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PROPOSAL FOR  
ESTABLISHMENT OF UPPER HEMLOCK CREEK  
WITHIN THE CLEARWATER NATIONAL FOREST,  
IDAHO COUNTY, IDAHO  
AS A  
RESEARCH NATURAL AREA



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# PROPOSAL FOR ESTABLISHMENT OF UPPER HEMLOCK CREEK WITHIN THE CLEARWATER NATIONAL FOREST IDAHO COUNTY, IDAHO AS A RESEARCH NATURAL AREA.

## Introduction

The proposed Upper Hemlock Creek Research Natural Area (RNA) of 1,945 acres is located within the Clearwater National Forest, Idaho County, Idaho, and is entirely National Forest land. Extensive landslides occurring on the Clearwater Forest during 1995 resulted in eroding stream channels turning them into a slurry of braided and unstable mud flats. Upper Hemlock Creek which is unroaded was not impacted and thus provides a suitable reference site to compare with those aquatic areas affected.

## Justification

Upper Hemlock Creek is proposed as an RNA to provide a baseline site of a mid-sized montane stream of moderate gradient. The physical, chemical and biotic conditions of Upper Hemlock Creek indicate that it is a site of high biological integrity. The drainage is thus important as a reference stream to compare with site locations on the forest which have been impacted in the past and may continue to be affected in the future. The area includes several first order tributaries, two second order reaches, a third order stream, a short section of Zoe Creek (third order) which flows into Hemlock Creek and a fourth order stretch. In addition to the stream sections there exists wet meadows and forests of Engelmann's spruce, sub-alpine fir and mountain hemlock. A rare species of caddisfly found only in Idaho and Montana has been collected in both Zoe Creek and Hemlock Creek.

## Principal Distinguishing Features

Features of Upper Hemlock Creek have already been described briefly. They include:

A. Stream of moderate gradient (Fig 1) fed by a number of small side streams that includes Zoe Creek a third order tributary. A rare caddisfly is present in both Zoe Creek and Hemlock Creek. Riparian vegetation along much of the stream is sedges and grasses which comprise stringer meadows (Figs 2-3).



Fig 1. Upper Hemlock Creek near Zoe Creek junction

B. Wet meadows abound on the slopes and consist of spruce bottoms of Engelmann's spruce and subalpine fir (Figs 5). Sphagnum is commonly present here.

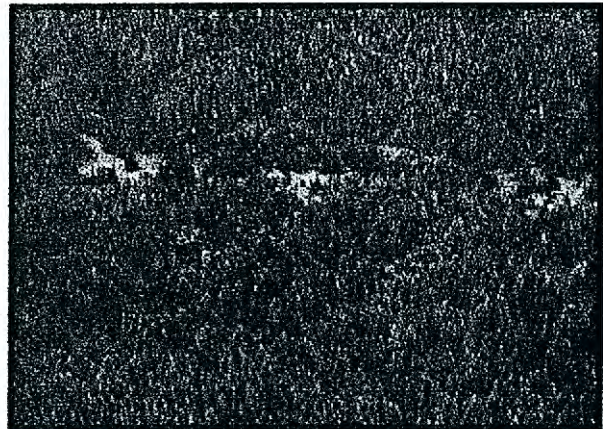


Fig 2. Flood plains and terraces

C. Mature forest of lodgepole pine, subalpine fir and Engelmann's spruce (Figs 6-7)

## Location

The site of the recommended RNA is an enlarged portion of the Snowy Summit topog map. This part of Upper Hemlock drainage covers 1,945 acres of land. A good portion of the south and west boundaries is formed by the Beaver Saddle Road (547) which follows the ridgeline. A pack trail a ways east of Beaver Saddle defines the north end of the proposed site. About 1/2 mile west of Footrot Corrals Campground the border angles southeast, then south and finally southwest to tie in with Beaver

Saddle Road. The proposed site includes Upper Hemlock Creek (third order stream) and a number of first and second order streams feeding Hemlock Creek. Only a short distance of Zoe Creek which enters Hemlock Creek at the north end of the

