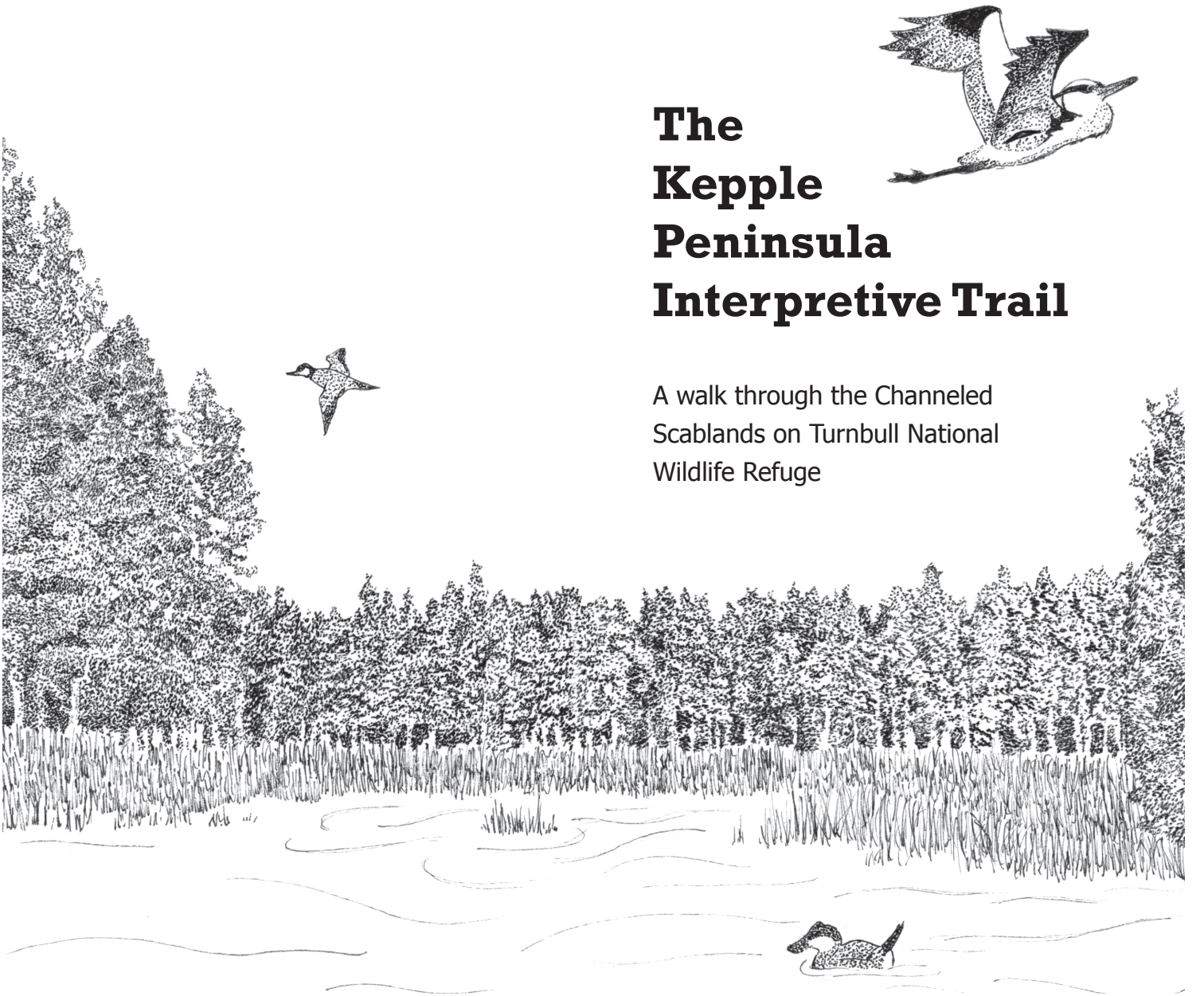
