

White Rock Fen

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The large central fen has a floating sphagnum mat. *Rhododendron macrophyllum* in the foreground. Photo by Barbara Raible.

As the crow flies, it is only 20 miles east of Lebanon, Oregon, but you will not doubt that you've left the beaten path when you reach these wetlands with floating sphagnum mats and bog-dwelling rarities like fetid adder's tongue and Willamette isopyrum. Here in the western Cascade Mountains, White Rock Fen Area of Critical Environmental Concern (ACEC) harbors four pristine wetlands in minor drainages north of White Rock Creek, a tributary in the Crabtree Watershed in the South Santiam Basin. The wetlands were discovered in 1983 by Salem BLM District personnel while doing a field survey. Nominated as an ACEC candidate in 1986, the designation was approved in the District Resource Management Plan in 1995 (BLM 1995). A primary zone around the wetlands is surrounded by a secondary protection zone, for a total of 54 acres (see map). Elevation ranges from 3,320 to 3,520 feet. The area has

not been logged and remains essentially undisturbed.

White Rock Fen was designated as an ACEC to protect the four wetlands which make up the core area. The central wetland is the largest and contains a thick mat of sphagnum under an open tree canopy, with 2- to 10-foot wide channels of water meandering through it. A wet meadow and a shrubby area surround the central mat of sphagnum, with a mossy cliff and moist draw lying to the north. The two smaller wetlands that lie to the east and west of the central wetland have different water levels and correspondingly different vegetation. To the northeast, above BLM road 13.2, the northern-most wetland supports a small pool of open water with sphagnum banks. The entire area provides excellent opportunities for a variety of studies in palynology, sediments, sphagnum ecology, wetland development, and other biological and ecological research.

Plant Communities

Sphagnum wetlands provide specialized habitats for uncommon species. The floating sphagnum mat in the central wetland is particularly remarkable, and contains at least two species of sphagnum. Sphagnum is also present in the northern-most wetland. No sphagnum is visible in the other two wetlands, although it may be hidden beneath the other vegetation. In the mat, sphagnum mosses form a spongy turf where their upright stems crowd together to support each other. This growth pattern and specialized cells in sphagnum leaves and stems enables it to absorb and retain large quantities of water like a sponge. The sphagnum forms a living, saturated moss turf considerably higher than the original water level as it grows over a thick accumulation of dead sphagnum (peat).

Chester Novack, the district hydrologist, recorded a pH of 5.0 in the central wetland of the ACEC. This low (acid) pH, coupled with the abundance of sphagnum in floating mats and the primary influence of mineral-rich groundwater or pond water on the sphagnum formations, technically classifies White Rock Fen as a “poor fen” rather than a bog. In contrast, true bogs have lots of sphagnum but also have a raised or domed peat profile that isolates the vegetation from groundwater or pond water and limits the source of moisture to precipitation that is relatively mineral-poor compared to groundwater. There are no true bogs in Oregon, although fens and poor fens may contain localized hummocks of sphagnum and other vegetation that may be raised above the influence of groundwater (John Christy, pers. comm.). The acidity of water in poor fens and bogs is largely due to sphagnum removing metal cations from the water and leaving hydrogen ions as the predominant cation in solution.

The acidic environment of bogs and poor fens selects a distinctive assemblage of plants. Two species, round-leaved sundew (*Drosera rotundifolia*) and swamp cranberry (*Vaccinium oxycoccus* var. *intermedium*), have been identified in the central wetland. The



Close view of flower of fetid adder's tongue, with a fungus gnat. Photo by Aaron Liston.

Wetlands: Bogs, Fens and Poor Fens

Wetland ecosystems support water-loving (hydrophytic) plants. Soils are usually wet or damp much of the year and are typically saturated for two weeks or more during the growing season. Wetland nomenclature and classification vary widely depending on geography, purpose, or political system. No single naming system is widely accepted worldwide. In the United States, the US Army Corps of Engineers, the Environmental Protection Agency, the US Fish and Wildlife Service, and various state and local government agencies use various systems with similarities and differences.

General terms include marsh, bog, fen, mire, and swamp. Tidal flats, salt marshes, freshwater marshes, peat bogs, cranberry bogs, pocosins, moors, are specific terms for wetland types.

Fen, **poor fen**, and **bog** are used in this issue of *Kalmiopsis* to describe special wetlands found in several botanical areas. Although these terms have been defined in many different ways throughout the world, the terms here follow those in the recent US Environmental Protection Agency publication EPA 843-F-01-002b, *Types of Wetlands*, March 2002, available on line at http://www.epa.gov/owow/wetlands/facts/types_pr.pdf.

