

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

Establishment Record

For

HALLIDAY FEN RESEARCH NATURAL AREA

Colville National Forest
Sullivan Lake Ranger District
Pend Oreille County, Washington



SIGNATURE PAGE

for

RESEARCH NATURAL AREA ESTABLISHMENT RECORD

Halliday Fen Research Natural Area

Colville National Forest

Pend Oreille County, Washington

The undersigned certify that all applicable land management planning and environmental analysis requirements have been met and that boundaries are clearly identified in accordance with FSM 4063.41 5.e(3) in arriving at this recommendation.

Prepared by	<u>Kathy Ahlenslager</u>	<u>11 Jan. 1999</u>
	Kathy Ahlenslager, Forest Botanist Colville National Forest	Date
Prepared by	<u>Penny R. Miller</u>	<u>8 Jan 99</u>
	Penny R. Miller, Public Affairs Assistant Colville National Forest	Date
Recommended by	<u>Timothy M. Bertam</u>	<u>22 Dec 98</u>
for	Fred Gonzalez, District Ranger Sullivan Lake Ranger District	Date
Recommended by	<u>Robert L. Vaught</u>	<u>11 JAN 99</u>
	Robert L. Vaught, Forest Supervisor Colville National Forest	Date
Concurrence of	<u>Thomas J. Mills</u>	<u>2/10/99</u>
/s/	Thomas J. Mills, Station Director Pacific Northwest Research Station	Date

ESTABLISHMENT RECORD

For

HALLIDAY FEN RESEARCH NATURAL AREA

Within

THE COLVILLE NATIONAL FOREST

PEND OREILLE COUNTY

WASHINGTON

INTRODUCTION

The Halliday Fen Research Natural Area (RNA) is located in northeastern Washington in the Selkirk Mountains, east of the Pend Oreille River. It is part of the Colville National Forest and is administered by the Sullivan Lake Ranger District. This 724 acre (293 hectare) RNA is named after the trail that crosses through the area and is about six miles (10 km) northeast of Metaline Falls. It is not within a designated wilderness, wild and scenic river, national recreation area, or other Congressionally designated area.

Earle Layser (1972), Biotic Planning Specialist on Sullivan Lake Ranger District, was the first to recognize Halliday Fen as unique due to its alkaline nature. In 1980 he pointed out its locally unusual habitat and suggested it be protected as a "natural area" or "botanical area." The Pacific Northwest Region Natural Area Committee proposed Halliday Fen as a RNA in 1980 (Greene 1980). Reid Schuller (1981, 1982), an ecologist with the Washington Natural Heritage Program, suggested designating Halliday Fen an "area of special interest" in 1981 and 1982.

The Halliday Fen RNA encompasses a small, oval-shaped tributary drainage basin issuing into Slate Creek, which in turn drains into the Pend Oreille River (Photo 1). A dominant feature of the basin is a 10 acre (4 hectare) alkaline wetland (Photo 2). This marl fen is dominated by wetland grasses, sedges and forbs. Surrounding slopes support a mixed conifer over-story of Douglas-fir, grand fir, western white pine, western redcedar and western hemlock with a shrub and forb under-story (Photo 3). The RNA provides habitat for thirteen sensitive plant species (Photo 4) (Butruille 1991, Washington Natural Heritage Program 1997, 1998).

There has been much discussion of the boundary for this RNA. In 1982 Washington Natural Heritage Program staff supported the inclusion of the original area (T40N, R44E, Sec. 31, SW 1/4) encompassing 420 acres (170 hectares). In 1984 and 1988, Sarah Greene, Research Natural Area Scientist for the Pacific Northwest Region, recommended that Halliday Fen RNA be enlarged to include greater ecological diversity and afford better protection to the fen (Greene 1984, 1988).

Further study of the area in 1988 in conjunction with the Threemile Timber Sale analysis, led to concern that the Halliday Fen RNA boundaries as proposed (420 acres, 170 hectares) would not protect the marl fen or the sensitive plants found there. The original boundaries were dictated by a planned timber sale and road, but the analysis for the Threemile Environmental Impact Statement recognized the need for an expanded boundary to include more of the basin surrounding the fen (USDA Forest Service 1992). The additional area included 304 acres (123 hectares) for a total of a 724 acre (340 hectares) RNA.

Land Management Planning

The Halliday Fen RNA was recommended for establishment in the Land and Resource Management Plan for the Colville National Forest (USDA Forest Service 1988). This RNA is described in the Final Environmental Impact Statement of the Land and Resource Management Plan (LRMP). The size of the area recommended in the LRMP was 420 acres (170 hectares) with a provision that further analysis would determine appropriate action to protect the fen and sensitive plants in the area. As part of the Decision Notice establishing the RNA, the LRMP will be amended to include the additional 304 acres (123 ha) of the Halliday Fen RNA. At the north end of the fen, a 20 acre (8 hectare) privately owned parcel with about 10 acres (4 hectares) within the northern watershed line of the RNA was acquired by the Forest Service on July 25, 1995.



Photograph 1. The outlet of Halliday Fen drains into Slate Creek.
Photograph attribute: Kathy Ahlenslager.



Photograph 2. Halliday Fen is an alkaline wetland dominated by grasses, sedges and forbs.
Photograph attribute: Kathy Ahlenslager.



Photograph 3. A mixed coniferous forest surrounds the basin containing Halliday Fen. Photograph attribute: Kathy Ahlenslager.



Photograph 4. Hoary willow (*Salix candida*) is one of the thirteen rare plant species found at Halliday Fen. Photograph attribute: Kathy Ahlenslager.

OBJECTIVES

The Forest Service Manual outlines the objectives for the establishment of RNAs as follows (USDA Forest Service 1996):

1. Preserve a wide spectrum of pristine representative area that typify important forest, shrubland, grassland, alpine, aquatic, geological, and similar natural situations that have special or unique characteristics of scientific interest and importance that, in combination, form a national network of ecological areas for research, education, and maintenance of biological diversity.
2. Preserve and maintain genetic diversity.
3. Protect against serious environmental disruptions.
4. Serve as reference areas for the study of succession.
5. Provide onsite and extension educational activities.
6. Serve as baseline areas for measuring long-term ecological changes.
7. Serve as control areas for comparing results from manipulative research.
8. Monitor effects of resource management techniques and practices.

JUSTIFICATION STATEMENT FOR ESTABLISHMENT OF AREA

A number of strong justifications exist for the establishment of the Halliday Fen RNA. Wetlands throughout Washington are increasingly impacted by human activities, such as livestock grazing, water diversions and development. Forests are frequently managed for silvicultural purposes. Identification and protection of the remaining pristine wetlands is essential.

Within the Okanogan Highlands, there are few examples of wetland ecosystems represented within the RNA system and no marl fens (Washington Department of Natural Resources 1995). This RNA is designed to include not only the marl fen, but the hydrological processes and geological features which support the dynamic natural ecosystem of Halliday Fen.

Individuals from the fields of botany, wetland ecology, wildlife biology, geology and hydrology have visited the RNA, and contributed to the information contained in this Establishment Record. They strongly support RNA designation of the area. The site has attracted inventory efforts by the Washington Natural Heritage Program and the Washington Native Plant Society.

In comparison to similar areas in other locations, the Halliday Fen RNA should be recognized and valued because of the high quality condition of the watershed in which it is located, and because of the overall size and biological diversity of the wetland ecosystem. Overall, it provides an outstanding example of a marl fen in the Okanogan Highlands.

A primary consideration in the selection of RNAs is the presence of multiple elements. Halliday Fen RNA is a good example of a multiple element site. It contains three terrestrial communities, one wetland community and thirteen rare plant species. Within the RNA the following recognized elements are represented:

- I. Terrestrial Ecosystems (Washington Department of Natural Resources 1995)
 - a. Western redcedar/queenscup beadlily community
 - b. Western redcedar/devil's club community
 - c. Western hemlock/queenscup beadlily community

- II. Wetland and Aquatic Ecosystems (Washington Department of Natural Resources 1995)
 - a. Marl fen

- III. Endangered, Threatened and Sensitive Plant Species (Buttrille 1991; Washington Natural Heritage Program 1997, 1998)
 - a. Sensitive
 - Mingan moonwort (*Botrychium minganense*)
 - Mountain moonwort (*Botrychium montanum*)
 - Buxbaum's sedge (*Carex buxbaumii*)
 - Yellow sedge (*Carex flava*)
 - Crested shield-fern (*Dryopteris cristata*)
 - Green-keeled cottongrass (*Eriophorum viridicarinatum*)
 - Water (purple) avens (*Geum rivale*)
 - Northern twayblade (*Listera borealis*)
 - Marsh muhly (*Muhlenbergia glomerata*)
 - Hoary willow (*Salix candida*)
 - Maccall's willow (*Salix maccalliana*)
 - Mountain willow (*Salix pseudomonticola*)
 - Black snake-root (*Sanicula marilandica*)

- IV. Endangered, Threatened and Sensitive Animal Species (McGowan 1994)
 - a. Endangered
 - Gray wolf (*Canis lupus*)
 - American peregrine falcon (*Falco peregrinus anatum*)
 - b. Threatened
 - Grizzly bear (*Ursus arctos*)
 - c. Sensitive
 - North American lynx (*Felis lynx canadensis*) (Proposed for Federal Listing)
 - Wolverine (*Gulo gulo luteus*)

PRINCIPAL DISTINGUISHING FEATURES

A number of features, mainly aquatic, make the Halliday Fen area an outstanding RNA. It is a high quality example of a marl fen, typical of those found in Pend Oreille County. The wetland is alkaline due to leaching of surrounding limestone, or marl deposits. Marl, often found in peat deposits, is a powdery to fine-grained material composed mainly of calcium carbonate. The calcium originates from streams, rock weathering or glacial drift.

The occurrence of calcium is reflected in the calciphilic vegetation present. In addition, thirteen sensitive plant species, listed on the Regional Forester's Sensitive Species List (Buttrille, 1991; Washington Natural Heritage Program 1997, 1998), are found at Halliday Fen RNA. This RNA is representative of several riparian plant associations which encompass carrs, fens and bogs. All have organic soils. A carr is a wetland dominated by shrubs, but fens and bogs are dominated by herbaceous plants. Bogs are distinguished from fens by the dominance of sphagnum mosses and the presence of peat deposits.

The RNA contains several small wetlands that drain into Slate Creek. Two of the wetlands are located in T40N R44E section 31. One is in the northeast quarter and the other in the northwest quarter directly north of the fen. A third wetland is found at T40N R43E section 36 in the southwest quarter.

LOCATION

Halliday Fen RNA is located within the Sullivan Lake Ranger District of the Colville National Forest (Map 1). It lies within the Selkirk Mountains of northeastern Washington.

The center of the RNA is latitude 117° 17' 30" N and longitude 48° 55' 30" W. The Universal Transverse Mercator (UTM) system coordinates are 5419000m Northing and 479000m Easting, as shown on the USGS 7.5 minute topographic Boundary Dam quadrangle map of 1967, photorevised in 1986 (Map 2).

The area includes parts of the following legal descriptions:

- T40N R44E Section 30, South 1/2 of Southeast 1/4;
- T40N R43E Section 36, East 1/2 of Northeast 1/4;
- T40N R44E Section 31;
- T40N R44E Section 32, West 1/2 of West 1/2;
- T39N R44E Section 1, Northeast 1/4 of Northeast 1/4;
- T39N R43E Sections 6, North 1/2 of North 1/2

The following color aerial photos at the Sullivan Lake Ranger District office cover the RNA. Photo 1785-249 shows the entire RNA.

<u>Photo Date</u>	<u>Flight Line Numbers</u>
8-26-86	USDA-F12 1785-249
8-26-86	USDA-F12 1785-250
8-26-86	USDA-F12 1785-251

The total area of the Halliday Fen RNA is 724 acres (340 hectares). Elevations range from 2450 feet to 3975 feet (747 to 1212 m), for a relief of 1525 feet (465 m) in elevation. The basis for elevation is mean sea level, as shown on the Boundary Dam USGS 7.5 minute topographic quadrangle map of 1967, photorevised 1986.

Access to the RNA is shown on USDA Forest Service maps of Colville National Forest. The RNA is accessible on foot or horseback from late May through October and by skis or snowshoes the rest of the year. Access routes are from U.S. Highway 31. About 7.5 miles (12 km) north of Metaline Falls turn east on to Forest Road 180. The Halliday Fen trailhead is adjacent this junction. Follow trail #522 for 1.1 miles (0.6 km) to the RNA.

AREA BY COVER TYPES

Vegetation of the RNA has not been studied or type-mapped in any detail. The following are estimates by cover types (Berube and Richardson 1995) (Map 3).

Society of American Foresters Cover Types (Eyre 1980)		Acres	Hectares
Middle Elevations, Interior			
210 Interior Douglas-fir		525	213
218 Lodgepole pine		77	31
North Pacific			
227 Western redcedar-Western hemlock		72	29
Non-forested		50	20
TOTAL		724	293
Kuchler Types (Kuchler 1964)			
K-2 Cedar-hemlock Douglas-fir		674	273
Non-forested		50	20
TOTAL		724	293

Forested Plant Associations (Williams, Lillybridge and Smith 1990) that occur in the RNA include:

- Douglas-fir/ninebark (*Pseudotsuga menziesii*/*Physocarpus malvaceus*)
- Grand fir/ninebark (*Abies grandis*/*Physocarpus malvaceus*)
- Western redcedar/big huckleberry (*Thuja plicata*/*Vaccinium membranaceum*)
- Western redcedar/queencup beadlily (*Thuja plicata*/*Clintonia uniflora*)
- Western redcedar/wild sarsaparilla (*Thuja plicata*/*Aralia nudicaulis*)
- Western hemlock/wild sarsaparilla (*Tsuga heterophylla*/*Aralia nudicaulis*)
- Western hemlock/oak fern (*Tsuga heterophylla*/*Gymnocarpium dryopteris*)

These Riparian Plant Associations (Kovalchik 1993) occur in the RNA:

- Western red-cedar/soft leaved sedge (*Carex disperma*)
- Western redcedar/devil's club (*Thuja plicata*/*Oplopanax horridum*)
- Few-flowered spikerush (*Eleocharis pauciflora*)
- Mountain alder/bladder sedge (*Alnus incana*/*Carex utriculata*)
- Willow/slender sedge (*Salix* spp./*Carex lasiocarpa*)
- Mountain alder/tall mannagrass (*Alnus incana*/*Glyceria elata*)
- Bladder sedge (*Carex utriculata*)
- Cusick's sedge (*Carex cusickii*)

PHYSICAL AND CLIMATIC CONDITIONS

The Halliday Fen RNA is in a glacially-carved basin. It lies at an elevation of 2953 feet (900 m) above sea level with ridges rising to 3974 feet (1212 m) to the north and 3558 feet (1085 m) to the south. The confluence of an unnamed creek in the fen with Slate Creek lies at about 2000 feet (6098 m). The eastern boundary of the basin is difficult to determine due to the lack of a defined ridge. The marl fen lies in the remnants of a lake with a "chalk" bottom and peat deposits. About 25% of the watershed burned in 1926.

A hiking and horse trail (# 522) to Crowell Ridge in the Salmo-Priest Wilderness pass through the watershed. Trail #522 crosses the unnamed creek by a wooden footbridge at the outlet of the fen. The trail is stable with only minor sheet erosion on exposed soil during wet weather. At the fen crossing, the stream channel gradient increases, as the stream passes from the wider lake bed into a narrow V-shaped draw. No other physical disturbance is evident within the basin (Wasson 1994).

The climate of northeastern Washington is influenced by air masses from the continent and the Pacific that cross the area. Winters are long and occasional outbreaks of cold air from the

Canadian Arctic result in low temperatures. Air from over the Pacific has a moderating influence throughout the year. Summers are warm with light rainfall (Phillips and Durkee 1972).

The primary factors influencing the climate are the latitude, topography, distance from the ocean, prevailing westerly winds, and the development and movement of weather systems over the North Pacific. The Rocky Mountains protect eastern Washington from outbreaks of cold air, although some enter each winter. Cooling and condensation occur, as air from the northeast rises over the 5000 to 7000 foot (1524 to 2134 m) peaks of the Selkirk Mountains. This serves to increase the amount of cloudiness, precipitation, and the number of lightning storms, as compared to other areas east of the Cascade Range. Throughout the year, maritime air from the Pacific has a moderating influence, while extreme temperatures are observed with drier air from the interior (Phillips and Durkee 1972).

