

RESEARCH NATURAL AREAS ON THE
CLEARWATER NATIONAL FOREST: A SURVEY OF AQUATIC
AND RIPARIAN PLANT COMMUNITIES

by

Juanita Lichthardt
Conservation Data Center

November, 1997

Idaho Department of Fish and Game
600 South Walnut, P.O. Box 25
Boise, Idaho 83707
Stephen P. Mealy, Director

Cooperative Challenge Cost-share Project
Clearwater National Forest

Idaho Department of Fish and Game
Purchase Order No.: 43-0276-6-0074

ABSTRACT

Six of the ten established Research Natural Areas (RNAs) on the Clearwater National Forest were visited during the summer of 1996, to document wetland plants and plant communities. Wetlands within the RNAs are associated with both high- and low-gradient streams, wet meadows, subalpine lakes, and cobble river banks. Sedge meadows and a peat fen are found in Sneakfoot Meadows RNA which is described elsewhere. High-gradient streams are the most common aquatic feature represented, and low-gradient streams are very poorly represented. The wetland communities observed are described briefly. An existing wetland community classification for northwestern Montana did not prove useful for classifying the communities encountered. Plot methods were used to describe examples of selected communities. The community types documented will be added to the Idaho Conservation Data Center's site basic records for the RNAs. Plant species observed in wetland communities are included as an appendix and will be added to the RNA files.

TABLE OF CONTENTS

ABSTRACT	i
TABLE OF CONTENTS	ii
LIST OF TABLES	iii
LIST OF APPENDICES	iii
INTRODUCTION	1
METHODS	1
AQUARIUS RNA	2
<i>Thuja plicata</i> / <i>Adiantum pedatum</i> and <i>Thuja plicata</i> / <i>Athyrium</i> <i>felix-femina</i> community types	2
<i>Boykinia major</i> – <i>Calamagrostis canadensis</i> community type	2
CHATEAU FALLS RNA	2
<i>Betula papyrifera</i> / <i>Alnus incana</i> community type	3
<i>Alnus incana</i> / <i>Athyrium filix-femina</i> community type	3
DUTCH CREEK RNA	3
FOUR-BIT CREEK RNA	4
<i>Alnus incana</i> – <i>Athyrium filix-femina</i> community type	4
Tall-forb meadow	4
GRAVE PEAK RNA	5
<i>Carex utriculata</i> community type	5
<i>Carex lenticularis</i> – <i>C. praeceptorum</i> community type	5
<i>Carex aquatilis</i> – <i>C. scopulorum</i> community type	5
STEEP LAKES RNA	5
SUMMARY AND RECOMMENDATIONS	6
REFERENCES	9

LIST OF TABLES

	Page
Table 1. Plant taxa associated with aquatic and wetland features of Grave Peak RNA, and their presence at each of the five lakes. Lakes are numbered from highest (1) to lowest (5) in elevation as in the Establishment Record. Species are ordered as they were encountered, moving from lake 1 to lake 5.	6
Table 2. Summary of aquatic features found in established RNAs on the Clearwater National Forest.	7

LIST OF APPENDICES

APPENDIX A MAPS

- Map 1 Topography and boundaries of Aquarius RNA
- Map 2 Topography and boundaries of Chateau Falls RNA
- Map 3 Topography and boundaries of Dutch Creek RNA
- Map 4 Topography and boundaries of Four-bit Creek RNA
- Map 5 Topography and boundaries of Grave Peak RNA
- Map 6 Topography and boundaries of Steep Lakes RNA

APPENDIX B PLANT SPECIES LISTS

- Table 1 Aquarius RNA
- Table 2 Chateau Falls RNA
- Table 3 Dutch Creek RNA: List of Riparian Plant Taxa
- Table 4 Four-bit Creek RNA: List of Riparian Plant Taxa
- Table 5 Grave Peak RNA
- Table 6 Steep Lakes RNA