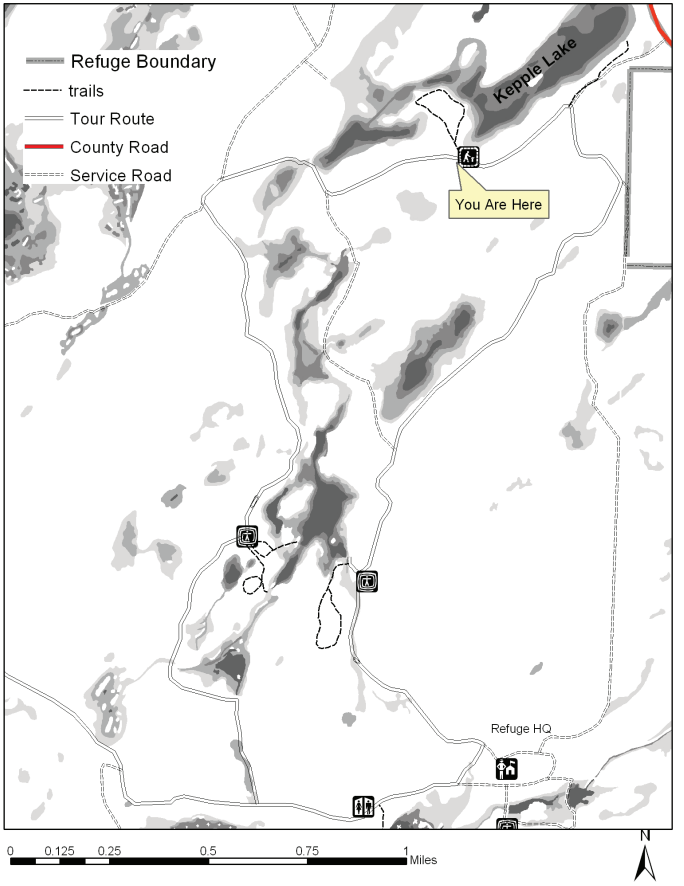


