Walk With Larch

Paths Through an Ever-Changing Forest

Coram Experimental Forest

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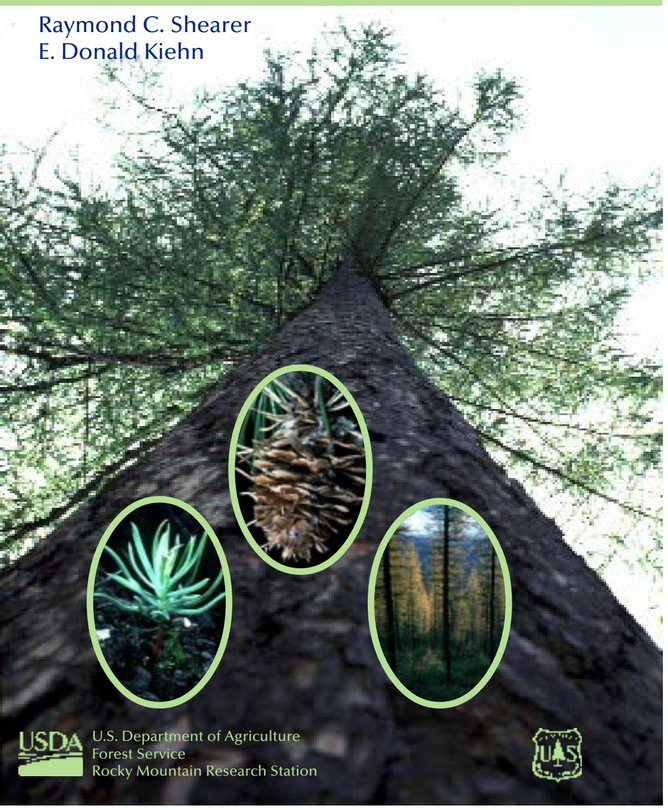

U.S. Department of Agriculture
Forest Service
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Walk With Larch, a Continuing Adventure

As you return to the parking area, consider what you have seen. You may have unanswered questions—so do we. That is why research continues here and elsewhere on the Coram Experimental Forest. Answers will come in the future, but usually every answer raises more questions.

Puzzler Clues—as you read this brochure, we hope you kept track of the underlined letters. One vital letter is still missing. Here are clues to its identity, as well as to the key concept of the mystery word itself: in forests there are **no beginnings and no ends**, all parts and processes are **interconnected**, always in transition, forever **cycling**, a **continuous circle** of mysteries!

The mystery word is: _ _ _ _ _ _ _ _ _ _

Photo Credits: R. Steven Wirt and Raymond C. Shearer

Cover: Life cycle of larch. 200 year old larch. Insets: cone dispersing seeds; first year seedling; and 42-year-old pole-size trees.

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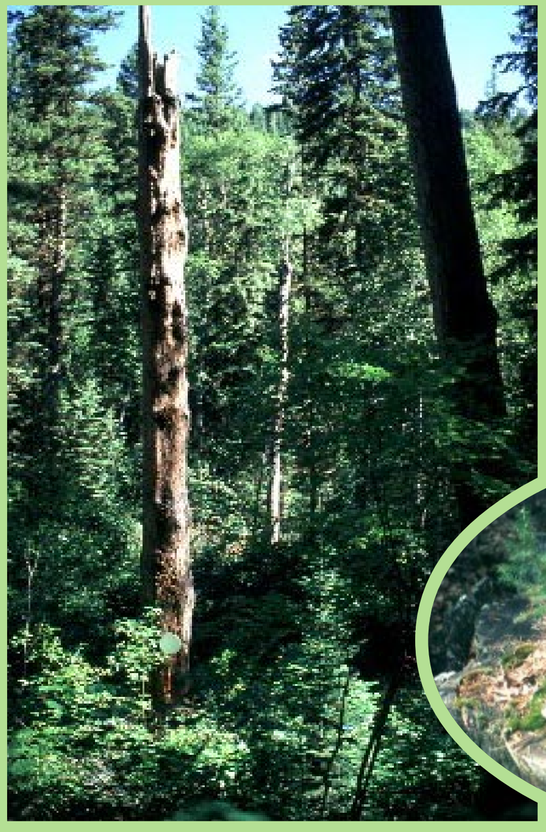
Mushroom and larch needle, Upland Trail, Stop 2.

