

Natural Areas Data Form

Site name	Fortynine Meadows
General location	About 15 miles south of Avery, ID on Rd 301 close to Breezy Saddle
Directions	See page 1 of enclosed report
County	Clearwater
USGS Quads	Grandmother Mountain Monumental Butte
Township-range-section	N 52 degrees, 16" W 116 85" S. 6
Size	About 391 acres
Elevation	4920 ft – Meadow very flat
Boundary rationale	Road bounds area on three sides Breezy Saddle to road curvature of Road 760 is fourth side BLM property line directly west
Designer	Fred Rabe
Map date	On two quads – 1995
Ownership/Management	St. Joe National Forest
Site description	See title page of report and 1-2
Elements	Peatland ecosystem consisting of forested, scrub-shrub and herbaceous mat classes as defined by Cowardin and others, 1979 Spring stream through meadow Temporal pond, pothole habitats
Protection urgency	Unknown
Land use comments	Conifers bordering peatland may be attraction to loggers
Information sources	Rabe, F. W. , Bursik, R. J. and E. B. Cantor 1990. Classification and moni- toring wetlands in selected areas of the Pacific Northwest. Rpt on file with Inter- mountain Research Station, Ogden,Ut, 209 p Rabe, F. W. and R. J. Bursik 1991. Nat- ural Wetland diversity in Idaho. Water Research Research Institute, U. of Idaho, 13 p

Working group(s) to receive a copy	Forest Service, Mountaineers Foundation, Idaho Native Plant Society
Identified by	Charles Wellner (deceased)
Data form completed by	Fred W. Rabe
Best contact	Fred W. Rabe, fredr@uidaho.edu
Data sensitive	No
PART 2	
Key environmental factors on area	None exerts major influence
Exotics	None potentially damaging
Designation	Nothing
Protecting comments	Presence of bull trout
Conservation intent	No known conservation intentions
Public access	Open to general public
Mineral rights	Unknown
Off-site land uses	Moist peatlands probably restricts most uses
PART 3	
Natural hazards	None known in area
Climate description	Cool and humid, mild winters without intense solar radiation These conditions favor peatlands
Management needs	Tree barrier surrounds meadows. No fencing required
Pests/pathogens	None known
Natural Area history	Study done in 1988 - see Information sources. Old trapper's cabin once in meadow Periodic beaver colony - presence and exodus
Managed area comments	None known about

Status summary

None

Target comments

Long narrow meadow with spring stream. Peatland plant communities chiefly sphagnum and sedges
See report
Surveys in 1988 and 2010
Access favorable for monitoring site
Future studies here might include Northern bog lemming A state Species of Concern

Discussion summary

No status.

Species list

Vascular plant and macroinvertebrate lists. See report - p 4 and 6

Fortynine Meadows

Proposed Research Natural Area



Fred Rabe Brett Haverstick Elisabeth Brackney

Workshop sponsored by Friends of the Clearwater

**Funded by: Mountaineers Foundation and Idaho Native Plant Society,
ERIG Program**

October 2010

The objective of this project was to educate people about peatland ecosystems by conducting a two-day workshop at Fortynine Meadows, a tributary to the Little North Fork Clearwater River.

Enrollees in the workshop helped us gather plant and invertebrate data and became familiar with techniques employed in the collections. They were also aware that this information would help in the effort to propose Fortynine Meadows as a Research Natural Area to the U.S. Forest Service.

General description Peatlands are poorly drained areas whose substrate is periodically saturated or covered with water having a peat layer about 12 in (30 cm) or more in thickness (Chadde et al. 1998).

The availability of oxygen and nutrients essential to growth of plants is reduced significantly once peat develops to this depth. Lack of oxygen together with cool temperatures limits microbial decomposition thus reducing plant growth. As a result peatlands must depend on an external supply of nutrients from either the inflow of mineral-enriched water or precipitation.

Fortynine Meadows is about 100 acres in size. It contains a *spring stream* (Meadow Creek) where ground water aquifers discharge to the surface. Water is relatively cold and shows little temperature variation during the summer. It is a first order stream with a low gradient (1-3%).

