile Trip No. 2.
 UPPER 30MILE - 30.MI.9.29.96 Upper Thirtymile Creek.
 18:123 9/29/96 Thunder log counts.
 [NO FLORA INFORMATION]
 [PLOT NOTES] 8/17/96 Ecology plot data collection.
 UPPER 30MILE-DILL CONFLUENCE
 [PLOT NOTES] 9/7/96 Ecology plot data collection.
 [NO FLORA INFORMATION]
 [NOTES] 9/97 Thirtymile Meadows FS survey.
 UPPER 30MILE MEADOWS - FS SURV Rare plant found on FS survey.
 [NOTES] 9/1/97 Dog Creek ecology plot data collection.
 DOG CREEK 9/1/97 Dog Creek Keyouts.

Table of 217 vascular plant species found in the Thunder fire perimeter, with alphacode and common name.

ACHMIL	<i>Achillea millefolium</i>	common yarrow	Asteraceae
ACOCOL	<i>Aconitum columbianum</i>	Columbian monkshood	Ranunculaceae
AGO AUR	<i>Agoseris aurantiaca</i>	orange agoseris	Asteraceae
AGOGLA D	<i>Agoseris glauca</i> var. <i>dasycephala</i>	pale yellow false-dandelion	Asteraceae
AGOLAC	<i>Agoseris lackschewitzii</i>	pink agoseris	Asteraceae
AGRSCA	<i>Agrostis scabra</i>	rough bentgrass	Poaceae
AGRTHU	<i>Agrostis thurberiana</i>	Thurber's bentgrass	Poaceae
ALLCER	<i>Allium cernuum</i>	nodding onion	Liliaceae
ALNVIRS 2	<i>Alnus viridis</i> ssp. <i>sinuata</i>	Sitka alder	Betulaceae
ANGARG	<i>Angelica arguta</i>	Lyall's angelica	Apiaceae
ANTLAN	<i>Antennaria lanata</i>	woolly pussytoes	Asteraceae
ANTLUZ	<i>Antennaria luzuloides</i>	woodrush pussytoes	Asteraceae
ANTMIC2	<i>Antennaria microphylla</i>	rosy pussytoes	Asteraceae
ANTRAC	<i>Antennaria racemosa</i>	raceme pussytoes	Asteraceae
ANTUMB	<i>Antennaria umbrinella</i>	umper pussytoes	Asteraceae
AQUFOR	<i>Aquilegia formosa</i>	western columbine	Ranunculaceae
ARAGLA	<i>Arabis glabra</i>	tower rockcress	Brassicaceae
ARAHOLH	<i>Arabis holboellii</i> var. <i>holboellii</i>	Holboell's rockcress	Brassicaceae
ARAHOLR	<i>Arabis holboellii</i> var. <i>retrofracta</i>	Holboell's rockcress	Brassicaceae
ARCUVA	<i>Arctostaphylos uva-ursi</i>	bearberry, kinnickinnick	Ericaceae
ARECAP	<i>Arenaria capillaris</i>	mountain sandwort	Caryophyllaceae
ARNCOR	<i>Arnica cordifolia</i>	heartleaf arnica	Asteraceae
ARTTRIV 2	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	mountain big sagebrush	Asteraceae
ASTALP2	<i>Astragalus alpinus</i>	alpine milkvetch	Fabaceae
ASTFOL	<i>Aster foliaceus</i>	leafy aster	Asteraceae

BETNAN	<i>Betula nana</i>	bog birch	Betulaceae
BOTLUN	<i>Botrychium lunaria</i>	moonwort	Ophioglossaceae
BOTMIN	<i>Botrychium minganense</i>	Victorin's moonwort	Ophioglossaceae
BOTPIN	<i>Botrychium pinnatum</i>	pinnate moonwort	Ophioglossaceae
BROANO	<i>Bromus anomalus</i>	nodding brome	Poaceae
BROCAR	<i>Bromus carinatus</i>	California brome	Poaceae
BROCIL2	<i>Bromus ciliatus</i>	fringed brome	Poaceae
BROTEC	<i>Bromus tectorum</i>	cheatgrass	Poaceae
CALBIFB	<i>Caltha biflora</i> var. <i>biflora</i>	elkslip	Ranunculaceae
CALCAN	<i>Calamagrostis canadensis</i>	blue reedgrass	Poaceae
CALRUB	<i>Calamagrostis rubescens</i>	pinegrass	Poaceae
CARAUR	<i>Carex aurea</i>	goldenfruit sedge	Cyperaceae
CARCAN	<i>Carex canescens</i>	hoary sedge	Cyperaceae
CARCON	<i>Carex concinnoides</i>	northwestern sedge	Cyperaceae
CARDEW	<i>Carex deweyana</i>	roundfruit sedge	Cyperaceae
CARDIS	<i>Carex disperma</i>	softleaf sedge	Cyperaceae
CARHOO	<i>Carex hoodii</i>	Hood's sedge	Cyperaceae
CARNOR	<i>Carex norvegica</i>	closedhead sedge	Cyperaceae
CARPET	<i>Carex petasata</i>	Liddon sedge	Cyperaceae
CARPHA	<i>Carex phaeocephala</i>	dunhead sedge	Cyperaceae
CARRAY	<i>Carex raynoldsii</i>	Raynolds' sedge	Cyperaceae
CARROS	<i>Carex rossii</i>	Ross' sedge	Cyperaceae
CARSCOP	<i>Carex scopulorum</i> var. <i>prionophylla</i>	saw-leaved sedge	Cyperaceae
CARVAL2	<i>Carex vallicola</i>	valley sedge	Cyperaceae
CASELM	<i>Castilleja elmeri</i>	Wenatchee Indian paintbrush	Scrophulariaceae
CASMIN	<i>Castilleja miniata</i>	great red Indian paintbrush	Scrophulariaceae
CASTHO	<i>Castilleja thompsonii</i>	Thompson's Indian paintbrush	Scrophulariaceae
CERBER	<i>Cerastium beringianum</i>	Bering chickweed	Caryophyllaceae
CHASUA	<i>Chamomilla suaveolens</i>	pineapple weed	Asteraceae
CHEATR	<i>Chenopodium atrovirens</i>	Fremont's goosefoot	Chenopodiaceae
CHECHE2	<i>Chenopodium chenopodioides</i>	red goosefoot	Chenopodiaceae
CIRARV	<i>Cirsium arvense</i>	Canada thistle	Asteraceae
CIRVUL	<i>Cirsium vulgare</i>	bull thistle	Asteraceae
CISUMB	<i>Cistanthe umbellata</i>	pussypaws	
CLALAN	<i>Claytonia lanceolata</i>	lanceleaf springbeauty	Portulacaceae
CLARUB	<i>Claytonia rubra</i>	redstem springbeauty	Portulacaceae
COLPAR	<i>Collinsia parviflora</i>	smallflower blue-eyed Mary	Scrophulariaceae
CONCAN C	<i>Conyza canadensis</i> var. <i>canadensis</i>	Canadian horseweed	Asteraceae
CORUNA	<i>Cornus unalaschkensis</i>	western cordilleran bunchberry	Cornaceae
CYSFRA	<i>Cystopteris fragilis</i>	brittle bladder fern	Polypodiaceae
DANINT	<i>Danthonia intermedia</i>	timber oatgrass	Poaceae
DELNUTL 2	<i>Delphinium nuttallianum</i> var. <i>lineapetalum</i>	upland larkspur	Ranunculaceae
DESINCV 2	<i>Descurainia incana</i> ssp. <i>viscosa</i>	mountain tansymustard	Brassicaceae
DESSOP	<i>Descurainia sophia</i>	flixweed	Brassicaceae
DODDEN	<i>Dodecatheon dentatum</i>	white shootingstar	Primulaceae
DODPULP 3	<i>Dodecatheon pulchellum</i> ssp. <i>pulchellum</i>	birdie-beaks, shootingstar	Primulaceae
DRAALB	<i>Draba albertina</i>	slender whitlowgrass	Brassicaceae
ELYALAL	<i>Elymus alakanus</i> ssp. <i>latiglumis</i>	cutting wheatgrass	Poaceae
ELYELY	<i>Elymus elymoides</i>	bottlebrush squirreltail	Poaceae
EPIANA	<i>Epilobium anagallidifolium</i>	alpine willowherb	Onagraceae
EPIANG	<i>Epilobium angustifolium</i>	fireweed	Onagraceae
EPICILW	<i>Epilobium ciliatum</i> ssp. <i>watsonii</i>	Watson's willowherb	Onagraceae
EPIGLA	<i>Epilobium glaberrimum</i>	smooth willowherb	Onagraceae
EPIHAL	<i>Epilobium halleanum</i>	Hall's willowherb	Onagraceae
EPIIAC	<i>Epilobium lactiflorum</i>	creamy willowherb	Onagraceae
EQUARV	<i>Equisetum arvense</i>	field horsetail	Equisetaceae
ERIAUR	<i>Erigeron aureus</i>	alpine yellow fleabane	Asteraceae
ERIPER	<i>Erigeron peregrinus</i>	wandering daisy	Asteraceae