Above: Upland Trail, Stop 5.
Left: Upland Trail, Stop 4.

Above: Upland Trail, Stop 7.

Above: Upland Trail, Stop 6.
Left: Riparian Trail, Stop 4.



Above: Abbot Creek near Stop 3.
Left: Stump garden, Riparian Trail, Stop 6.

Welcome to the Coram Experimental Forest

"When we try to pick out anything by itself, we find it hitched to everything else in the universe." - John Muir

An ecosystem includes the interdependent relationships of living things and their physical environment—the land, water, and air. Ecosystems exist on many scales, smaller than this area to as large as earth itself. Forest ecosystems have global implications because they protect water supplies, cleanse the air of pollutants, produce oxygen and counteract the harmful buildup of carbon dioxide in the atmosphere.

Natural and human-caused forest disturbances are inevitable. Fire, flood, avalanche, windstorm, insects, disease, and timber harvest create forest openings that let in more sunlight, starting new cycles of plant and animal life. During early stages in succession, pioneer species such as fireweed and deer mice thrive at the Coram Experimental Forest. Then shrubs and trees and other mammals dominate. Faster growing trees, such as western larch, thrive in sunnier, disturbance-created openings. Later, trees that grow in larches' shadow prevail such as Douglas-fir, spruce, and subalpine fir. Succession involves entire communities of plants and animals because each species has unique requirements and interdependency with other organisms; while some species flourish, others decline. Disturbances set the forest clock back, but even without significant disturbance, forest communities undergo subtle change over time.

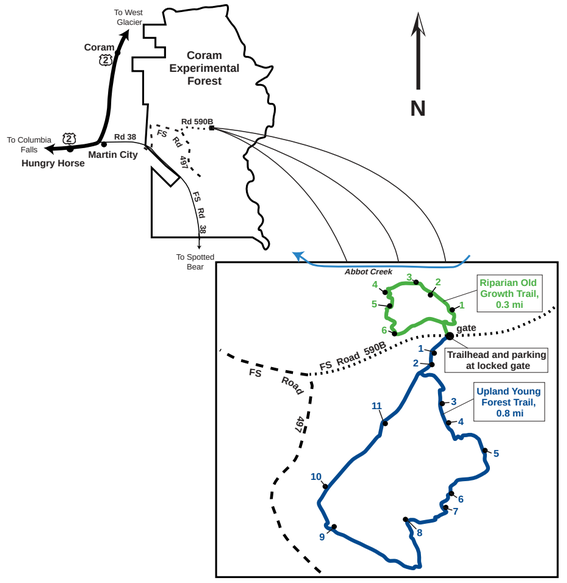
Whether called "ecosystem management" or "sustainable forestry," foresters use science-based approaches to ensure that earth's ecosystems will be sustained. Their challenge is to maintain soil, water, air, diverse life forms, and ecological processes, as well as the human communities that are a part of and depend on ecosystems.

In 1933, the Forest Service established the 7,460 acre Coram Experimental Forest to study the ecology and management of native western larch forests found in the Inland Mountain West. Coram is a typical mid-elevation forest of high biodiversity having 11 conifer and three hardwood tree species. Its hundreds of shrub, grass, forb, and other plants attract a wide array of animals and birds.

Western larch is one of only two coniferous genera worldwide whose foliage turns color and drops in the fall. It is the most shade-intolerant conifer in the Northern Rockies, but under ideal conditions will outgrow other conifers during its first hundred years. Within its natural range, mature larch is the most fire-resistant tree and resists many insects and diseases. People prize larch for its year-round beauty, firewood, and commercial wood products. Many of Coram's larches are over 300 years old. A few that regenerated after a major fire about the time Columbus discovered America are over 500 years old.