Pools, runs and glides are the major flow patterns of Meadow Creek with a few riffles and cascades. A large number of stream channels coalesce to form larger channels. Bottom substrate is silt and organic material. Grass mats and aquatic moss provide the main habitat for aquatic invertebrates.

The dominant vascular plants in the meadow are firethread sedge (*Carex prionophylla*) and cotton-grass (*Eriophorum angustifolium*) occurring with sphagnum moss that covers the entire site.

Subalpine peatlands form along high-elevation, low gradient streams compared to valley peatlands like Hager Lake that occur at relatively low elevations in major river valleys (Bursik 1990). Subalpine peatlands are characterized by plant species common to the western cordillera while valley peatlands have numerous boreal species whose populations are disjunct by hundreds of miles from the main portion of their range in Canada. Their formation is likely due to alpine glaciation during the Wisconsin glacial advance.



Map of Fortynine Meadows. Note confluence of Meadow Creek with Little North Fork Clearwater River. See location description below.



Aerial view of Fortynine Meadows showing easy access to sampling sites from Road 760.

Location Drive to Avery, Idaho. Cross an old bridge over the St. Joe River and continue 3 miles west along the river. Turn left on Road 301 and proceed about 14 miles to Breezy Saddle (see map above). Continue on Forest Road 301 until it intersects with Road 760. Turn right on 760 which soon swings around and parallels the meadow. From the road intersection, it is 0.8 miles to the upper meadow sampling site and 1.4 miles to the middle meadow site. Continue on Road 760 until it crosses Little North Fork Clearwater River. The confluence of Meadow Creek and Little North Fork occurs here.

Aquatic habitats



A glide section of Meadow Creek where water is relatively shallow and slow moving. Note the silt bottom substrate. Shade is mostly nonexistent since the riparian vegetation is predominantly sedge and grass plants.



Some sections of Meadow Creek are runs where the water is deeper and the current faster. Few riffles occur in the stream. Pools measured up to 3 ft (1 m) in depth. Overhanging banks provided cover and shade for bull trout (*Salvelinus confluentus*).



Small ponds were common in June. However, in July they began to dry up. The invertebrate community here was different from that of the stream. Note the number of low spots with water in the meadow.



Small potholes or pools isolated from the stream were quite deep and one had to be careful walking. A different composition of invertebrates occurred there compared to the stream and ponds.

Aquatic invertebrates

Twenty-seven species of macroinvertebrates were identified from moss, grass and open water in Meadow Creek (Table 1). Surprisingly, 12 species occurred in a pothole that was only about six feet in diameter. Seven species were sampled from the small ponds.

All 27 species occurred in the moss (*Fontinalis neomexicana*) as compared to seven species from grass and seven species in the open water.

The soft bottom substrate, consisting of fine silt and organic material is typical of spring streams. However, it is much less productive than the rocky substrate at the confluence with the Little North Fork Clearwater River or the aquatic vegetation and open water in Meadow Creek that were sampled instead



Aquatic moss (*Fontinalis neomexicana*) provides suitable habitat for invertebrates. It was found in Meadow Creek but not in the ponds or pothole.



Aquatic grass was less common in the stream. The invertebrates attached to the grass occurred mostly in the root system. The grass had not yet flowered by mid-July so it was not identified.

Species of *Fontinalis* provide additional structure and stability to the habitat ensuring greater species richness and invertebrate biomass (Brusven et al. 1990, Rabe 2002).



Grass often occurred together with moss in the stream as shown here. Both grew best in runs where the water flow was faster and the channel was deeper.

Two mayflies (*Ephemerella* sp., *Baetis tricaudatus*) were dominant in the moss. As a source of food, they both collect and gather detritus and small algae. *Ephemerella* has a tolerance level of 1 (on a scale of 1-10) compared to *B. tricaudatus* with a tolerance level of 5. *Ephemerella* is unable to tolerate very poor habitat or water quality whereas *Baetis* can exist under a wider set of environmental conditions.