ERIUMB	Eriogonum umbellatum var. majus	subalpine wild buckwheat	Polygonaceae
FESIDA	Festuca idahoensis	Idaho fescue	Poaceae
FESOCC	Festuca occidentalis	western fescue	Poaceae
FESOVIB 2	Festuca ovina var. brachyphylla	alpine fescue	Poaceae
FILARV	Filago arvensis	field cotton-rose	Asteraceae
FRAVES	Fragaria vesca	woodland strawberry	Rosaceae
FRAVIR	Fragaria virginiana	Virginia strawberry	Rosaceae
GALTRI3	Galium trifidum	three-petal bedstraw	Rubiaceae
GAYDIFP	Gayophytum diffusum ssp. parviflorum	spreading groundsmoke	Onagraceae
GENAMA A4	Gentianella amarella ssp. acuta	northern gentian	Gentianaceae
GERPUS	Geranium pusillum	small geranium	Geraniaceae
GEUALE	Geum aleppicum	yellow avens	Rosaceae
GEUMAC	Geum macrophyllum	large-leaf avens	Rosaceae
GEUTRI	Geum triflorum	old-man's-whiskers, prairie smoke	Rosaceae
GNAMIC	Gnaphalium microcephalum	white cudweed	Asteraceae
GNAPAL	Gnaphalium palustre	lowland cudweed	Asteraceae
HACMIC	Hackelia micrantha	Jessica's stickseed	Boraginaceae
HIEGRA	Hieracium gracile	low alpine hawkweed	Asteraceae
JUNDRU	Juncus drummondii	Drummond's rush	Juncaceae
JUNPAR	Juncus parryi	Parry's rush	Juncaceae
KOEMAC	Koeleria macrantha	prairie junegrass	Poaceae
LEDGLA	Ledum glandulosum	false Labrador tea	Ericaceae
LEWPYG	Lewisia pygmaea	dwarf, or alpine bitterroot	Portulacaceae
LINBOR	Linnaea borealis	twinflower	Caprifoliaceae
LISCOR	Listera cordata	heart-leaf twayblade	Orchidaceae
LITTEN	Lithophragma tenella	woodlandstar or fringe-cup	Saxifragaceae
LOMAMB	Lomatium ambiguum	streambank desert-parsley	Apiaceae
LONINV	Lonicera involucrata	four-line honeysuckle	Caprifoliaceae
LONUTA	Lonicera utahensis	Rocky Mountain honeysuckle	Caprifoliaceae
LUPARC	Lupinus arcticus	arctic lupine	Fabaceae
LUPWYE	Lupinus wyethii	Wyeth's lupine	Fabaceae
LUZPAR	Luzula parviflora	smallflowered woodrush	Juncaceae
LUZSPI	Luzula spicata	spiked woodrush	Juncaceae
MELBULB	Melica bulbosa var. bulbosa	oniongrass	Poaceae
MICNUT	Microseris nutans	nodding silverpuffs	Asteraceae
MITPEN	Mitella pentandra	five-stamen bishop's-cap	Saxifragaceae
ORTSEC	Orthilia secunda	sidebells pyrola	Ericaceae
OSMDEP	Osmorhiza depauperata	blunt-fruit sweet Cecily	Apiaceae
OSMOCC	Osmorhiza occidentalis	western sweet Cecily	Apiaceae
OSMPUR	Osmorhiza purpurea	purple sweet Cecily	Apiaceae
PEDBRA	Pedicularis bracteosa	greater wood-betony	Scrophulariaceae
PENCON	Penstemon confertus	lesser yellow beardtongue	Scrophulariaceae
PENFLO	Pentaphylloides floribunda	shrubby cinquefoil, yellow rose	
PENPRO	Penstemon procerus	small-flowered penstemon	Scrophulariaceae
PENPROT	Penstemon procerus var. tolmiei	small-flowered penstemon	Scrophulariaceae
PENWAS	Penstemon washingtonensis	Washington penstemon	Scrophulariaceae
PHAHAS	Phacelia hastata	silver-leaf scorpion-weed	Hydrophyllaceae
PHLALP	Phleum alpinum	alpine fescue	Poaceae
PHLGRAG	Phlox gracilis ssp. gracilis	annual phlox	Polemoniaceae
PINALB	Pinus albicaulis	whitebark pine	Pinaceae
PINPON	Pinus ponderosa	ponderosa pine	Pinaceae
PLADIL	Platanthera dilatata	scentbottle	Orchidaceae
PLAMAJ	Plantago major	great plantain	Plantaginaceae
PLASTR	Platanthera stricta	slender bog orchid	Orchidaceae
POAALP2	Poa alpina	alpine bluegrass	Poaceae
POAANN	Poa annua	annual bluegrass	Poaceae
POALEP	Poa leptocoma	bog bluegrass	Poaceae
POAPRA	Poa pratensis	Kentucky bluegrass	Poaceae
POASEC	Poa secunda	Sandberg's bluegrass	Poaceae

POLAVI	<i>Polygonum aviculare</i>	crackweed, jointweed, doorweed	Polygonaceae
POLDOU	<i>Polygonum douglasii</i>	Douglas' knotweed	Polygonaceae
POLELE	<i>Polemonium elegans</i>	elegant Jacob's-ladder	Polemoniaceae
POLPULP 3	<i>Polemonium pulcherrimum</i> ssp. <i>pulcherrimum</i>	showy polemonium, showy Jacobs ladder	Polemoniaceae
POLVIV	<i>Polygonum viviparum</i>	serpent-grass	Polygonaceae
POPTRE	<i>Populus tremuloides</i>	quaking aspen	Salicaceae
POTDIVD	<i>Potentilla diversifolia</i> var. <i>diversifolia</i>	mountain-meadow cinquefoil	Rosaceae
POTDIVP	<i>Potentilla diversifolia</i> var. <i>perdissecta</i>	mountain-meadow cinquefoil	Rosaceae
POTDRU	<i>Potentilla drummondii</i>	Drummond's cinquefoil	Rosaceae
PSESPIS2	<i>Pseudoroegneria spicata</i> ssp. <i>spicata</i>	bluebunch wheatgrass	Poaceae
PYRASA	<i>Pyrola asarifolia</i>	pink wintergreen	Ericaceae
PYRMIN	<i>Pyrola minor</i>	lesser wintergreen	Ericaceae
RANESC	<i>Ranunculus eschscholtzii</i>	Eschscholtz's buttercup	Ranunculaceae
RANGLAE	<i>Ranunculus glaberrimus</i> var. <i>ellipticus</i>	elliptical buttercup	Ranunculaceae
RANUNC	<i>Ranunculus uncinatus</i>	hooked buttercup	Ranunculaceae
RIBVIS2	<i>Ribes viscosissimum</i>	sticky currant	Grossulariaceae
SALDRU	<i>Salix drummondiana</i>	Drummond's willow	Salicaceae
SALFAR	<i>Salix farriae</i>	Farr's willow	Salicaceae
SALPLA	<i>Salix planifolia</i>	diamondleaf willow	Salicaceae
SALSCO	<i>Salix scouleriana</i>	Scouler's willow	Salicaceae
SALTWE	<i>Salix tweedyi</i>	Tweedy's willow	Salicaceae
SAXAPE	<i>Saxifraga apetala</i>	dwarf saxifrage	Saxifragaceae
SAXODO	<i>Saxifraga odontoloma</i>	brook saxifrage	Saxifragaceae
SEDLAN	<i>Sedum lanceolatum</i>	lance-leaf stonecrop	Crassulaceae
SELDEN	<i>Selaginella densa</i>	dense spike-moss	Selaginellaceae
SENINT	<i>Senecio integerrimus</i>	lamb-tongue ragwort	Asteraceae
SEMPAU	<i>Senecio pauciflorus</i>	rayless alpine butterweed	Asteraceae
SENPSE	<i>Senecio pseud aureus</i>	streambank ragwort	Asteraceae
SENSTR	<i>Senecio streptanthifolius</i>	Rocky Mountain ragwort	Asteraceae
SENSYL	<i>Senecio sylvaticus</i>	woodland ragwort	Asteraceae
SENTRI	<i>Senecio triangularis</i>	arrowleaf groundsel	Asteraceae
SHECAN	<i>Shepherdia canadensis</i>	russet buffalo-berry	Eleagnaceae
SIBPRO	<i>Sibbaldia procumbens</i>	creeping sibbaldia	Rosaceae
SOLMUL	<i>Solidago multiradiata</i>	northern goldenrod	Asteraceae
STECRI	<i>Stellaria crispa</i>	crisped starwort	Caryophyllaceae
STELONM	<i>Stellaria longipes</i> var. <i>monantha</i>	long-stalk starwort	Caryophyllaceae
STEOCC2	<i>Stenanthium occidentale</i>	bronze bells	Liliaceae
STIOCC	<i>Stipa occidentalis</i>	western needlegrass	Poaceae
STRAMP	<i>Streptopus amplexifolius</i>	clasping twistedstalk	Liliaceae
SUKRAN	<i>Suksdorfia ranunculifolia</i>	buttercupleaved saxifrage	Saxifragaceae
TAROFF	<i>Taraxacum officinale</i>	common dandelion	Asteraceae
THAOCC	<i>Thalictrum occidentale</i>	western meadowrue	Ranunculaceae
TRADUB	<i>Tragopogon dubius</i>	yellow salsify	Asteraceae
TRACRA	<i>Trimorpha acris</i> var. <i>asteroides</i>	bitter boreal-daisy	Asteraceae
TRACRD	<i>Trimorpha acris</i> var. <i>debilis</i>	northern daisy	Asteraceae
TRISPI2	<i>Trisetum spicatum</i>	spike trisetum	Poaceae
TROLAX	<i>Trollius laxus</i>	American globeflower	Ranunculaceae
VACCAE	<i>Vaccinium caespitosum</i>	dwarf huckleberry	Ericaceae
VACMYR2	<i>Vaccinium myrtilus</i>	whortle-berry	Ericaceae
VACSCO	<i>Vaccinium scoparium</i>	grouseberry, dwarf whortleberry	Ericaceae
VALDIO	<i>Valeriana dioica</i>	marsh valerian	Valerianaceae
VALSIT	<i>Valeriana sitchensis</i>	Sitka valerian	Valerianaceae
VERSERH 2	<i>Veronica serpyllifolia</i> ssp. <i>humifusa</i>	thyme-leaf speedwell	Scrophulariaceae
VERVIR	<i>Veratrum viride</i>	American false hellebore	Liliaceae
VERWOR	<i>Veronica wormskjoldii</i>	American alpine speedwell	Scrophulariaceae
VIOADU	<i>Viola adunca</i>	long spurred violet	Violaceae
VIOMAC	<i>Viola macloskeyi</i>	smooth white violet	Violaceae
VIONUT	<i>Viola nuttallii</i>	Nuttall's violet	Violaceae
VIOORB	<i>Viola orbiculata</i>	round-leaved, or evergreen violet	Violaceae