Walk With Larch Trails

A half-century of research seems a long time—over half a lifetime for most people! But, for the life span of a larch, it is only a start—a tenth the age of the oldest larch on Coram Experimental Forest. Come, enjoy a walk through time and see old-growth and ponder what known and unknown events shaped its destiny. Consider how various forest management activities coupled with natural factors, transformed an old-growth forest into diverse young stands. **And so that people may continue to enjoy and learn here, please stay on the trails and do not litter or alter the forest environment in any way. Please do not touch or remove research signs, stakes, flags, or tags. And please enjoy your walk with larch.**



Puzzler—As you read this trail guide, keep track of the underlined letters. When put in correct order they spell out a mystery word, but one letter is missing. Look for clues on the back cover.

Riparian Old Growth Trail 0.3 mi.

As you descend the trail and approach Abbot Creek, feel and smell the cooler moist air of this shady forest. This is a "riparian zone," that is, land near and influenced by water. Riparian areas support diverse vegetation and are important wildlife habitats. Only 1 percent of Montana is riparian, but it is used by 80 percent of the wildlife. Riparian areas are vital in cleansing our water as well as in recharging groundwater.

Stop 1. Partial Cutting—You are near large decaying stumps above an intermittent stream that flows into Abbot Creek only during spring and early summer. In 1951, the largest trees were cut above where you are standing. Harvesting stopped here to protect the riparian zone above Abbot Creek. The larger western larch, Douglas-fir, and spruce up the hill were reserved as "shelterwood" to shade the area and provide seed. Vegetation thrives in this moist, shaded area: western hemlock, western redcedar, subalpine fir, spruce and Douglas-fir are regenerating; red-osier dogwood, devil's club, Pacific yew, ferns, horsetails, lichens, and a carpet of mosses are in the understory. No western larch seedlings survive here because there is too much shade and a thick mat of decomposing organic material!

Stop 2. Riparian Forest—Near Abbot Creek bottom, you can see and smell decaying wood. The old growth forest is diverse and changing. Toppled trees of all sizes and species as well as branches lie on the forest floor in various stages of decomposition. Several large snags (standing dead trees) provide homes for numerous wildlife species. Living trees include western larch, Douglas-fir, spruce, hemlock and paper birch; younger seedlings and saplings are shade-tolerant species. A diverse array of plants make up the understory of this old growth forest.

Members of the weasel family, such as pine marten and fisher, prefer these old riparian forests. They use downed woody material, and shrubs for denning, hunting, and cover.

Stop 3. North Fork Abbot Creek—Trees and plants keep Abbot Creek shaded, cool, filtered, and clean as it meanders through the uncut riparian forest. Fallen trees criss-cross the streambed, slowing the water flow, creating dams, pools, and riffles which increase the protective cover and gravel spawning beds of fish. Fallen trees also help trap leaves, fine woody debris and other vegetation; sources of nutrition enhancing the number and diversity of fish, aquatic invertebrates, and other animals.

Stop 4. Snags: High-Rise Forest Dwellings—Standing dead larch are excellent wildlife condos because they usually are tall, large in diameter, and slow to decay. Several snags can be seen. Those with many branches died recently; others with few or no branches probably have been dead for decades. Small birds and bats may nest under the loosened bark during early stages of decay. Many insects mine the dead wood then woodpeckers excavate the wood to harvest the insects and to create cavities for nest sites. Woodpeckers are primary cavity nesters that use each nest once and then abandon it to other species called secondary cavity nesters, such as mountain bluebirds, kestrels, owls, nuthatches, swallows and small mammals. Several raptors, such as hawks and eagles, prize snags as perch and nest sites. Snags are valuable real estate in any forest ecosystem!