Three local weather stations are located near the RNA, at Boundary Dam, Metaline Falls and Sullivan Lake Ranger Station. Each is approximately five miles (8 km) from the RNA. About 70 percent of the precipitation occurs in the form of snow. Snow depths in late winter typically average about four feet (1 m). The average monthly precipitation for the period of 1979 to 1996 at Sullivan Lake Ranger Station at an elevation of 2600 ft. (793 m) is:

<u>Month</u>	<u>Precipitation</u> (in. / cm)
January	2.68 / 6.81
February	2.36 / 5.96
March	2.30 / 5.84
April	2.39 / 6.07
May	2.73 / 6.93
June	2.71 / 6.88
July	1.81 / 4.60
August	1.73 / 4.39
September	1.45 / 3.68
October	1.74 / 4.42
November	3.11 / 7.90
<u>December</u>	<u>3.17 / 8.05</u>
<u>TOTAL</u>	<u>28.18 / 71.58</u>

DESCRIPTION OF VALUES

Flora

No systematic study of the flora of the RNA exists. The observations of several botanists are compiled in Appendix A. This includes 173 vascular plants and one non-vascular plant (Layser 1972). Scientific nomenclature follows Little (1979) for trees and Hitchcock and Cronquist (1973) for other vascular plants. Further botanical inventory of the area is highly recommended, as it will likely lead to new discoveries, as well as expanded distributions of rare plant populations.

The RNA contains no federally listed plant species or any proposed for listing as endangered or threatened. Thirteen plant species rare in Washington are included in the Regional Forester's Sensitive Species List (Butruille 1991; Washington Natural Heritage Program 1997, 1998). These include: Mingan moonwort (*Botrychium minganense*), mountain moonwort (*Botrychium montanum*), Buxbaum's sedge (*Carex buxbaumii*), yellow sedge (*Carex flava*), crested shield-fern (*Dryopteris cristata*), green-keeled cottongrass (*Eriophorum viridicarinatum*), water (purple) avens

(*Geum rivale*), northern twayblade (*Listera borealis*), marsh muhly (*Muhlenbergia glomerata*), hoary willow (*Salix candida*), Maccall's willow (*Salix maccalliana*), mountain willow (*Salix pseudomonticola*) and black snake-root (*Sanicula marilandica*).

The fen and the stream flowing from it, roughly bisect the RNA. The uplands to the northeast are southwesterly facing slopes. The geology of the uplands is broken. Small finger ridges and draws break up the landscape with vegetation changing constantly from ridge to draw (Berube and Richardson 1995).

The plant association at the tops of the finger ridges is Douglas-fir/ninebark (*Pseudotsuga menziesii*/*Physocarpus malvaceus*). Grand fir/ninebark (*Abies grandis*) associations are found on the more flattened ridges closer to the fen. The sides of the finger ridges are primarily western redcedar/big huckleberry or queencup beadlily (*Thuja plicata*/*Vaccinium membranaceum* or *Clintonia uniflora*) associations. The western redcedar/wild sarsparilla (*Aralia nudicaulis*) association covers draw bottoms. This grades to western hemlock/wild sarsparilla (*Tsuga heterophylla*) in wetter lower elevation draws.

The southwest side of the fen drains northeast into the fen and is wetter. Douglas-fir/ninebark or grand fir/ninebark plant associations are limited to the very tops of the ridges and are sometimes only 30 to 40 ft. (9-12 m) wide. Plant associations grade quickly to western redcedar/big huckleberry or western redcedar/queencup beadlily on the side slopes. Draw bottoms in this area are primarily western redcedar/wild sarsparilla or western hemlock/sarsparilla.

Plant associations on the flat margin surrounding the fen vary between western hemlock/oak fern (*Gymnocarpium dryopteris*) and western redcedar/wild sarsparilla or western hemlock/wild sarsparilla.

The following are descriptions of the riparian plant associations that occur in the Halliday Fen RNA (Kovalchik 1993):

Forest Wetland

1. Western redcedar/soft-leaved sedge (*Thuja plicata*/*Carex disperma*)

The Western Redcedar/Soft-leaved Sedge Plant Association is found along wet, sub-irrigated fringes of Halliday Fen. In some places the forest is fairly mature and dominated by western redcedar and Engelmann spruce (*Picea engelmannii*). Another unsampled area is dominated by seral water birch (*Betula occidentalis*) with western redcedar and Engelmann spruce subdominant. In both cases the soil surface is moderately undulating and standing water is often present in the low areas throughout the growing season. In both areas the soil is a black organic muck. At a position intermediate between mound and ponded areas, the water table was at the soil surface in June and less than four inches (10 cm) below the surface in late July. Soft-leaved sedge dominates the ground vegetation.

Mountain alder (*Alnus incana*), bog birch (*Betula glandulosa*), red-osier dogwood (*Cornus stolonifera*), bunchberry dogwood (*Cornus canadensis*), alder buckthorn (*Rhamnus alnifolia*), and Bebb's willow (*Salix bebbiana*) are common. Other herbs include aster (*Aster* spp.), enchanter's nightshade (*Circaea alpina*), wood reed-grass (*Cinna latifolia*), blue wildrye (*Elymus glauca*), several-flowered bedstraw (*Galium triflorum*), large-leaved avens (*Geum macrophyllum*), tall mannagrass (*Glyceria elata*), alpine mitella (*Mitella pentandra*) and star Solomen's seal (*Smilacina stellata*).

2. Western redcedar/devil's club (*Thuja plicata*/*Oplopanax horridum*)

The stream originating in Halliday Fen plunges through a steep, narrow, V-shaped canyon below the fen. The Western Redcedar/Devil's Club Plant Association is restricted to streambanks and slopes, immediately adjacent to the stream bottom. The loamy soil lies within a matrix of cobbles and boulders. Western redcedar is dominant over western hemlock (*Tsuga heterophylla*) and grand fir (*Abies grandis*). Devil's club is the dominant ground vegetation. Wild ginger (*Asarum caudatum*), baneberry (*Actea rubra*), wild sarsaparilla (*Aralia nudicaulis*), enchanter's nightshade (*Circaea alpina*), trillium (*Trillium ovatum*), several-flowered bedstraw (*Galium triflorum*), twisted stalk (*Streptopus amplexifolius*) and twinflower (*Linnaea borealis*) are common.

Bog

1. Few-flowered spikerush (*Eleocharis pauciflora*)

The Few-flowered Spikerush Plant Association forms an extensive stand on sites along the northeast fringe of Halliday Fen. Its essentially a big seep zone with numerous springs and water paths within it. These cold anerobic conditions are ideal for the rapid building of a deep layer of peat. Mosses are extremely important, comprising 75% of the canopy cover.

The water table is at or near the soil surface throughout the growing season. Few-flowered spikerush is the dominant herb (60%). Other herbs include Buxbaum's sedge (*Carex buxbaumii*), yellow sedge (*C. flava*), inland sedge (*C. interior*), slender sedge (*C. lasiocarpa*), bladder sedge (*C. utriculata*), water avens (*Geum rivale*), fowl mannagrass (*Glyceria striata*), softstem bulrush (*Scirpus validus*), streambank butterweed (*Senecio pseud aureus*), star Solomen's seal (*Smilacina stellata*), Canadian goldenrod (*Solidago canadensis*) and marsh violet (*Viola palustris*).

Carr

1. Mountain alder/bladder sedge (*Alnus incana*/*Carex utriculata*)

The Mountain Alder/Bladder Sedge Plant Association is centrally located in the alder zone on the east end of Halliday Fen. The soil surface is very hummucky with the tall shrubs restricted to the larger hummucks. Standing water is common even in late summer. Mountain alder and alder buckthorn (*Rhamnus alnifolia*) dominate the shrub layer. Bog birch (*Betula glandulosa*) and Bebb's willow (*Salix bebbiana*) are also common. There are scattered conifers, but not enough to call this a forest.

Bladder sedge and Cusick's sedge (*Carex cusickii*) dominate the herb layer. The rich herb layer also includes plants such as mannagrasses (*Glyceria* spp.), crested shield-fern (*Dryopteris cristata*), coltsfoot (*Petasites sagittatus*), yellow monkey-flower (*Mimulus guttatus*) and marsh cinquefoil (*Potentilla palustris*). The soil within the rooting zone is a sedge peat with muck below. The water table is near the surface throughout the growing season.

2. Willow/slender sedge (*Salix* spp./*Carex lasiocarpa*)

The Willow/Slender Sedge Plant Association dominates much of the wet central portion of Halliday Fen. The soil is a sedge and moss peat. A silt soil exists at 49 inches (125 cm). Sphagnum moss is abundant. The water table is near the soil surface throughout the growing season. The soil surface is quite hummucky. Shrubs grow primarily on the hummucks. Bog birch (*Betula glandulosa*) is dominant. Alder buckthorn (*Rhamnus alnifolia*) and willows are well represented.

Slender sedge dominates the herb layer. Buxbaum's and Cusick's sedges (*C. buxbaumii* and *C. cusickii*) are also prominent. Common forbs include water avens (*Geum rivale*), black snake-root (*Sanicula marilandica*), streambank butterweed (*Senecio pseud aureus*), star Solomen's seal (*Smilacina stellata*), Canadian goldenrod (*Solidago canadensis*) and marsh violet (*Viola paulstris*).

3. Mountain alder/tall mannagrass (*Alnus incana*/*Glyceria elata*)

The Mountain Alder/Tall Mannagrass Plant Association dominates a southeasterly lobe of Halliday Fen. The soil is a muck, especially below the rooting zone. The water table is slightly above the rooting zone at snowmelt lowering to more than 10 inches (25 cm) below the soil surface by late summer. Mountain alder and red-osier dogwood (*Cornus stolonifera*) dominant the site. The rich herb layer includes soft-leaved sedge (*Carex disperma*), enchanter's nightshade (*Circaea alpina*), blue wildrye (*Elymus glauca*), common horsetail (*Equisetum arvense*), lady fern (*Athyrium filix-femina*), fowl mannagrass (*G. striata*), alpine mitella (*Mitella pentandra*), arrowleaf grousel (*Senecio triangularis*) and star Solomen's seal (*Smilacina stellata*).

Fen

1. Bladder sedge (*Carex utriculata*)

The Bladder Sedge Plant Association is prominent around the eastern edge of the beaver pond. The soil is a shallow sedge peat layer about 14 inches (35 cm) thick over silt pond fill. The water table is four inches (10 cm) below the soil surface in June and is near the surface in September. Bladder sedge is dominant. Other herbs include Cusick's sedge (*C. cusickii*), yellow sedge (*C. flava*), slender sedge (*C. lasiocarpa*), common spikerush (*Eleocharis palustris*), small bedstraw (*Galium trifidum*), fowl mannagrass (*Glyceria striata*) and coltsfoot (*Petasites sagittatus*).

2. Cusick's sedge (*Carex cusickii*)

The Cusick's Sedge Plant Association occurs on the edge of the beaver pond. Cusick's sedge is established on jack-strawed logs in the pond, creating a heterogeneous linearly fragmented community of Cusick's sedge surrounded by water, except on the shore. The soil is a sedge peat within the root mass over muck. Cusick's sedge is dominant. Occasional western redcedar (*Thuja plicata*) seedlings may indicate a very slow succession to western redcedar/soft-leaved sedge (*C. disperma*). Other herbs include yellow sedge (*C. flava*), bladder sedge (*C. utriculata*), small bedstraw (*Galium trifidum*), fowl mannagrass (*Glyceria striata*), spearmint (*Mentha spicata*), coltsfoot (*Petasites sagittatus*) and Cooley's hedge-nettle (*Stachys cooleyae*).

Fauna

There are no systematic studies of the wildlife of the RNA, but a list of vertebrates and invertebrates observed in or near the RNA is shown in Appendix B. Of the 15 species, five are mammals, six are birds and nine are snails (Burke 1993). The RNA is within the ranges of several federally listed endangered and threatened species (McGowan 1994, Burke 1993). Endangered species in this area include the gray wolf (*Canis lupus*) and American peregrine falcon (*Falco peregrinus anatum*). Halliday Fen RNA is within the recovery area for the federally threatened grizzly bear (*Ursus arctos*) (U.S. Fish and Wildlife Service 1993). The RNA is also within the range of two U.S. Forest Service sensitive species, the North American lynx (*Felis lynx canadensis*) and wolverine (*Gulo gulo luteus*) (McGowan 1994). In addition, the North American lynx is proposed for listing as threatened

Geology

Rodney Lentz (1993), Area Mining Geologist, describes the geology of Halliday Fen as follows:

The regional geology of northeastern Washington is a complicated history of diverse geologic processes which range from stable, craton-margin sedimentation to possible continental collision and accretion (Alt and Hyndman 1987). Bedrock beneath more than half of this region is composed of medium- to coarse-grained rocks of granitic composition. East of the Columbia River these consist of numerous quartz monzonite, granodiorite and granite intrusives which together make up the Kaniksu Batholith.

The batholith intrudes older marine sediments which were deposited more than 400 million years ago on the margin of a stable land mass to the east. Deformation and metamorphism accompanying the intrusion folded and faulted the sediments and converted them to siltite, argillite, quartzite, phyllite and weakly recrystallized limestone and dolomite. This metasedimentary belt, stretching from well into Canada to Spokane, is known as the Kootenay Arc.

Intense regional metamorphism toward the end of the Mesozoic Era (140 million years ago) gently up-warped and recrystallized the rocks. Where temperatures and pressures were greatest, sediments and volcanics were metamorphosed to feldspathic quartzite, mica schists, marbles, amphibolites and gneisses. Low grade metamorphism elsewhere produced meta-conglomerates, phyllites and greenstones. Contemporaneous with uplift came invasion by granitic plutons like those to the east.

Halliday Fen RNA is located on the eastern margin of the Kootenay Arc. The area is underlain by Cambrian Maitlen Phyllite and the lower, gray limestone unit of Metaline Limestone (Dings and Whitebread 1965). These formations dip variably to the northeast and are overlain in the western part of the RNA by the Ordovician Ledbetter Slate.

Greenish gray phyllite is exposed along Trail 522 east of the fen. Medium gray, massive to laminated, very-fine-grained limestone can be seen cropping out on the ridges and slopes to the north. Black, carbonaceous slate, gray quartzite, and medium gray, massive to brecciated, fine-grained dolomite is exposed in Blue Bird Ridge, to the north, and in the steep-walled valley formed by the outlet stream. A major fault, Slate Creek, juxtaposes the lower Metaline Limestone against the Ledbetter Slate. This structure has been interpreted as a high angle reverse fault or a low angle thrust, also dipping southeast.

During the Tertiary Period (beginning 63 million years ago) erosion and renewed volcanism filled continental basins such as the ancestral valley of the Pend Oreille River with clastic sediments and volcanic flow and tephra deposits. More recently, continental glaciers scoured all but the highest peaks leaving a mantle of till and outwash over much of the area, even at higher elevations. At lower elevations within the Halliday Fen basin, bedrock is overlain by unconsolidated glacial drift. Ash falls from Cascade and local volcanic eruptions have also contributed to the surficial deposits in the region.

Soils

Paula Barreras (1996), geologist for the Colville National Forest, describes the soils of Halliday Fen based on information available in the State Soil Survey (Washington Department of Natural Resources 1986) and the Soil Survey of Pend Oreille County Area, Washington (USDA Soil

Conservation Service 1992).