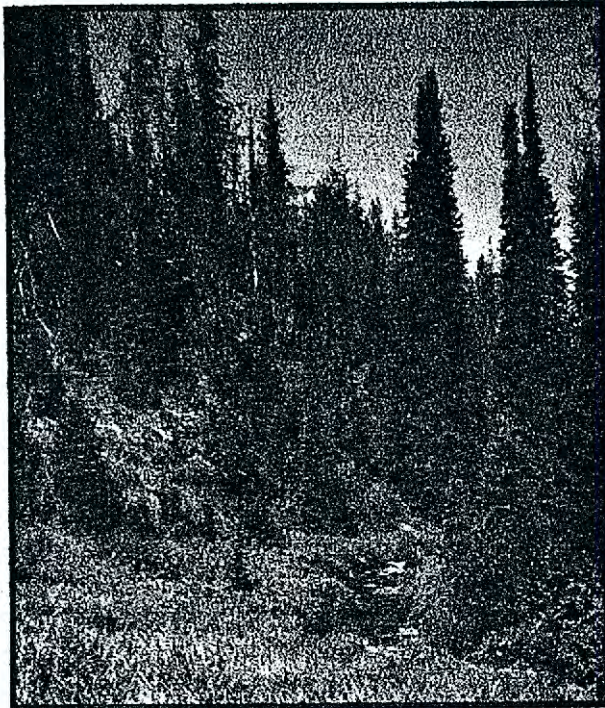


Fig 3. Stringer meadow

boundary is included in the RNA. Below this confluence, a fourth order stream exists for about 1/5 of a mile. Elevations range from 4440 feet where



Fig 4. Broad meadowland

Zoe Creek enters Hemlock Creek to 5492 feet on the Beaver Saddle Road.

## Landforms and Landtypes

Landform 10-Floodplains and Recent Terraces is where the overall relief consists of nearly level to level flood plains and terraces adjacent to rivers and streams ( Fig 2). The unit often includes old meander scars and cutoff stream channels. Adjoining map units have highly contrasting land-forms such as mountain slopes or stream breaklands.

Stringer meadows (Fig 3) were fairly continuous along the stream and broad meadowlands occurred occasionally (Fig 4).

Landtype 10-A90- These units are located on high elevation floodplains and terraces. Soils include both well and poorly drained types with deep profiles developed in alluvial parent material. The habitat type is subalpine fir/pachistima with riparian vegetation in wet areas.

Landform 24-Moderate Relief Rolling Uplands-Overall relief consists of rounded convex ridgetops and straight (Fig 5) to concave sideslopes. Drainage patterns are dendritic and well



Fig 5. Meadow located on side slope

developed.

Landtype 24-G95- These units are located on high elevation, moderate relief rolling uplands. Soils are well drained on ridges, poorly drained in draws and have deep profiles developed in granite and gneiss parent material. The habitat type is subalpine fir/pachistima with riparian vegetation in wet draws.

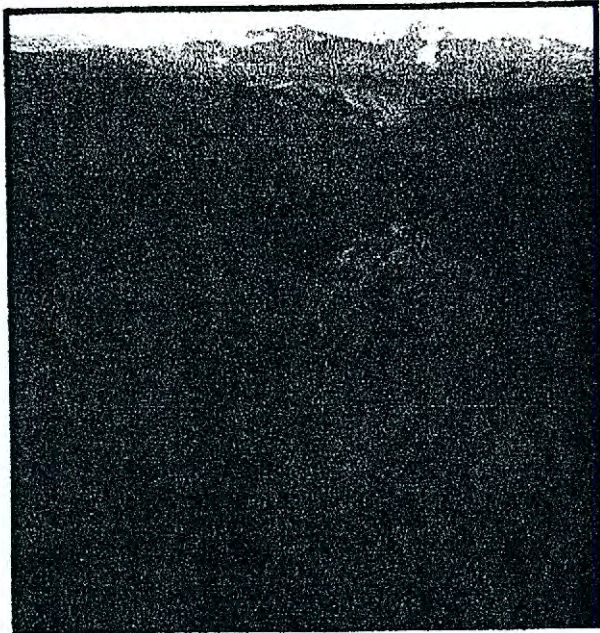


Fig 6. Hemlock Creek watershed with rounded slopes



Fig 8. First Order stream (aerial view)

**Landform 32 Rounded Mountain Slopelands.-** Overall relief consists of upper slopes or ridgetops of middle to high elevation ridges. Slopes are rounded (Fig 6) with weak V-shaped draws. Well regulated subsurface flow with frequent springs (Fig 7) and seeps forming first order streams (Fig 8).