The Kepple Peninsula Interpretive Trail

A walk through the Channeled Scablands on Turnbull National Wildlife Refuge



Thank you for visiting Kepple Peninsula Trail at the Turnbull National Wildlife Refuge.

This Trail Guide is made possible by the Friends of Turnbull National Wildlife Refuge. To support environmental education at the refuge please join the Friends of Turnbull National Wildlife Refuge.

Acknowledgements:
The text of this brochure was written by Margaret O'Connell of Eastern Washington University's Turnbull Laboratory for Ecological Studies. Original drawings were contributed by Eastern Washington University Students Jeremiah Dung, Jennifer Justice, Cassie Hebel, Melinda Howard, Katrina Refior, and Licia Stragis. Heather McKean and Larry Conboy of Eastern Washington University contributed to the design. Graphic design by Kristina Fritz. Refuge staff assisted with photos and editing.

17 Native Plants

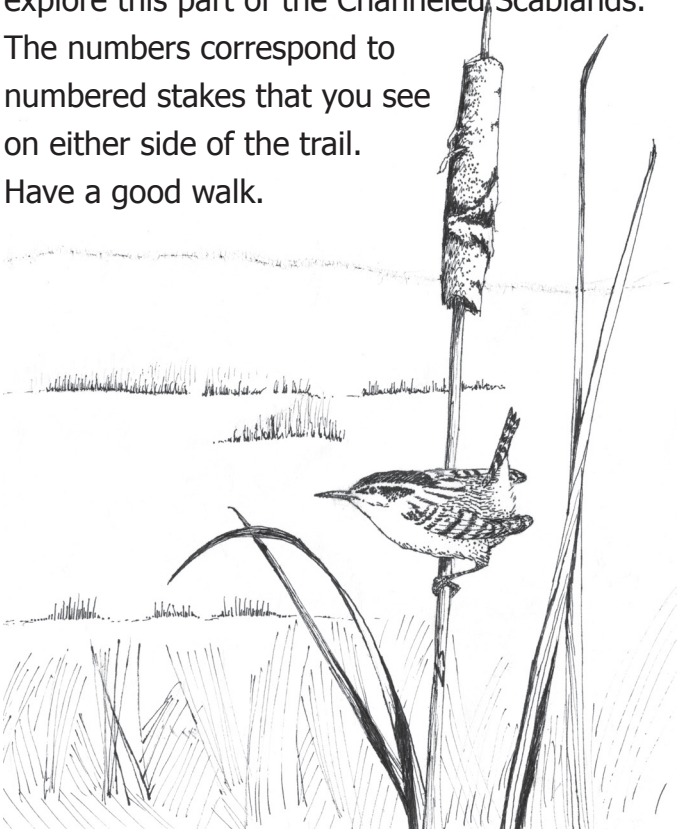
Depending upon the time of year, the field in front of you might be different hues of green; mosaics of yellows, blues, and green; or shades of browns with a low carpet of green. The common native plants that grow in these meadows include yarrow, arrowleaf balsamroot, grass widow, lupine, fern-leaved lomatium, yellow bells, camas and Idaho fescue. Native Americans have used many of these plants for food or other purposes. Yarrow has been used to stop the bleeding of and disinfect wounds, as a poultice for burns, as a tea to treat fevers, and as a boiled solution to treat aching backs. The tender, inner portions of arrowleaf balsam root flower stalks can be eaten like celery and the seeds roasted and ground. The blue-flowered lily, camas, was one of the most important food staples of many western Native Americans and it was widely traded between peoples of different regions. The camas bulbs were dug up in late spring when the flowers on the lower part of the stalk began to fade and the bulbs were at their sweetest. The bulbs were then baked in earth ovens near pine stands close to the digging camps. Although men helped with collecting firewood, they were not allowed to participate in the digging or baking of the camas "lest bad luck and famine overtake all".

BLUE CAMAS

Welcome to

Kepple Peninsula Interpretive Trail

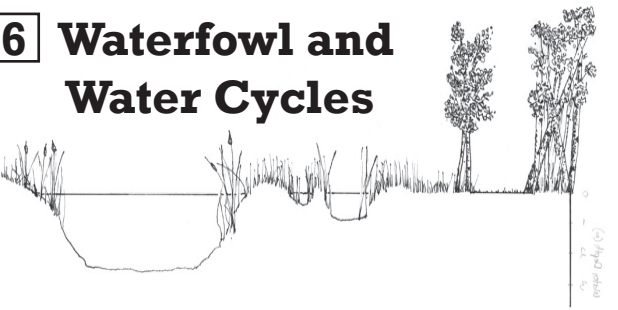
The 0.44-mile trail will lead you through grasslands, ponderosa pine forests and by ponds and marshes. Use this guide as you explore this part of the Channeled Scablands. The numbers correspond to numbered stakes that you see on either side of the trail. Have a good walk.



1 Prescribed Burns

Fire is a natural part of the ponderosa pine ecosystem; evidence suggests that historically fires occurred every 8-25 years. The thick bark and relatively high crown of mature ponderosa pine trees allow them to withstand the effects of low intensity burns. Early explorers described these forests as consisting of very large trees, spaced widely apart with a great diversity of flowers and grasses on the forest floor. With increasing European settlement, fire suppression led to dense, unnatural forest stands and encroachment of ponderosa pine trees into aspen stands. To restore these forests to their former park-like condition and reduce the growth of pines into the aspen stands, managers in 1990 began prescribed burnings coupled with prior thinning. The forest stand across the auto-tour road was one of the first areas to be burned under this program. Notice how the aspen trees are regenerating.