Whether the water, soil or substrate is acidic or alkaline greatly influences which plant species thrive in a given wetland. A **fen** is a wetland in which the water is alkaline to only slightly acid and has been in contact with mineral soil; the substrate is accumulated organic material derived primarily from graminoids (grasses, sedges, rushes) and bryophytes other than *Sphagnum*. Fens may be flat or sloping, including relatively steep slopes. A **bog** is a wetland in which the water is acidic and comes only from precipitation that is relatively mineral-poor compared to groundwater; the substrate is accumulated organic material derived primarily from *Sphagnum*, graminoids, and Ericaceous shrubs. Bogs may be flat or sloping and are characterized by a sphagnum peat layer that lifts the vegetation above contact with mineral-rich ground water. In Oregon, there are apparently no true bogs, and the acidic wetlands with sphagnum are classified as **poor fens**. The modifier comes from the relatively poor nutrient levels and acidic conditions. In western Oregon, certain species are indicators of acid substrates, such as *Drosera rotundifolia* and *Vaccinium oxycoccus*. Others, including *Darlingtonia californica* and *Gentiana setigera*, are commonly found in fens.

Peat refers to the amorphous or partially decomposed organic remains of plant materials found in a bog, fen, or other wetland. Peat found in bogs derives from *Sphagnum*, so it is acidic and has special characteristics related to the antiseptic properties of the moss. It is often used as an additive to make garden soils acid and improve their organic content. Peat formed from graminoid organic matter may not be acidic.

—Frank Lang and John Christy



Fetid adder's tongue (*Scoliopus ballii*). Photo by Charlene Simpson.

surrounding riparian zone supports fetid adder's tongue (*Scoliopus ballii*), a former BLM watch-listed species, and Hall's false rue anemone (*Enemion ballii*), a former BLM review-listed species.

One of the more unusual flowering plants characteristic of poor fens in the western Cascades is round-leaved sundew, an insectivorous plant. Its leaves, concentrated in a basal rosette, are adapted for catching small insects. After the sticky, knobbed hairs on the upper surface and along the margins snare a victim, the longer hairs at the leaf edge slowly bend inward, and the prey is soon securely trapped. Glands on the hairs release enzymes that initiate digestion of the insect proteins, while other small glands on the leaf surface absorb the products of digestion. This insectivorous capability offsets one obstacle associated with living in a bog or poor fen, where nitrogen and other minerals are scarce. Sundew produces a few six-petaled white flowers, each about 1/4-inch across, on a stalk that forks once or twice. The flowers open for a relatively short time near midday and thus are likely to pass unnoticed.

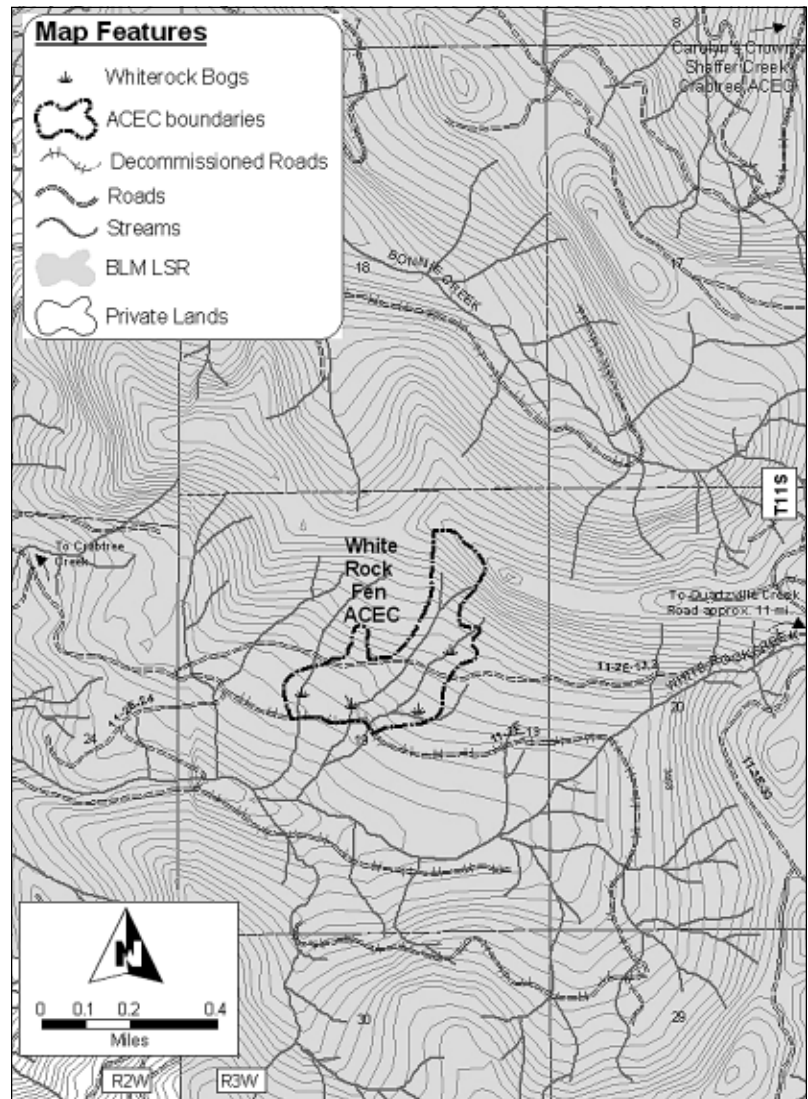
Also at White Rock Fen is wild cranberry, a tiny shrub in the heath family whose trailing stems grow in tangled masses. Its leaves, mostly less than 3/8-inch long, are pointed at the tip. The nodding, deep pink flowers have four petals and are approximately 3/8-inch across when first open, before the petals turn up. The berries, ripening in late summer, are nearly round, generally less than 3/8-inch in diameter and bright red. The berries are edible and were very highly valued by the coastal Native Americans.