Fig 7. Squawberry Spring

**Landtype 32-U60.** These units are located of high elevation, cool aspect, rounded mountain slopelands. Soils are deep, well drained and are developed in undifferentiated parent material. The habitat type is subalpine fir/pachistma.

**Landtype 32-U66** differs from Landtype 32-U60 by having a habitat type of subalpine fir/menziesia.

**Landtype 32-U95** differs with a habitat type of sub-alpine fir/pachistima with riparian vegetation in wet areas.

**Landform 36-High Elevation Concave Headlands.** Overall relief consists of small concave inverted teardrop-shaped landforms which occur at high elevations in association with broad convex land - forms. These landforms act as concave catch basins .

**Landtype 367-U92.** These units are located on high elevation, concave uplands. Soils are well drained on ridges, poorly drained in concave areas and have deep profiles developed in undifferentiated parent material. The habitat type is



Fig 9. First Order Stream (on site)

subalpine fir/kpachistima with riparian vegetation in wet concave areas.

**Physical Factors**



Fig 10. Second Order Stream

Selected hydrological characteristics are presented in Table 1. Major channel types in low order streams (Order 1-2) are A3 and A4 where gradient approaches 4% and dominant substrate is gravel and rubble (Figs 9-10). Order 3 streams less

than 4% are B2-B3 types where dominant substrate is cobble and boulders (Figs 11-12). Stream width of reach 2 and 3 (third order) averaged about 10 feet. These study sites covered a distance of 2.5 miles above where Zoe Creek enters Hemlock Creek. Habitat assessment modified from Plafkin et al.

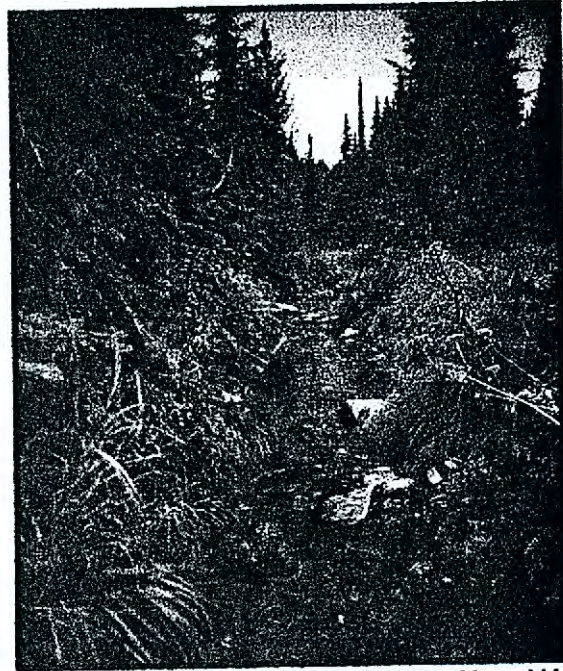


Fig.11 Third Order Stream characterized by cobble and boulder substrate (Reach 1)



Fig. 12 Third Order Stream characterized by boulder and bedrock substrate (Reach 2)

1989 of reach 1 and 2 is presented in Table 2. Total maximum points attainable is 180. Actual points scored was 142 or 78% of a hypothetical ideal habitat condition. Hemlock Creek would fall in a non-impaired category when using the ecoregional reference condition as described by DEQ (1996).

According to Wisseman (1993), some of the ideal mid-order montane stream characteristics that describe Upper Hemlock Creek are a moderate to high gradient, cobble and boulder substrates where a high roughness exists, a strong perennial flow of cold water, high diatom production to support scrapers, and low filamentous algae production, low inputs of fine sediment, limited scouring and resorting of substrates and a high amount of "crevice space" around and under surface rocks (Fig 13). In addition the rocks take on a darkened look (Fig 11) which is a film of organic