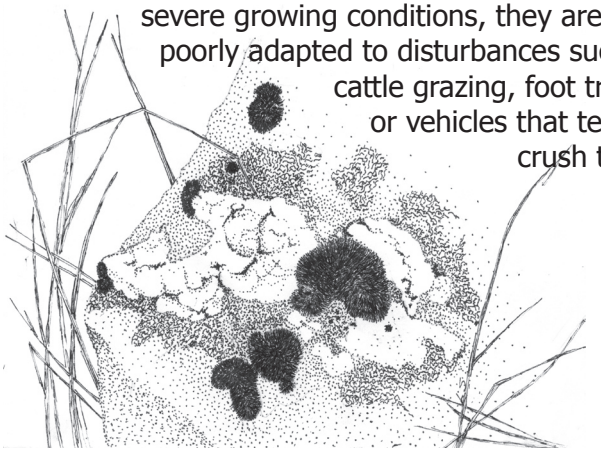
16 Waterfowl and Water Cycles



Depending on the time of year you are here, the waterfowl activity in Kepple Pond will vary. During spring and summer look for mallards, redheads, American widgeons, lesser scaups, teals, ruddy ducks, buffleheads, and hooded mergansers. During the spring and fall migrations, tundra swans and common and Barrow's goldeneyes might be seen. Winter activity depends upon how frozen the pond becomes. The biodiversity of Turnbull stems, in large part, from the variety its wetlands. Some of these are small, seasonal vernal pools that depend on annual spring runoff. Other ponds, such as Kepple, also depend on annual runoff, but are much larger and deeper than the small vernal pools. These deeper ponds retain water throughout the year except during extreme drought conditions. Other ponds on the refuge (for example, Pine Lake) are spring fed.

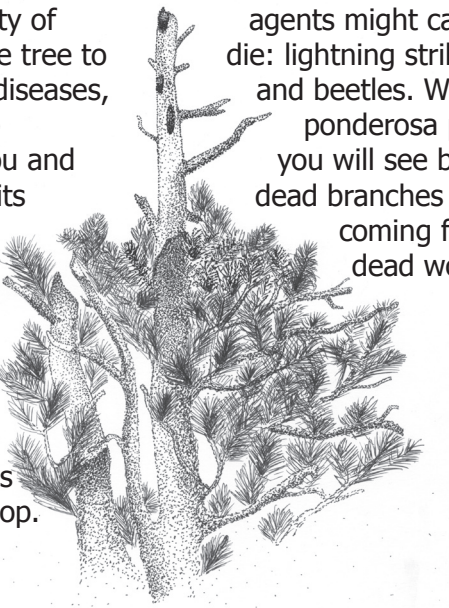
15 Cryptogamic Crust

In the dry Columbia Basin, open ground spaces can be covered by a highly specialized community of organisms known by a variety of names such as biological soil crusts, microbiotic crusts, or cryptogamic crusts. You can see examples of such microbiotic crusts on both sides of the trail. These organisms include cyanobacteria (i.e., blue-green algae), green and brown algae, mosses, and lichens. The lichens themselves are a combination of fungi, algae, and cyanobacteria. Cryptogamic crusts play several important roles in their ecosystems. Through the binding action of the bacterial filaments and the "rootlike" hypha and rhizoids of the fungi and mosses, respectively, the crusts contribute to increased soil stability and resilience to wind and water erosion. Comparisons of nutrients of plants growing in areas with and without crusts indicate that plants associated with cryptogamic crusts have higher levels of nutrients such as nitrogen, phosphorous, and calcium. Although these crusts have evolved to grow in severe growing conditions, they are poorly adapted to disturbances such as cattle grazing, foot traffic, or vehicles that tend to crush them.