Many herbaceous plants such as boykinia, bittercress, sedges, bog orchids, and groundsel, surround the wetlands. On drier ground, bunchberry, willowherb, and foam flower appear interspersed with a shrub layer of rhododendron, thimbleberry, salmonberry,

willows, slide alder, fool's huckleberry, and vine maple. This brushy area trends into a dense forest considered to be marginal for timber production. The western hemlock, western red cedar and Douglas fir are over 140 years old, but are short (100 ft.), small-diameter trees. With hundreds of trees per acre little sunlight reaches the ground, so understory vegetation is sparse, consisting of occasional beargrass and swordfern. Oxalis, lady ferns, and twinflower grow only in the riparian areas along the streams.

Soils, Geology and Climate

The soils found in White Rock Fen are predominately Crabtree stony loam with areas of Bensley and Valsetz stony loams (Langridge 1987). Crabtree soils are underlain by a strongly consolidated subsoil which can contribute to the presence of a perched water table two to three feet below the surface. Where the upper soil horizons have been removed, this water table intersects the ground surface, sometimes creating standing water.



Topographic map of White Rock Fen.



The surrounding dense forest of western red cedar, western hemlock and Douglas fir has a depauperate understory. Photo by Barbara Raible.

Formation of the wetlands here appears to be the result of ancient large-scale mass wasting (slumping/landslides) of the local ridge system, creating a system of landslide scarps and sag ponds. Highly permeable soil and shallow bedrock permit extensive lateral movement of subsurface water through this area. A rocky, boulder-strewn slope above the wetlands appears to provide the water source. No similar configuration of hydrological systems is known elsewhere on Salem District (Jim Fogg, BLM hydrologist, file report), although it is not uncommon elsewhere in landslide topography in the western Cascade Range (John Christy, pers. comm.). The three lower wetlands may have formed from what was at one time a single large wetland. The linear configuration of the lower wetlands and the large stair-stepped topography lend credence to this theory (C. Novak, 1988 file report).

Wildlife

The wetlands are visited by a variety of wildlife species seeking water. Signs of elk and deer as well as bear have been seen throughout the ACEC. Because the surrounding dense forest canopy has little forest floor vegetation, the open habitat around the bogs is well browsed. The water habitat attracts many insects and amphibians. Damselfly and

dragonflies can be seen flying over the central wetland, while giant Pacific salamanders and rough skinned newts swim in the channels.

Management

This ACEC is managed to permit natural processes to occur unhindered by overt human intervention. It is surrounded by land designated as Late Successional Reserve (LSR) under the Northwest Forest Plan. Because of the advanced ages of the surrounding forests this land is planned for retention as older forest habitat in the future. The site is monitored on an annual or bi-annual schedule to detect any unacceptable human use and to track the course of natural processes.