VIOPAL2	<i>Viola palustris</i>	alpine-marsh violet	Violaceae
ZIGVEN	<i>Zigadenus venenosus</i>	meadow deathcamas	Liliaceae

TOTALS OF VASCULAR PLANT RECORDS

Total plant records entered (including duplicates) = 483
 Total plant families represented = 41
 Plants not identified to vascular species = 0
 No. of duplicate, non blank records (redundant) = 265
 No. of duplicate, non blank vascular taxa (unique) = 110
 Number of unique taxa identified = 218
 No. vars/spps duplicated as specifics (listed below) = 1
 PENPRO
 Recalculated no. of taxa, less variety duplicates = 217
 Number of subspecific taxa identified = 52 (24%)
 Number of species with more than one variety unidentified = 54 (25%)

LIFE FORM CLASSIFICATION

Number of identified species classed as trees = 8 = 3.9%
 Number of identified species classed as shrubs = 21 = 10.1%
 Number of identified species classed as forbs = 178 = 86.0%
 TOTAL found in life form database: 207 100.0%

DETAIL OF LIFE FORMS (REDUNDANT COUNTS)

Number of grass species identified = 42 = 19.4%
 Number of vine species identified = 0 = 0.0%
 Number of cane species identified = 0 = 0.0%
 Number of aquatic species identified = 0 = 0.0%
 Number of parasitic species identified = 0 = 0.0%
 Number of coniferous species identified = 6 = 2.8%
 Number of forb species identified = 134 = 62.0%
 Number of subshrub species identified = 10 = 4.6%
 Number of woody species identified = 15 = 6.9%
 Number of insectivorous species identified = 0 = 0.0%
 Number of fern species identified = 4 = 1.9%
 TOTAL REDUNDANT PERCENTAGES (OF UNIQUE TAXA = 216)
 97.7%

DETAIL OF AGE CLASSIFICATION

Number of perennial species identified = 186 = 89.9%
 Number of biennial species identified = 5 = 2.4%
 Number of annual species identified = 16 = 7.7%
 TOTAL: 207 100.0%

DETAIL OF LEAF CLASSIFICATION

Number of evergreen species identified =	7 = 3.4%
Number of deciduous species identified =	188 = 90.8%
Number of semigreen species identified =	12 = 5.8%
TOTAL:	207 100.0%

DETAIL OF NATIVE/INTRODUCED SPECIES

No. of Wash St Noxious weeds identified =	2 = .9%
No. of other introduced spp identified =	12 = 5.5%
List of introduced spp.(*=Noxious):	
ARAGLA BROANO BROTEC *CIRARV	
*CIRVUL DESSOP FILARV GERPUS	
PLAMAJ POAANN POAPRA POLAVI	
SENSYL TAROFF TRADUB	
Number of (positively) native species identified =	188 = 86.2%
No. of species with ambiguous provenance =	16 = 7.3%
TOTAL:	218 100.0%

DETAIL OF RARITY CLASSIFICATION

Number of rare Washington plant species possible =	15 = 6.9%
--	-----------

ALPHABETICAL LIST OF SPECIFIC, IDENTIFIED TAXA:

Appendix C. Initial TES plant surveys for the Forest Service

From: George Wooten, Okanogan NF
 To: Thunder Interdisciplinary Analysis Team
 Re: Thunder Analysis Area surveys
 Date: July 25, 1995

SURVEY DATES:

Dog Creek, lower end - 6/29/95

Thirtymile & Twentymile Creek saddle (Skull and Crossbones) - 7/6/95,7/7/95

Thirtymile Creek, Ridge NW of Thirtymile meadow - 7/8/95, 7/9/95

Purpose of survey was to determine the location of sensitive plants in the area of the Thunder burn (1994); to propose alternative conservation measures for their continued viability; to inventory wildlife and vegetation components within cutting unit boundaries and within the burn area; and to inspect riparian reserves and their integrity for species within reserves.

Note: This report accompanies a vegetative analysis report and three sensitive plant survey forms.

HABITATS INVENTORIED

BIGDRY Partly burned, dry sagebrush meadow 1 mi. ENE of Thirty mile meadows.
 BOT HB Hot burned, riparian bottomlands in Dog Creek.

BOTSTAND Partially burned tributary bottomlands with standing water.
 CLASSBOG Mostly unburned bog 1.5 mi ENE of Thirtymile meadows on a southwest flowing tributary of Thirtymile Creek. Some scorched, and fallen burned trees present.
 OTHER Miscellaneous plant records, this survey.
 U30 Upper Thirtymile Creek, in saddle above upper Twentymile Creek.
 U30-BOT Upper Thirtymile and Twentymile Creeks, saddle, in Botrychium lunaria site.
 UNBURNED Westernmost unburned patch at lowermost end of Dog Creek in burn.
 WET Dog Creek Meadows at main tributary junction.

FIRE, VEGETATIVE TRENDS

Several types of burn condition are present in Thunder fire. Four noted are (1) hot burned areas, which left no visibly living vegetation in 1995, primarily in lodgepole stands; (2) understory burned areas, with canopies more than 50% intact, primarily in Douglas fir/pinegrass areas; (3) scorched areas, with 50% to 90% of the overstory killed; and (4) unburned areas.

On 6/29/95, vegetative conditions inside and outside burned areas were assessed at the lowermost, western edge of Dog Creek at approx. 5000 ft. elevation. Both leader growth and vegetation cover were measured. Plants growing in the same habitats inside and outside areas that were burned hot had the following differences in leader growth of the year.

Species	Burned Growth"	Unburned Growth	Burned %Cover	Unburned %Cover
<i>Vaccinium scoparium</i>	6"		0	40
<i>Carex scopulorum prionophylla</i>	8"	12"	20	20
<i>Ledum glandulosum</i>	5"		0	5
<i>Lupinus latifolius</i>	1"	4"	1	5
<i>Valeriana sitchensis</i>	4"		0	5
<i>Alnus sinuatus</i>	4"			
<i>Equisetum arvensis</i>	6"			
<i>Luzula parvifolia</i>	2"			
<i>Polemonium pulcherrimum</i>	3"			
<i>Streptopus amplexifolius</i>	24"	24"		
<i>Lonicera involucrate</i>	6"			
<i>Arnica cordifolia</i>	2"			
<i>Stenanthium occidentale</i>	6"			
<i>Cornus stolonifera</i>	3"			

From this it can be seen that fire generally reduces both aerial coverage as well as leader growth. The affect of fire on the growth of different species is highly variable, however. In lodgepole uplands, the commonest plant is often whortleberry, *Vaccinium scoparium*. This species was almost completely absent from hot burned areas in 1995. On the other hand, the common riparian plant *Carex scopulorum* var. *prionophylla* remains unchanged in coverage. Since its growth is 50% higher where unburned, this suggests that its lower roots were not harmed by the fire due to saturated soils. This is

not the case with Sitka valerian, *Valeriana sitchensis*. In 1996, it was not visible in hot burned areas where it apparently occurred before the fire. The twisted stalk, *Streptopus amplexifolius*, was apparently unchanged by the fire, and this plant also shows the most rapid leader growth of the forbs in hot burned areas. Most shrubs are sprouting adequately in the hot burned area, except labrador tea, *Ledum glandulosum*, which may have been completely killed wherever it burned.

Other expected observations were rapid sprouting of deciduous shrubs, seeding out of pinegrass, *Calamagrostis rubescens*, and widespread seedling growth of fireweed, *Epilobium angustifolium*.

SENSITIVE AND RARE PLANTS AND COMMUNITIES

Carex norvegica, Scandinavian sedge. R-6 Sensitive. This plant was found by George Thornton in a dozen or so localities in upper Thirtymile Creek. It prefers edges of bog/fen habitats where it is associated with *Carex disperma* and mosses and where *Carex scopulorum* var. *prionophylla* and other aggressive competitors are less dominant. Little is known about its biology here, but it does not occur south of Idaho. Suspected reasons for its rarity are habitat loss. It is currently undergoing development of a Conservation Strategy. A second population was found by Mary Poss near Round Meadow.

Salix tweedyi, Tweedy's willow. R-6 Sensitive. George Thornton found one male plant of *Salix tweedyi* on the Thirtymile side of the saddle between Twentymile Creek. Repeated searches found no more of this. Tweedy's willow prefers aerated, rapidly moving water, with open canopies, at elevations above 6000 ft., although it will tolerate slower-moving water or denser or more open habitats, or lower elevations. The characteristics of its preferred habitats are limited and declining in Thirtymile drainage, and its continued presence here is tenuous. It is an indicator for chemical water quality and stream gradient and changes in these two environments would be detrimental to it.

Botrychium lunaria, moonwort. R-6 Sensitive. Five plants found in the saddle of Thirtymile and Twentymile Creeks. It was growing in the only grass dominated site in a small island in the middle of the fen/bog in the saddle. The ground here was dry enough to sit on. This is expected, since *Botrychium* species often occur at the edges of wetlands, where some seasonal drying can occur. This habitat occurs in Thirtymile Meadows, and more plants undoubtedly exist there. Plants often occur with *Fragaria* spp., *Potentilla* spp., and other *Botrychium* spp.

Botrychium pinnatum, pinnate moonwort. R-6 Sensitive. Five plants found with *Botrychium lunaria*, above. See discussion under *Botrychium lunaria*.

Botrychium minganense, Victorin's moonwort. R-6 Sensitive. One plant found in a large dry meadow, 1 mi. ENE of Thirtymile Meadows, apparently in association with mountain sagebrush, *Artemisia tridentata* var. *vaseyana*. I have found *Botrychium minganense* associated with mountain sagebrush on DNR land, in nearly identical habitats. This plant was growing 2" from the base of a live sagebrush. Relationship

may be mycorrhizal, as sagebrush forms mycorrhizal associations with a number of species, for instance, *Orobanche*, and *Comandra*. The fire in the big meadow burned approx. one half of the sagebrush plants, however its affect on other species in this plant community is not apparent. Threats are loss of mountain sagebrush, and invasion by *Poa pratensis*, Kentucky bluegrass, which can change fire and mycorrhizal characteristics with the flora.