APPENDIX C COMPLETED PLOT FORMS FOR SELECTED COMMUNITIES

APPENDIX D SLIDE TRANSPARENCIES

Introduction

Research Natural Areas (RNAs) are small tracts of public land set aside to preserve examples of natural plant communities for study and use as reference areas. RNAs are part of a network of reserves, established by public and private organizations, designed to include examples of all natural plant communities in Idaho. Ten RNAs have thus far been established on the Clearwater National Forest: Aquarius, Bald Mountain, Bull Run Creek, Chateau Falls, Dutch Creek, Four-bit Creek, Grave Peak, Lochsa, Sneakfoot Meadows, and Steep Lakes. These areas all contain forest habitat types (Cooper *et al.* 1991) that help fill the needs of the Idaho RNA system. They also include incidental communities (*e.g.*, wet meadows, riparian, cliffs etc.) that were used to justify establishment. Such communities often represent a disproportionately large amount of the total biodiversity present.

Aquatic features represented in RNAs on the Clearwater National Forest include high-elevation lakes, rivers, streams, waterfalls, wet meadows, and peat fen. Sneakfoot Meadows and Chateau Falls RNAs in particular, were set aside for their aquatic features. Wetland plant communities associated with aquatic features often represent a high degree of plant diversity. For this reason, and because no classification of wetland communities exists for this region, wetland communities were not thoroughly documented during initial reconnaissance work for RNA establishment.

Documenting community elements within RNAs serves three purposes: 1) allows the evaluation of representativeness within the RNA system, 2) allows individual RNAs to be placed in a regional biodiversity context, and 3) indicates opportunities for research. The objective of this project was to document wetland plant communities or community complexes in RNAs on the Clearwater National Forest.

Between July and September of 1996, I attempted to visit six RNAs on the Clearwater National Forest—Aquarius, Chateau Falls, Dutch Creek, Four-bit Creek, Grave Peak, and Steep Lakes—and to document wetland plants and plant communities. Sneakfoot Meadows RNA has been previously described (Bursik 1990), and aquatic features of Bald Mountain, Bull Run Creek, and Lochsa RNAs are minimal. The wetland communities I observed were undisturbed by human factors such as grazing of domestic animals, logging, or recreation. Most are dynamic communities by virtue of their occurrence along steeply graded streams.

Methods

I described streams using the classification of Savage and Rabe (1979) which is based on order, gradient, and substrate. Within the RNAs visited, permanent streams are mostly of the cascade-pool type, with gradients greater than 9% and substrates of coarse sediments, bedrock, and/or log debris.

I attempted to classify the communities observed using the wetland vegetation classification for Northwestern Montana (Boggs *et al.* 1990), but with little success. Instead, I have provided brief descriptions of the communities present. Where a conifer overstory is present, the forest habitat types of Cooper *et al.* (1991) were used. Each community is given a conservation ranking of A (excellent) through F (terrible) which will be part of the community occurrence record in the Conservation Data Center's (CDC) Database. Sample plots were described for selected communities using the methods of Bourgeron *et al.* (1991).

The wetland community types described will be added to the site basic records for the RNAs. Plant species observed in wetlands are tabled in Appendix B and will be added to the RNA files. A set of slides is appended to copies of this report at the CDC and the Natural Areas Program, USDA Forest Service, Rocky Mountain Research Station, Missoula, Montana.

Aquarius RNA

Aquatic features of Aquarius include a section of the North Fork Clearwater River, six first-order perennial tributaries, and two second-order perennial tributaries. There are also ephemeral seeps, some associated with steep rock outcrops (Appendix D, slide 1), and supporting a diversity of herbaceous vegetation. Although I did not do a thorough survey of the riparian vegetation of Aquarius, it has been visited much more regularly than other RNAs on the forest because of an established monitoring program. Riparian communities are mostly limited to narrow, shaded stringers along steeply graded tributary streams. Along the North Fork are also found seasonally exposed rock bars and terraces. Most riparian plant species are also found in moist forest habitat types. An updated species list for Aquarius is included as Appendix B, Table 1.