The natural succession of wetlands is to fill with sediment and change into meadows or other upland habitats. Shrubs are encroaching on the two smaller wetlands, and trees are beginning to fill in around the edges. Standing water is present only during winter and spring. As these are natural processes, no management actions will be taken to alter the outcome. It is not unusual for even larger pools and ponds to be dry by the end of summer during drought years (J. Christy, pers. comm.). Core sampling of sediments under the wetland would provide clues to the history of the site.

Visiting White Rock Fen

Few people visit White Rock Fen because the area is not easily accessed. Much of the route consists of narrow gravel roads not suitable for large or low clearance vehicles. Snow typically blocks roads from December to April and it is recommended that visitors contact the Salem BLM Office [503-375-5646; address above] for directions, a map, and current road conditions.

To find White Rock Fen, drive east on Highway 20 from Sweet Home for four miles, turn north on the Quartzville Access Road at the sign for Quartzville and Green Peter Reservoir. Follow this paved road 20.5 miles along Green Peter Reservoir and Quartzville Creek, which is a designated National Wild and Scenic River, then



The pond area of the central wetland was dry in 2003. Photo by Barbara Raible.



The central wetland normally has open water, bordered by a sphagnum mat with sundew. Moving out from this edge, one encounters bog cranberry, rushes, rhododendron, and finally a band of Sitka alder before entering the forest. Photo by Barbara Raible.

turn left onto Yellowstone Access Road, 11-3E-35.3. After 2.1 miles, keep left on Road 11-3E-26.1 for another 0.7 miles and then stay left again as the road becomes 11-3E-35.1 and drive 1.3 miles. Turn right on Road 11-3-27 and drive 2.9 miles, then turn right on Road 11-3E-33. Drive 3.3 miles, and turn left on 11-2E-13.2. Drive 1.6 miles and turn left onto the 11-2E-24. Continue 0.2 mile and park when you reach Road 11-2E-19, which is blocked and has had the culverts removed. Walk along this ripped-up road, then go uphill at the first drainage (culvert has been pulled) to reach the first wetland. The largest wetland is uphill from the second drainage, but walking through the forest between the wetlands is fairly easy because of the lack of understory, although there is considerable downed wood. There is no drinking water, nor developed trails or facilities. Care should be taken with natural hazards, including downed trees across the animal trails and floating sphagnum mats at the edges of the wetlands, which are not solid footing.

Acknowledgments

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Vascular Plant Species List

This non-comprehensive list was compiled by BLM botanist Claire Hibler. Nomenclature follows the checklist for the Oregon Flora Project.

FERNS AND THEIR ALLIES

BLECHNACEAE (Deer Fern Family)

Blechnum spicant (L.) Sm. (deer fern)

DENNSTAEDTIACEAE (Bracken Family)

Pteridium aquilinum (L.) Kuhn var. *pubescens* L. Underw. (bracken fern)

DRYOPTERIDACEAE (Wood Fern Family)

Athyrium filix-femina (L.) Roth var. *cyclosorum* Rupr. (northwestern lady fern)

Polystichum munitum (Kaulf.) C. Presl (western swordfern)

EQUISETACEAE (Horsetail Family)

Equisetum (horsetail)

GYMNOSPERMS

CUPRESSACEAE (Cypress Family)

Thuja plicata D. Don (western red cedar)

PINACEAE (Pine Family)

Pinus monticola Douglas (western white pine)

Pseudotsuga menziesii (Mirbel) Franco var. *menziesii* (Douglas fir)

Tsuga heterophylla (Raf.) Sarg. (western hemlock)

DICOTYLEDONS

ACERACEAE (Maple Family)

Acer circinatum Pursh (vine maple)

APIACEAE (Carrot Family)

Cicuta douglasii (DC.) J. Coulter & Rose (western water hemlock)

Oenanthe sarmentosa J.S. Presl (Pacific water parsley)

ARALIACEAE (Ginseng Family)

Oplopanax horridus (Sm.) Miq. (devil's club)

ARISTOLOCHIACEAE (Birthwort Family)

Asarum caudatum Lindl. (wild ginger)

ASTERACEAE (Sunflower Family)

Lactuca muralis (L.) Fresen. (wall lettuce)

Senecio triangularis Hook. (bog groundsel)

BETULACEAE (Birch Family)

Alnus rubra Bong. (red alder)

Alnus viridis (Chaix) DC. ssp. *sinuata* (Regel) A. Löve & D. Löve (Sitka alder)

BRASSICACEAE (Mustard Family)

Cardamine (bittercress)

CAPRIFOLIACEAE (Honeysuckle Family)

Linnaea borealis L. var. *longiflora* Torr. (western twinflower)