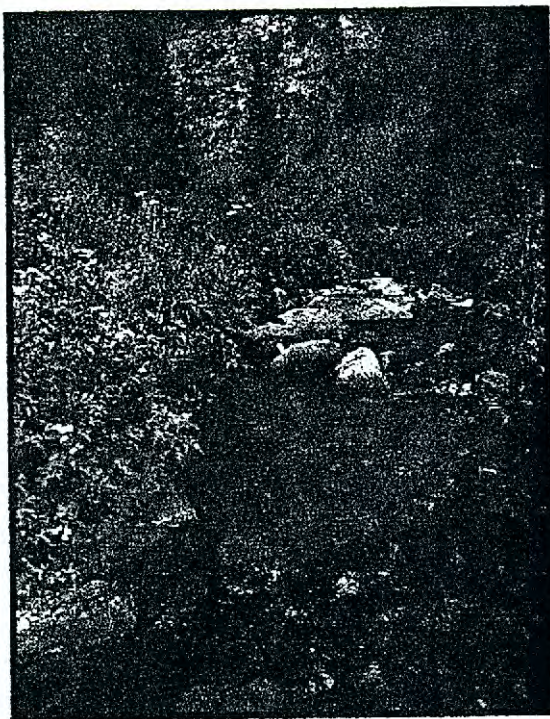


Fig.13 Third Order Stream characterized by exposed angular boulders in stream channel

stain indicating little movement over time because of the angularity of the rocks (Pfankuch 1975). Some of the ideal conditions that do not occur in Upper Hemlock Creek are a narrow and deep channel, a moderate to high amount of bole wood to increase habitat complexity and aid retention of CPOM as also mentioned by Clearwater BioStudies 1992 and a high input of deciduous leaves and conifer needles since the main



Fig.14 Pool formed by large organic debris

vegetation type along the Upper Hemlock Creek is grasses and sedges. In addition Clearwater BioStudies who studied physical factors and fish populations in Hemlock Creek *below* Zoe Creek mention a lack of pool habitat together with limited availability of high quality winter habitat and spawning sites for salmonids. The pools present in Upper Hemlock Creek were formed mostly from debris dams (Fig 14).

### Water Chemistry

Samples from the two streams was somewhat similar (Table 3). Conductivity was quite low as was alkalinity and the pH values indicate a circumneutral condition. Many of the cations were below detectable limits. The presence of *Fontinalis neomexicanus* an aquatic moss in both streams is indicative of soft water.

### Vascular Plants

A list of vascular plants appearing in wet meadows, riparian and upland habitats of Upper Hemlock Creek is presented in Table 4. Six tree species, 15 species of shrubs and subshrubs, 28 species of forbs, 2 species of ferns and 11 species of graminoids are listed.

A partial list of forest habitat types (Cooper et al.

1991) includes:

Mountain hemlock/twisted stalk h.t.-*Menziesia* phase (*Tsuga mertensiana*/*Streptopus amplexifolius* -*Menziesia ferruginea*)

Mountain hemlock/*Menziesia*-beargrass phase (*Tsuga mertensiana*/*Menziesia ferruginea* - *Xerophyllum tenax* )  
Subalpine fir/*Menziesia*  
(*Abies lasiocarpa* /*Menziesia ferruginea* )

Subalpine fir/queencup beadlily-beargrass phase (*Abies lasiocarpa* /*Clitonia uniflora* -*Xerophyllum tenax* )

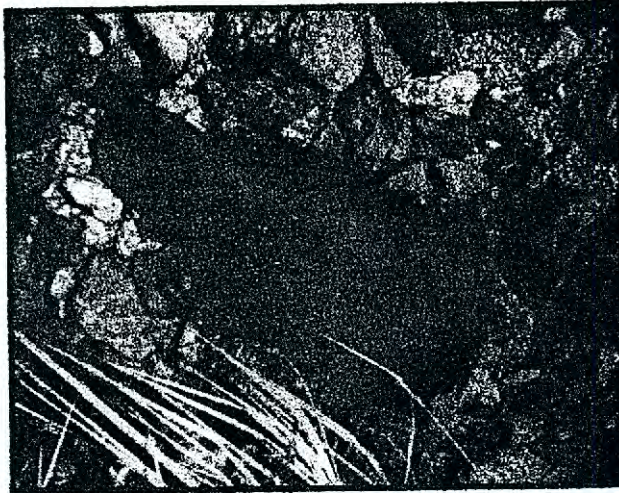


Fig.15 *Fontinalis neomexicanus*

#### Non-forest types:

Bluejoint (*Calamagrostis canadensis* ) meadows  
Water sedge (*Carex aquatilis* ) meadows

#### Non-Vascular Plants

*Fontinalis neomexicanus* a true aquatic moss that occurs in cold nutrient poor sites was common in the two streams (Fig 15). It provides a habitat for additional macroinvertebrates that colonize the bottom substrate and thus enhances secondary production.