Carex scopulorum var. *prionophylla*. R-6 Sensitive. Throughout the area, wherever wet. Plant more common than previously thought. Plant is an indicator species for saturated soil and wetlands.

Potentilla diversifolia var. *perdissecta*. R-6 Sensitive. In wet habitats, this variety of *Potentilla diversifolia* can be predominant. Identification complicated by the presence of the similar *Potentilla drummondii*. Relatively distinct populations occur at the bend in the final headwaters of Twentymile Creek, and in the small bog 1.5 mi ENE of Thirtymile Meadows in a small unburned tributary. Populations not mapped due to intergradient forms with *Potentilla diversifolia* var. *diversifolia*.

Dodecatheon pulchellum var. *watsonii*. WNHP Monitor. Known from Thirtymile Meadows and Dog Creek Meadows. Intergradient with *D. pulchellum* v. *pulchellum*.

Saxifraga apetala. WNHP Monitor. Forms of this species apparently occur in this area, however more taxonomic work needs to be done to establish its status.

Geum triflorum var. *campanulatum*. Subalpine populations of *Geum triflorum* are partly cleistogamous (selfers) and this condition has been classified as an Olympic Mountain ecotype (plants of the same genome with different habits in differing environments--they are not technically varieties). Although our entity may be the same, no systematic study has been to demonstrate whether or not the plant is an ecotype or indeed, a variety, and whether our plants are the same as those on the Olympic. Status unknown.

ECOLOGY NOTES

See attachment with floral data.

The total number of taxa for this survey, approx. 106, is typical for surveys of several miles in extent, lasting a day or two. Comparison with more complete surveys indicate 52 of 278 species in common with the Granite Analysis Area, 51 of 310 species in common with the Horseshoe Basin area, and 57 of 244 species in common with the North Boulder Analysis Area. This number found on this survey is lower partly because many of genera have not been keyed to species. The largest group of sensitive species, which was undersampled in this survey, are the sedges, *Carex* spp. Although difficult to key out, this would allow assurances that affected species are not TES species. This coupled with the low overall plant count and the short time spent, over only a small percentage of the area, indicates that the plant survey is not valid under NEPA.

The number of perennial species is notable at 99%. This is typical of the Pacific Northwest and temperate coniferous forests.

The number of introduced species is notably low at 2 or 2%. Few areas in the state still remain this free of weeds.

The number of rare plant taxa is relatively high, and indicates caution should be taken in those special habitats.

Appendix D. List of wetland plants observed in the Okanogan Range

The following plants of the Okanogan Range are listed in the National list of plants occurring in wetlands for Region 9 of the US Army Corps of Engineers, available on the internet at <http://www.nwi.fws.gov/ecology.htm>. (Key R9 = R9 indicator status for the current list, SUPP = indicator status for the supplement to Region 9, GWREV = recommendations submitted to NWI by George Wooten for changes, based on their occurrence in wetlands here; OBL = obligate wetland, FAC = facultative, FACW = facultative, mostly wet, FACU = facultative, mostly upland, UPL = upland, NI = no information or purportedly not occurring in area, (*) = species needing further information, (+) = categories leaning toward more to wet, (-) = categories leaning more toward dry.

Taxon	R9IND	SUPP	GWREV
<i>Abies lasiocarpa</i>	FACU	.	.
<i>Achillea millefolium</i>	FACU	.	.
<i>Agoseris aurantiaca</i>	.	FACU	.
<i>Agoseris glauca</i> var. <i>dasycephala</i>	FAC	FAC-	.
<i>Agoseris lackschewitzii</i>	NI	.	.
<i>Agropyron caninum</i>	FAC-	.	.
<i>Agropyron spicatum</i>	FACU-	UPL	.
<i>Agrostis thurberiana</i>	.	.	FACW
<i>Alnus sinuata</i>	FACW	.	.
<i>Angelica arguta</i>	FACW	.	.
<i>Antennaria microphylla</i>	.	.	FAC
<i>Antennaria umbrinella</i>	FACU	.	.
<i>Aquilegia formosa</i>	FAC	.	.
<i>Arabis holboellii</i> var. <i>holboellii</i>	FACU-	.	.
<i>Arabis holboellii</i> var. <i>retrofracta</i>	FACU-	.	.
<i>Arctostaphylos uva-ursi</i>	FACU-	.	.
<i>Aster foliaceus</i>	FACW-	.	.
<i>Astragalus alpinus</i>	FAC-	.	.
<i>Betula glandulosa</i>	OBL	.	.
<i>Botrychium lunaria</i>	FAC	.	.
<i>Bromus ciliatus</i>	FAC+	FAC*	.
<i>Bromus inermis</i> ssp. <i>pumpellianus</i> var. <i>tweedyi</i>	.	.	FAC*
<i>Calamagrostis canadensis</i>	FACW+	.	.

<i>Caltha biflora</i> var. <i>biflora</i>	.	.	OBL
<i>Carex aurea</i>	FACW+	.	.
<i>Carex disperma</i>	FACW	.	FACW+
<i>Carex hoodii</i>	NI	FAC	FACU
<i>Carex norvegica</i>	FACW	.	FACW+
<i>Carex petasata</i>	.	.	FAC
<i>Carex phaeocephala</i>	FACU	.	.
<i>Carex raynoldsii</i>	FACU	.	.
<i>Carex scopulorum</i> var. <i>prionophylla</i>	FACW	.	.
<i>Castilleja elmeri</i>	.	.	FACU-
<i>Chenopodium fremontii</i> var. <i>atrovirens</i>	FACU	.	.
<i>Cirsium vulgare</i>	FACU	.	.
<i>Claytonia lanceolata</i>	FAC-	.	.
<i>Conyza canadensis</i> var. <i>canadensis</i>	FACU	.	.
<i>Cystopteris fragilis</i>	FACU	.	.
<i>Danthonia intermedia</i>	FACU+	.	.
<i>Dodecatheon dentatum</i>	FAC-	.	FACW
<i>Dodecatheon pulchellum</i>	FACW	.	.
<i>Epilobium alpinum</i>	.	.	FAC
<i>Epilobium alpinum</i> var. <i>lactiflorum</i>	.	.	FAC
<i>Epilobium angustifolium</i>	FACU+	.	.
<i>Epilobium glaberrimum</i>	FACW	.	.
<i>Epilobium halleianum</i>	FACW	.	.
<i>Equisetum arvense</i>	FAC	.	.
<i>Erigeron peregrinus</i>	FACW	NI	.
<i>Festuca idahoensis</i>	.	FACU*	.
<i>Festuca ovina</i> var. <i>brachyphylla</i>	.	FACU*	.
<i>Fragaria virginiana</i>	UPL	FACU*	FACU
<i>Galium trifidum</i>	FACW+	.	.
<i>Gentiana amarella</i> var. <i>acuta</i>	.	.	FACU
<i>Geum aleppicum</i>	FACW-	.	.
<i>Geum macrophyllum</i>	FACW+	FACW-*	FACW+
<i>Geum triflorum</i>	FACU	.	.
<i>Juncus drummondii</i>	FACW-	.	.
<i>Juncus parryi</i>	FAC+	.	.
<i>Ledum glandulosum</i>	FACW+	.	FACW
<i>Lewisia pygmaea</i>	FACU	.	.
<i>Linnaea borealis</i>	FACU-	.	.
<i>Listera cordata</i>	FACW	FACU*	FAC
<i>Lonicera involucreta</i>	FAC	FAC+*	FAC+
<i>Lonicera utahensis</i>	FACU+	FAC	.
<i>Lupinus latifolius</i>	.	.	FACU+
<i>Lupinus polyphyllus</i> var. <i>burkei</i>	FAC+	.	.
<i>Luzula parviflora</i>	FAC-	.	.
<i>Luzula spicata</i>	FACU	.	.
<i>Melica bulbosa</i> var. <i>bulbosa</i>	FACU	.	.
<i>Microsteris gracilis</i>	FACU	.	.
<i>Mitella pentandra</i>	FACW+	FAC*	.

<i>Osmorhiza purpurea</i>	FAC+	.	.
<i>Penstemon procerus</i>	NI	.	.
<i>Penstemon procerus</i> var. <i>tolmiei</i>	NI	.	.
<i>Phleum alpinum</i>	FAC	FACW	.
<i>Picea engelmannii</i>	FAC	.	.
<i>Pinus contorta</i>	FAC-	FAC	.
<i>Platanthera dilatata</i>	FACW+	.	.
<i>Poa annua</i>	FAC-	FAC	.
<i>Poa leptocoma</i>	FACW+	.	.
<i>Poa pratensis</i>	FACU+	FAC	.
<i>Polygonum aviculare</i>	FACW-	.	.
<i>Polygonum douglasii</i>	FACU	.	.
<i>Polygonum viviparum</i>	FAC	.	.
<i>Potentilla diversifolia</i>	FACU	.	.
<i>Potentilla diversifolia</i> var. <i>perdissecta</i>	FACU	.	.
<i>Potentilla drummondii</i>	FAC	.	.
<i>Potentilla fruticosa</i>	FAC-	.	.
<i>Pseudotsuga menziesii</i>	.	FACU*	.
<i>Pyrola asarifolia</i>	FACU	.	FACW
<i>Pyrola minor</i>	FACU+	.	.
<i>Pyrola secunda</i>	FACU	.	.
<i>Ranunculus eschscholtzii</i>	FACW	FACW*	FAC
<i>Ranunculus uncinatus</i>	FAC	FAC-	FACW-
<i>Ribes viscosissimum</i>	NI	FAC	.
<i>Salix drummondiana</i>	FACW	.	OBL
<i>Salix farriae</i>	OBL	.	.
<i>Saxifraga arguta</i>	FACW+	.	.
<i>Senecio integerrimus</i>	FAC	FACU	.
<i>Senecio pauperculus</i>	FACW	.	.
<i>Senecio streptanthifolius</i>	FACU	.	.
<i>Senecio triangularis</i>	FACW+	.	.
<i>Shepherdia canadensis</i>	NI	.	.
<i>Sitanion hystrix</i>	FACU-	.	.
<i>Solidago multiradiata</i>	FACU	.	.
<i>Stellaria longipes</i> var. <i>altocaulis</i>	FACW-	.	.
<i>Stenanthium occidentale</i>	FACW	FAC*	.
<i>Streptopus amplexifolius</i>	FAC-	.	.
<i>Suksdorfia ranunculifolia</i>	FAC	.	.
<i>Taraxacum officinale</i>	FACU	.	.
<i>Thalictrum occidentale</i>	FACU	FACU*	.
<i>Trisetum spicatum</i>	FACU-	UPL	FACU-
<i>Trollius laxus</i>	OBL	.	.
<i>Vaccinium caespitosum</i>	.	.	FACU+
<i>Vaccinium myrtillus</i>	NI	.	FACU
<i>Vaccinium scoparium</i>	FACU-	.	.
<i>Valeriana dioica</i>	FACW	.	FACW+
<i>Valeriana sitchensis</i>	FAC	.	FACW
<i>Veratrum viride</i>	OBL	FACW	.