CALLITRICHACEAE (Water-starwort Family)

Callitriche (water-starwort)

CORNACEAE (Dogwood Family)

Cornus unalaschensis Ledeb. (bunchberry dogwood)

DROSERACEAE (Sundew Family)

Drosera rotundifolia L. (roundleaf sundew)

ERICACEAE (Heath Family)

Chimaphila umbellata (L.) W. Bartram (prince's pine)

Gaultheria ovatifolia A. Gray (Oregon wintergreen)

Gaultheria shallon Pursh (salal)

Ledum glandulosum Nutt. (western Labrador tea)

Menziesia ferruginea Smith (fool's huckleberry)

Rhododendron macrophyllum D. Don (Pacific rhododendron)

Vaccinium oxycoccos L. (swamp cranberry)

Vaccinium parvifolium Smith (red huckleberry)

Vaccinium uliginosum L. ssp. *occidentale* (bog blueberry)

GROSSULARIACEAE (Gooseberry Family)

Ribes bracteosum Douglas ex Hook. (stink currant)

HYDROPHYLLACEAE (Waterleaf Family)

Hydrophyllum tenuipes A. Heller (Pacific waterleaf)

HYPERICACEAE (St. John's Wort Family)

Hypericum anagaloides Cham. & Schltld. (bog St. John's wort)

LAMIACEAE (Mint Family)

Mentha canadensis L. var. *canadensis* (L.) Kuntze (field mint)

MENYANTHACEAE (Buckbean Family)

Menyanthes trifoliata L. (buckbean, bogbean)

OLEACEAE (Ash Family)

Fraxinus latifolia Benth (Oregon ash)

ONAGRACEAE (Evening Primrose Family)

Epilobium ciliatum Raf. ssp. *glandulosum* (Lehm.) Hoch & Raven (purple leaved willow herb)

OXALIDACEAE (Oxalis Family)

Oxalis oregana Nutt. (redwood sorrel)

PRIMULACEAE (Primrose Family)

Trientalis latifolia Hook. (western starflower)

RANUNCULACEAE (Buttercup Family)

Caltha leptosepala D.C. (marshmarigold)

Enemion hallii (A. Gray) J.R. Drumm. & Hutch. (Willamette false rue anemone)

ROSACEAE (Rose Family)

Physocarpus capitatus (Pursh) Kuntze (Pacific ninebark)

Rubus parviflorus Nutt. (thimbleberry)

Rubus spectabilis Pursh. (salmonberry)

Spiraea douglasii Hook. (Douglas spiraea, hardhack)

RUBIACEAE (Madder Family)

Galium oreganum Britton (Oregon bedstraw)

Galium triflorum Michaux (sweetscented bedstraw)

SALICACEAE (Willow Family)

Salix (willow)

SAXIFRAGACEAE (Saxifrage Family)

Boykinia major A. Gray (mountain boykinia)

Boykinia occidentalis Torrey & A. Gray (coast boykinia)

Mitella ovalis Greene (coastal mitrewort)

Tiarella trifoliata var. *unifoliata* (Hook.) Kurtz (one leaf foamflower)

Tolmiea menziesii (Pursh) Torr. & A. Gray (piggyback plant)

SCROPHULARIACEAE (Figwort Family)

Mimulus guttatus DC (common monkeyflower)

VIOLACEAE (Violet Family)

Viola glabella Nutt. (stream violet)

MONOCOTYLEDONS

ARACEAE (Arum Family)

Lysichiton americanum Hultén & St. John (skunk cabbage)

CYPERACEAE (Sedge Family)

Carex (sedge)

Carex hendersonii Bailey (Henderson's sedge)

Scirpus (bulrush)

JUNCACEAE (Rush Family)

Juncus (rush)

Luzula parviflora (Ehrh.) Desv. (small flowered woodrush)

LILIACEAE (Lily Family)

Clintonia uniflora (Schult.) Kunth (beadlily)

Scoliopus hallii S. Watts. (fetid adder's tongue)

Triantha glutinosa (Michx.) Baker (sticky tofieldia)

Trillium ovatum Pursh (western trillium)

Xerophyllum tenax (Pursh) Nutt. (beargrass)

ORCHIDACEAE (Orchid Family)

Goodyera oblongifolia Raf. (rattlesnake plantain)

Platanthera dilatata (Pursh) Lindl. ex Beck var. *leucostachys* (Lindl.) Luer (white bog orchid)

Platanthera stricta Lindley (slender bog-orchid)

Listera (twayblade)

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