Soils of the Halliday Fen RNA vary only slightly from silt loam and shaley loam on the mountain sideslopes and ridgetops to a sandy gravelly loam on the glacial outwash terraces. Specific soils for the Halliday Fen are shown on Map 4 and described below:

Mountain side slopes:

- Ahern is a yellowish brown loam over a light brownish gray gravelly silty clay loam soil. It formed in ash mantled calcareous glacial (shales and limestone) glacial till. The soils are moist, below the plastic limit and are moderately permeable. It is an Andic Xerochrepts.
- Belzar is a brown over light brown silt loam soil formed in residuum and colluvium from calcareous shale and limestone mantled by ash and loess. The soils are moist and below the plastic limit. This well-drained soil is an Andic Xerochrepts.
- Boundary is a yellowish brown silt loam soil formed in a fine-textured glacial till mantled by volcanic ash. This moderately well-drained soil is an Andic Haploxeralfs.
- Hartill is a pale brown silt loam soil formed in ash mantled residuum and colluvium from phyllites, argillites and sandstones. This non-plastic, soft and moist soil is an Andic Xerochrepts.
- Merkel is a pale brown over light yellowish brown stony sand loam soil formed in granitic glacial till with an admixture of volcanic ash in upper horizons. This non-plastic, slightly acidic, moist and well-draining soil is a Vitrandic Xerochrepts.
- Newbell is a yellowish brown light yellowish brown silt loam formed in granitic glacial till with a volcanic ash mantle. This moist, soft, well-drained and below the plastic limit soils is an Andic Xerochrepts.
- Raisio is a grayish brown shaley loam soil formed in colluvium and residuum from shaley rock like argillite or phyllite with an admixture of volcanic ash, loess and till. It is below the plastic limit, is moist, hard and a well-drained soil, which is a Vitrandic Haploxerolls.
- Rufus is a grayish brown shaley loam formed in colluvium and residuum from shaly rocks like argillite or phyllite with an admixture of volcanic ash, loess and till. This soil is below the plastic limit, moist, hard and well-drained. This soil is a Lithic Ultic Haploxerolls.
- Three-mile is a yellowish brown loam and silt loam from an alkaline loamy glacial till with an ash mantle. This well-drained soil is an Andic Xerochrepts.
- Waits is a light brown loam soil, formed in alkaline loamy glacial till mantled by volcanic ash. This is a moist, soft, below the plastic limit and well-drained Andic Xerochrepts.

Most of the soils on the mountain side slopes are well-drained, which means water is available for plants throughout most the growing season and moisture level does not inhibit root growth at significant periods during the growing season.

Upland basins

- Uncas is a very dark grayish brown, moist, silt loam formed in well-decomposed organics. This soil type has very poor drainage and is a Histic Vitraquands. Water is removed so slowly from Unca soils that they are periodically saturated during the growing season or may remain wet for long periods.

- Typic Xerochrepts is a grayish brown loam soil formed in stratified glaciofluvial deposits with a mantle of ash and loess. This soil is moderately well-drained with a restrictive stratified soil layer at 40 inches (1 meter). On this soil, water is removed readily, but not rapidly. Water is available for plants throughout the growing season.

Glacial terraces

- Kiehl is a pale brown gravelly silt loam formed in coarse glacial outwash with a mantle of volcanic ash. This non-plastic and well-drained soil is an Andic Xerochrepts.
- Kaniksu is a brown over light yellowish brown sandy loam from sandy glacial outwash with an admixture of volcanic ash. This soil is well-drained and is a Vitrandic Xerochrepts.

On these glacial terraces water is removed readily, but not rapidly. Water is available to plants throughout the growing season and moisture level does not inhibit growth of roots for significant periods during the growing season.

Lands

All lands within the RNA are reserved National Forest System lands. The RNA is not located in any existing classified area (USDA Forest Service 1988).

Cultural

Cultural resource surveys did not locate any cultural sites within the RNA area. It is likely however, that aboriginal peoples used portions of the RNA for hunting, fishing, gathering and travel routes (Mattson 1993).

IMPACTS AND POSSIBLE CONFLICTS

Mineral Resources

One forest activity affected by the establishment of RNA's is mineral extraction. To protect and preserve the natural environment in the RNA, the area would have high access restrictions which would discourage mineral entry (USDA Forest Service 1988). Rodney Lentz, Area Mining Geologist for the US Forest Service, evaluated the mineral resources of this RNA. This section on mineral resources is taken from his 1993 report.

Exploration and mine development in northeastern Washington began about the turn of the century. Soon the region's mining districts became significant producers of precious and base metals and some non-metals such as limestone, dolomite, magnesite and quartzite. Sand and gravel or quarry rock became important locally as communities and roadways were established.

Many mines in the region closed before or during the depression years of the 1930's, never to reopen. Important exceptions are the Republic gold district, Metaline zinc-lead and limestone district, Addy dolomite and quartzite district and Spokane uranium district. All of these districts include, or until recently, included producing mines.

The proposed withdrawal is in the eastern part of the productive Metaline Mining District. The geology and mineral deposits of the Metaline district were studied by Park and Cannon (1943)

and Dings and Whitebread (1965). The first mineral production from this district was recorded in 1906.

Between 1903 and 1970 nearly \$150 million worth of zinc, lead and silver were produced from Pend Oreille County (Moen 1982). Most came from the Pend Oreille, Grandview and Metaline mines, all located on the Pend Oreille River approximately five miles southwest of the RNA. Zinc and lead occur as replacement deposits in limestone and dolomite of the Metaline Limestone. No significant zinc-lead production has come from the Metaline district since 1977, when the Pend Oreille Mine closed.

Undoubtedly the area of the RNA and surrounding lands have been prospected in the past. Flagged lines were noted in the western half of the RNA. These may be associated with unpatented lode claims by Resource Finance, Inc., although no corners or discovery monuments were positively identified. Two shallow prospect pits were noted during the field exam. Assuming the RNA boundary runs along the crest of Blue Bird Ridge, the workings of the patented Hill No. 2 lode claim lie just outside the RNA boundary.

Existing mineral inventories and analysis indicate that none of the RNA lands are prospectively valuable for leasable minerals, including oil, gas, coal or geothermal resources. Field and literature reviews completed for this examination supports that data.

Salable minerals (e.g. sand, gravel and stone) are present in the RNA. The quality of materials, however, varies considerably. Due to the isolation of the RNA and/or quality of available materials, there is no apparent market for these commodities at the present time, nor in the foreseeable future. Consequently, the potential for salable mineral development is considered low.

Geological interpretations of the RNA area show that there is a potential for Blue Bird Ridge vein-type and Metaline replacement type zinc-lead occurrences beneath part or all of the RNA, which means there is a high potential for finding zinc and lead. In addition, a high purity and high calcium limestone unit underlies the RNA. Peat deposits also occur in the marl.

Portions of 13 unpatented mining claims are owned or controlled by Resource Finance, Inc. overlap the western RNA boundary. The Patsy claims owned by Metaline Contact Mines are overlapped by, but senior to, Resource Finance's later claim group.

A group of about 30 claims known as the Blue Bird, staked by Washington Resources, Inc., formerly occupied the southern half of section 30 and the northern half of section 31, T40N R44E. These claims were located in 1951, probably for zinc-lead, and abandoned in 1982. Apparently little development work has been completed on these claims.

Grazing

Another resource element affected by the establishment of this RNA is grazing. The RNA is not within a grazing allotment. Livestock grazing is not a tool to protect and preserve the natural environment of this RNA, so grazing allotments and permits are not (USDA Forest Service 1988).

Timber

Another resource element affected by the establishment of RNA's is timber harvest. Scheduled

timber harvest is not permitted in RNAs (USDA Forest Service 1988). Thus, 674 acres (273 ha) of forest in the RNA have been removed from the Forest's suitable timber base. In addition, salvage and/or firewood harvest is also not appropriate in the RNA.

Watershed Values

Watershed values of the RNA are high. The protection of the area as a RNA, will help maintain watershed values on a local scale. Halliday Fen RNA is within the Slate Creek watershed and the lack of disturbance through multiple use forest management will allow the watershed to function naturally. The hydrologic functioning of the area, the protection of the soil by vegetation, the infiltration capacity and runoff conditions are controlled in their present state. These processes and values are important to the cumulative state of the Slate Creek watershed (Wasson 1994).

Recreation Values

Another resource element affected by the establishment of this RNA is recreation. To protect and preserve the natural environment in the RNA, recreation might either be curtailed, if degradation occurred, or discouraged through interpretive signing. Existing facilities might be closed (USDA Forest Service 1988).

The Halliday Fen trail (#522) goes through the RNA. There is a dispersed use site just across the fen on a flat area along the trail. The Halliday Fen trail receives very light recreational use by hikers, horseback parties and hunters. Although this use could increase, it is not believed that it will conflict appreciably with RNA values. Recreational use is not encouraged. Plans for the RNA include erecting a sign at the Halliday Fen trailhead and at the entrance to the fen, to explain the RNA ecosystem, the purpose of RNAs and guidelines for traveling through the RNA. The sign is not expected to increase the currently light use and will not be visible from the highway.

Wildlife and Plant Values

Designation of the Halliday Fen RNA would have no detrimental effects on wildlife or plant values. Since the RNA provides quality habitat for animal and plant species which are threatened, endangered or sensitive within the state, there is potential for biological and ecological studies. Establishment of Halliday Fen as a RNA would ensure the continued protection of this ecosystem and the species which depend upon it.

Special Management Area Values

This RNA is not within a congressionally designated area.

Transportation Plans

Establishment of this RNA will have no impact on the transportation system within the Colville National Forest. Any proposed roads within the sections encompassing or surrounding the RNA will be evaluated by Sullivan Lake Ranger District personnel for potential impact to the RNA. No additional trails are planned within the RNA, but the existing trail will be maintained.

MANAGEMENT PRESCRIPTION

Halliday Fen RNA is included, along with other RNAs in the Land and Resource Management Plan for Colville National Forest under Management Area 4 (USDA Forest Service 1988). Management Area 4 includes goals and management standards for resource elements (Appendix C). Such activities as livestock grazing, logging and mining will be prohibited in the RNA. Use of the area other than the trail will not be encouraged. Existing trails can be maintained, but no new trails are permitted. No roads will be constructed and there will be no reconstruction of old roads.

VEGETATION MANAGEMENT

Management and protection of the Halliday Fen RNA will be directed toward maintaining natural features and natural ecological processes. The Land and Resource Management Plan for the Colville National Forest (USDA Forest Service 1988) prescribes the following in case of wildfire:

"Unless plans approved by the station director provide for letting natural fires burn, aggressive containment using low impact methods should be used. High impact methods will be used only to prevent a total loss of the Research Natural Area. Mop-up should be minimized with natural burnout being the preferred method.

Initial attack and suppression methods will be designed to maintain RNA characteristics."

Insect and disease control "is appropriate to protect the uniqueness of the Research Natural Area." Plant collection "will be prohibited in existing or proposed RNAs, unless expressly authorized in an approved research project."

ADMINISTRATION RECORDS AND PROTECTION

Administration and protection of Halliday Fen RNA will be the responsibility of the Colville National Forest. The District Ranger at Sullivan Lake Ranger District has direct responsibility. Requests to conduct research in the RNA can be made to the Director of the USDA Forest Service Pacific Northwest Research Station, who will be responsible for any research or studies conducted in the area. The Director will evaluate research proposals and coordinate all RNA studies and research with the District Ranger. All plant and animal specimens collected in the course of RNA research will be properly preserved and maintained within university or federal agency herbaria and museums, approved by the Director.

Records for the Halliday Fen RNA will be maintained in the following offices:

- Regional Forester, Portland, Oregon
- Forest Supervisor, Colville National Forest, Colville, Washington
- District Ranger, Sullivan Lake Ranger District, Metaline Falls, Washington
- Pacific Northwest Research Station, Portland, Oregon

ARCHIVING

The Pacific Northwest Research Station of the USDA Forest Service will be responsible for maintaining the Halliday Fen RNA research data file and list of herbarium and species samples collected. All data will also be submitted to the Research Natural Area monitoring database at the Forestry Sciences Lab in Corvallis, Oregon.

REFERENCES

- Alt, D. D. and D. W. Hyndman. 1987. Roadside geology of Washington. Mountain Press Publishing Co., Missoula, MT. 282 pp.
- Barreras, Paula. 1996. Soil report for Halliday Fen, December 16, 1996, filed at the Colville National Forest Supervisor's Office, Colville, WA. 3 pp.
- Berube, J. M. and Julia Richardson. 1995. Plants sighted on September 8, 1995 and not already listed for the RNA, filed at the Colville National Forest Supervisor's Office, Colville, WA. 1 pp.
- Burke, Thomas E. 1993. Letter to Jan Lerum and Penny Miller dated March 30, 1993 commenting on the draft establishment records for Bunchgrass Meadows and Halliday Fen RNAs, filed at the Colville National Forest Supervisor's Office, Colville, WA. 4 pg.
- Butruille, John F. 1991. A 2670 memo of June 10, 1991 to Forest Supervisors regarding revisions to the sensitive plant list. USDA Forest Service, Pacific Northwest Region, Portland, OR. 1 pp.
- Dings, M. G. and D. H. Whitebread. 1965. Geology and ore deposits of the Metaline zinc-lead district, Pend Oreille County, Washington, US Geological Survey Professional Paper 489. 109 pp.
- Eyre, F. H. 1980. Forest cover types of the United States and Canada. Society of American Foresters, Washington, D.C. 148 pp.
- Greene, Sarah E. 1980. Letter dated August 27, 1980 to Colville National Forest Supervisor, Robert Terrill, regarding recommendations of proposed RNAs for the Colville National Forest, filed at the Colville National Forest Supervisor's Office, Colville, WA. 14 pp.
- Greene, Sarah E. 1984. Letter dated December 17, 1984 to Colville National Forest Planning Staff Officer, Steve Kelley, regarding change in boundary for the proposed Halliday Fen RNA, filed at the Colville National Forest Supervisor's Office, Colville, WA. 1 pp.
- Greene, Sarah E. 1988. Letter dated October 21, 1988 to Colville National Forest Supervisor, Ed Schultz, regarding expansion of the boundary for the proposed Halliday Fen RNA, filed at the Colville National Forest Supervisor's Office, Colville, WA. 2 pp.
- Hitchcock, C. Leo and Cronquist, Arthur. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, WA. 730 pp.
- Kovalchik, Bernard L. 1993. Riparian plant associations on the National Forests of eastern Washington, a partial draft version 1, May, 1993, filed at the Colville National Forest Supervisor's Office, Colville, WA. 203 pp.
- Kuchler, A.W. 1964. Potential natural vegetation of the conterminous United States. American Geographical Society, Special Publication No. 36. New York, 116 pp.
- Layser, Earle F. 1972. Reply to impoundment proposal, filed at the Colville National Forest Supervisor's Office, Colville, WA. 2 pp.
- Layser, Earle F. 1980. Flora of Pend Oreille County, Washington. Washington State University, Cooperative Extension, Pullman, Washington. 146 pp.

- Lentz, Rodney T. 1993. Mineral potential of the proposed Halliday Fen RNA withdrawal, unpublished administrative report M-446, filed at the Colville National Forest Supervisor's Office, Colville, WA. 18 pp.
- Little, Jr., Elbert. 1979. Checklist of United States Trees (Native and Naturalized). Agricultural Handbook 541. Washington, D.C.: U.S. Department of Agriculture, Forest Service. 375 pp.
- Mattson, Daniel. 1993. Personal communication, October 25, 1993, on file at Colville National Forest Supervisor's Office, Colville, WA. 1 pp.
- McGowan, Jim. 1994. Biological evaluation for the establishment of Halliday Fen Research Natural Area, July 7, 1994; filed at the Colville National Forest Supervisor's Office, Colville, WA. 8 pp.
- Moen, W. S. 1982. The mineral industry of Washington - highlights of its development, 1853-1980. Washington Division of Geological and Earth Resources Information Circular 74. 26 pp.
- Park Jr., C. F. and R. S. Cannon Jr. 1943. Geology and ore deposits of the Metaline quadrangle, Washington. US Geological Survey Professional Paper 202. 81 pp.
- Phillips, E. L. and D. C. Durkee. 1972. Washington Climate for these counties, Ferry, Pend Oreille and Stevens. Cooperative Extension Service, College of Agriculture, Washington State University, Pullman, WA. 63 pp.
- Schuller, Reid. 1981. Letter dated June 29, 1981 to Colville National Forest Supervisor, Bill Shenk, recommending consideration of Halliday Fen as a Special Interest Area in the Forest Plan, filed at the Colville National Forest Supervisor's Office, Colville, WA. 2 pp.
- Schuller, Reid. 1982. Letter dated November 8, 1982 to Colville National Forest Supervisor, Bill Shenk, with additional justification of Halliday Fen as a Special Interest Area, filed at the Colville National Forest Supervisor's Office, Colville, WA. 3 pp.
- USDA Forest Service. 1988. Colville National Forest land and resource management plan, filed at the Colville National Forest Supervisor's Office, Colville, WA. 1744 pp.
- USDA Forest Service. 1992. Draft Environmental Impact Statement Threemile Area Timber Sales and Other Projects, filed at the Colville National Forest Supervisor's Office, Colville, WA.
- USDA Forest Service. 1998. USDA Forest Service manual. USDA Forest Service, Pacific Northwest Region, Portland, OR.
- USDA Soil Conservation Service. 1992. Soil survey of Pend Oreille County area, Washington. Washington, D.C. 417 pp.
- US Fish and Wildlife Service. 1993. Grizzly bear recovery plan. Missoula, MT. 181 pp.
- Washington Department of Natural Resources. 1986. State soil survey report for the Northeast Area Forest Land Management Division. Olympia, WA. 48 pp.
- Washington Department of Natural Resources. 1995. State of Washington natural heritage plan: 1993/1995 update. Olympia, WA. 191 pp.