Diatoms are common on the rock substrate as evidenced by the high percentage of scrapers in the streams. Over 50% of the insects sampled in Zoe Creek were scrapers. The dominant form in both streams was *Yoraperla brevis* , a scraper.

Little or no filamentous algae was observed.

Where dense, this form indicates nutrient enrichment. Instead small amounts of *Prasiola*, a green algae with a broad frond-like thallus was noted together with *Batrachospermum*, a red algae. The macroscopic thalli of *Batrachospermum* are highly branched and beaded and are encased in a copious, soft mucilage forming arbuscular growths on stones and sticks in flowing water (Prescott 1970).

#### Macroinvertebrates

A list of macroinvertebrates collected from Upper Hemlock Creek and Zoe Creek is presented in Table 5. An analysis of the macroinvertebrate communities is seen in Table 6 and a functional group comparison in Table 7.

Certain positive indicators of a stream with a high biological integrity are described by Wisseman 1994 and can be related to Upper Hemlock and Zoe Creek. There is a high percentage (38% and 53%) of scrapers, organisms which feed off diatoms and algae in a stream (Table 7). Wisseman mentions that at least 10% of macroinvertebrates are scrapers in unimpacted sites. Eleven of the 35 species were scrapers in Hemlock Creek and 9 of 19 in Zoe Creek. Shredder percentage was also relatively high in the two streams (33% and 28%) According to Wisseman they are thought to be a very sensitive indicator of stream health. *Yoraperla brevis* , a stonefly shredder was the dominant species in both streams. Six species were shredders in Hemlock Creek and 4 in Zoe Creek.

Wisseman mentions that intolerant mayflies such as *Baetis bicaudatus*, *Caudatella* spp., *Drunella doddsi* and *Epeorus grandis* found in Hemlock and Zoe Creeks are cool-adapted, not tolerant of fine sediment and low oxygen tensions and sensitive to high winter scour/resorting of substrates.

He also describes *Zapada columbiana*, *Doroneuria*, *Megarcys*, *Setvena* and *Orapera* found in the two streams as intolerant stoneflies matching somewhat the same conditions as for intolerant mayflies described above. As Wisseman mentions these species decline in number when most types of degradation of habitat and water quality occur.

Some intolerant caddisflies occurring in the two streams are *Rhyacophila verrula*, *Neothremma* and *Sericostriata surdickae*.

*Sericostriata surdickae* is considered a rare species (personal communication). *Cryptochia* also collected is listed as uncommon.

Glossosomatids which were fairly common are relatively intolerant scraper caddisflies that cannot exist where filamentous algae covering rocks is dense or where fines smother rock surfaces. No filamentous algae was noted and embeddedness was low.

Collector-gatherers and collector filterers were relatively few in number compared to other feeding groups (Table 7). Dominance of collector-gatherer types often indicates tolerant taxa. When filamentous algae increase, filterers commonly increase especially in open enriched systems.

A comparison of these two streams is made between the best conditions recorded of streams sampled in the Northern Rockies ecoregion (DEQ 1996). Seven metrics compiled from several of these sites provided the best value for each metric. A stream was considered non-impaired if it received a score greater than 3.5. Hemlock Creek scored 5.5 and Zoe Creek 5.1. A perfect score of 7.0 was based on a hypothetical situation where the best characteristics of several streams was considered. Scores of Hemlock Creek and Zoe Creek are considered in the upper ten percent of those I have worked as to biological integrity based on macroinvertebrate community attributes.

A rare species of caddisfly to Idaho as related by two entomologists from the University of Idaho was collected from both streams. *Sericostriata surdickae* – Family Uenoidae (Fig. 16) is only known from Idaho and Montana (Wiggins 1996). The larvae is up to 6 mm in length and its case is constructed entirely of dark, tough silk. It occurs on the upper surfaces or rocks in rapid streams frequently in the hypopetric zone and Wiggins indicates that at least two years may be required for completion of the life cycle.

#### Cold Water Vertebrates

Clearwater Biostudies 1992 reports finding resident populations of westslope cutthroat (*Oncorhynchus clarki lewisi*) and rainbow-steelhead trout (*O. mykiss*) below the confluence of Zoe Creek. They also observed a spawning population of kokanee salmon (*O. nerka*) that grows to maturity downstream in Dworshak Reservoir and may be preyed on by bull trout (*Salvelinus confluentus*).