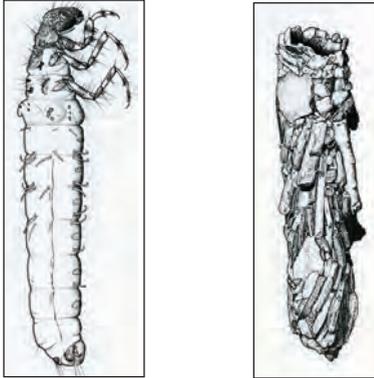


Ephemerella, a mayfly with a relatively low tolerance level, was one of the dominant species in Meadow Creek.

**Table 1. Macroinvertebrates from three aquatic habitats in Fortynine Meadows
June-July 2010**

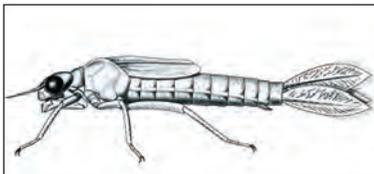
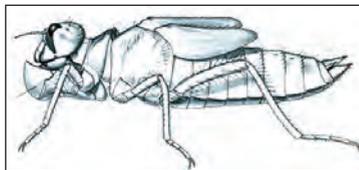
Taxa	Meadow Creek	Pond	Pothole
Ephemeroptera			
<i>Ephemerella</i> sp.	X		
<i>Cingyma</i> sp.	X		X
<i>Baetis tricaudatus</i>	X	X	X
<i>Paraleptophlebia</i> sp.	X		
<i>Drunella spinifera</i>	X		
<i>Drunella flavilinea</i>	X		
<i>Cinygmula</i> sp.	X		
<i>Ameletus</i> sp.	X		
Plecoptera			
<i>Megarcys</i> sp.	X		
Capniidae	X		
Peltoperlidae	X		
Chloroperlidae	X		
<i>Malenka</i> sp.	X	X	
Trichoptera			
<i>Desmona</i> sp.	X		
<i>Psychoglypha</i> sp.	X		X
<i>Dolophiloides</i> sp.	X		
<i>Micrasema</i> sp.	X		
<i>Cryptochia</i> sp.			X
<i>Limnophilus</i> sp.	X		
Odonata			
<i>Aeshna</i> sp.		X	X
<i>Enallagma</i> sp.		X	
Libellulidae		X	
Coleoptera			
<i>Derovatellus</i> sp.			X
<i>Acillus</i> sp.			X
<i>Agabus</i> sp.			X
<i>Haliphus</i> sp.			
<i>Hydrobius</i> sp.	X		
Diptera			
<i>Culex</i> sp.			X
Chironomidae	X	X	X
<i>Limnophyla</i> sp.	X		
<i>Antocha</i> sp.	X		
Simulidae	X		
Megaloptera			
<i>Sialis</i> sp.	X		
Annelida			
Oligochaeta	X		X
Mollusca			
<i>Pisidium</i> sp.	X	X	
<i>Gyraulus</i> sp.			X
Platyhelminthes			
<i>Planaria</i> sp.	X		

The dominant macroinvertebrate identified in the pothole was *Psychoglypha* sp., a caddisfly. This organism is an omnivore that has a tolerance limit of 1, indicating it is a sensitive species.



The caddisfly *Psychoglypha* has a brown spotted head and single abdominal gills. Its case is constructed of small rock fragments and pieces of wood combined in a straight tube of little taper. From: Wiggins, 1994.

Dragonflies (*Aeshna* and Libellulidae) together with a damselfly (*Enallagma*) were collected in the small pond and pothole but not the stream. These are predators adapted to living in still water.



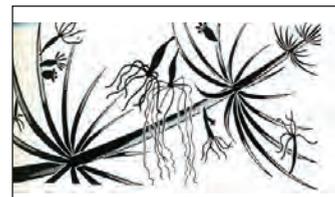
Top to bottom: Libellulidae, *Enallagma*, *Aeshna*.



Activity traps were set overnight in the stream to sample invertebrates that swim fast and elude the net. A plastic bottle is cut in half and the original open end is inverted into the closed portion. Bait is inserted and the trap filled with water. Only predaceous flatworms (planaria) attracted to the meat were caught.



Zooplankton sampled in the stream's pools were few in number. A specimen of *Hydra* (below) occurred amongst the plants in the stream. *Hydra* is not tolerant of poor water quality and is considered an indicator of clean water conditions.