Washington Natural Heritage Program. 1997. Endangered, threatened and sensitive vascular plants of Washington - with working lists of rare non-vascular species. Department of Natural Resources, Olympia, WA. 62 pp.

Washington Natural Heritage Program. 1998. Biological and conservation database of endangered, threatened and sensitive plant records. Department of Natural Resources, Olympia, WA.

Wasson, Bert. 1994. Memo of March 28, 1994, and Natural Resources Conservation Service data, filed at Colville National Forest Supervisor's Office, Colville, WA. 2 pp.

Williams, Clinton K., Terry R. Lillybridge and Bradley G. Smith. 1990. Forested plant associations of National Forest. USDA Forest Service, Pacific Northwest Region, Portland, OR. 133 pp.

APPENDIX A

FLORA OF HALLIDAY FEN RESEARCH NATURAL AREA

The vegetation of Halliday Fen RNA includes 174 vascular and non-vascular taxa. A key to the sources of the sightings follows at the end of the list. An asterisk following the scientific name indicates a sensitive species (Butruille 1991). Nomenclature follows Little (1979) for trees and Hitchcock and Cronquist (1973) for other vascular plants.

VASCULAR

<u>Scientific Name</u>	<u>Common Name</u>	<u>+Source of Sighting</u>
TREES		
<i>Abies grandis</i>	grand fir	5
<i>Abies lasiocarpa</i>	subalpine fir	9
<i>Betula papyrifera</i>	paper birch	9
<i>Larix occidentalis</i>	western larch	5, 8
<i>Picea engelmannii</i>	Engelmann spruce	5
<i>Pinus contorta</i>	lodgepole pine	5
<i>Pinus monticola</i>	western white pine	5
<i>Pinus ponderosa</i>	Ponderosa pine	5
<i>Populus trichocarpa</i>	black cottonwood	9
<i>Pseudotsuga menziesii</i>	Douglas fir	4
<i>Taxus brevifolia</i>	western yew	9
<i>Thuja plicata</i>	western redcedar	5, 8
<i>Tsuga heterophylla</i>	western hemlock	5
SHRUBS		
<i>Acer glabrum</i>	mountain maple	4
<i>Alnus incana</i>	mountain alder	5
<i>Amelanchier alnifolia</i>	serviceberry	5
<i>Arctostaphylos uva-ursi</i>	kinnikinnick	5
<i>Berberis aquifolium</i>	tall Oregon-grape	5
<i>Berberis repens</i>	creeping Oregon-grape	5
<i>Betula glandulosa</i>	bog birch	1, 5, 6
<i>Cornus canadensis</i>	bunchberry dogwood	5
<i>Cornus stolonifera</i>	red-osier dogwood	5
<i>Corylus cornuta</i>	hazelnut	4
<i>Holodiscus discolor</i>	oceanspray	4
<i>Juniperus communis</i>	creeping juniper	9
<i>Lonicera ciliosa</i>	orange honeysuckle	4
<i>Lonicera involucrata</i>	black twinberry	5
<i>Lonicera utahensis</i>	Utah honeysuckle	4
<i>Menziesia ferruginea</i>	fool's huckleberry	4
<i>Oplopanax horridum</i>	devil's club	5
<i>Pachistima myrsinites</i>	mountain lover	5
<i>Physocarpus malvaceus</i>	ninebark	4
<i>Prunus virginiana</i>	chokecherry	4
<i>Rhamnus alnifolia</i>	alder buckthorn	1, 5, 6
<i>Rhododendron albiflorum</i>	white rhododendron	4
<i>Ribes lacustre</i>	swamp gooseberry	5

<u>Scientific Name</u>	<u>Common Name</u>	<u>+Source of Sighting</u>
<i>Rosa gymnocarpa</i>	baldhip rose	5
<i>Rubus idaeus</i>	red raspberry	5
<i>Rubus parviflorus</i>	thimbleberry	5
<i>Salix bebbiana</i>	Bebb's willow	1
<i>Salix bebbiana</i> var. <i>perrostrata</i>	Bebb's willow	5
<i>Salix candida</i> *	hoary willow	1, 2, 5
<i>Salix communtata</i>	variable willow	1, 5
<i>Salix maccalliana</i> *	MacCall's willow	1, 5
<i>Salix pseudomonticola</i> *	mountain willow	5
<i>Salix scouleriana</i>	Scouler willow	4
<i>Salix</i> sp.	willow	8
<i>Shepherdia canadensis</i>	buffaloberry	5
<i>Spiraea betulifolia</i> var. <i>lucida</i>	white spiraea	5
<i>Symphoricarpos albus</i>	common snowberry	5
<i>Vaccinium membranaceum</i>	big huckleberry	5
<i>Vaccinium myrtillus</i>	dwarf bilberry	4
<i>Viburnum edule</i>	high-bush cranberry	5, 6
HERBS		
<i>Achillea millefolium</i>	yarrow	4
<i>Aconitum columbianum</i>	monkshood	5
<i>Actaea rubra</i>	baneberry	5
<i>Adenocaulon bicolor</i>	pathfinder	5
<i>Agropyron spicatum</i>	bluebunch wheatgrass	8
<i>Angelica arguta</i>	sharptooth angelica	5
<i>Anaphalis margaritacea</i>	pearly everlasting	5
<i>Antennaria racemosa</i>	raceme pussy-toes	4
<i>Apocynum androsaemifolium</i>	spreading dogbane	5
<i>Aralia nudicaulis</i>	wild sarsaparilla	5
<i>Arenaria capillaris</i>	mountain sandwort	4
<i>Arnica cordifolia</i>	heart-leaf arnica	4
<i>Asarum caudatum</i>	wild ginger	5
<i>Athyrium filix-femina</i>	lady fern	5
<i>Botrychium minganense</i> *	Mingan moonwort	3
<i>Botrychium montanum</i> *	mountain moonwort	3
<i>Botrychium virginianum</i>	Virginia grape-fern	2, 5, 6, 8
<i>Bromus cilata</i>	fringed brome	4, 8
<i>Bromus</i> sp.	brome	8
<i>Calamagrostis rubescens</i>	pinegrass	4
<i>Campanula rotundifolia</i>	harebell	4
<i>Carex aurea</i>	golden sedge	5
<i>Carex buxbaumii</i> *	Buxbaum's sedge	1, 5, 8
<i>Carex cusickii</i>	soft-leaved sedge	1, 5
<i>Carex flava</i> *	yellow sedge	1, 2, 5, 6, 8
<i>Carex interior</i>	inland sedge	1, 5, 8
<i>Carex lanuginosa</i>	wooly sedge	1, 8
<i>Carex lasiocarpa</i>	slender sedge	1, 5, 8
<i>Carex leporinella</i>	Sierra-hare sedge	8
<i>Carex pyrenaica</i>	Pyrenaean sedge	5
<i>Carex utriculata</i>	bladder sedge	1, 5

<u>Scientific Name</u>	<u>Common Name</u>	<u>+Source of Sighting</u>
<i>Chimaphila umbellata</i>	prince's pine	5
<i>Cicuta douglasii</i>	Douglas' water-hemlock	5
<i>Cinna latifolia</i>	woodreed	5
<i>Circaea alpina</i>	enchanter's nightshade	5
<i>Cirsium brevifolium</i>	paluse thistle	5
<i>Clematis columbiana</i>	Columbia clematis	4
<i>Clintonia uniflora</i>	queen's-cup beadlily	5
<i>Corallorhiza maculata</i>	spotted coral-root	4
<i>Cryptogramma crispa</i>	rock-brake	4
<i>Disporum trachycarpum</i>	wartberry fairy-bell	5
<i>Dryopteris austriaca</i>	mountain wood fern	6, 7
<i>Dryopteris cristata</i> *	crested shield fern	1, 6, 7
<i>Eleocharis palustris</i>	common spike-rush	5
<i>Eleocharis pauciflora</i>	few-flowered spike-rush	5
<i>Eleocharis</i> sp.	spike rush	8
<i>Elymus glaucus</i>	western wildrye	5
<i>Epilobium angustifolium</i>	fireweed	4
<i>Epilobium watsonii</i>	Watson's willow-herb	1
<i>Equisetum arvense</i>	common horsetail	5
<i>Equisetum fluviatile</i>	swamp horsetail	7
<i>Equisetum hyemale</i> var. <i>affine</i>	common scouring rush	5, 7
<i>Equisetum palustre</i>	marsh horsetail	5
<i>Eriogonum vimineum</i>	broom buckwheat	5
<i>Eriophorum viridicaratum</i> *	green-keeled cottongrass	1, 8
<i>Festuca subulata</i>	bearded fescue	5
<i>Fragaria vesca</i>	woods strawberry	4
<i>Fragaria virginiana</i> var. <i>platypetala</i>	broadpetal strawberry	5
<i>Galium aparine</i>	cleavers	5
<i>Galium triflorum</i>	several-flowered bedstraw	5
<i>Galium trifidum</i>	small bedstraw	5
<i>Gaultheria ovatifolia</i>	slender wintergreen	4
<i>Geum macrophyllum</i> var. <i>perincisum</i>	large-leaved avens	5
<i>Geum rivale</i> *	water avens	1, 5, 8
<i>Glyceria elata</i>	tall mannagrass	5
<i>Glyceria striata</i>	fowl mannagrass	5, 8
<i>Goodyera oblongifolia</i>	western rattlesnake-plantain	5
<i>Heuchera cylindrica</i>	roundleaf alum	4
<i>Hieracium albiflorum</i>	white-flowered hawkweed	4
<i>Hieracium pratense</i>	meadow hawkweed	10
<i>Hippuris vulgaris</i>	common mare's-tail	4
<i>Lilium columbianum</i>	tiger lily	4
<i>Linnaea borealis</i> var. <i>longiflora</i>	twinflor	5
<i>Listera borealis</i> *	northern twayblade	4
<i>Listera caurina</i>	western twayblade	4
<i>Listera cordata</i>	heart-leaf twayblade	4
<i>Lomatium utriculatum</i>	common lomatium	5
<i>Mentha spicata</i>	spearmint	5
<i>Menyanthes trifoliata</i>	bog bean	1, 5, 6, 7
<i>Microsteris gracilis</i>	microsteris	4
<i>Mimulus guttatus</i> var. <i>guttatus</i>	yellow monkey-flower	4, 5

<u>Scientific Name</u>	<u>Common Name</u>	<u>+Source of Sighting</u>
Mitella pentandra	five-stamened mitrewort	5
Muhlenbergia glomerata*	marsh muhly	1, 6, 8
Orobanche uniflora	naked broomrape	4
Osmorhiza chilensis	mountain sweet-cicely	10
Osmorhiza purpurea	purple sweet-cicely	5
Parnassia palustris	fringed grass-of-Parnassus	8
Petasites sagittatus	arrowleaf coltsfoot	5
Plantanthera dilatata var. leucostachya	leafy white bog-orchid	2, 5
Platanthera unalascensis	Alaska rein-orchid	4
Potentilla palustris	marsh cinquefoil	1
Prunella vulgaris	self-heal	5
Pteridium aquilinum	bracken fern	5
Pyrola asarifolia	pink pyrola	5
Pyrola picta	white vein pyrola	5
Pyrola secunda	sidebells pyrola	5
Pyrola uniflora	woodnymph	4
Ranunculus gmelinii	Gmelin's buttercup	5
Ranunculus gormanii	Gorman's buttercup	5
Ranunculus uncinatu	little buttercup	5
Rorippa nasturtium-aquaticum	water-cress	10
Sanicula marilandica*	black snake-root	1, 5
Saxifraga mertensiana	Merten's saxifrage	10
Scirpus validus	softstem bulrush	5
Senecio pseud aureus	streambank butterweed	4, 5
Senecio triangularis	arrowleaf groundsel	5
Smilacina racemosa	false Solomon's seal	4
Smilacina stellata	star Solomon's seal	5
Solidago canadensis	goldenrod	5, 7
Sparganium spp.	bur-reed	5
Streptopus amplexifolius var. chalazatus	clasping-leaved twisted-stalk	5
Stachys cooleyae	Cooley's hedge-nettle	5
Stellaria longipes	longstalk starwort	5
Tiarella trifoliata var. unifoliata	cool-wort foamflower	5
Trifolium repens	Dutch white-clover	10
Triglochin palustre	marsh arrow-grass	6
Trillium ovatum	trillium	5
Typha latifolia	cattails	5
Utricularia minor	lesser bladderwort	6
Valeriana dioica	northern valerian	5
Veronica americana	American speedwell	5
Viola orbiculata	round-leaved violet	5
Viola palustris	marsh violet	1, 5
Woodsia sp.	woodsia	8
Zigadenus elegans	glaucous death-camas	5

NON-VASCULAR

MOSESSES

Scorpidium scorpioides

6

+Source of Sightings

1. Ahlenslager, Kathy and Bernard Kovalchik. 1992. Plants sighted on May 26, 1992, filed at the Colville National Forest Supervisor's Office, Colville, WA. 4 pp.
2. Althausen, Nick, Sheryl Althausen and Tony Basabe. 1979. A summary of searches for rare, threatened and endangered plant taxa for the Colville National Forest, filed at the Colville National Forest Supervisor's Office, Colville, WA. 36 pp.
3. Alverson, Ed. 1983. Sensitive plant sighting forms filed at the Colville National Forest Supervisor's Office, Colville, WA.
4. Benner, Barbara, Jean Wood and Aspen Swartz. 1993. Plants sighted on July 10, 1993, filed at the Colville National Forest Supervisor's Office, Colville, WA. 1 pp.
5. Kovalchik, Bernard. 1990. Ecology plots taken July 9, 1990, filed at the Colville National Forest Supervisor's Office, Colville, WA.
6. Layser, Earle F. 1972. Reply to impoundment proposal, filed at the Colville National Forest Supervisor's Office, Colville, WA. 2 pp.
7. Layser, Earle F. 1980. Flora of Pend Oreille County, Washington. Washington State University Cooperative Extension, Pullman, WA. 146 pp.
8. Mital, David J. and Kristen Tarp. 1985. Sensitive plants survey of selected areas of the Colville National Forest, filed at the Colville National Forest Supervisor's Office, Colville, WA. 24 pp.
9. Berube, J. M. and Julia Richardson. 1995. Plants sighted on September 8, 1995 and not already listed for the RNA, filed at the Colville National Forest Supervisor's Office, Colville, WA. 1 pp.
10. Ahlenslager, Kathy, Fred Gonzalez and Jay Berube. 1996. Plants sighted on July 10, 1996 and not already listed for the RNA, filed at the Colville National Forest Supervisor's Office, Colville, WA. 1 pp.

APPENDIX B

FAUNA OF HALLIDAY FEN RESEARCH NATURAL AREA

Fauna observed in or near Halliday Fen RNA include 11 vertebrates and nine invertebrates (Burke 1993).