Both adult and immature tailed frogs, *Ascaphus truei*, were collected in the kicknet along with macroinvertebrates. They were quite common in the samples.



Fig.17 *Sericostriata surdickae* and case



*Schroepers, coll. gath.*

Uenoidae: Sericostriata 26.5

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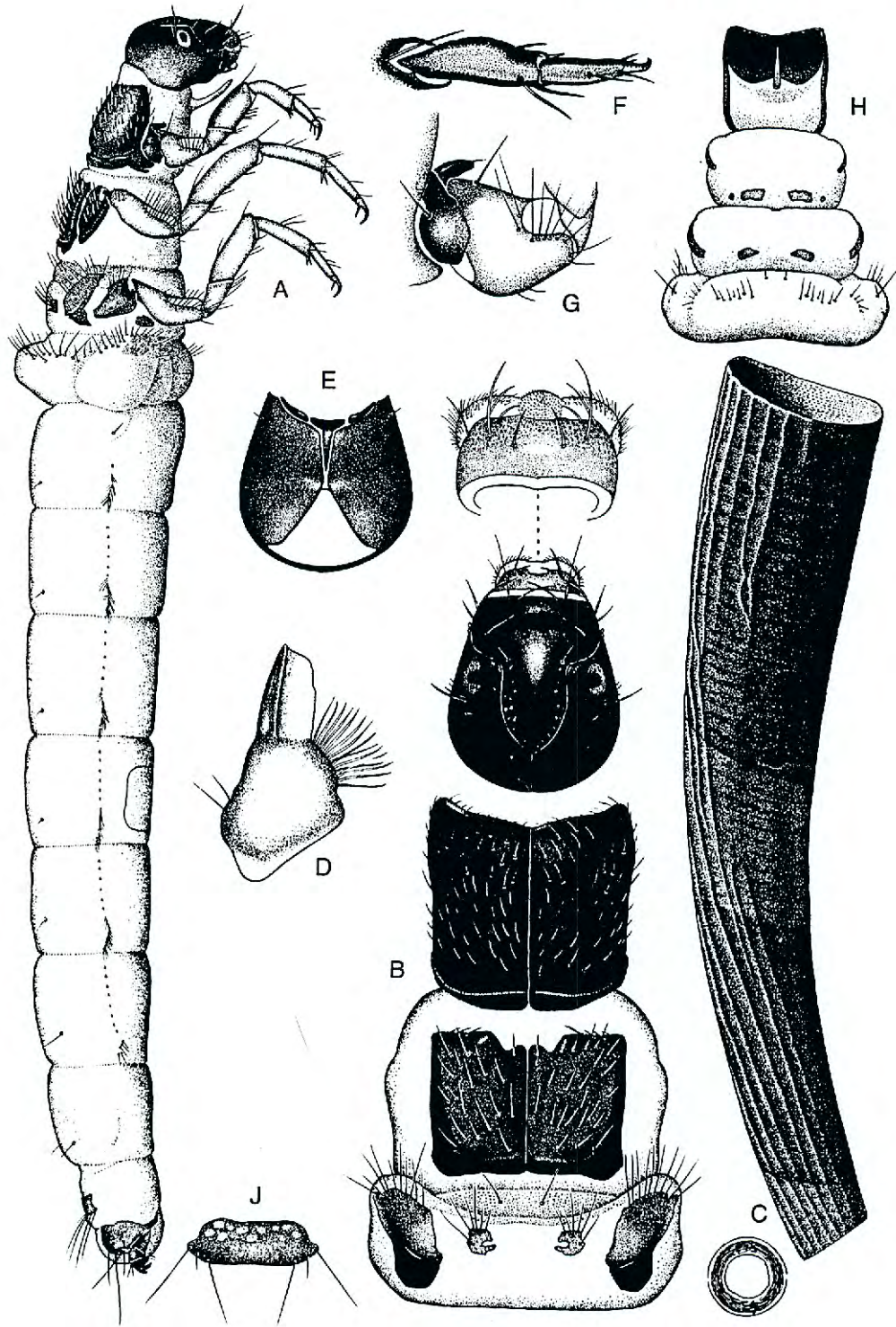
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**Plant species list for Upper Hemlock Creek, Pierce Ranger District,  
Clearwater National Forest**