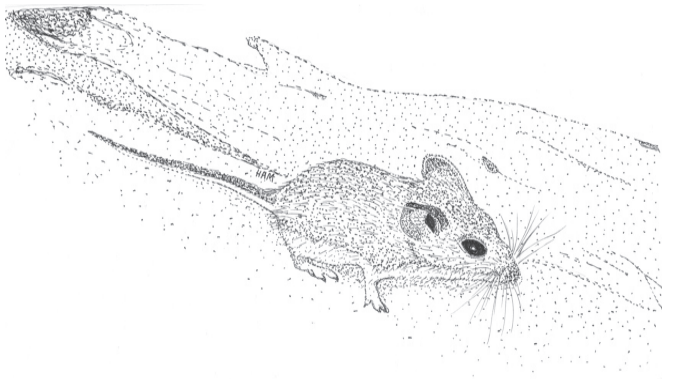
2 Dead-top Pine Trees

Your first reaction to seeing a big pine tree with its top part dead might be "oh, how sad". However, these trees play a critical role in the forest ecosystem because many species of birds, mammals, amphibians, and invertebrates need dead trees for shelter. When the entire standing tree is dead it is called a snag and resource managers develop plans to ensure that there are sufficient snags in forests for these wildlife species. Because they are dead and starting to rot, snags fall down quicker than live trees. This is especially true at Turnbull because the shallow, rocky, nutrient-poor soils of much of the Refuge preclude the growth of strong taproots. Consequently, these live trees with dead tops provide the benefits of snags while having the potential to remain standing for a much longer time. A variety of agents might cause the top of the tree to die: lightning strikes, porcupines, diseases, and beetles. Watch the dead-top ponderosa pine in front of you and you will see birds perching on its dead branches and going and coming from holes in the dead wood. If it's spring or summer, there might be bats roosting inside cavities in the dead top.



3 Logs

The importance of trees in forest ecosystems doesn't end when the trees fall over and become logs. Decaying logs play several key roles. As the logs decay, they contribute to nutrient recycling and soil building. It is not uncommon to see tree seedlings sprouting from the mounds of well-decayed logs. Many invertebrates including spiders, ants, earthworms, beetles, and snails, find shelter and food in the decaying logs. The moist environment under the bark of decaying logs provides habitat for salamanders, such as the long-toed salamander (*Ambystoma macrodactylum*), that feed on the invertebrates and need to keep their skins moist. Small mammals, such as the deer mouse (*Peromyscus maniculatus*) and yellow-pine chipmunk (*Tamias amoenus*) will use the logs as runways for travel as well as foraging sites for invertebrates and fungi. Larger mammals will use the larger logs as den sites.



14 Kinnickinnick

The low-growing shrub along side the trail is called *Arctostaphylos uva-ursi* or by its common name, bearberry. This evergreen shrub grows well in sandy soils of ponderosa pine stands. If it is spring or early summer, look for clusters of white-to-pink urn-shaped flowers. Bearberry's bright red berries are persistent into winter and are eaten by a variety of wildlife. Native Americans named this shrub skwasay and used it in many ways. The leaves were combined with leaves of other plants including tobacco to make a smoking mixture. This use has led to another common name for this plant, kinnickinnick, which is an Algonquian word for, "that which is mixed". The leaves of bearberry have long been used for medicinal purposes. Best collected on clear, fall mornings, the leaves are dried. The leaves can then be brewed to make a curative tea for kidney ailments or the leaves can be pulverized to make a poultice for burns or canker sores. The berries were sometimes eaten raw, especially during hard winters to stave off starvation, but were more commonly cooked. The berries can be fried in grease until they pop like popcorn, dried and used as a condiment for deer liver, or used to produce a cider. Current uses for the berries include jellies, cobblers, pies, and wine.

13 At Home in the Rocks

A variety of wildlife use rock outcrops such as the one to the right of the trail. After their early spring migration to the water to lay eggs, long-toed salamanders return to crevices in these outcrops to find moist, cool habitat during the summer months and protected areas for their winter dormancy. Yellow-pine chipmunks scurry in and out of holes in these outcrops as they forage for food during the

warmer months and then retreat to protected burrows in winter. Seeds are chipmunk's main food but they also eat insects and fungi. Recent studies on the refuge reveal that chipmunks find and consume underground fruiting bodies of fungi, known as truffles. The chipmunks disperse the spores of the truffles and therefore play an important role in forest health because these underground fungi become associated with the roots of the pine trees and facilitate the uptake of nutrients and water. Another inhabitant of the refuge's rock outcrops is the long-eared myotis bat (*Myotis evotis*). When you think of bats roosting in rocks, you probably think about large caves or deep mines, but radio-tracking studies of the long-eared myotis on the refuge reveal that female bats select roosts in basalt outcrops to raise their young.