<i>Veronica wormskjoldii</i>	FAC+	FAC*	FAC+
<i>Viola adunca</i>	FAC	.	.
<i>Viola macloskeyi</i>	OBL	.	.
<i>Viola palustris</i>	OBL	.	.
<i>Zigadenus venenosus</i>	FAC	FACU*	UPL

Appendix E. Transect summary information

Note that plots 1-26 were established in 1996; plots 30-36 were added in 1997, along with a transect at plot 3

Plot Dimensions

- 1 1-100, 101-200, 201-300 = 300 ft
- 2 1-50, 61-70, 101-146, 201-300, 301-323 , 229 points / 0.5 mi transect
- 3 1-100 = 100 pts
- 4 1-100 = 100 pts
- 5 1-100, 101-194, 201-300, 310-400, 401-500= 494 pts
- 6 1-100 = 100 pts
- 7 1-100 = 100 pts
- 8 1-100, 101-200 = 200 pts
- 9 1-100, 101-200, 201-300 = 300 pts
- 10 1-100, 101-150, 201-250 = 200 pts
- 11 1-100, 101-200 = 200 pts
- 20 1-50 = 50 pts + 2 m-quadrats, Quad-10.0 and Quad-40.0
- 21 1-100, 101-138 = 138 pts
- 22 1-94 = 94 pts + 2 m-quadrats, Quad-15.0 and Quad-85.0, changed in 1997 to Quad-15.2 and Quad-84.2
- 23 1-75 = 75 pts + 1 m-quadrat, Quad-15.0
- 24 1-97 = 97 pts
- 25 1-100 = 100 pts
- 26 1-100, 101-200 = 200 pts
- 30 1-100, 101-150 = 150 pts
- 31 1-100 = 100 pts + 2 m-quadrats
- 32 1-100 = 100 pts
- 33 1-89 = 89 pts
- 34 1-76 = 76 pts
- 35 1-99 = 99 pts
- 36 1-100, 101-190 = 190 pts

Appendix F. Habitat categories observed along transects

Broad habitat categories: burn intensity, soil dryness, logging occurrence.

The following table lists all 81 habitats designated in all transects, along with burn intensity [(O)verstory 0-5, (U)nderstory 0-5, (S)urface 0-5], soil moisture (dry, moist, or wet), and logging intensity (Yes, No, or Near (a unit)). (red records are added in 2003)

Transect	Fire	Soil	Logged	Description
01-1a	O3U3S3	dry	Yes	Dill Cr. PICO unit edge low-int. burn, tractored
01-1b	O3U3S3	dry	Near	Dill Cr. unlogged PICO adj. unit 6 low-int. burn
02-1	O3U3S3	dry	Yes	Dill Cr. PICO unit logged
02-2(1b)	O3U3S3	dry	Yes	Dill Cr. PIEN unit moist, logged draw
02-3(1c)	O3U3S3	moist	No	Dill Cr. PICO unit leave-tree reserve
02-4(1d)	O3U3S3	dry	Yes	Dill Cr. PICO unit logged south end
02-2	O3U3S3	moist	Yes	Dill Cr. moist, logged PIEN swale in unit 6.
02-3	O3U3S3	dry	No	Dill Cr. unlogged, upland PICO in unit 6 leave-tree reserve.
02-4	O3U3S3	dry	Yes	Dill Cr. logged, upland PICO in unit 6 south end.
03-1	O5U5S5	dry	No	Dill Cr. PICO (PSME) hot-burned rocky ridge
04-1	O4U4S1	dry	No	Dog-30mi ridge patchy vegetation slope
04-2	O2U3S4	dry	No	Dog-30mi ridge patchy vegetation slope
04-3	O2U3S1	dry	No	Dog-30mi ridge patchy vegetation slope
04-4	O3U3S4	dry	No	Dog-30mi ridge patchy vegetation slope
04-5	O3U2S0	dry	No	Dog-30mi ridge patchy vegetation slope
05-1	O4U2S2	moist	No	Dog-30mi ridge PIEN/LEGL bench
05-2a	O3U4S3	dry	No	Dog-30mi ridge ABLA/VASC bench
05-2b	O4U4S3	dry	No	Dog-30mi ridge ABLA/VASC bench
05-2c	O4U2S0	dry	No	Dog-30mi ridge ABLA/VASC bench
05-2d	O4U4S3	dry	No	Dog-30mi ridge ABLA/VASC bench
05-3	O5U5S3	moist	No	Dog-30mi ridge PIEN moist draw
05-4	O5U5S4	dry	No	Dog-30mi ridge PICO across draw
05-3b(4a)	O5U5S4	moist	No	Dog-30mi ridge PIEN across draw
05-4b	O5U5S4	dry	No	Dog-30mi ridge PICO across draw
06-1	O3U3S3	moist+wet	No	Dog Cr. partial burn riparian conifer
06-2	O4U4S4	moist	No	Dog Cr. partial burn ripar. conif burned drier patch
07-1	O5U5S4	dry	No	Dog Cr. hot-burned bank, open
07-2	O5U5S4	moist+wet	No	Dog Cr. hot-burned bottom riparian
07-3	O5U5S4	dry	No	Dog Cr. hot-burned south aspect
08-1	O5U5S5	dry	No	Dog Cr. ABLA/VASC/CARU[PICO/EPAN] slope
08-2	O5U5S5	moist+wet	No	Dog Cr. moist bench bottom
08-3	O5U5S5	dry	No	Dog Cr. south-facing, sandy bank outside unit
09-1	O4U4S4	dry	No	Dill Cr. adj. unit streambank upland outside unit
09-2	O4U4S4	wet	No	Dill Cr. trib adj. unit 6 riparian outside unit
09-3	O4U4S4	dry	No	Dill Cr. adj. unit 6 north bank upland outside unit

09-4a	O4U4S4	dry	Near	Dill Cr. trib adj. unit unlogged bench outside unit
09-4b	O4U4S4	dry	Near	Dill Cr. trib adj. unit unlogged bench inside unit
09-5	O4U4S4	dry	Yes	Dill Cr. trib adj. unit logged bench
10-1	O4U4S3	dry	Near	Dill Cr. finger wetland adj. unit 6 north (dry) bank
10-1b	O4U4S3	dry	Near	Dill Cr. finger wetland adj. unit 6 north (dry) bank
10-1c	O4U4S3	dry	Near	Dill Cr. finger wetland adj. unit 6 north (dry) bank
10-2	O3U3S3	wet	Near	Dill Cr. finger wetland adj. unit 6
10-2b	O3U3S3	wet	Near	Dill Cr. finger wetland adj. unit 6
10-2c	O3U3S3	wet	Near	Dill Cr. finger wetland adj. unit 6
10-3	O4U4S3	moist	Near	Dill Cr. finger wetland adj. unit 6 south PIEN bank
11-1a	O2U2S0	dry	No	Upper 30-mi. drainage mixed conifer spur-bench
11-1b	O0U3S3	dry	No	Upper 30-mi. drainage mixed conifer spur-bench
11-2	O0U1S0	dry	No	Upper 30-mi. drainage mixed conifer spur-bench
11-3	O3U3S4	dry	No	Upper 30-mi. drainage mixed conifer spur-bench
11-4	O4U5S5	dry	No	Upper 30-mi. drainage mixed conifer spur-bench
20-1	O3U3S3	dry	No	Dill Cr. bottom PICO medium int. burn
21-1	O4U5S5	dry	No	Dog Cr. slope PICO
21-2	O4U5S3	dry	No	Dog Cr. slope PICO
22-1	O4U4S4	dry	No	Dog Cr. swale on slope PICO
22-2	O4U4S4	dry	No	Dog Cr. bench on slope PICO
23-1	O4U5S4	moist-dry	No	Dog-30mi. ridge-saddle drier edge of PIEN
23-2	O4U5S3	moist	No	Dog-30mi. ridge-saddle lush PIEN swale
24-1	O4U5S4	dry	No	30mi Cr. upper ridge S-facing erosive lupine
25-1	O3U3S1	wet	No	30mi. fen CASCP, scorched ABLA-PIEN
25-2	O4U4S4	wet	No	30mi. fen margin burned CASCP growth effects
25-3	O4U4S4	wet	No	30mi. fen hot burned margin EQUIS-EPILO-ASFO
25-4	O4U4S4	moist	No	30mi. fen moist subirrigated EPAN/MAPO
25-5	O4U4S4	moist	No	30mi. fen dry, subirrigated EPAN
25-6	O4U4S4	moist	No	30mi. fen ARCO moist upland
25-7	O4U4S4	dry	No	30mi. fen VASC upland
26-1	O2U2S2	dry	Yes	Upper 30mi. pulverized clearcut landing
26-2	O2U2S2	dry	No	Upper 30mi. PICO medium burn adj to CCut
30-1	O0U0S0	dry	No	Dog Cr-rd jcn unburned drier adj. to creek
30-2	O0U0S0	moist+wet	No	Dog Cr-rd jcn unburned bottomland

31-1	O4U4S5	dry	No	Sheep Mtn hot-burned PICO near unburned PICO
32-1	O4U4S4	dry	No	Sheep Mtn light-burned PICO pole stand
33-1	O0U0S0	dry	No	30mi Mead. PICO [PSME] patchy burn
34-1	O2U3S4	dry	No	S of 30mi Mead. partial burn in PICO [PSME]
35-1	O5U5S5	moist-dry	No	Dill Cr. bench near ravine - moist, concave draw
35-2	O5U5S5	dry	No	Dill Cr. bench near ravine - dry convex esker
36-1	O0U0S0	dry	No	Adj to CCut - unburned, unlogged PICO pole
36-2	O0U0S0	dry	Near	CCut edge - uncut more open more blowdown
36-3	O0U0S0	dry	Near	CCut edge blowdown unlogged no soil disturbed
36-4	O1U1S1	dry	Yes	CCut edge rd-30mi. logged, soil disturbed
36-4b	O1U1S1	moist	Yes	CCut edge rd-30mi. logged, soil disturbed swale
36-5	O1U1S1	dry	Yes	CCut edge rd-30mi. logged, soil disturbed

Appendix G. Photographic log through 1997

A notebook of photographs of transect changes through time is being maintained. As of Dec. 1997, it contained the following photos.