Plants

Vascular plants collected in Fortynine Meadows - June and July, 2010.

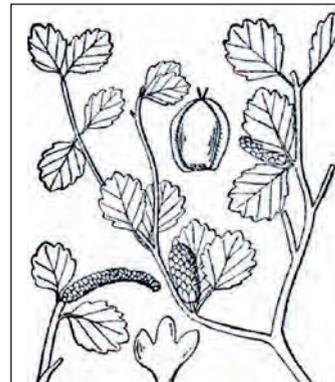
Subalpine fir	<i>Abies lasiocarpa</i>
Engelmann spruce*	<i>Picea engelmannii</i>
Lodgepole pine	<i>Pinus contorta</i>
Western larch*	<i>Larix occidentalis</i>
Grand fir*	<i>Abies grandis</i>
Western hemlock*	<i>Tsuga heterophylla</i>
Douglas fir*	<i>Pseudotsuga menziesii</i>
Western whitepine*	<i>Pinus monticola</i>
Labrador tea	<i>Ledum glandulosum</i>
bog birch	<i>Betula glandulosa</i>
Western bog laurel	<i>Kalmia microphylla</i>
Fool's huckleberry*	<i>Menziesia ferruginea</i>
Willow*	<i>Salix</i> sp.
Mountain heath	<i>Phyllodoce</i> sp.
Cottongrass	<i>Eriophorum angustifolium</i>
Firethread sedge	<i>Carex prionophylla</i>
Elephant's head	<i>Pedicularis groenlandica</i>
Saxifrage*	<i>Saxifraga oblongifolia</i>
White marsh marigold*	<i>Caltha biflora</i>
Horsetail	<i>Equisetum</i> sp.
False hellebore	<i>Veratrum californicum</i>
Meadow death camas	<i>Zigadenus venenosus</i>
Buckbean	<i>Menyanthes trifoliata</i>
Shooting star*	<i>Dodecatheon</i> sp.
Arrowleaf ragwort	<i>Senecio triangularis</i>
Montia	<i>Montia cordifolia</i>
Wallflower	<i>Erysimum cheiranthoides</i>
Alpine meadow butterweed	<i>Senecio cymbalaroides</i>
Bog orchid	<i>Platanthera dilatata</i>
Licorice root	<i>Ligusticum canbyi</i>
Sundew	<i>Drosera</i> sp.
Aquatic moss	<i>Fontinalis neomexicana</i>
Unidentified aquatic grass	

*located at edge of meadow

A hierarchical classification of semiaquatic wetland plants used by Cowardin et al. (1979) enabled us to define plant groupings in the meadow.

At the head of the meadow were small stands of *forested wetlands* dominated by lodgepole pine and subalpine fir. Six additional conifer species occurred at the meadow's edge. This was considered to be a highly diverse situation given such a small area (personal communication).

Scrub-shrub type communities were located mostly in the middle and southern end of the meadow with the dominant species being bog birch and western bog laurel.



Above and below: Scrub-shrub community of bog birch



Scrub-shrub community dominated by bog laurel.

Cowardin considered *herbaceous mats* as a third class of wetlands. Identification of moss here did not occur. However, it is believed that *Sphagnum* was dominant since the genus is characteristic of poor fens, sites with low alkalinity readings.



The entire meadow is defined as a peatland with a thick layer of moss supporting vascular plants dominated by sedges.



Firethread sedge (*Carex prionophylla*) flowers primarily in June. Its staminate spikes are dark colored. This same sedge is dominant at nearby Pinchot Marsh.



Cottongrass (*Eriophorum angustifolium*) was the dominant species of sedge blooming in July. The cotton-like inflorescences hanging from the top are carried by wind to aid in dispersal. It prefers acidic waters typical of poor fens.



Elephant's head (*Pedicularis groenlandica*). Some species of *Pedicularis* are smoked and thought to have medicinal effects.



Licorice root (*Ligusticum canbyi*).



Sundew (*Drosera rotundifolium*) uses sticky tentacles covering leaves to attract, trap and digest insect prey.



Bog orchid (*Platanthera dilatata*).