4 Gopher Mounds

The mounds of dirt that you see along side the trail were made by northern pocket gophers (*Thomomys talpoides*). Gophers live underground, digging tunnels through the dirt and pushing the excavated earth to the surface to form these gopher mounds. They are known as "chisel-teeth diggers" because their two strong upper front teeth remain on the outside when their mouths are closed and are used to dig. Their teeth grow continuously and if a gopher can't dig, the teeth will grow longer and longer and begin to coil back on themselves. On each side of the gopher's mouth are fur-lined cheek pouches that they use to transport roots, leaves, and seeds that they eat. The tunnels and nesting chambers that gophers excavate are used by other wildlife species including other rodents, snakes, weasels, and salamanders.

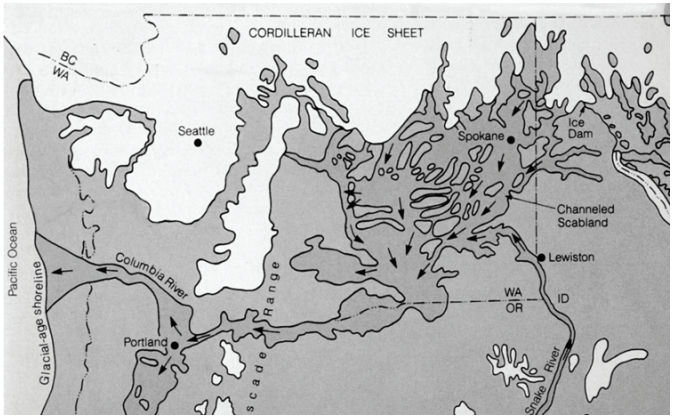
5 Environmental Education

This shelter is one of the 4 outdoor Environmental Education teaching areas on Turnbull. Although maintaining suitable habitat for wildlife is the primary mission of the refuge, successful wildlife management ultimately depends upon an informed public. The US Fish and Wildlife Service at Turnbull is committed to an Environmental Education Program that provides students of all ages a chance to both learn and educate others about the refuge's wildlife and wildlife habitat. Each year about 6,000 people visit these outdoor classrooms. School groups visit the refuge for day-long environmental activities. Workshops and classroom visits help prepare teachers and students for their environmental education trips. Other activities include summer night hikes that are open to the public. Volunteers help facilitate many of the field trips. This structure was constructed by volunteers from the Inland Northwest Wildlife Council and Geiger Corrections Centers.

Eventually, the rising lake level caused Lake Missoula's ice dam in northern Idaho to catastrophically fail, sending a torrent of water, with a flow 10 times that of all today's rivers of the world combined, racing across Idaho's Rathdrum Prairie and into eastern Washington. The raging floodwaters reached speeds of 60 mph and carried 400 million cubic feet of water per second; the height of the flood crest where you stand reached over 200 feet! Perhaps as many as 89 different flood events occurred during the last glaciation. The floods scoured the earth, carrying boulders, huge blocks of basalt bedrock, and icebergs. The result of the floods left a rough jumble of mesas and depressions so irregular that there are no through-flowing streams for nearly 70 miles, creating the unique wetlands and sloughs of Turnbull.

12 Ice Age Floods Shaped the Land

Turnbull is in the "Channeled Scablands". All the water bodies or sloughs of the region, such as the one in front of you, lie in a more or less parallel northeast to southwest orientation. There is a spectacular story behind the formation of these sloughs. As the glacial ice sheets moved south from Canada during the last Ice Age (16,000 to 12,000 years ago) they blocked the Columbia and Clark Fork Rivers creating large glacial lakes behind these ice dams. The largest of these lakes was Glacial Lake Missoula that covered about 3,000 square miles and was about 2,000 feet deep.