***Thuja plicata*/*Adiantum pedatum* and *Thuja plicata*/*Athyrium filix-femina* community types.** Tributaries to the North Fork within Aquarius, with gradients of nearly 2,000 ft per mile, are cascade–pool type streams (Savage and Rabe 1979). They are deeply entrenched and shaded by conifer or deciduous forest overstory (Appendix D, slide 2). Composition of these communities is essentially the same as the *Thuja plicata*/*Adiantum pedatum* and *Thuja plicata*/*Athyrium filix-femina* upland habitat types (potential natural communities; see Appendix B, Table 1 for common names). Associated with the streams are narrow stringers of wet-site plants, mostly *Athyrium filix-femina*, *Adiantum pedatum*, *Boykinia major*, *Streptopus amplexifolius*, *Montia siberica*, and *Circaea alpina*, as well as species from adjoining, drier habitat: *Gymnocarpium dryopteris*, *Tiarella trifoliata*, *Asarum caudatum*, *Viola glabella*, and *Sorbus scopulina*. *Oplopanax horridum* and *Lysichitum americanum* are scarce and never occur with high cover. Violent washouts initiate *Alnus rubra* as the overstory dominant along streams and on alluvial fans (Appendix D, slide 3). Such a community is described by plot 97JL001 (Appendix C). This example appears to be seral to the *Thuja plicata*/*Athyrium filix-femina* habitat type but may be long-persistent. Both the *T. plicata*/*A. pedatum* and *T. plicata*/*A. filix-femina* community types are extensive in the RNA (1310 and 69 acres respectively) and represent A-ranked element occurrences (EO).

***Boykinia major*–*Calamagrostis canadensis* community.** Unique riparian habitat is provided by seasonally submerged rock banks and point bars along the North Fork. The substrate is cobble or cobble and sand. This zone is habitat for the rare Idaho plant, *Tofieldia glutinosa* var. *brevistyla* [= *Triantha occidentalis* (S. Watson) Gates subsp. *brevistyla* (Hitchcock) Packer]. A large cobble bar is found on the south bank, 3/4 mile downstream from the mouth of Beaver Creek. The bar is occupied by a *Boykinia major*–*Calamagrostis canadensis* community containing a diverse mixture of forbs and grasses. *Apocynum androsaemifolium* is abundant. Sprouts of *Alnus rubra* and *Cornus stolonifera* are present but do not attain any size. As sediment accumulates on such cobble bars, this community may succeed to *Alnus rubra*, and ultimately *Thuja plicata*.

Chateau Falls RNA

Chateau Creek is a third-order stream that joins Cave Creek just before its confluence with the North Fork Clearwater River. It is a very high-gradient, cascade-pool type stream in granitic bedrock. The lower third of Chateau Creek is included in the RNA

(Appendix A, Map 2). The creek, with its series of waterfalls and several ephemeral tributaries, constitute the aquatic features of the RNA. Bob Moseley joined me in the survey and made a list of all vascular plant species we observed in the RNA (Appendix B, Table 2), significantly adding to the original plant list. Plants occurring in the riparian zone are noted in the table.

***Betula papyrifera/Alnus incana* community type.** Our survey began in Cave Creek, which forms the western boundary of the RNA and joins Chateau Creek just before entering the North Fork. Cave Creek has a steep, boulder and bedrock substrate, an overall gradient of 1400 ft/mile, and includes a spectacular waterfall (Appendix D, slide 5). Riparian vegetation consists of a narrow stringer of primarily deciduous trees and shrubs including *Betula papyrifera*, *Alnus incana*, *Acer glabrum*, *Prunus emarginata*, and *Pseudotsuga menziesii* (see Appendix B, Table 2 for common names). Upstream from the confluence with Chateau Creek, *Acer glabrum* comes to dominate the overstory with a subcanopy of *Salix drummondiana* in the stream channel. Rock crevices in the spray zone of the falls support small hanging gardens with mosses, *Saxifraga mertensiana*, and *S. occidentalis*.