<u>Scientific Name</u>	<u>Common Name</u>
VERTEBRATES	
Mammals	
<i>Cervus canadensis</i>	elk
<i>Martes americana</i>	marten
<i>Tamiasciurus hudsonicus</i>	red squirrel
<i>Sorex vagrans</i>	vagrant shrew
<i>Microtus pennsylvanicus</i>	meadow mouse
Birds	
Strigiformes (Barn Owls)	
<i>Glaucidium gnoma</i>	northern pygmy owl
<i>Strix varia</i>	barred owl
Piciformes (Woodpeckers)	
<i>Picoides tridactylus</i>	three-toed woodpecker
<i>Colaptes auratus</i>	common flicker
Passeriformes (Perching Birds)	
<i>Regulus satrapa</i>	golden-crowned kinglet
<i>Corvus corax</i>	common raven
INVERTEBRATES	
Aquatic Snails	
<i>Lymnae auricularia</i>	European ear snail
<i>Helisoma sp.</i>	ramshorn snail
<i>Gyraulus sp.</i>	gyro snail
Land Snails	
<i>Allogona ptycophora</i>	Idaho forest snail
<i>Haplotrema vancouverense</i>	robust lancetooth snail
<i>Succinea rusticana</i>	rustic amber snail
<i>Cochlicopa lubrica</i>	glossy pillar snail
<i>Euconulus fulvus</i>	brown hive snail
<i>Pisidium sp.</i>	Peaclam

Appendix C. Colville National Forest Plan, RNA Management Prescription



MANAGEMENT PRESCRIPTION: 4

EMPHASIS: Research Natural Area

MANAGEMENT GOAL: Provide opportunities for research in ecosystems influenced only by natural processes.

DESCRIPTION: Research Natural Areas (RNAs) contain examples of typical natural ecosystems or unique kinds of vegetation, animals and land which are reserved for scientific and educational purposes. RNA's are dedicated to non-manipulative and non-destructive research. Specific resource values and management activities will be prescribed in individual establishment reports.

Resource Element	Resource/Activity Standards and Guidelines
------------------	--

RECREATION

Visual Management

Research facilities installed within RNA's will blend with the natural surroundings.

Developed Recreation

No new physical improvements for recreation purposes are permitted, unless needed to protect the values for which the RNA was established.

Off-Road Vehicles

Off-road vehicle use is prohibited.

WILDLIFE AND FISH
Habitat Improvement

Habitat improvement is generally not appropriate. Protection and maintenance of unique values of the RNA is appropriate.

Use appropriate RNA guidelines when studying wildlife, fish and plants.

RANGE
Range Management

Conditions of grazing will be followed as defined in the establishment report.

TIMBER
Timber Harvesting

No scheduled timber harvest is permitted.

Salvage and/or firewood harvest is not appropriate.

MINERALS
Minerals Management

Recommend withdrawal from mineral entry. If withdrawn, validity examinations may be conducted on existing mining claims.

Decisions to lease oil and gas, or other leasable minerals will be made through NEPA analysis.

Saleable mineral disposal and stockpile sites are not appropriate.

LANDS
Land Ownership Adjustment

Retain National Forest System lands; acquire private lands needed to support the RNA program.

Special Uses

Rights-of-way grants are not appropriate.

Special use permits will not be issued.

FACILITIES

Roads

Construction of new roads is not appropriate.

Trails

Maintenance and reconstruction of existing trails is permitted. Construction of new trails not allowed.

Utility Corridors

Avoid locating utility corridors in this management area.

PROTECTION

Wildfire

Unless plans approved by the Station Director provide for letting natural fires burn, aggressive containment using low impact methods should be used. High impact methods will be used only to prevent a total loss of the Research Natural Area. Mop-up should be minimized with natural burnout being the preferred method.

Initial attack and suppression methods will be designed to maintain RNA characteristics.

Prescribed Fire

Planned ignitions may be used as a means of achieving RNA objectives.

Insect & Disease Control

Insect and disease control is appropriate to protect the uniqueness of the Research Natural Area.

Plant Collection

Plant collection will be prohibited in existing or proposed RNAs, unless expressly authorized in an approved research project.

APPENDIX D

BOUNDARY CERTIFICATION AND DESCRIPTION

HALLIDAY FEN RESEARCH NATURAL AREA

Boundary Description for Halliday-Fen Research Natural Area

A tract of land located in Secs. 30, 31, and 32, T. 40 N., R. 44 E., Sec. 36, T. 40 N., R. 43 E., Sec. 1, T. 39 N., R. 43 E., and Sec. 6, T. 39 N., R. 44 E., Willamette Meridian, Pend Oreille County, State of Washington; as per map drawn October 8, 1998, on file in the Supervisors Office of the Colville National Forest, Boundary Management unit, being more particularly described as follows:

Commencing at the Sec. corner common to secs. 30 and 31, T. 40 N., R. 44 E., which is an iron pipe with brass cap marked and set in accordance with the official record.

Base of bearings is the geodetic meridian as predicated on the North American Datum of 1927(NAD27), as derived by mapping grade GPS observations. Aluminum monuments were set at selected angle points in this description and consist of a one inch outside diameter aluminum piston drive monument with a three and one quarter inch aluminum cap marked U.S. Dept. of Agriculture U.S. Forest Service, Halliday-Fen Research Natural Area, 1992 with the appropriate angle point number.

Thence;

S.19-57W., 347.8 meters to Angle Point 1, which is the true point of beginning. This point is 3 meters southerly of the Halliday trail number 522 and has approximate geodetic coordinates of 48-55-42.9N and 117-18-07.3W(NAD27),
S.09-18W., 48.7 meters to a tree,
S.27-50E., 54.5 meters to a tree,
S.11-04E., 42.8 meters to Angle Point 2,
S.50-45E., 35.0 meters to Angle Point 3,
S.25-24W., 76.2 meters to a post,
S.28-13W., 70.5 meters to Angle Point 4,
S.68-51E., 46.3 meters to Angle Point 5,
S.13-03E., 154.9 meters to a post,
S.05-22W., 151.1 meters to a post,
S.18-27E., 165.5 meters to Angle Point 6,
S.30-49E., 59.0 meters to a tree,
S.15-29W., 39.8 meters to a tree,
S.17-05W., 90.5 meters to a post,
S.32-37W., 73.2 meters to Angle Point 7,
S.62-16E., 53.0 meters to Angle Point 8,
S.20-51W., 53.8 meters to a tree,
S.20-59W., 103.2 meters to a post,
S.34-12W., 131.5 meters to Angle Point 9,
S.63-06E., 124.4 meters to a post,
S.27-16W., 92.4 meters to Angle Point 10,
S.78-06E., 145.7 meters to a post,
N.67-15E., 47.6 meters to Angle Point 11,
S.43-19E., 28.4 meters to a tree,
S.36-06E., 90.7 meters to a tree,
S.20-12E., 90.1 meters to a tree,
S.05-36E., 44.8 meters to a post,

S.24-25W., 69.7 meters to Angle Point 12,
 S.59-12E., 72.9 meters to Angle Point 13,
 N.34-49E., 107.7 meters to a tree,
 N.11-18E., 50.8 meters to a post,
 N.79-51E., 102.1 meters to a tree,
 S.86-36E., 69.4 meters to Angle Point 14,
 N.20-03E., 99.0 meters to a tree,
 N.25-07E., 81.6 meters to a tree,
 N.19-35E., 50.6 meters to a post,
 N.38-11E., 63.9 meters to a post,
 S.87-38E., 99.6 meters to a tree,
 S.87-14E., 104.6 meters to a post,
 N.84-30E., 95.8 meters to a tree,
 N.87-46E., 86.7 meters to a post,
 S.74-43E., 23.6 meters to Angle Point 15,
 N.29-15E., 104.7 meters to a tree,
 N.14-54W., 40.5 meters to a tree,
 N.50-35E., 91.8 meters to a tree,
 N.16-41E., 35.3 meters to Angle Point 16,
 N.44-21E., 37.9 meters to Angle Point 17,
 S.78-34E., 93.8 meters to a tree,
 N.72-59E., 23.7 meters to a post,
 N.32-52E., 74.1 meters to a tree,
 N.49-00E., 76.7 meters to a post,
 N.25-05E., 186.6 meters to Angle Point 18. This point is 4 meters northerly of a packtrail and has approximate geodetic coordinates of 48-55-16.2N and 117-16-49.4W(NAD27),
 N.12-23E., 102.4 meters to a post,
 N.43-35E., 88.6 meters to a tree,
 N.48-06E., 34.3 meters to Angle Point 19,
 N.16-20E., 92.3 meters to a tree,
 N.32-39E., 81.2 meters to a post,
 N.35-06E., 93.3 meters to a tree,
 N.03-52E., 93.6 meters to a post,
 N.10-12E., 69.3 meters to a tree,
 N.31-10E., 100.4 meters to a post,
 N.35-44E., 113.8 meters to Angle Point 20,
 N.24-06W., 82.8 meters to a tree,
 N.12-44E., 64.4 meters to a post,
 N.44-12W., 90.4 meters to a tree,
 N.14-52W., 57.5 meters to a tree,
 S.51-33W., 47.1 meters to a post,
 N.74-15W., 49.9 meters to Angle Point 21,
 N.43-53W., 81.8 meters to a tree,
 N.38-41W., 80.4 meters to a post,
 N.38-04W., 100.5 meters to a tree,
 N.33-25W., 85.3 meters to a post,

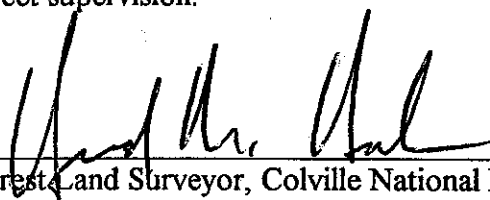
N.54-38W., 58.5 meters to Angle Point 22,
N.49-23W., 86.4 meters to a tree,
N.48-12W., 59.9 meters to a tree,
N.55-42W., 17.0 meters to a post,
N.48-57W., 88.0 meters to a tree,
N.61-52W., 95.6 meters to a post,
N.62-16W., 77.6 meters to a tree,
N.73-48W., 56.6 meters to Angle Point 23,
S.28-13W., 91.3 meters to a tree,
S.38-39W., 78.1 meters to a post,
S.41-32W., 106.4 meters to a tree,
S.38-19W., 96.1 meters to a post,
S.48-16W., 88.5 meters to a tree,
S.40-09W., 90.6 meters to a post,
S.58-41W., 89.9 meters to a tree,
S.30-10W., 85.2 meters to a post,
S.28-46W., 29.6 meters to Angle Point 24,
S.64-08W., 63.5 meters to a tree,
S.84-36W., 66.3 meters to a draw, course NE and SW,
N.82-29W., 61.2 meters to a post,
N.61-20W., 33.0 meters to Angle Point 25,
N.79-30W., 81.3 meters to a tree,
N.74-51W., 80.7 meters to a post,
N.80-38W., 76.0 meters to a tree,
N.78-43W., 79.5 meters to a tree,
N.81-47W., 13.0 meters to a post,
N.82-15W., 92.8 meters to a tree,
N.82-43W., 40.2 meters meters to Angle Point 26,
S.36-27E., 90.7 meters to a tree,
S.17-46E., 82.7 meters to a post,
S.34-45W., 64.0 meters to a tree,
Thence S.06-12W., 44.0 meters to Angle Point 1, the true point of beginning.

Said tract contains 293 hectares more or less.

Supplemental Statement: There is a possible conflict with an unsurveyed, unpatented mining claim according to the field notes for the setting of Angle Point 21 made in 1992. Blue Bird mining claim cor. N.E., bears S.10 degrees W., 19.7 ft. dist. No attempt was made to verify this or other located claims within the RNA description.

General Description: Halliday-Fen RNA can be accessed by following State Highway No. 31, northerly 10.5 kilometers from Metaline Falls, to the junction with Forest Road No.180. Turn right onto Forest Road No. 180. There is a trailhead for Forest Trail 522(Halliday) immediately on the left. Follow this trail 0.77 kilometers to its intersection with the RNA boundary near Angle Point 1. Elevation ranges from approximately 880 meters to 1220 meters.

I certify that the above boundary description of the Halliday-Fen RNA was prepared by me or under my direct supervision.



Forest Land Surveyor, Colville National Forest

10/9/98

Date

Attachment:

Map of Record, drawn October 8, 1998

HALLIDAY FEN RESEARCH NATURAL AREA

COLVILLE NATIONAL FOREST

COVERING PORTIONS OF SECTION 1, T.39N. R.43E;
SECTION 6, T.39N. R.44E; SECTION 36, T.40N. R.43E;
AND SECTIONS 30, 31 & 32, T.40N. R.44E, W.M.
PEND OREILLE COUNTY, STATE OF WASHINGTON

METHOD AND DATE OF SURVEY:
THE BOUNDARY SURVEY OF THE RESEARCH NATURAL AREA
WAS PERFORMED UTILIZING THE GLOBAL POSITIONING
SYSTEM WITH A TRIMBLE PATHFINDER RECEIVER AS A
SYSTEM AND ONE AS A BASE UNIT LOCATED AT GPS STATION
HALLIDAY. THE SURVEY WAS COMPLETED ON SEPTEMBER 24,
1992 AND WAS COMPLETED ON SEPTEMBER 28, 1992.

POSITIONAL TOLERANCE
OF THE PATHFINDER SYSTEM
DURING THE SURVEY
PUBLIC LAND SURVEY CORNERS
TO 15 METERS ON
THE TRAIL LOCATIONS.

BASIS OF BEARING AND MEASUREMENT:
POSITIONS AND MEASUREMENT VALUES
ARE BASED ON NAD 83 GEODETIC
COORDINATES AND ARE CALCULATED AS
COORDINATES INITIATED FROM
ANGLE POINT #1.

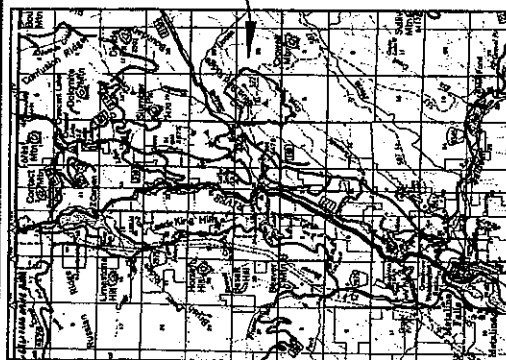
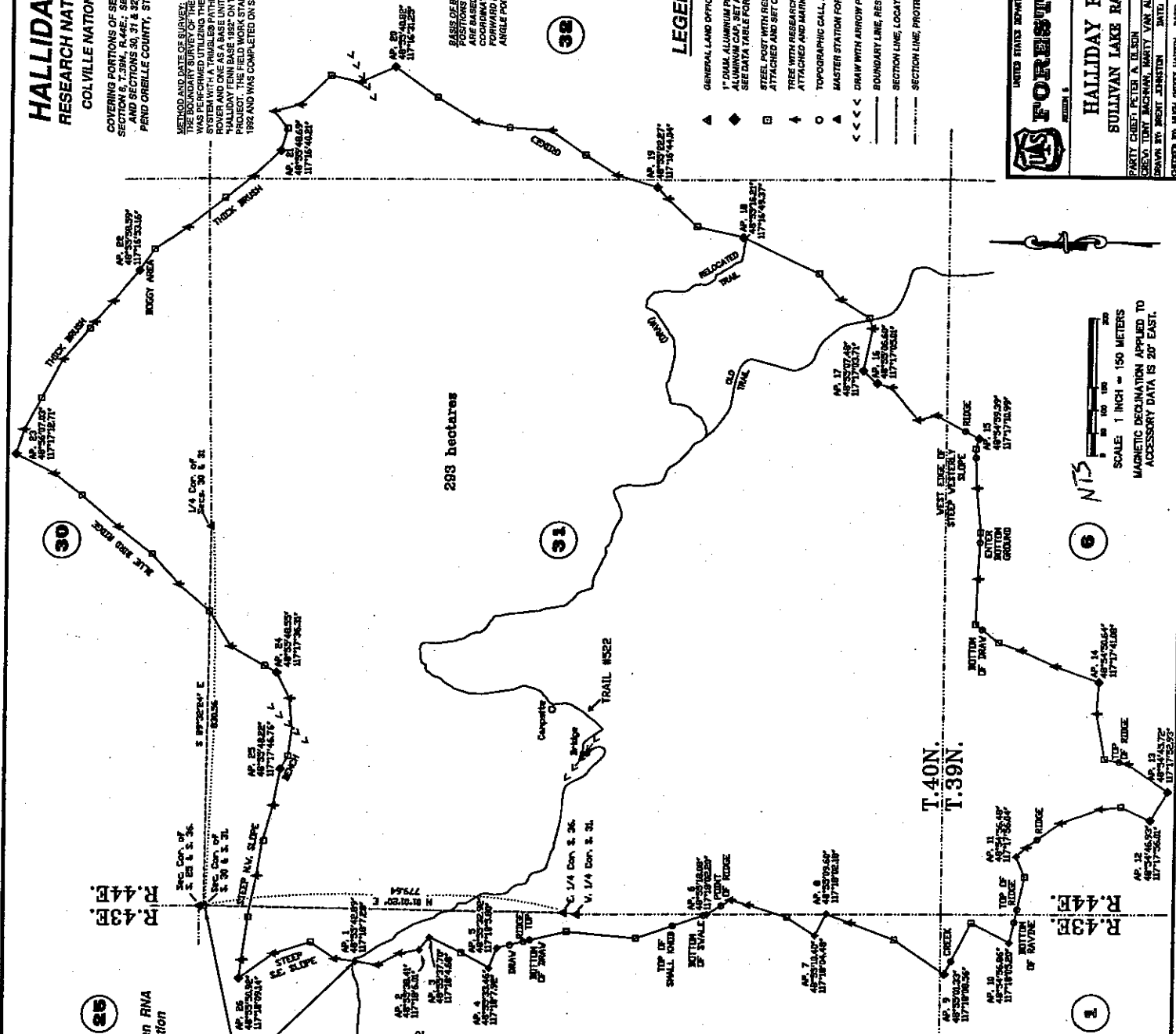
LEGEND