Date	PLOT NO	Yr	From	To	Az	Print	mm
8/17/96	TH-001	6	100	000	184	print	38
8/17/96	TH-001	6	100	200	4	print	38
9/11/97	TH-001	7	100	200	4	both	38
9/11/97	TH-001	7	200	300	184	both	38
8/18/96	TH-001	6	200	100	94	print	38
9/11/97	TH-001	7	300	200	184	both	38
8/17/96	TH-002	6	000	Az-130	130	print	38
8/17/96	TH-002	6	000	50	184	print	90
8/17/96	TH-002	6	000	Az-274	274	print	38
8/19/96	TH-002	6	100	---	--	missing	60
8/19/96	TH-002	6	100	070	184	missing	38
8/17/96	TH-002	6	121	Reserve	360	slide	60
8/19/96	TH-002	6	S-end	N	360	slide	60
9/9/97	TH-003	7	000	Az-192	?	both	65
8/18/96	TH-003	6	000	Az-192	192	slide	75
9/9/97	TH-003	7	000	40	232	both	75
8/18/96	TH-003	6	000	Az-232	232	slide	75
9/9/97	TH-003	7	000	Az-176	76	both	75
8/18/96	TH-003	6	000	Az-76	76	slide	75
9/9/97	TH-003	7	040	0	52	both	75
9/10/97	TH-003	7	100	40	52	both	38
8/18/96	TH-004	6	?	Az-210	210	slide	55
8/18/96	TH-004	6	?	Az-28	250	slide	55
8/18/96	TH-004	6	?	Az-88	88	slide	55
9/9/97	TH-004	7	A	C	210	both	55
9/9/97	TH-004	7	A	B	88	both	55
8/18/96	TH-004	6	D	Az-250	270	slide	55
9/9/97	TH-004	7	D	E	270	both	50
8/18/96	TH-004	6	D	Az-270	28	slide	55

9/9/97	TH-004	7	D	F	28	both	65
9/9/97	TH-004	7	G	H	?	both	38
8/18/96	TH-005	6	000	015	304	print	38
8/31/97	TH-005	7	000	030	305	both	38
8/31/97	TH-005	7	100	000	125	both	38
8/18/96	TH-005	6	100	---	295	missing	---
9/10/97	TH-005	7	110	200	305	both	38
8/18/96	TH-005	6	200	250	305	slide	65
9/10/97	TH-005	7	200	250	305	both	38
9/10/97	TH-005	7	300	350	305	both	38
8/18/96	TH-005	6	300 (250?)	337 (300?)	305	slide	65
9/10/97	TH-006	7	000	025	65	both	50
8/18/96	TH-006	6	000	050	65	slide	?
8/18/96	TH-006	6	100	050	245	print	38
9/10/97	TH-006	7	100	050	245	both	38
9/10/97	TH-007	7	000	100	290	both	38
8/18/96	TH-007	6	050	000	40	slide	80
9/10/97	TH-007	7	100	000	110	both	80
9/10/97	TH-008	7	000	100	320	both	38
9/10/97	TH-008	7	095 (100?)	000	140	both	38
8/19/96	TH-008	6	100	000	140	print	38
9/10/97	TH-008	7	100	150	320	both	38
8/19/96	TH-008	6	100?	110	340	slide	?
8/19/96	TH-008	6	200	188	140	print	38
9/10/97	TH-008	7	200	188	140	print	38
8/19/96	TH-009	6	000	100	330	print	38
9/11/97	TH-009	7	000	100	330	both	38
9/11/97	TH-009	7	100	0	150	both	70
8/19/96	TH-009	6	100	000	154	slide	70
8/19/96	TH-009	6	100?	200	154	slide	38
9/11/97	TH-009	7	200	100	150	both	38
9/11/97	TH-009	7	200	300	330	both	38
8/19/96	TH-010	6	?	030	?	print	
8/19/96	TH-010	6	?	150	?	slide	70
8/19/96	TH-010	6	?	Boundary tree	?	print	
8/19/96	TH-010	6	?	Cut-log	?	missing slide	
9/11/97	TH-010	7	?	Cut-log	?	both	38
8/19/96	TH-010	6	?	Edge	?	print	
8/19/96	TH-010	6	?	Upper-bank	?	print	
9/11/97	TH-010	7	100	Cut-log	?	both	38
9/11/97	TH-010	7	150	Cut-log	?	both	38
9/10/97	TH-011	7	000	100	20	both	38
9/10/97	TH-011	7	100	200	20	both	38
9/19/97	TH-020	7	?	Quad-10.0'	?	both	38
9/19/97	TH-020	7	?	Quad-40.0'	?	both	38
9/19/97	TH-020	7	000	050 (137?)	?	both	38
9/11/96	TH-020	6	000	025	330	print	38
9/8/96	TH-021	6	000	050	45	print	38
8/31/97	TH-021	7	000	137	45	both	38
9/8/96	TH-021	6	100	050	225	print	38
8/31/97	TH-021	7	137	000	225	both	38
9/8/96	TH-022	6	?	Quad-15.2'	?	dupl slide	38
9/8/96	TH-022	6	?	Quad-15.2'	?	dupl slide	---
9/8/96	TH-022	6	?	Quad-15.2'	?	slide	---
9/8/96	TH-022	6	?	Quad-85.0	?	slide	---
8/31/97	TH-022	7	000	094	45	both	38
9/8/96	TH-022	6	000	010	50	print	38
9/8/96	TH-022	6	094	074	210	print	38
8/31/97	TH-022	7	094	000	45	both	38
9/8/96	TH-022	6	200	---	310	missing	38
9/9/97	TH-022	7	West-2'	Quad-15.2'	?	both	38
9/9/97	TH-022	7	West-3'	Quad-85.0'	?	both	38
9/9/97	TH-022	7	West-5'	Quad-15.2'	?	both	38
9/8/96	TH-023	6	?	Quad-15.0'	?	dupl slide	38
9/8/96	TH-023	6	?	Quad-15.0'	?	slide	---
9/9/97	TH-023	7	?	Quad-15.0'	?	both	38

8/31/97	TH-023	7	000	040	275	both	38
9/8/96	TH-023	6	040	076	130	print	38
9/8/96	TH-023	6	076	000	310	print	38
8/31/97	TH-023	7	076	040	95	both	38
8/31/97	TH-024	7	000	100	0	both	38
9/8/96	TH-024	6	000	097	275	print	38
9/8/96	TH-024	6	097	077	95	print	38
8/31/97	TH-024	7	100	000	0	both	38
9/8/96	TH-025	6	003	023	330	print	38
9/10/97	TH-025	7	003	023	330	both	38
9/8/96	TH-025	6	080	060	150	print	38
9/10/97	TH-025	7	080	060	150	both	38
9/10/97	TH-025	7	080	100	330	both	38
9/10/97	TH-025	7	100	080	330	both	38
9/8/96	TH-026	6	000	030	105	missing print	38
9/11/96	TH-026	6	000	100	105	missing	38
9/11/97	TH-026	7	000	100	105	both	38
9/11/97	TH-026	7	101	150	305	both	38
9/11/96	TH-026	6	101	200	305	missing	38
7/25/97	TH-030	7	000	100	?	both	38
7/25/97	TH-030	7	100	000	?	both	38
7/26/97	TH-030	7	150	100	?	both	38
9/19/97	TH-031	7	?	Quad-14.0	?	both	38
9/19/97	TH-031	7	?	Quad-79.0	?	both	38
9/19/97	TH-031	7	000	050	255	both	38
9/19/97	TH-032	7	000	100	?	both	38
9/19/97	TH-033	7	000	089	?	both	38
9/20/97	TH-034	7	000	050	?	both	38
9/19/97	TH-035	7	050	000	200	both	38
9/19/97	TH-035	7	100	050	20	both	38
9/20/97	TH-036	7	010	050	195	both	38
9/20/97	TH-037	7	190	130	15	both	38

Appendix H. Timeline and record of survey visits, 1994 onward

This section lists dates and attendees of workshops and long-term ecological research work in the Thunder Mountain Fire area.

1994

Summary:

The 8000 acre Thunder Mountain Fire started and burned for the rest of the year in the Okanogan Range north of Road 39. Heavy equipment was used to clear triple-width firelines, opening many miles of formerly roadless areas to future development. The Second Artists in the Forest Gathering was held in late summer and offered hikes into the still-smoldering Thunder fire.

1994 Timeline:

09/10/94 - The Artist in the Forest Gathering sponsored a hike into the Thunder Mountain fire via Thirtymile Creek. Attendees included Mary Poss, George Wooten, Peter Morrison, and about four others.