We left the Cave Creek drainage at the base of the falls and intercepted Chateau Creek at 3500 ft elevation. At this point the stream channel is steep and the riparian zone very narrow or absent, occasionally widening to as much as 10 meters where ephemeral streams enter. There is an open forest overstory of *Pseudotsuga menziesii* with many large snags still standing from a circa-1930 fire. The forest habitat type is *Thuja plicata/Clintonia uniflora*.

***Alnus incana/Athyrium filix-femina* community type.** The widest areas of stream bottom are occupied by a tall shrub layer of *Alnus incana*, *Acer glabrum*, and *Amelanchier alnifolia* and an understory of *Rubus parviflorus*, *Ribes hudsonianum*, *Streptopus amplexifolius*, *Athyrium filix-femina*, *Gymnocarpium dryopteris*, and *Boykinia major*. Periodic flood events probably limit conifer establishment in this community. Because of the size and dynamic nature of this community it is difficult to describe or classify. Less than 0.1 acre of this type was observed (EO Rank = C).

Lower Chateau Creek descends over a series of four spectacular waterfalls (here numbered from down- to upstream) interspersed with lesser falls and cascades. We encountered the top of falls #4 at approximately 3500 ft. It drops about 50 ft over a sheer granite face, then cascades through a series of basins in the bedrock (Appendix D, slide 6). Three, first-order streams enter before the top of falls #3 at approximately 3100 ft. Falls #3 is a straight drop of about 40 ft followed by a series of cascades. Falls #2 occurs at 2800 ft (Appendix D, slide 9), and falls #1 at 2500 ft. Falls #1 drops about 80 ft in three steps, to the confluence with Cave Creek. At this point the valley widens somewhat and is characterized by an overstory of *Betula papyrifera*, which continues to the mouth.

Dutch Creek RNA

Dutch Creek, a first-order tributary of the Lochsa River, is a steeply graded, actively downcutting, cascade-pool type stream flowing over cobble and boulders (Appendix D, slide 11). Within the RNA, it descends from 2600 to 2200 ft elevation within a distance of 1/2 mile (Appendix A, Map 3). Depositional segments with sand bottom alternate with riffles and cascades. Outside the narrow riparian zone, vegetation is early seral forest and shrubfield. Many large snags remain standing along the stream from a circa-1929/1934 fire, and the stream is criss-crossed with downed logs (Appendix D, slide 13).

Along gentle stream segments, a narrow floodplain is occupied by a riparian community of very limited extent, consisting of *Boykinia major*, *Rubus parviflorus*, *Solidago canadensis*, *Pteridium aquilinum*, and *Cornus stolonifera*, with *Athyrium* lining the streambank (Appendix D, slide 14). Plant species found in the riparian zone are listed in Appendix B, Table 3.

Four-bit RNA

Four-bit Creek is a first-order stream that forms a portion of the northeast boundary of the RNA, from 3200 to 3600 ft elevation. It flows into Eldorado Creek, a low-gradient, meandering stream with a wide floodplain that is outside the RNA (Appendix A, Map 4). The only other aquatic feature present is an unnamed, ephemeral tributary of Eldorado Creek. Riparian species observed in the RNA are listed in Appendix B, Table 4.

Four-bit Creek has a moderately wide floodplain, 50 to 150 ft (20-40 m) across near its mouth, but narrows rapidly upstream as the gradient steepens. At its mouth, it is a clear, low-gradient stream with a sandy bottom. This stretch would be classified as a meandering-glide type stream (Savage and Rabe 1979). Slightly above the floodplain there is an open, *Picea engelmannii* overstory with a dense, tall-forb understory of *Senecio triangularis*, *Athyrium filix-femina*, *Ligusticum canbyi*, and *Symphoricarpos albus* (see Appendix B, Table 4 for common names).