		Habitat		
		Wet		
		Meadows	Riparian	Upland
<b>Trees:</b>				
<i>Abies grandis</i>	grand fir			X
<i>Abies lasiocarpa</i>	subalpine fir		X	X
<i>Picea engelmannii</i>	Engelmann's spruce	X	X	X
<i>Pinus albicaulis</i>	white-bark pine			X
<i>Pinus contorta</i>	lodgepole pine		X	X
<i>Tsuga mertensiana</i>	mountain hemlock			X
<b>Forbs:</b>				
<i>Aster foliaceus</i>	leafy-bract aster		X	
<i>Anaphalis margaritacea</i>	pearly everlasting			X
<i>Boykinia major</i>	boykinia	X	X	
<i>Clintonia uniflora</i>	queencup beadlilly			X
<i>Corydalis caseana</i> var. <i>hastata</i>	Case's corydalis		X	
<i>Dodecatheon jefferyi</i>	shooting star	X	X	
<i>Epilobium angustifolium</i>	fireweed			X
<i>Epilobium watsonii</i>	Watson's willowherb			X
<i>Geranium viscosissimum</i>	sticky geranium			X
<i>Geum macrophyllum</i>	big-leaf buttercup			X
<i>Heracleum lanatum</i>	cow parsnip		X	
<i>Hypericum anagalloides</i>	bog St. Johnswort	X		
<i>Ligusticum canbyi</i>	Canby's licorice root	X	X	
<i>Listera</i> sp.	twayblade			X
<i>Mertensia paniculata</i>	panicle bluebells		X	
<i>Mimulus guttatus</i>	yellow monkeyflower		X	
<i>Mimulus moschatus</i>	musk-flower		X	
<i>Osmorhiza chilensis</i>	mountain sweet-cicely			X
<i>Polemonium pulcherrimum</i>	sky pilot			X
<i>Pyrola asarifolia</i>	common pink wintergreen			X
<i>Rudbeckia occidentalis</i>	western coneflower			X
<i>Senecio triangularis</i>	arrowleaf groundsel	X	X	
<i>Solidago canadensis</i>	meadow goldenrod	X	X	
<i>Streptopus amplexifolius</i>	twisted stalk		X	X
<i>Tiarella trifoliata</i>	foamflower			X
<i>Trillium ovatum</i>	white trillium			X
<i>Veratrum californicum</i>	corn lilly	X	X	X
<i>Viola orbiculata</i>	round-leaved violet			X
<b>Ferns:</b>				
<i>Athyrium filix-femina</i>	ladyfern		X	
<i>Pteridium aquilinum</i>	bracken fern			X
<b>Shrubs and subshrubs:</b>				
<i>Alnus sinuata</i>	Sitka alder		X	
<i>Amelanchier alnifolia</i>	serviceberry			X
<i>Ledum glandulosum</i>	Labrador tea	X	X	
<i>Lonicera utahensis</i>	Utah honeysuckle			X
<i>Menziesia ferruginea</i>	fool's huckleberry			X

Rhamnus alnifolia	alder buckthorn	X	X	
Ribes lacustre	prickly currant		X	X
Rubus parviflorus	thimbleberry			X
Salix scouleri	Scouler's willow		X	X
Sambucus racemosa	blue elderberry		X	X
Sorbus sitchensis	Sitka mountain ash			X
Spiraea betulifolia	birch-leaf spiraea			X
Spiraea douglasii	Douglas' spiraea		X	
Vaccinium membranaceum	thin-leaf huckleberry			X
Vaccinium scoparium	grouse whortleberry			X
<b>Graminoids:</b>				
Agrostis stolonifera	redtop bentgrass	X		
Bromus vulgaris	columbia brome			X
Calamagrostis canadensis	bluejoint	X	X	
Carex aquatilis	water sedge	X		
Carex brunnescens	brownish sedge		X	
Carex luzulina	woodrush sedge			X
Danthonia sp.	oatgrass			X
Glyceria sp.	mannagrass	X	X	
Juncus ensifolius	dagger-leaf rush	X		
Luzula hitchcockii	smooth woodrush			X
Luzula parviflora	millet woodrush			X

Partial list of habitat types:

**Forest habitat types (Cooper et al. 1991):**

Mountain hemlock/twisted stalk h.t.-Menziesia phase  
(*Tsuga mertensiana*/*Streptopus amplexifolius*-*Menziesia ferruginea*)

Mountain hemlock/Menziesia-beargrass phase  
(*Tsuga mertensiana*/*Menziesia ferruginea*-*Xerophyllum tenax*)