Reference sites

Research Natural Areas (RNA) can be used as reference points to observe changes on land and water over long periods of time. They serve as history books to help us understand events that shaped our current conditions. Also, RNAs provide baseline data to measure our impact on the habitat by investigating natural systems and comparing them with those affected by human activities.

Water samples, plants and invertebrates were collected from 42 wetland sites in National Forests of the Pacific Northwest from 1987-89 (Rabe et al. 1989). This included proposed and established RNAs, amongst them Fortynine Meadows.

Alkalinity readings in the meadows have remained essentially the same (9-11 mg/l) since July 1988. Water temperature readings varied little from 47 degrees F (8 degrees C) during the summer of 2010. Temperatures were not recorded in 1988.

Beaver living in northern Idaho have occupied and abandoned peatland sites similar to Fortynine Meadows including Lily Lake RNA, Bottle Lake RNA and Potholes RNA (Rabe and Chadee 1994, Chadee and others 1998). Over a period of about 20 years, beaver rebuild dams, raise water level, exhaust food supplies and abandon sites. Once they leave, a well advanced succession occurs with less water enabling encroachment of pioneer species on the sphagnum mat.

Two aquatic plants (*Sparganium* sp. and *Callitriche* sp.) occurred in beaver ponds in 1988 but were absent in 2010 probably since beaver had subsequently left the area. Additional aquatic and semiaquatic plants were not recorded in 1988 so it was not possible to make further comparisons.

Over a 22-year period (1988-2010) similarities and differences were noted in the aquatic invertebrate taxa. Seventeen species of macroinvertebrates occurred in 1988 compared to 27 species in 2010. However, more zooplankton species were observed in 1988 than in 2010. Sample size was limited for both of these dates.

Species of fly larvae (Diptera), caddisflies (Trichoptera) and beetle larvae and adults (Coleoptera) were somewhat similar on both dates. However, mayflies (Ephemeroptera) and snails (Gastropoda) were dissimilar. Sample size was too small to distinguish other groups.



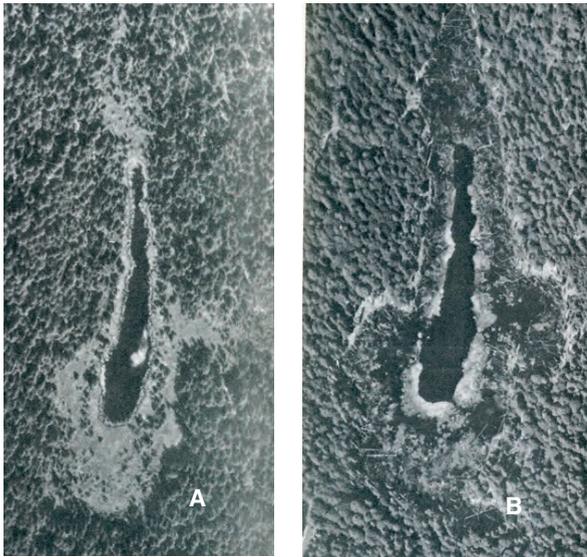
Present site of an abandoned beaver pond. In 1988, it was estimated to be 2.5 acres (1ha) in size and 3 ft (1m) deep (Rabe and others 1989). Chisel marks on a tree nearby were a sign of beaver occupancy then. A number of smaller ponds were dispersed along the stream. None exist today.



Once beaver leave a peatland like Fortynine Meadows, it is likely their dams break and the mudflats are colonized by pioneer plants such as conifers seen above. Rhizomatous sedges that appear in the background are cottongrass (*Eriophorum angustifolium*).



Bur-reed (*Sparganium* sp.), a macrophyte observed in 1988, was not seen in 2010.



Aerial photographs of Bottle Lake RNA in 1932 (A) and 1956 (B) (Rabe and Savage, 1977).

The above photographs are an example of peatland changes caused by beaver activity. The waterbody to the left (1932) illustrates beaver abandonment over a long period of time. The mat of sphagnum, surrounded by a sedge-dominated fen with scattered trees, became fixed to the pond bottom. This allowed species of conifers to colonize the lake basin and the yellow pond lily (*Nuphar* spp.) to establish itself in shallow water.