The floodplain includes large areas of tall-forb meadow with no conifers. *Alnus incana*–*Cornus stolonifera* tall-shrub thickets adjoin the streambed in places. Further upstream, where the gradient steepens, the floodplain narrows, then disappears. Shaded, riparian stringer vegetation is characteristic of the *Thuja plicata*/*Athyrium filix-femina* habitat type. The following two riparian communities occur along the low-gradient portion of Four-bit Creek:

***Alnus incana*–*Athyrium filix-femina* community type.** This community occurs occasionally in the lower, low-gradient portion of Four-bit Creek where it is associated with periodically flooded streambanks and overflow channels. The overstory is dominated by *A. incana* and *Cornus stolonifera*. Other shrubs include *Lonicera involucrata*, *Ribes hudsonianum*, and *Ribes lacustre*. The herbaceous understory is made up of *Senecio triangularis*, *Heraclium lanatum*, *Glyceria elata*, *Trautvetteria caroliniensis*, and *Athyrium filix-femina*. There is no forest overstory. Plot 96JL018 (Appendix C) is an example of this community. It occurs in small patches totalling only about 1/2 acre within the RNA. (EO Rank = B due to limited extent).

This community occupies sites similar to those of the *Alnus sinuata* community type of Boggs et al. (1990), but the *A. sinuata* c.t. is indicative of human disturbance and floristically dissimilar from that described here. An *Alnus incana*/*Ribes hudsonianum* c.t. is described by Youngblood et al. (1985) for riparian sites in Eastern Idaho. It has a lower shrub stratum of *R. hudsonianum* and highly variable herbaceous cover.

Tall-forb meadow. Open areas of the stream floodplain are dominated by tall-forb meadow. Major species are *Ligusticum canbyi*, *Senecio triangularis*, *Trautvetteria caroliniensis*, *Glyceria elata*, and *Sphagnum* sp. Shrubs are scarce. *Scirpus microcarpus* and *Carex aquatilis* occupy wetter microsites. Conifer reproduction is not evident. In the ephemeral stream, a smaller, more shaded meadow is dominated by *Boykinia major* and *Ligusticum canbyi*, with a carpet of *Sphagnum* moss and some conifer reproduction on rotting wood (see Appendix C, Plot 97JL002).

Grave Peak RNA

Wetland vegetation of Grave Peak RNA is associated with a series of five subalpine lakes lying in two drainages (Appendix A, Map 5). Lake 1 is the highest and does not have a distinct zone of hydrophytic vegetation. However, the fellfield *Carex nigricans* community that continues to the water's edge is considered a wetland community type by some (e.g. Kovalchik 1993). In fact, none of lakes 1 through 3 are associated with well developed wetland communities. Scattered forbs and graminoids occur in the narrow zones below their high-water lines. *Carex lenticularis*, *Juncus mertensianus*, and *Gentiana calycosa* are common in this zone (see Appendix B, Table 5 for common names). Other species that may be present are *Senecio triangularis*, *Dodecatheon* sp., *Erigeron peregrinus* var. *scaposus*, *Luetkea pectinata*, *Juncus drummondii*, and *Carex nigricans*. In the narrow riparian zones along steeply graded streams connecting lakes 1, 2, and 3, *Senecio triangularis*, *Erigeron peregrinus*, *Hypericum formosum*, and *Athyrium distentifolium* were noted. These streams are deeply incised in places, flowing over cobble and bedrock.

Only lakes 4 and 5 are associated with well-developed graminoid meadows. The most extensive and floristically diverse meadow is that of lake 5. In Table 1, species are listed as they were encountered, moving from lake 1 to lake 5. The following three sedge-meadow communities were identified at lakes 4 and 5. Additional species associated with each can be found in Table 1. Appendix B, Table 5 lists all plants identified during the 1996 field visit.

***Carex utriculata* community type** (Lake 4): A monoculture of *Carex utriculata* is found on the most recently exposed sediments at the lake edge. It is about 0.5 acre in extent. (EO rank = A).

***Carex lenticularis*–*C. praeceptorum* community type** (Lake 4) occupies a slightly drier zone, on lake sediments between the *Carex utriculata* community and the rocky upland. It is about 0.5 acre in extent. (EO rank = A).