6 Shrubs

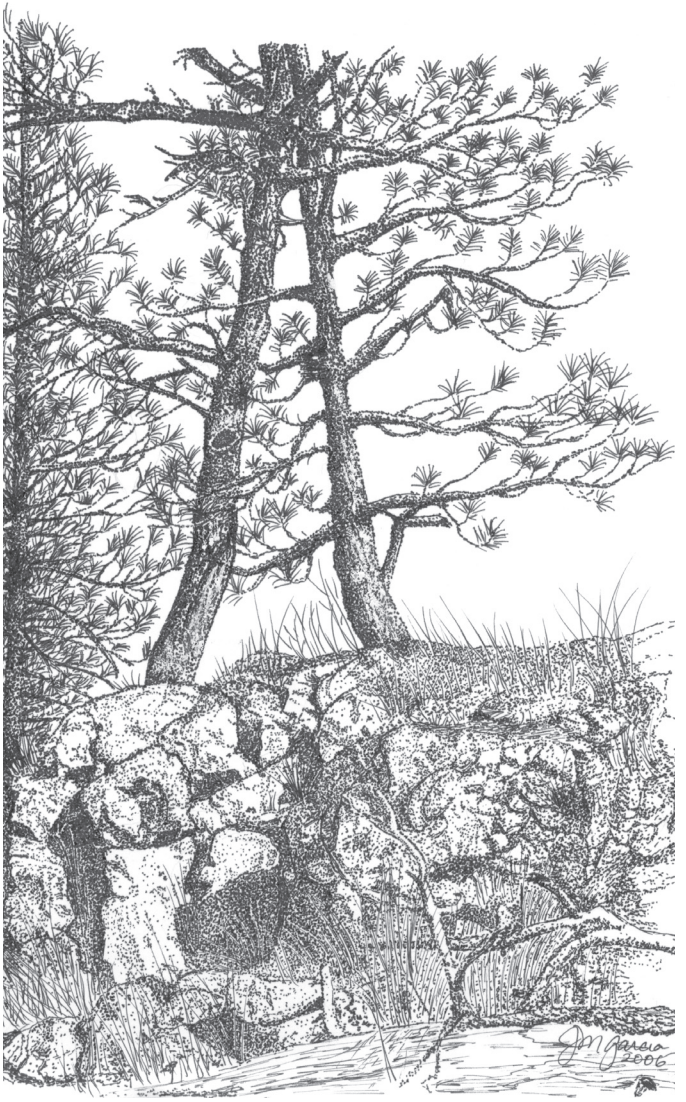
Shrubs such as willows (*Salix* spp.), snowberry (*Symphoricarpos albus*), and rose (*Rosa woodsii*) create interface habitat between wetlands and pine forests and between open meadows and pine forests. The thickets formed by these shrubs provide nesting sites for many birds and hiding cover during fawning/calving for deer, elk, and moose. The berries of the snowberry provide food for wildlife and both the leaves and fruits of the other shrubs are eaten by a variety of wildlife. Higher insect numbers in these thickets also attract foraging bats.

7 Reed Canary Grass

The marsh vegetation to the left has become dominated by an introduced grass species known as reed canary grass (*Pharlaris arundinacea*). Native to Eurasia, reed canary grass was planted by farmers for hay. This grass was introduced to the refuge during the 1940's to stabilize banks of islands that managers created to maximize nesting habitat for ducks. The creeping rhizomes of this grass are well-suited for this purpose. Although reed canary grass cannot withstand long periods in deep water, it does well in areas with spring flooding of up to 4 feet. A combination of drought and land-use practices has contributed to the grass becoming established in many areas of the refuge. In some areas, reed canary grass has displaced sago pondweed (*Potomogeton pectinatus*) that is an important food for many ducks and gray howelia (*Howelia aquatilis*), a threatened aquatic plant. The reed canary grass exemplifies the reason why many managers now favor using native plants instead of introduced species.