09/23/94-09/25/94 - A workshop on forestry, hydrology and forest microcosms instructed by the Public Forestry Foundation, Dr. Al Isaacson, and Dr. Art Partridge was sponsored by Inland Empire Public Lands Council and East Side Task Force. The Thunder fire area was visited with Greg Harty from Public Forestry Foundation. Attendees included Peter Morrison, Mary Poss, George Wooten, Tod Johnson, and about 10 others.

1995Summary:

Wetland inventory and noxious plant workshop (Dates: 07/07/95-07/08/95): Purpose: To educate interested persons about non-native weed species in the Methow Valley. To conduct a vegetative inventory of a large wetland in a high intensity burn portion of the Thunder Mt fire area. Location: Boulder Creek, tributary of the Chewuch River, and a large wetland near Thirtymile Meadows in the Thunder Fire area. Coordinator: George Wooten. Participants: George Wooten, Mary Poss, Gina Monteverde, Alton Gaskill, John Jakubowski, Brian Muldoon, Josh Wozniak, Will Betz, Scott ..., cooperating with Okanogan Chapter of the Washington Native Plant Society. Status: Two day workshop, funded from undesignated monies from Patagonia grant. Successfully Completed. Wetland plant information entered into database for flora list for Thunder Mountain area.

Amphibian Surveys (Dates: 07/95-09/96): Purpose: To determine the incidence of amphibian species within the Thunder Mt Fire area. To inventory wetlands in and around the area included in the Thunder Mt fire perimeter for amphibian breeding sites. Location: Thunder Mountain Fire area. Five visits to the area were made. Methods: Sites are visited and evaluated by visual encounter and by setting larval traps. Sites and specimens are photographed and described. Coordinator: Dana Visalli. Contributors: Dana Visalli, Mary Poss, Josh Wozniack. Status: Eighteen month project supported by a grant from the Mountaineers Foundation. Final report issued to Mountaineers Foundation in Nov 1996.

Wildlife Tracking Surveys (Dates: 12/28/95-01/01/96 (Tripod Peak); 02/29/96-03/10/96 (Thunder Mountain): Purpose: To assess habitat utilization by all wildlife and avian species in target areas. To determine how areas affected by a natural fire influence carnivore activity. To survey for Threatened, Endangered and Sensitive species. Mary Poss, Alton Gaskill. Location: Meadows area from Tripod Peak area north to the northern boundary of the Thunder Mountain Fire area. Methods: Data is collected by winter wildlife track surveys, conducted twice each winter. Transects through burn area are inventoried for all tracks. Track descriptions are recorded and photographed. Funding: Partial grant support from Mountaineers Foundation grant.

1995 Timeline:

- 02/95 - A coalition of volunteers conducted a 10 day winter wildlife tracking survey in the Thunder fire area. They documented that lynx and other wildlife were actively using high intensity burn areas. Mary Poss.
- 04/95 - Volunteers conducted a five day winter wildlife tracking survey in the Thunder fire area. They documented snowmobile use on the northern fire perimeter road. Mary Poss.
- 06/95 - A survey into Dog Creek was conducted to evaluate revegetation and soil stability in the high intensity burn areas. Mary Poss
- 06/29/95 - Timber Sale surveys were begun at the lower end of Dog Creek, where it goes over cliffs into the Chewuch, for the Forest Service's TES plant survey program. George Wooten.

- 07/06/95-07/07/95 A Forest Service survey into the Thirtymile-Twentymile Creek Saddle area was continued by George Wooten and George Thornton, with a volunteer from Outward Bound. Lost in a fog bank, George and the volunteer learned the lesson that no moss grows on the north side of a tree after a forest fire.
- 07/07/95- 07/09/95 - The Trust for Habitat Conservancy and members of the Okanogan Chapter of the Washington Native Plant Society joined in a workshop in the Thunder Fire area focusing on noxious weeds, wildfire, wetlands, ecology, and field studies. (Dates: 07/07/95-07/08/95): Purpose: To educate interested persons about non-native weed species in the Methow Valley. To conduct a vegetative inventory of a large wetland in a high intensity burn portion of the Thunder Mt fire area. Location: Boulder Creek, tributary of the Chewuch River, and a large wetland near Thirtymile Meadows in the Thunder Fire area. Coordinator: George Wooten. Participants: George Wooten, Mary Poss, Gina Monteverde, Alton Gaskill, John Jakubowski, Brian Muldoon, Josh Wozniak, Scott xxx..., Will Betz... Status: Two day workshop, funded from undesignated monies from Patagonia grant. Successfully Completed. Wetland plant information entered into database for flora list for Thunder Mountain area.
- 07/10/95 - Thirtymile Cr., Ridge NW of Thirtymile meadow, FS TES plant survey. George Wooten.
- 07/95- Conducted amphibian surveys in the Thunder fire and located 4 spotted frog breeding sites. Purpose: To determine the incidence of amphibian species within the Thunder Mt Fire area. To inventory wetlands in and around the area included in the Thunder Mt fire perimeter for amphibian breeding sites.
- Location: Thunder Mountain Fire area. Dates: 07/95-09/96 - Five visits to the area were made.
- Methods: Sites are visited and evaluated by visual encounter and by setting larval traps. Sites and specimens are photographed and described.
- Coordinator: Dana Visalli. Contributors: Dana Visalli, Mary Poss, Josh Wozniack. Status: Eighteen month project supported by a grant from the Mountaineers Foundation. Final report issued to Mountaineers Foundation in Nov 1996.
- Documented damage to wetlands in the Sheep Creek drainage from the fire perimeter roads. Mary Poss.
- 12/28/95-01/01/96 - A wildlife tracking survey to Tripod Peak was completed. Mary Poss, Alton Gaskill.

1996

Summary:

Thunder Mountain Biological Evaluation - Beginning of revegetation study; vegetation transects and plots are established (Dates: 08/17/96-08/19/96, 09/06/96-09/09/96): Purpose: To study the post-fire revegetation of this unique boreal ecosystem. Location: Thunder Mountain Fire area. Methods: Control and experimental vegetation transects and aerial plots are permanently fixed in areas with defined burn intensity. Vegetation and habitat parameters recorded. Plots are to be reread every year, and the data analyzed for trends. The sites

are used to establish a study route for other projects. Coordinator: Mary Poss. Contributors: George Wooten, Mary Poss, Mark Lawler. Paid work: George Wooten (field work): 8/17, 8/18, 8/19, 9/8, @\$150 per day = \$450. An additional \$150 was procured during December bringing the total 1996 funding to \$600 Status: Funded as a pilot project through a Mountaineers Foundation grant. Plans include expanding the Thunder Mt RNA proposal through proposals to be submitted to the Bullitt Foundation and to EDF minigrants.

Thunder Mountain Birding and Ecology Workshop & Hike (Dates: 09/21/96-09/22/96, 09/27/96-09/29/96): Purpose: To promote the educational value of the unique ecological area of the Thunder Mt Fire, through an outreach program of hikes and educational opportunities. Locations: Thirtymile and Dog Creek junctions with road 39, in the Thunder Mountain fire area. Hikes radiated from these areas. Coordinator: Mary Poss. Participants: (9/21/96-9/23/96) Dave Rudholme, Meagan Rudholme, Tilden Rudholme, Brett Floyd, Rieto Riesen (Vancouver, BC), Mark Colombino (Seattle), Yuriko Takahashi (Vancouver, BC), Becky McEachern, Kathleen McEachern (Albion, BC), Geoff Catrall (Vancouver, BC), Jerry Broadus (Puyallup, WA), Clarice Clark (Puyallup, WA), Chrissy Yeung, Dan, Pat and Graham Legen (Stamwood, WA), George Wooten, Mary Poss; (09/27/96-09/29/96) Mary Poss, George Wooten, Maryann Baird, Susan Crampton, Ed Swan, Leahe Swayze, Peter Morrison, Mark Lawler. Status: No grant support.

1996 Timeline:

- 02/29/96-03/10/96 - Thunder Mountain winter wildlife tracking survey was completed in Thunder fire area. Snowmobile use of the southwestern fire perimeter road was documented. Mary Poss, Alton Gaskill.
- 07/13-14/96 - Amphibian survey and TES plant survey conducted in the Thunder burn area; surveys from Smarty Cr to for the upper Sheep Creek by MP, GW along fireline. Discrepancies between the unit design and what had been marked on the ground. Many mosquitoes, came out to meet Lanette and almost hugged a grizzly.
- 8/17/96, 8/18/96, 8/19/96, 9/8/96 - Field work - 4 days @\$150 per day = \$600. This was funded as a pilot project through a Mountaineers Foundation grant. \$450 of this was paid in the fall, and an additional \$150 was procured during December to bring the total 1996 funding to \$600 Status. 1996 field work included 4 days donated time from Mary Poss and 1 day donated time from Mark Lawler.
- 09/07/96-09/09/96 - Thunder Mountain Revegetation study was continued and additional vegetation transects were established. Mary Poss, George Wooten.
- 09/21/96-09/22/96 - Thunder Mountain Birding and Ecology Workshop & Hike: Purpose: To promote the educational value of the unique ecological area of the Thunder Mt Fire, through an outreach program of hikes and educational opportunities. Locations: Thirtymile and Dog Creek junctions with road 39, in the Thunder Mountain fire area. Hikes radiated from these areas. Dates: 09/21/96-09/22/96, 09/27/96-09/29/96. Coordinator: Mary Poss. Free to the public. Participants: (9/21/96-9/23/96) Dave Rudholme, Meagan Rudholme, Tilden Rudholme, Brett Floyd, Rieto

Riesen (Vancouver, BC), Mark Colombino (Seattle), Yuriko Takahashi (Vancouver, BC), Becky McEachern, Kathleen McEachern (Albion, BC), Geoff Cattrall (Vancouver, BC), Jerry Broadus (Puyallup, WA), Clarice Clark (Puyallup, WA), Chrissy Yeung, Dan, Pat and Graham Legen (Stamwood, WA), George Wooten, Mary Poss; (09/27/96-09/29/96) Mary Poss, George Wooten, Maryann Baird, Susan Crampton, Ed Swan, Leahe Swayze, Peter Morrison, Mark Lawler. Status: No grant support.