***Carex scopulorum* community type** (Lake 5): This sedge-dominated community borders open water and is seasonally inundated. *Carex aquatilis* is codominant with *C. scopulorum*. *C. aquatilis*, *C. scopulorum*, *C. illota*, and *Sphagnum* sp. were found only in this community (Table 1). Forbs are minor and include *Tofieldia glutinosa* ssp. *montana*, *Gentiana calycosa*, and *Dodecatheon* sp. *Kalmia microphylla* is an inconspicuous shrub. This community occupies about 2 acres (EO rank = A).

Steep Lakes RNA

The RNA encompasses a subalpine basin between 5,750 and 7,290 ft. I visited only the lower of the two lakes in the basin. The lower lake occupies a steep-sided basin surrounded by bedrock slopes and talus, leaving only a narrow zone beneath the high water line. A steep outlet stream flows less than 1000 ft before leaving the RNA boundary. The stream flows over and between large boulders and has a cobble bed. *Alnus sinuata* lines the stream, along with *Salix scouleriana*, *Lonicera involucreta*, and *Athyrium* sp. Plant species associated with the outlet stream and a seepy area between the trail and the stream are listed in Appendix B, Table 6. A more thorough survey will be

necessary to adequately describe wetland vegetation of the RNA since there is an additional lake, a permanent pond, and several small, wet meadows in the upper basin (Appendix A, Map 6).

Table 1. Plant taxa associated with aquatic and wetland features of Grave Peak RNA, and their presence at each of the five lakes. Lakes are numbered from highest (1) to lowest (5) in elevation as in the Establishment Record. Species are ordered as they were encountered, moving from lake 1 to lake 5.

Scientific Name	Common Name	Lake					Upland
		1	2	3	4	5	
<i>Carex nigricans</i>	black alpine sedge	x		x			x
<i>Juncus drummondii</i>	Drummond's rush	x	x	x			
<i>Juncus mertensianus</i>	Merten's rush	x	x	x			
<i>Hypericum formosum</i>	w. St. John's-wort	x	x				
<i>Luetkea pectinata</i>	luetkea	x		x			
<i>Carex lenticularis</i>	lentil-fruited sedge		x	x	x		
<i>Deschampsia cespitosa</i>	tufted hairgrass		x		x	x	x
<i>Dodecatheon</i> sp.	shooting star		x	x		x	
<i>Erigeron peregrinus</i> ssp. <i>callianthemus</i> var. <i>scaposus</i>	subalpine daisy		x	x		x	
<i>Gentiana calycosa</i>	mountain bog gentian		x	x		x	
<i>Senecio triangularis</i>	arrowleaf groundsel		x	x			
<i>Carex multicostata</i>	many-nerved sedge			x			
<i>Phyllodoce empetriformis</i>	pink mountain heather			x			x
<i>Spiraea douglasii</i>	Douglas' spiraea			x			x
<i>Athyrium distentifolium</i>	alpine ladyfern				x		
<i>Carex praeceptorum</i>	teacher's sedge				x	x	
<i>Carex utriculata</i>	beaked sedge				x		
<i>Kalmia microphylla</i>	small-leaved laurel				x	x	
<i>Carex aquatilis</i>	water sedge					x	
<i>Carex illota</i>	small-headed sedge					x	
<i>Carex scopulorum</i>	Rocky Mtn. sedge					x	
<i>Sphagnum</i> sp.	sphagnum moss					x	
<i>Tofieldia glutinosa montana</i>	sticky tofieldia					x	

Summary and Recommendations

Within RNAs on the Clearwater National Forest, wetland communities are associated with a variety of aquatic features including rivers; perennial streams; ephemeral streams; subalpine lakes and ponds; vernal pools and seeps; peatlands; and wet meadows (Table 2). The feature most abundantly represented is that of high gradient, low-order streams. These are the cascade-pool type streams of Savage and Rabe (1979). Low-gradient, meandering -glide streams are poorly represented. Classification and inventory of

wetland communities is difficult because of the lack of a classification system for this region.

Table 2. Summary of aquatic features found in established RNAs on the Clearwater National Forest.