- ▲ GENERAL LAND OFFICE BRASS CAP, AS NOTED.
- ◆ 1" DIAM. ALUMINUM PISTON DRIVE ROD, WITH
ALUMINUM CAP, SET AT ANGLE POINTS OF BOUNDARY.
SEE DATA TABLE FOR REFERENCE TO BEARING THREE.
- STEEL POST WITH RESEARCH NATURAL AREA SIGN
ATTACHED AND SET ON BOUNDARY.
- ▲ TREE WITH RESEARCH NATURAL AREA SIGN
ATTACHED AND MARKED AS BOUNDARY.
- TOPOGRAPHIC CALL, AS NOTED.
- ▲ MASTER STATION FOR GPS BASE UNIT.
- <<<< DRAW WITH ARROW POINTS INDICATING DIRECTION.
- BOUNDARY LINE, RESEARCH NATURAL AREA.
- SECTION LINE, LOCATED BY GPS.
- SECTION LINE, PROTRACTED.

U.S. FOREST SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

HALLIDAY FEN RNA
SULLIVAN LAKE RANGER DISTRICT

PARTY CHIEF: PETER A. ELSON
CHECKED: LINDA J. JENSEN
DRAWN BY: JAMES JENSEN
DATE: 10/04/98
SHEET: 1 of 1



VICINITY MAP

GPS Base Station - Halliday Fen RNA 1992
Federal Geographic Data Committee
Used to local base for
GPS point file corrections.

ANGLE POINT ACCESSORY DATA

ANGLE POINT NO.	BEARING	DISTANCE (FEET)	REMARKS (NOTES)
1	117°18'12.71"	117.181271	AP. 1
2	117°18'12.71"	117.181271	AP. 2
3	117°18'12.71"	117.181271	AP. 3
4	117°18'12.71"	117.181271	AP. 4
5	117°18'12.71"	117.181271	AP. 5
6	117°18'12.71"	117.181271	AP. 6
7	117°18'12.71"	117.181271	AP. 7
8	117°18'12.71"	117.181271	AP. 8
9	117°18'12.71"	117.181271	AP. 9
10	117°18'12.71"	117.181271	AP. 10
11	117°18'12.71"	117.181271	AP. 11
12	117°18'12.71"	117.181271	AP. 12
13	117°18'12.71"	117.181271	AP. 13
14	117°18'12.71"	117.181271	AP. 14
15	117°18'12.71"	117.181271	AP. 15
16	117°18'12.71"	117.181271	AP. 16
17	117°18'12.71"	117.181271	AP. 17
18	117°18'12.71"	117.181271	AP. 18
19	117°18'12.71"	117.181271	AP. 19
20	117°18'12.71"	117.181271	AP. 20
21	117°18'12.71"	117.181271	AP. 21
22	117°18'12.71"	117.181271	AP. 22
23	117°18'12.71"	117.181271	AP. 23
24	117°18'12.71"	117.181271	AP. 24
25	117°18'12.71"	117.181271	AP. 25
26	117°18'12.71"	117.181271	AP. 26

DECISION NOTICE/DESIGNATION ORDER
AND
FINDING OF NO SIGNIFICANT IMPACT

Halliday Fen Research Natural Area
Establishment and Forest Plan Amendments

Sullivan Lake Ranger District, Colville National Forest
Pend Oreille County, Washington

Introduction

The purpose of establishing the Halliday Fen Research Natural Area (RNA) is to contribute to a series of RNAs designed to "illustrate adequately or typify for research or education purposes, the important forest and range types in each forest region, as well as other plant communities that have special or unique characteristics of scientific interest and importance" (36 CFR 251.23).

An evaluation by the Regional RNA Committee, pursuant to direction in Forest Service Manual (FSM) 4063.04b, identified these types as suitable and desirable for inclusion in the national RNA network. Halliday Fen RNA was selected to represent a marl fen, in northeastern Washington. Currently, there are no RNAs representing marl fens within the Washington Natural Areas reserve system.

In addition to the marl fen, Halliday Fen RNA includes western redcedar and western hemlock forests and habitat for a variety of rare plant and animal species. Establishment of Halliday Fen RNA provides long-term protection and recognition of these community types and populations of rare plants and animals. How the proposed Halliday Fen RNA contributes to the RNA network by providing examples of these community types is discussed in the Land and Resource Management Plan (Forest Plan) Final Environmental Impact Study (FEIS) for the Colville National Forest (p. III-134) and the State of Washington Natural Heritage Plan—1993/1995 Update (pp. 65 and 94).

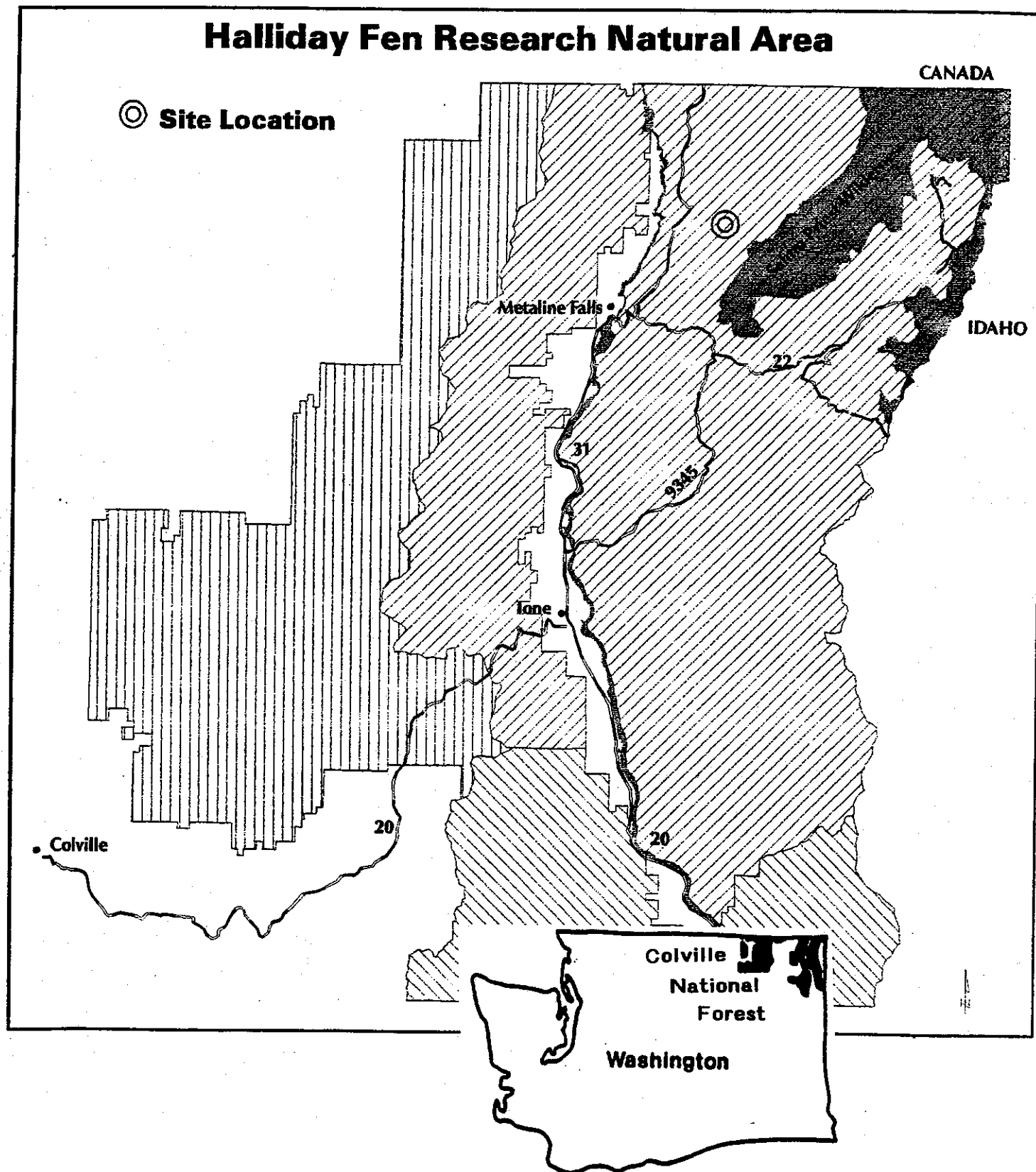
The Halliday Fen area was reexamined from 1992 to 1994 to determine whether the environmental effects of establishing it as an RNA had changed since 1988. Issues raised in this reexamination included the existence of mineral claims and the size of the RNA needed to protect the hydrology of the area. This analysis was documented in the attached environmental assessment.

Decision

By virtue of the authority vested in me by the Chief of the Forest Service in FSM 4063, I hereby select Alternative D of the environmental assessment and establish the 724-acre (293-hectare) Halliday Fen RNA. It shall comprise 724 acres (293 hectares) of land in Pend Oreille County, Washington on the Colville National Forest (Sullivan Lake Ranger District). See Establishment Record "Location" (p. 6) and location map on next page.

This decision establishes a 724-acre (293-hectare) Halliday Fen RNA, which is to be managed according to direction provided in the Forest Plan (pp. 4-89 to 4-91). Reference should also be made to the Forest Plan FEIS for the Colville National Forest (pp. III-131 to III-136). Alternative D was selected because it provided the best long-term protection and recognition of a marl fen and

Map 1. Site Location



western redcedar and western hemlock community types (EA pp. 5-6), while recognizing a portion of the existing mineral claims.

A 420-acre (170-hectare) Halliday Fen RNA (Alternative C) was identified in the Forest Plan and was to be managed according to direction provided in the Forest Plan. As directed in FSM 4063.1, the boundaries of the RNA were enlarged to 724 acres (293 hectares) to better protect the integrity of the marl fen. The added acres will increase the original RNA area (Alternative C) by 304 acres (123 hectares). These additional acres will allow conditions within the interior of the RNA to remain largely unmodified.

This formal designation of the 724-acre RNA will amend the Forest Plan. The decision is consistent with the management direction, but not consistent with the land allocation for Halliday Fen RNA in the Forest Plan. The Colville Forest Plan is hereby amended to change the allocation of the 420-acre (170-hectare) "proposed" to 724-acre (293-hectare) "established" (Management Area 4).

The Forest Plan is also amended to allow for a recommendation to withdraw from mineral entry only a portion of the RNA, 628 acres (254 hectares) out of the total 724 acres (293 hectares). This is a non-significant amendment of the Forest Plan (36 CFR 219.10(f)). Adoption of this amendment will not significantly change the forest-wide impacts disclosed in the FEIS for the Colville National Forest Plan.

Public Involvement

Halliday Fen, was identified in the Forest Plan as a proposed RNA based on the relatively undisturbed conditions in the area in 1988. Comments received from interested and affected members of the public supported establishment of a RNA. At that time, a proposed Halliday Fen RNA provided the most appropriate site of a marl fen for inclusion in the national RNA network.

Designation of proposed RNAs was considered during development of the Forest Plan and FEIS (p. II-17). Site conditions and public concerns were reviewed. General conditions and environmental effects of designation are much the same as described on pages II-117, III-131 to III-136 of the FEIS.

Scoping began with the 1988 Forest Plan. A scoping letter on issues was mailed to the public in 1993. The Halliday Fen RNA proposal has been listed in the quarterly NEPA schedule of proposed actions since spring, 1993.

Other Alternatives Considered

Alternative A (Existing Mineral Claims) would establish a 724-acre (293-hectare) RNA with the entire RNA withdrawn from mineral entry.

Alternative B (No Action) continues management of the proposed Halliday Fen RNA according to direction the Forest Plan. This alternative does not meet guidelines in the Forest Plan for formal establishment of proposed RNAs.

Alternative C (Forest Plan Boundary) would establish a 420-acre (170-hectare) Halliday Fen RNA, which was identified in the Colville Forest Plan (pp. III-134 to III-135) for RNAs. This boundary is inadequate to protect the hydrologic features of the area.

Finding of No Significant Impact

Based upon an environmental analysis documented in an environmental assessment, this decision (Alternative D) is not a major federal action that would significantly affect the quality of the human environment. Therefore, an environmental impact statement is not required. This determination is based on the following factors (40 CFR 1508.27):

Context.

*Although this is an addition to the national network of RNAs, both short-term and long-term physical and biological effects are limited to the local area (Establishment Record, pp. 14-16).

Intensity.

*There are no known effects on public health and safety.

*There are no known effects on historical or cultural resources, actual or eligible National Register of Historic Places sites, park lands, prime farmlands, wetlands, wild and scenic rivers. No significant adverse effects are anticipated to any environmentally sensitive or critical area (see EA pp. 5-6, Establishment Record pp. 14, 16).

*Effects on the human environment are not uncertain, do not involve unique or unknown risks, and are not likely to be highly controversial.

*The action is not likely to establish a precedent for future actions with significant effects.

*No significant direct, indirect, or cumulative impact to the natural resources or other components of the human environment are anticipated (EA pp. 5-6, Establishment Record pp. 14-16).

*The decision will not adversely affect any federally listed or proposed endangered or threatened species or regionally sensitive species of plants or animals or their critical habitat (see EA pp. 5-6, Establishment Record pp. 8-11, 16).

*The proposed action is consistent with Federal, State, and local laws and requirements for the protection of the environment.

Implementation

Implementation of this decision shall not occur within seven days following publication of the legal notice of the decision in the newspapers of record: *The Seattle Post-Intelligencer*.

Appeal Opportunities

This decision is subject to appeal pursuant to 36 CFR Part 217. A copy of the Notice of Appeal must be in writing and submitted to:


Chief, USDA Forest Service
ATTN: NFS Appeals
14th & Independence Avenue, S.W.
P.O. Box 96090
Washington, D.C. 20090-6090

Any written Notice of Appeal of this decision must be fully consistent with 36 CFR 217.9 (Content of a Notice of Appeal) must include the reasons for appeal and be submitted within 45 days from the date of legal notice of this decision in *The Seattle Post-Intelligencer*.

The Forest Supervisor of the Colville National Forest will notify the public of this decision and mail a copy of the Decision Notice/Designation Order to all persons interested in or affected by the decision.

Contact Person

For more information on Halliday Fen RNA, contact Kathy Ahlenslager, Forest Botanist, Colville National Forest at 509-684-7178.