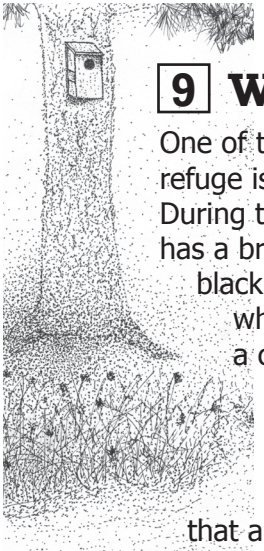
11 Lava Formed These Rocks

The rocks that form the outcrops, such as the one to the right of the trail, and cliffs on Turnbull are composed of basalt. Basalt is a type of volcanic rock formed by the partial melting of the earth's crust. About 200 million years ago the land where you now stand was at the edge of the Pacific Ocean. As the North American plate moved westward with the expansion of the Atlantic Ocean, it rode up and over the Pacific plate resulting in mountain formation. During the same time large offshore islands, some the size of Japan's main island, rafted in and joined the North American plate to form what is now the Okanogan Highlands and other portions of western Washington and British Columbia. About 17.5 million years ago, huge volumes of dark lava called basalt began to episodically erupt from long cracks in northeastern Oregon, southeastern Washington, and western Idaho. These extremely voluminous flows were 100-200 feet thick and in some cases flowed hundreds of miles from their source vents. Those here in Turnbull are about 14.5 million years old and originated from vents in northeastern Oregon, about 100 miles away!



8 Tree Cavities

Keep your eyes open for holes in snags, tall stumps, or the dead top portion of live trees like the one to your left. At Turnbull, northern flickers, downy woodpeckers, hairy woodpeckers, red-naped sapsuckesr, pygmy nuthatches, white-breasted nuthatches, red-breasted nuthatches, mountain chickadees, and black-capped chickadees excavate holes each year. They are collectively known as "primary cavity nesters" and they play an important role in these pine forests because secondary cavity users (e.g., wrens, American kestrels, bluebirds, flying squirrels, bats, and marten) may occupy these cavities in following years. With the exception of the sapsucker, all Turnbull's primary cavity nesters are year-round residents. Biologists studying these birds during the winter months have observed as many as 15 individual pygmy nuthatches entering a single cavity to huddle on cold nights.



9 Wood Duck Box

One of the most colorful ducks on the refuge is the wood duck (*Aix sponsa*). During the breeding season the male has a bright red eye, a red, white, and black bill, a green head with striking white stripes about the face and a crest on top, a chestnut breast, golden flanks, a white belly, and iridescent dark green-blue back and wings. Wood ducks nest in cavities in big trees that are generally close to water. Females incubate their clutches of 8-15 eggs for about one month. Upon hatching, the young use their sharp claws to climb up the inside of the nesting cavity to its entrance, then jump and flutter to the ground. The female guides them to the nearest water, where they will spend the next eight to nine weeks foraging as a brood. With its many wetlands, Turnbull meets most of the habitat needs of this spectacular duck. However, prior logging reduced the number of large trees suitable for nesting. To help provide this critical habitat element, managers place wood duck boxes such as the one to the left of the trail. There are about 39 wood duck boxes placed adjacent to wetlands on the refuge. To your left is a wildlife viewing blind constructed by volunteers from the Spokane Home Builders Association and Geiger Corrections Center.

10 Emergent Pond Vegetation

Around the edges of the deeper ponds and across the shallower ponds of Turnbull, grow cattails (*Typha latifolia*), bulrushes (*Scirpus* spp.), and sedges (*Carex* spp.). Known as emergent vegetation, these plants are rooted in the soil under water but grow up above the water. Early in the growing season, when water levels are high, few green plants are seen above the surface of the water. As the season progresses, the emergent vegetation grows thicker. As the growing season ends, the dead stalks remain. Emergent vegetation is important for wildlife. Waterfowl construct nests of matted emergent vegetation. Songbirds weave nests on the upright emergent vegetation. Muskrats construct dome-shaped lodges from the stalks and leaves of emergent vegetation. These emergent plants provide hiding cover for many waterfowl - watch American Coots as they slip into the reeds and disappear. Finally, the leaves and seeds are food for wildlife. People have long used different species of emergent vegetation for a variety of purposes. Consider the cattail: the inner portions of young shoots can be eaten either raw or cooked, the flower stalks can be boiled and eaten like corn-on-the-cob, the downy fruits have been used as baby diapers and to treat burns, the rootstalks, best collected in the fall, can be cooked and ground into flour, and the dead leaves can be woven into mats.