RNA	Aquatic features
Aquarius	Fifth-order trunk stream; steeply graded ephemeral streams; perennial, cascade-pool streams; and seeps.
Bald Mountain	High-elevation ephemeral streams.
Bull Run Creek	A second-order, cascade-pool type stream.
Chateau Falls	A third-order, cascade-pool type stream; cascades and waterfalls.
Dutch Creek	A first-order cascade-pool type stream.
Four-bit Creek	A first-order perennial stream with both cascade-pool and meandering-glide reaches (borders RNA), and a low-gradient ephemeral stream.
Grave Peak	Five subalpine lakes and associated wet meadows.
Lochsa	Two, steeply graded perennial streams.
Sneakfoot Meadows	High-elevation peat fen and wet meadows.
Steep Lakes	Two subalpine lakes and one pond with associated wet meadows.

Existing classifications of wetland and riparian plant communities, written for western Montana and eastern Washington, do not work well on the Clearwater National Forest. This points to the need for quantitative descriptions of wetland communities in this region. Some work has been done on the adjoining Nez Perce National Forest, but the data have not yet been analyzed. Plant communities associated with high-gradient streams are especially difficult to classify because of their spatial variability and dynamic nature.

The wetland habitat that is most obviously under-represented is that of low-gradient meandering streams. A great deal of such habitat exists on the Clearwater at low and moderate elevations, but none is represented in Research Natural Areas. Expanding one of the established RNAs, or establishing an additional RNA with a meandering stream reach would greatly increase the biodiversity represented in the Forest's RNA system, adding an unrepresented aquatic feature and probably several new plant communities. Faunal diversity would also be greatly enhanced, including fish spawning habitat. The

floodplain of Eldorado Creek, which borders Four-bit RNA is a good example of such habitat and would be an important addition to the RNA.

Upper Hemlock Creek, on the Pierce Ranger District has been proposed as an RNA for its perennial, meandering-glide stream with associated sedge meadows (Rabe *et al.* 1996). The pristine nature of upper Hemlock Creek makes it an excellent reference area for comparison with the many landslide-affected streams on the Forest. The RNA program on the Forest should target such meandering stream/wet meadow systems, especially those offering a range of both forested and open community types.

References

- Boggs, K., P. Hansen, R. Pfister, and J. Joy. 1990. Classification and Management of Riparian and Wetland Sites in Northwestern Montana. University of Montana, Montana Forest and Conservation Experiment Station, School of Forestry, Missoula. 217 p. Draft Version 1.
- Bourgeron, P.S., R.L. DeVelice, L.D. Engelking, G. Jones, and E. Muldavin. 1991. WHTF site and community survey manual. Version 91C. Western Heritage Task Force, Boulder, CO. 24 p.
- Bursik, R. 1990. Floristic and phytogeographic analysis of northwestern Rocky Mountain peatlands, U.S.A. Unpublished thesis, University of Idaho, Moscow. 37 p.
- Cooper, S.V., K.E. Neiman, R. Steele, and D.W. Roberts. 1991. Forest habitat types of Northern Idaho: a second approximation. General Technical Report INT-236. USDA Forest Service Intermountain Research Station, Ogden, UT.
- Kovalchik, B.L. 1993. Riparian plant associations on the National Forests of Eastern Washington. Draft Version 1. USDA Forest Service. Colville, WA.
- Rabe, F.W., J. Lichthardt and D. Catts. 1996. Proposal for establishment of Upper Hemlock Creek within the Clearwater National Forest, Idaho County, Idaho as a Research Natural Area. Unpublished report on file at the Idaho Department of Fish and Game, Conservation Data Center, Boise, Idaho. 16 p.
- Savage, N.L. and F.W. Rabe. 1979. Stream types in Idaho: an approach to classification of streams in natural areas. *Biological Conservation* 15:301-315.
- Youngblood, A.P., W.G. Padgett, and A.H. Winward. 1985. Riparian community type classification of eastern Idaho–western Wyoming. USDA Forest Service R4-Ecol-85-01. Intermountain Region, Ogden, UT. 78 p.

APPENDICES NOT AVAILABLE ON WEB