ROBERT W. WILLIAMS
Regional Forester
Pacific Northwest Region (R6)

March 8, 1999
Date

(for) NANCY GRAYBEAL
Deputy Regional Forester

ENVIRONMENTAL ASSESSMENT

FOR

Halliday Fen Research Natural Area Establishment and Forest Plan Amendment

Colville National Forest, Sullivan Lake Ranger District
Pend Oreille County, Washington

Proposed Action

The proposed action is to establish an 724-acre (293-hectare) Halliday Fen Research Natural Area (RNA), and to manage it according to direction provided in the Land and Resource Management Plan (Forest Plan) for the Colville National Forest. Direction is provided in the Forest Plan (pp. 4-89 to 4-91) and in the Final Environmental Impact Statement (FEIS) for the Forest Plan (pp. III-134 to III-135).

Forest Plan direction requires the Colville National Forest to make a recommendation to the USDI Bureau of Land Management (BLM) for withdrawal of the RNA from mineral entry (p. 4-90) of 628 acres (254 hectares). The BLM makes the withdrawal decision after prescribed agency and public review. Should the lands be withdrawn, no new mining claims could be established. Existing claims could not be developed without a determination that valid existing rights had been established within each claim at the time of withdrawal.

A 420-acre (170-hectare) Halliday Fen proposed RNA (Map 1) was identified in the Forest Plan, to be managed according to direction provided in the Forest Plan. The RNA boundary was expanded to include most of the drainage basin; thus addressing the potential for impacts from management activities at the higher elevations around and above the fen. The proposed action, formal designation of the 724-acre (293-hectare) RNA by the Regional Forester, will amend the Forest Plan.

Purpose and Need for Action

The purpose of establishing the Halliday Fen RNA is to contribute to a series of RNAs designated to "illustrate adequately or typify for research or education purposes, the important forest and range types in each forest region, as well as other plant communities that have special or unique characteristics of scientific interest and importance" (36 CFR 251.23).

Halliday Fen RNA contributes to this series of RNAs by providing examples of four plant community types discussed in the Forest Plan (pages III-134 to III-135) and in the State of Washington Natural Heritage Plan—1993/1995 Update (pp. 65, 94). These are as follows:

Forest Plan Types
Aquatic Elements
Marl fen

Washington Natural Heritage Plan Types
Wetland and Aquatic Ecosystems
Marl fen
Terrestrial Ecosystems
Western redcedar/queenscup beadlily community
Western redcedar/devil's club community
Western hemlock/queenscup beadlily community

An evaluation by the Regional RNA Committee, pursuant to direction in Forest Service Manual 4063.04b, of the need for RNAs identified these types as suitable and desirable for inclusion in the national network. Establishment of the Halliday Fen RNA provides long-term protection and recognition of these types.

The Halliday Fen area was identified in the Forest Plan as a proposed RNA based on the relatively undisturbed conditions of these types in the area in 1987 and 1988. Comments received from interested and affected members of the public supported establishment of an RNA in the area. Halliday Fen was determined at that time to provide the most appropriate site for inclusion in the national network for protection of the types identified above. Designation of future RNAs for protection of this type was considered during Forest Plan development (p. II-117).

Site conditions and public concerns have been reviewed. Although general conditions and environmental effects of designation are much the same as described on pages II-117, III-131, III-134 and III-136 of the FEIS for the Forest Plan, an important new fact has become known since the issuance of the Forest Plan that may affect the RNA designation. It is the existence of unpatented mining claims on approximately 130 acres (53 hectares) within the western edge of the 724-acre (293-hectare) proposed RNA. This information was not considered in the development of the Forest Plan.

Alternatives Not Considered in Detail

Two alternatives were considered but not carried forward. One would have excluded the portion of the drainage basin downstream from the fen from the RNA. This alternative was rejected because it would not provide any protection to the excluded area. Another alternative, suggested in scoping comments, was to withdraw only the surface 1000 feet (310 meters) of the RNA from mineral entry. This alternative would prevent surface mining, but allow exploration from the surface and underground mining of potential lead and zinc deposits. This alternative was rejected because this type of withdrawal is not available.

Alternatives and Environmental Consequences

Alternative A [Existing Mineral Claims]

Alternative A would designate an 724-acre (293-hectare) area as the Halliday Fen RNA, and manage the area according to direction in the Forest Plan (pp. 4-89 to 4-91) for RNAs and in the Forest Service Manual 4063.3. These prohibit off-road vehicle use; scheduled timber harvest, including salvage and/or firewood harvest; the issuing of special use permits and rights-of-way grants; and new physical improvements for recreation. Habitat improvement is generally not appropriate and research facilities installed within the RNA must blend with the natural surroundings. Grazing is not a tool to maintain the vegetative communities at Halliday Fen. There are no grazing allotments and no plans to graze cattle in this area.

Under this alternative, the Forest Plan would be amended to formally establish the 724-acre (293-hectare) Halliday Fen RNA. In addition, a recommendation will be made to the BLM requesting that the entire RNA be withdrawn from mineral entry.

The environmental consequences of Alternative A, are described in the FEIS for Colville National Forest (pp. II-117, III-136, IV-135), with the additional 304 acres (123 hectares) taken out of Management Areas 6 (Scenic/Winter Range) and 8 (Winter Range). The withdrawal of the lands

from mineral entry (subject to the BLM's decision) will substantially reduce or prevent unmitigated surface disturbances from potential mineral activities on 724 acres (293 hectares).

There are no adverse or irreversible environmental effects aside from those described below. Irretrievable effects result from resource outputs either reduced or lost as a result of special area designation. There are no significant cumulative effects of establishing the RNA. In addition, the proposed protection of Halliday Fen watershed is expected to conserve and maintain the basic soil and water resources through the lack of disturbance. This is a subwatershed of Slate Creek which is a tributary to the Pend Oreille River.

The general consequences of withdrawal are discussed in the FEIS (pp. IV-86, IV-87, IV-135). This alternative will result (subject to BLM's decision) in the withdrawal of 724 acres (293 hectares) of land having high potential for zinc, lead, and high-calcium limestone from mineral entry. The additional 304 acres (123 hectares) will increase the total acreage withdrawn under the Forest Plan from about 44,200 to 44,504 acres (17,895 to 18,018 hectares).

This alternative will also result (subject to valid existing rights determinations) in the loss of the claimant's right to explore for and develop mineral deposits on portions (96 acres, 39 hectares) of 13 existing unpatented mining claims. This may result in the loss of some related economic benefits. Save for possible valid existing rights, there is no risk for indirect impacts to the fen from unmitigated mineral exploration and development within the watershed under this alternative.

Alternative B [No Action]

This alternative continues management according to direction in the Forest Plan (pp. 4-89 to 4-91) for proposed RNAs and in the Forest Service Manual 4063.3. Only short-term protection of the area, dependent on the life of the Forest Plan, will be provided. Management of the area will be the same as in Alternative A. In addition, a recommendation will be made to the BLM requesting that the entire RNA be withdrawn from mineral entry.

The environmental consequences of Alternative B, the "No Action" alternative, are as described in the FEIS for Colville National Forest Plan (pp. II-117, III-136, IV-135). The withdrawal of the lands from mineral entry (subject to the BLM's decision) will substantially reduce or prevent unmitigated surface disturbances from potential mineral activities on 420 acres (170 hectares).

No adverse or irreversible environmental effects are anticipated aside from those described below. Irretrievable effects result from resource outputs either reduced or lost as a result of special area designation. The RNA would be resubmitted for establishment or another proposed area with similar forest and range types would be submitted in the future in order to include these types in the national network. There are no significant cumulative effects of this alternative. There is low potential that management activities in the higher portion of the basin could negatively impact the fen and the features of interest.

The general consequences of withdrawal are discussed in the Forest Plan EIS (pp. IV-86, IV-87, IV-135). This alternative will result (subject to the BLM's decision) in the withdrawal of 420 acres (170 hectares) of land having high potential for zinc, lead, and high-calcium limestone from mineral entry. No additional acreage over that described in the Forest Plan for this RNA will be withdrawn.

This alternative will also result (subject to valid existing rights determinations) in the loss of the claimant's right to explore for and develop mineral deposits on portions (about 56 acres, 23

hectares) of 8 existing unpatented mining claims. This may result in the loss of some related economic benefits. Higher portions of the basin will remain open to mineral entry. Potential mineral exploration or development in these areas offer a low risk of impacts to the fen due to possible off-site impacts such as sedimentation.

Alternative C [Forest Plan Boundary]

Alternative C would establish a 420-acre (170-hectare) Halliday Fen RNA that was identified as the Halliday Fen proposed RNA in the Forest Plan (page III-134) and manage the area according to direction in the Forest Plan (pp. 4-89 to 4-91) for RNAs and in the Forest Service Manual 4063.3. Management of the area will be the same as in Alternative A. Under this alternative, the Forest Plan would be amended to formally establish the 420-acre (170-hectare) Halliday Fen RNA. In addition, a recommendation will be made to the BLM requesting that the entire RNA be withdrawn from mineral entry.

The environmental consequences of Alternative C, are described in the FEIS for Colville National Forest (pp. II-117, III-136, IV-135). The withdrawal of the lands from mineral entry (subject to BLM's decision) will substantially reduce or prevent unmitigated surface disturbances from potential mineral activities on 420 acres (170 hectares).

There are no adverse or irreversible environmental effects aside from those described below. Irretrievable effects result from resource outputs either reduced or lost as a result of special area designation. There are no significant cumulative effects of establishing the RNA. There is a low potential that management activities in the higher portion of the basin could negatively impact the fen and the features of interest.

The general consequences of withdrawal are discussed in the Forest Plan EIS (pp. IV-86, IV-87, IV-135). Specific consequences are the same as Alternative B.

Alternative D, Proposed Action [Expanded Boundary]

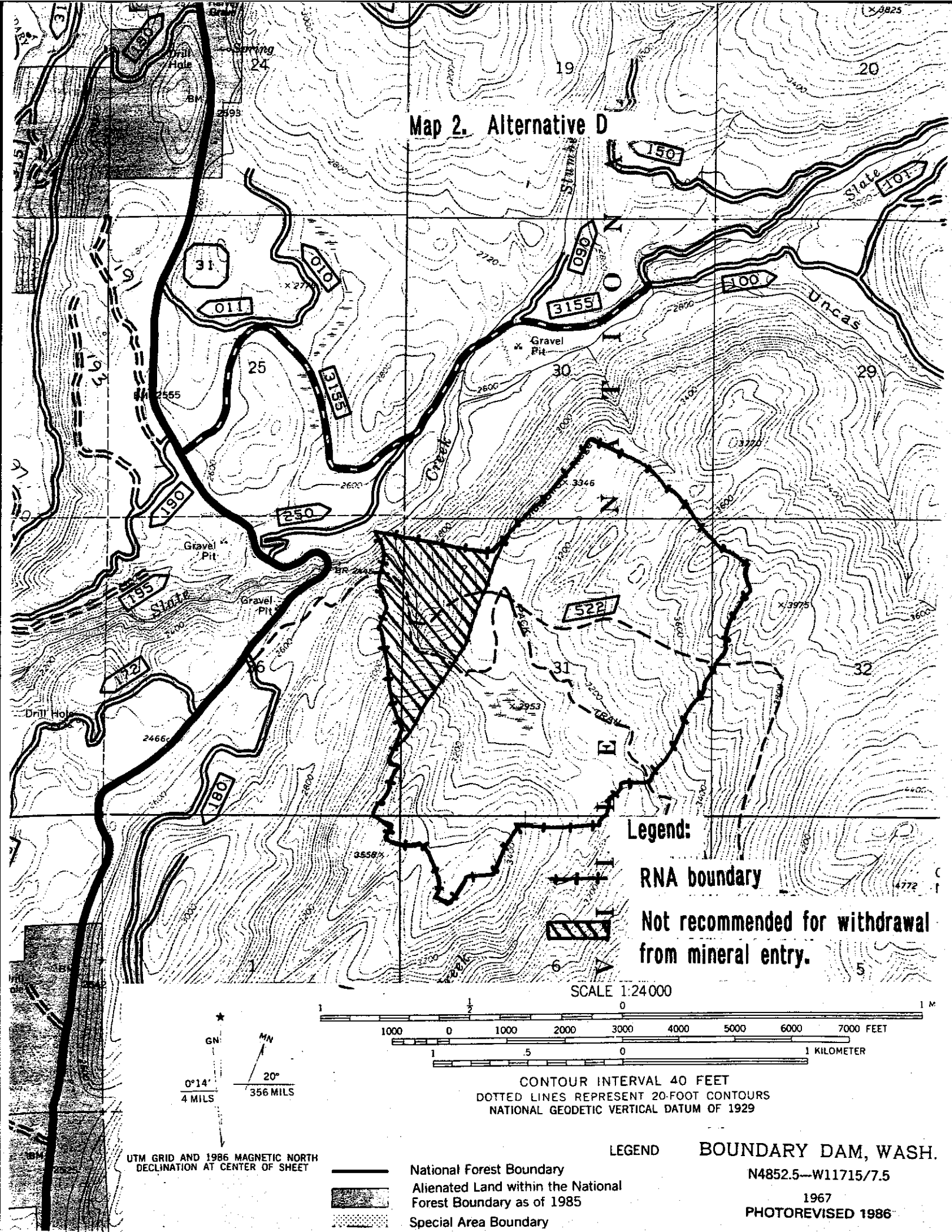
Alternative D is the preferred alternative. There is a high potential for lead, zinc and other minerals in the vicinity of Halliday Fen RNA. This alternative reduces mining claim conflict while still protecting the fen and its features of interest.

The alternative would designate an 724-acre (293-hectare) area as the Halliday Fen RNA, and manage the area according to direction in the Forest Plan (pp. 4-89 to 4-91) for RNAs and in the Forest Service Manual 4063.3. Management of the area will be the same as in Alternative A with the exception of the mineral withdrawal recommendation. Approximately 628 acres (254 hectares) will be withdrawn from mineral entry (subject to BLM's decision). Approximately 96 acres (39 hectares) of the RNA on its west margin and downstream from the fen will not be recommended for withdrawal. This is shown as the hatched area on Map 2.

The environmental consequences of Alternative D, are described in the FEIS for Colville National Forest (pp. II-117, III-136). The withdrawal of the lands from mineral entry (subject to the BLM's decision) will substantially reduce or prevent unmitigated surface disturbances from potential mineral activities on 628 acres (254 hectares).

There would be no adverse or irreversible environmental effects other than those described

Map 2. Alternative D



below. Irretrievable effects result from resource outputs either reduced or lost as a result of special area designation. The consequences of this alternative on the basic soil and water resources would be similar to those for Alternative A. There are no significant cumulative effects of establishing the RNA.

The general consequences of withdrawal are discussed in the Forest Plan EIS (pp. IV-86, IV-87). This alternative will result (subject to BLM's decision) in the withdrawal of 628 acres (254 hectares) of land having high potential for zinc, lead, and high-calcium limestone from mineral entry. The additional 208 acres (84 hectares) will increase the total acreage withdrawn under the Forest Plan from about 44,200 to 44,408 acres (17,895 hectares to 17,979 hectares).