By 1956 (B), beaver had returned and built dams causing the water level to rise. This flooded the sedge mat, replacing it with aquatic plant communities. The sphagnum mat then became floating. In addition, *Nuphar* did not survive the deeper pond water and invading trees died out.

As mentioned earlier, reference areas can be used both to monitor and inventory the biota. Where management activities such as timber harvest and grazing occur within or adjacent to peatland sites, monitoring is recommended (Chadee and others 1998). Changes in water chemistry, vegetation and invertebrate communities have been monitored for many years at several Idaho and Montana peatlands (Moseley and others 1985, Rabe and Chadee 1994).

Although not often thought of as monitoring, an inventory of the biota can provide important baseline information. The persistence or absence of plant and animal populations may be an indication of change or stability of an ecosystem. Moseley and Bursik (1992) used checklists prepared 20 and 40 years earlier and determined that several rare

peatland plant species had disappeared from ponds in northern Idaho. On a smaller scale, this also happened at Fortynine Meadows.

Education

By participating in field data collection, class members obtain the benefits of hands-on learning. In addition, a discussion of results and research methods later contributed to a better understanding of the scientific method.

A handout describing the physical layout of Fortynine Meadows together with plant and invertebrate information was initially provided to the group. Workshop members rotated between sampling macroinvertebrates from stream and standing water, identifying conifers and collecting vascular plants. A work table was set up at camp where plants were pressed and macroinvertebrates identified to order.



Sampling invertebrates from Meadow Creek.



Macroinvertebrates collected from meadow were identified to order and later to genus and species back at town. Class members wished to pursue this activity.



Pressing vascular plants in the field.



Discussing day's activities at camp which was only a few miles north of the meadows.

Acknowledgements

Financial support was provided by the Mountaineers Foundation and the Idaho Native Plant Society's ERIG program.

Our thanks to Emily Poor, herbarium worker at the University of Idaho and Idaho Native Plant Society member, who identified some of the plants in the meadows. Also, thanks to Wade Hoiland, a past graduate student. Wade keyed out some bothersome macroinvertebrates for his erstwhile major professor.

We would like to extend our special appreciation to the *Great Old Broads for Wilderness* who attended this workshop and helped us with the field work. We couldn't have done it without you.

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Recommendations

Fortynine Meadows is deserving of RNA status for the following reasons:

It is an outstanding landscape comprised of a narrow strip of land 0.1 mile wide and 1 1/2 miles in length. Eight species of conifers border the site with a narrow spring stream meandering through the entire length of the meadows. Little sign of impact or habitation is evident.

Vascular plant species here differ significantly from those in Pinchot Marsh, a small regional peatland managed by BLM. Additional plant identification to include bryophytes is proposed for Fortynine Meadows.

The slow moving stream (Meadow Creek) consists mostly of runs and glides bordered by sedge and grass species. Twenty-seven species of macroinvertebrates occur in the aquatic moss (*Fontinalis neomexicana*). The moss provides additional structure and stability to the habitat ensuring greater species richness and invertebrate biomass.

Bull trout (*Salvelinus confluentus*) inhabit Meadow Creek (Lisa Hawdon). The trout is a *threatened species*.

Future studies might compare the physical environment, riparian vegetation and macroinvertebrate communities of Meadow Creek (spring stream) with the Little North Fork Clearwater River (riffle-pool) downstream.

Seasonal comparisons of invertebrate composition in ponds and potholes could be initiated since water level fluctuates there during the season.

Observations of future beaver occupancy would be interesting. Their ponds were common in 1988 but not at present. We have no idea when beaver abandoned the meadows. If investigations of this cyclic behavior continued, better records of vegetation and invertebrate differences would be kept.

It might be possible to study whether or not the northern bog lemming (*Synaptomys borealis*) lives in the meadows. It typically inhabits sphagnum bogs and fens but also other habitats. It is listed as a species of special concern by the Idaho Conservation Data Center and Montana Natural Heritage Program.

Accessibility to such an outdoor lab makes it easier to conduct research and educational workshops. Combining studies of physical features, hydrology, water chemistry, floristics and invertebrate communities enables us to better understand and appreciate this peatland ecosystem. Friends of the Clearwater and Idaho Native Plant Society are interested in further studies of the site.