09/26/96 - Ecology plots were established in Timber Creek spruce wetlands by George Wooten and Mary Poss.

09/27/96-09/29/96 - A Thunder Mountain Birding and Ecology Workshop Hike was held. Mary Poss was coordinator, attending were Susan Crampton, George Wooten, Maryann Baird, Ed Swan, Leahe Swayze, Peter Morrison, and Mark Lawler. Maryann discussed here studies on soil nutrient cycling following fire that she conducted at the University of Washington.

1997 - Second year sampling

Summary:

Wildlife tracking: snowmobile trip into Thirtymile area (01/15): Mary Poss, Todd Johnson.

Thirtymile Meadows reconnaissance to plan the season (06/17): George Wooten, Mary Poss.

Forest Microcosms and Forest Ecology Workshop (Dates: June 26-28): Chewuch drainage and Eightmile Creek. Instructor(s): Art Partridge, Forest Pathologist. Location: Okanogan Meadows Area, upper Chewuch drainage, Thunder Fire Area in North Central Washington.

Thunder Boreal Ecosystem Workshop with Art Partridge (July 19): Art, Susan and George see grizzly and cub on the way up.

Boreal Ecology Workshop (Dates: Thu, Fri, July 24, 25). Instructors: Charley Dewberry, George Wooten. Location: Okanogan Meadows Area, upper Chewuch drainage, Thunder Fire Area in North Central Washington. This was a two-day workshop about the integration of forest and wetland ecology specific to the boreal ecosystem. Participants were introduced to concepts of plant geography and geomorphology. Emphasis was placed on understanding adaptations of plants and animals to this unique ecosystem.

Ecology Research Workshop (Dates: Fri, Sat, Sun, July 25-27). Instructors: Charley Dewberry, George Wooten. Location: Okanogan Meadows Area, upper Chewuch drainage, Thunder Fire Area in North Central Washington.

[Funding for K-12 teacher workshops sponsored by Trust for Habitat Conservation in 1997 came through an EPA Outreach Grant with the goals of providing K-12 teachers with both the field experience and material support that they need in order to incorporate principles of wetland ecology into an innovative science, art or environmental studies curricula.]

Chewuch River Research Natural Area (RNA) survey (07/31 through August): This was an ecological survey funded by the Forest Service in the Sheep and Trench Creek drainages overlapping into the Thunder fire, with the purpose of writing an establishment report justifying the Chewuch River RNA.

Timeline:

- 01/15/97 - Snowmobile to Thirtymile, M. Poss, Todd.
- 06/17/97 - GW, MP visit Thirtymile Meadows to plan the season.
- 06/19/97 - 06/21/97 - Database development - 3 days at \$150 per day = \$450, to George Wooten
- 06/26/97 - Art Partridge Workshop, Chewuch, Eightmile, Thunder.
- 07/19/97 - Thunder Boreal Ecosystem Workshop with Art Partridge. Art, Susan and George see grizzly and cub on the way up.
- 08/31/97, 09/09/97-09/11/97, 09/19/97 - Field Sampling (08/31, (09/09, 10, 11, 19) - 5 days at \$150 per day = \$750, to George Wooten
- 09/09-11/97 - Thunder ecology plot surveys.
- 09/19-20/97 - Thunder ecology plot surveys. Field Sampling 2 days time donated, Mary Poss
- 09/97 - A September, 1997 note appended on an invoice to Treasurer Mark Lawler indicates that this brings total expenditures paid to George Wooten for the vegetation surveys to \$1800, the amount originally allotted by the Board, but that "analysis and reporting still need to be completed separately".
- 09/20/97 - Annual Thunder Trundle
- 10/97 - Data entry - 2 days time donated by George Wooten
- 12/17/97 - Initial report writing - 2 days time donated by George Wooten

1998Summary:

Workshop: *Fire in the Boreal Ecosystem* (Sunday, Monday and Tuesday, July 19-20), was presented by Charlie Dewberry, Dave Rudholm, Mary Poss, and George Wooten at Thirtymile Meadows Area, in the upper Chewuch drainage, in the Thunder Fire Area in North Central Washington.

This was a 2-½ day workshop that concentrated on studying the interrelationships of fire in the boreal ecosystem. Participants explored areas with varying intensities of fire from the 1994 Thunder fire, including some of our established vegetation recovery plots, and examined the changing successional relationships between animals, fish, birds, fungi and plants.

Attending the workshop were a number of interesting participants, including three teens and an instructor from the Okanogan Work-Study Center, and a member of the US Fish and Wildlife Service Outreach Program. Participants got to see newly revegetated areas, they had hands on experience in comparing the vegetation of wetlands with uplands, they got to erect and monitor birding mist-net stations, and they sampled the aquatic ecosystem to learn how macroinvertebrates function in the ecosystem, all while taking pleasant hikes through to the various areas around Thirtymile Meadows. In the evenings, we had pleasant conversations around the campfire, discussing scientific methods and other pertinent items.

[From the 1999 Draft Annual Report] Boreal Ecology (Thirtymile Meadows, July 18-19, 1998). This workshop integrated forest and wetland ecology specific to the boreal ecosystem. It provided the background for the second workshop and most of the 8 participants took both courses. All these workshops were paid for through an EPA outreach grant.

At the Sept 27, 1998 THC Board Meeting, Mary Poss proposed putting \$566.52 + \$1188.21 = \$1754.73 from 2 Mountaineers Foundation grants, which was surplus money resulting from Mary donating time that was budgeted for salary in the grant into a combined "research fund". Discussion continued over what research was and what the money would be for. A vote was held that the money would be earmarked for Thunder related research with spending subject to board approval. The motion was approved.

Timeline:

07/17-19/98 - Boreal Ecology Workshop at Thirtymile Meadows with Charlie Dewberry, Mary Poss, Dave Rudholme family, Art Partridge, GW, et. al.
07/21/98 - Fire Ecology Workshop - Thirtymile Meadows; Charlie Dewberry, Dave Rudholm, Mary Poss, George Wooten.
07/98 Data entry from 1997 - 2 days time donated, George Wooten
08/05/98 - Loomis Forest Wetland Surveys: George Wooten, Sarah Masco, Martha Stauss, Peter Morrison.
08/98 - Preparation (includes form generation) 2 days in August time donated, George Wooten
08/4/98, 08/30-31/98, 9/2/98 Field sampling: 4 days donated time, George Wooten
09/02/98 - Visit to Thunder fire, GW, MP, cows in massive willow die-off.
09/25-27/98 - Annual Thunder Trundle.

1999

Summary:

In 1999, no vegetation sampling was performed.
Wildlife surveys (March 13-20) [from the 2000 Annual Report]: We conducted our fifth annual winter tracking survey of the Thunder Mountain Fire. The "resident" lynx was located in the same area that we have found tracks for the last four years. In addition, we found lynx tracks in 2 new areas. There were no unusual sightings on this trip although all of our regulars were present and accounted for. We thank the Washington State Department of Wildlife for assistance with transportation to the area.

From the May 15, 1999 Board Meeting: George gave a report on long term ecological research in the Thunder Mountain fire. Baseline data, including 3 seasons of data, was completed for all sites. Sites are linear transects with 50-500 points. Ninety-six hundred sites come from 31 plots. All of these have recorded burn intensities, elevation, aspect, slope, shading, and live tree cover. Twenty-five sites have been sampled for the past two years. Eleven sites were added in 1997 and resampled last year. Data entry and report writing is in progress. The 97 report was suggested as adequate for a summary of the proposal (for boreal ecological research). The annual report should describe trends seen. George will put a budget together. George said that the data management: recording, encoding, and entering, would require a full time person for two weeks per year. Mary suggested that proposals for grants must be done one year in advance, as obtaining actual money from a grant takes one year lag time. Mark suggested we need to publish our work in a refereed journal such as the Journal of Conservation Biology. This would give our work more

weight. Aileen suggested we monitor the sites again after 5-10 years. George said that if we decide this study merits a long term grant, we should ask Mary Pat to estimate how difficult the analysis would be. Volunteers should be recruited to do the field work. George needs an hourly rate of \$10-20 to enter data. To finish the report George needs 3 days pay (\$10 per hour) for typing and 3 days pay for proofreading. Mary said we have fulfilled our requirements for our funders. Larry volunteered to coordinate reports.

Timeline:

06/4-6/1999 - Washington Native Plant Society Annual Plant Study Weekend. Hike to Chewuch RNA. Thunder Fire / Thunder / Chewuch RNA: The Chewuch Research Natural Area presents geomorphic features along the Chewuch River. Thunder Fire is reached via a two-mile hike on a fireline east of the river, in subalpine meadows of aspen and sagebrush. If inaccessible, an alternative hike is planned up the level Chewuch River Trail to Chewuch Falls, 3 miles in. Leader, George Wooten

2000 - Year 5 after the fire - fourth year of sampling

Summary:

Hummock Wetland Workshop (06/23-25) Held at South Fork Twentymile Meadows Trailhead, with excursions to Thirtymile Meadows, Smarty Creek and Round Meadows. GW, Pam (PBI), Jo Ann Burkett, Sarah, Alex, Martha Hall.

Timeline:

09/2000 - Data preparation (early September) - 2 days time donation, George Wooten

09/09-11/2000 - Field work - 3 days time donation, George Wooten

11/05/2000 - Edit report - 1 day time donation, George Wooten

2001

Timeline:

01/06-07,13/2001 - Finish data entry from 2000 - 3 days donated, George Wooten

01/14/2001 - Proofread data - 1 days donated, George Wooten

01/15/2001 - Send standardized data to Mary Pat Larsen - 1 day donated, George Wooten

01/16/2001 - Data analysis - general trends - 1 day donated, George Wooten

2003

3/2006 Complete data preparation for Mary Pat Larsen in folder ana7

2007

1/2007 Resume data analysis in folder ana8