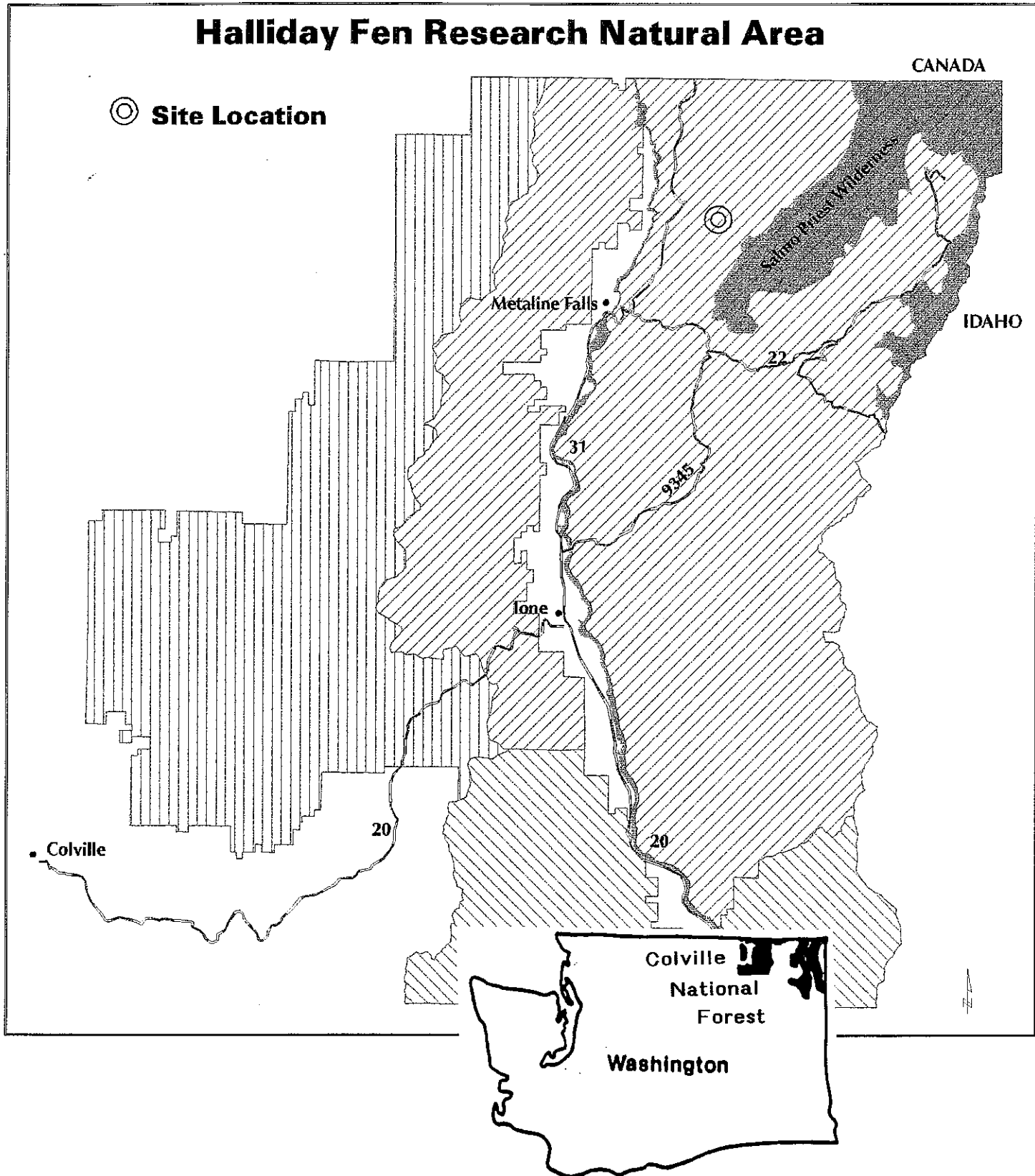
This alternative will also result (subject to valid existing rights determinations) in the loss of the claimant's right to explore for and develop mineral deposits on portions (about 27 acres, 11 hectares) of five existing unpatented mining claims. This may result in the loss of some related economic benefits. There is low risk of unmitigated surface disturbance from mineral exploration or development in this area. However, there are no risks of direct or indirect mineral-related impacts to the fen and its features of interest under this alternative.

Agencies and Persons Consulted

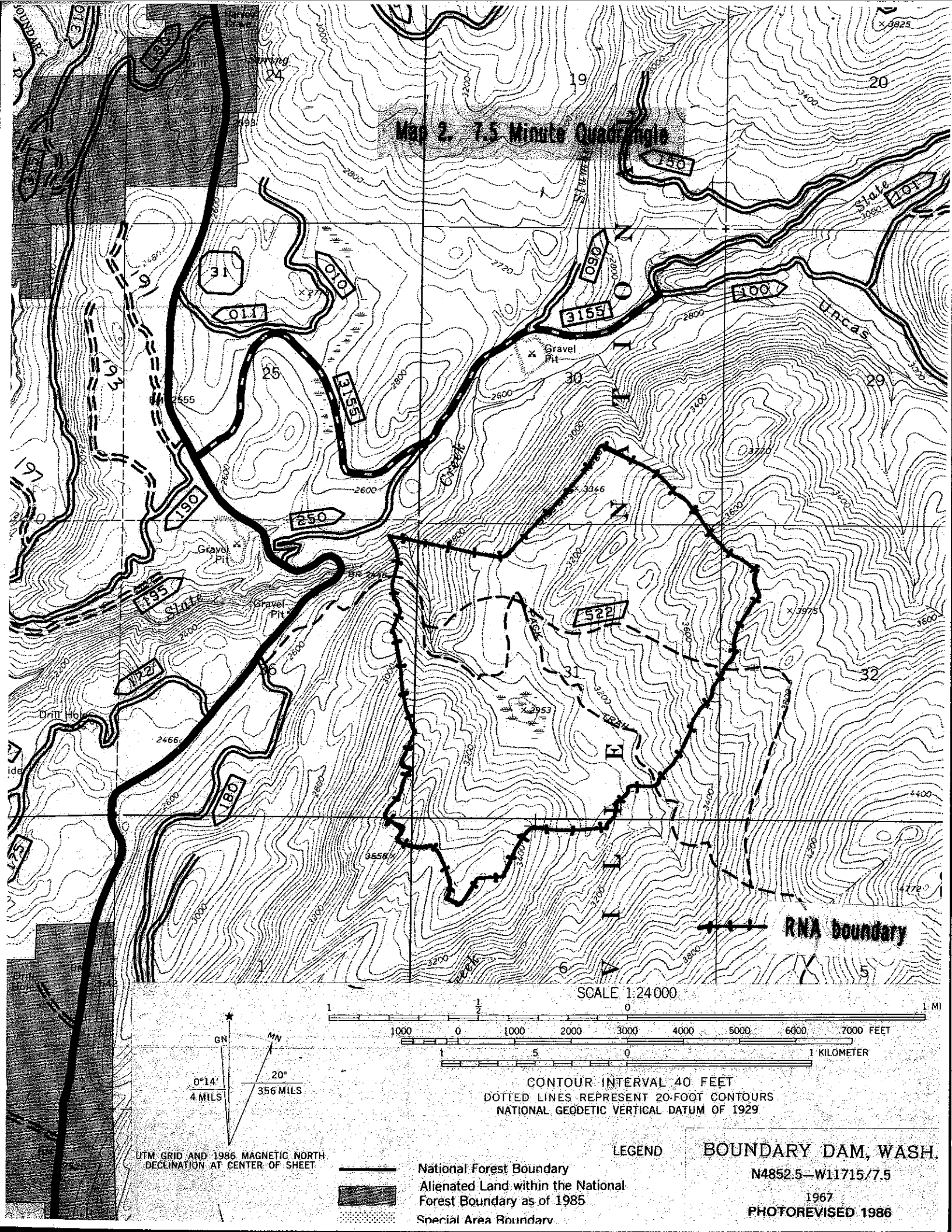
Agency personnel consulted in designing and analysis of this project include:

Kathy Ahlenslager, Forest Botanist
Paula Barreras, Forest Geologist
Tim Bertram, Sullivan Lake District Wildlife Biologist
Jay Berube, Forest Ecologist
Bud Kovalchik, Area Ecologist
Rodney Lentz, Area Mining Geologist
Daniel Mattson, Forest Archaeologist
Jim McGowan, Forest Wildlife Biologist
Penny Miller, Public Affairs Assistant
Julia Richardson, Silviculturist
Connie Smith, Forest Environmental Coordinator
Bert Wasson, Forest Hydrologist

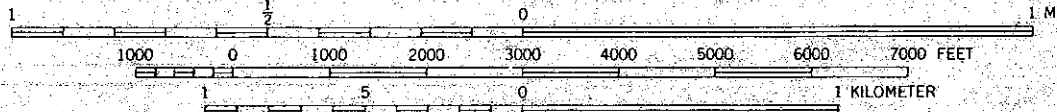
Map 1. Site Location



Map 2. 7.5 Minute Quadrangle



SCALE 1:24 000



CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1986 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET



National Forest Boundary
Alienated Land within the National
Forest Boundary as of 1985
Special Area Boundary

LEGEND

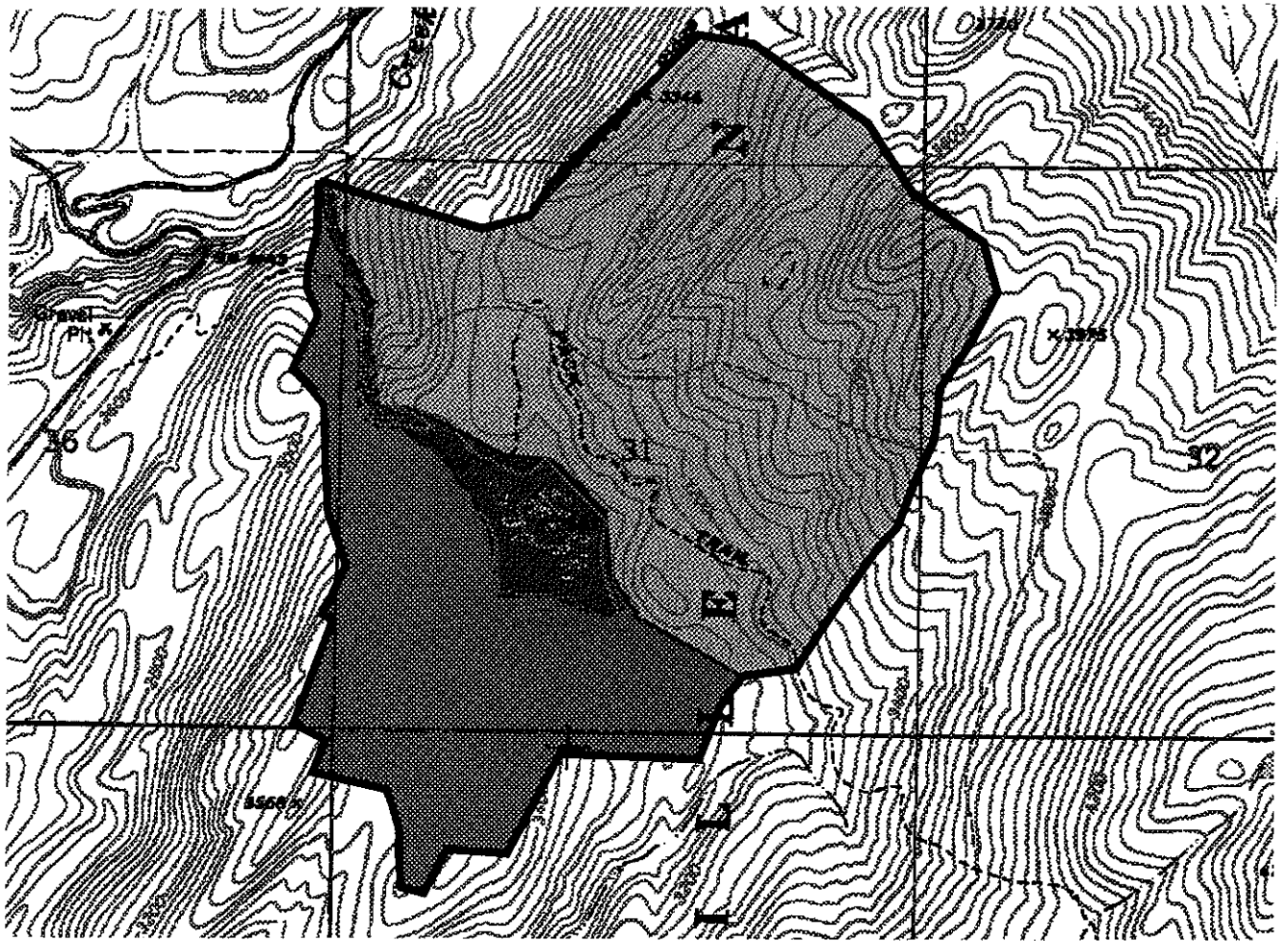
BOUNDARY DAM, WASH.

N4852.5-W11715/7.5





1967

PHOTOREVISED 1986

Map 3. Cover Types of Halliday Fen Research Natural Area

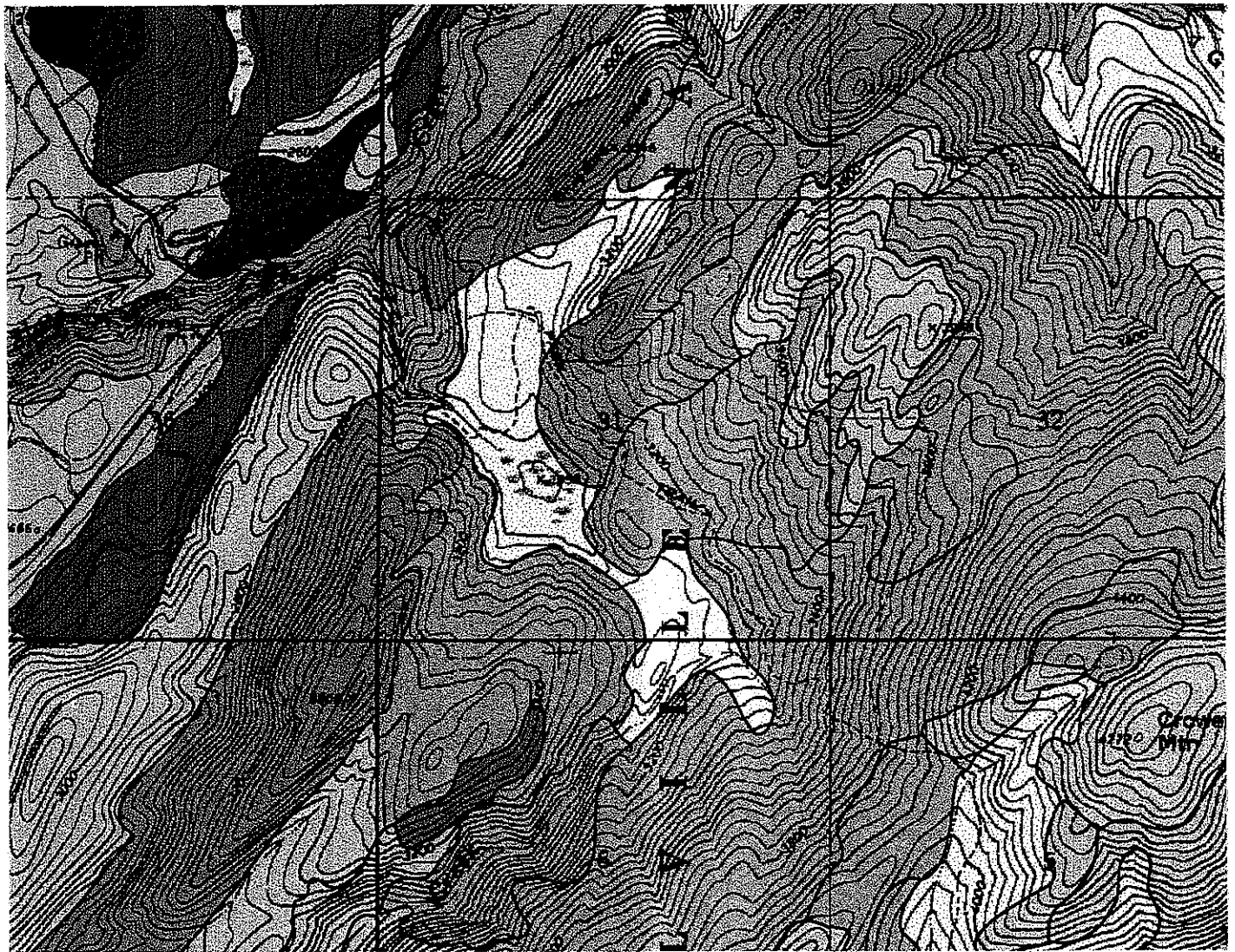


Legend

-  RNA Boundary
-  North Slope Associations
-  South Slope Associations
-  Riparian Associations



Map 4. Soil Types of Halliday Fen Research Natural Area



Legend

	AHREN
	BELZAR
	BOUNDARY
	HARTILL
	HUCKLEBERRY
	KANIKSU
	KEGEL
	KIEHL
	MERKEL
	NEWBELL
	PITS
	RAISIO
	RUFUS
	THREEMILE
	TYPIC XEROCHREPTS
	UNCAS
	WAITS