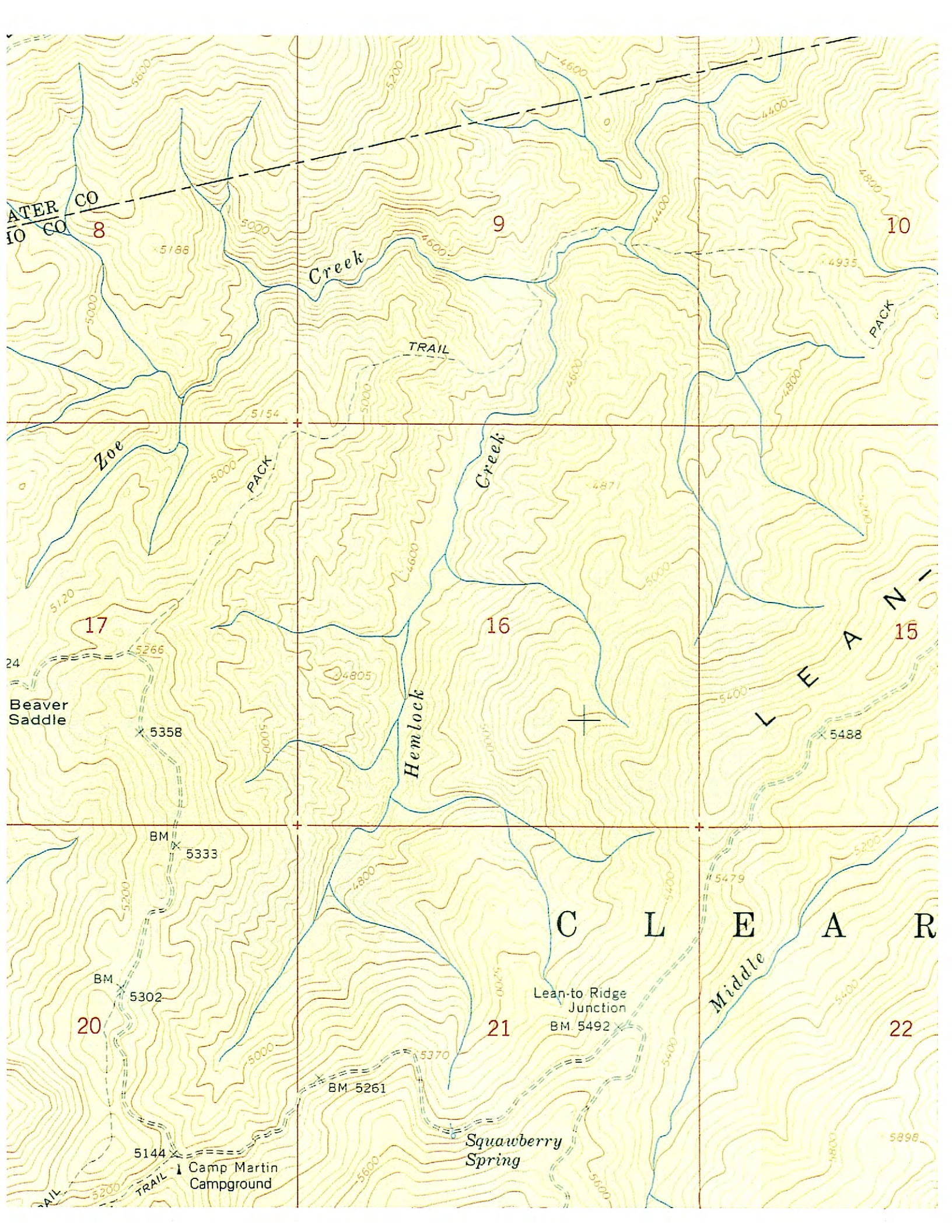
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**Non-forest types:**

Bluejoint (*Calamagrostis canadensis*) meadows

Water sedge (*Carex aquatilis*) meadows



WATER CO  
10 CO

8

9

10

Creek

TRAIL

PACK

Zoe

PACK

Creek

17

16

15

Beaver Saddle

4805

LEANING

Hemlock

BM 5333

C L E A R

20

21

22

Lean-to Ridge Junction  
BM 5492

BM 5302

5144  
Camp Martin  
Campground

Squawberry Spring

BM 5261

Middle

TRAIL

TRAIL