Stop 5. Nurse Logs: Life After Death—Large woody residues are important in recycling nutrients and elevating soil water retention; both enhance long-term productivity. As you climbed the slope, the forest floor was hummocky and spongy under its mossy mantle. These are the squashy remains of fallen trees (nurse logs). It is hard to detect old nurse logs except for a few patches of exposed wood. Nurse logs perform the functions of a home, nursery and recycling center, all in one. Some nurse logs have over 50 percent more living cells than their living counterparts! They are stuffed with microorganisms, fungi, and invertebrates that decay wood fibers, thereby recycling nutrients and enriching the soil. The resulting "soil wood" holds water that is released slowly throughout the year. Being rich in nutrients and water, nurse trees are outstanding seedbeds for a variety of plants—the wood loosened with rot and riddled with insect tunnels makes it easy for plant roots to establish themselves. Here are three large trees that developed long ago in this nursery—a paper birch, a Douglas-fir, and a spruce, with roots all twisted together now forming an excellent den site for small animals.

Stop 6. Stump Ecosystems—Once again you are in the area partially cut in 1951. Many stumps have evolved their own rich ecosystems. Providing a rooting medium, water, and nutrients, the tops of these stumps develop lush, circular gardens. This one has bunchberry dogwood, mosses, lichens, tiny birch and spruce seedlings, and numerous invertebrates. Stumps decay and function in the same important ways as nurse logs.

Upland Young Forest Trail 0.8 mi.

Go through this upland forest mostly regenerated in the 1950's after harvesting and see the effects of different site preparation techniques on stand composition. The trail continues through larch thinned to different spacings in 1961, a salvage logged old growth forest on a dry southwest-facing slope, and unthinned regeneration dating from 1953.

Stop 1. Harvest and Site Treatments—In 1951, about 60 percent (volume) of the virgin stand was harvested; the remainder (mostly smaller diameter larch, Douglas-fir, and spruce) were kept as shelterwood trees. Slash was hand piled and burned in September 1951. Although many seeds fell from trees in 1952 and 1954, the light fire treatment exposed so little bare soil that few conifers established. In December 1955, wind blew over many shelterwood trees. All usable trees (living and wind thrown) were removed in 1957. Most dominant trees now were seedlings or saplings that grew in the understory in 1957.

Stop 2. Nature's Way: Recycle—Notice two broken Douglas-fir snags, each over 6 feet tall, and several decaying logs. The thick loosened bark on snags provides nesting sites for bats. Squarish cavities were excavated by woodpeckers hunting for insects and making nests, then were left for other birds or animals. Wood-boring beetles tunneled through cracks in the bark to access the wood inside, soon followed by ants and other invertebrates. These insects carried fungal spores. Both play major roles in breaking down the woody structure (decay) and nutrient recycling of the wood. See and smell the process of soil enrichment and nutrient recycling! Downed logs, coarse woody debris, litter and duff on the forest floor, and snags provide raw materials for this vital ongoing process of forest regeneration.

During the spring or after heavy rains in the fall, you can see mushrooms: the reproductive parts of large mycelial structures of fungi. Mycelia are dense networks of threads spreading throughout dead logs, topsoil, and duff on the forest floor. Fungi play a role in nutrient recycling. They combine with roots of living trees, shrubs, and other plants to form mycorrhizae. With mycorrhizae, plants become more effective in absorbing water and nutrients from the soil, develop increased resistance to soilborne diseases, and in return, the plants provide the fungi with carbohydrates. Red-backed voles live in shady forests and feed on fungi and then widely disperse the spores of the mycorrhizal fungi. These are examples of extraordinarily complex forest mutualisms in which everyone is a winner!

Stop 3. Site Treatments in 1951 and 1952 Influence Later Vegetation Development—Examine three stands, one behind each sign. The only difference was how the seedbed was treated after cutting.

Slashing Only. Branches and tops from harvested trees were scattered on the forest floor reducing fire hazard but doing little to enhance regeneration. This stand is dominated by shade-tolerant subalpine fir and Douglas-fir trees, seedlings, or saplings. Occasional western larch regenerated.

Dozer Scarification. Bulldozers exposed bare mineral soil in August 1951 by pushing slash, litter, and duff into small piles that were burned 2 months later. This treatment enhanced ungulate habitat with heavy browse and more hiding cover. Scarification significantly improved larch regeneration, which requires bare mineral soil and plenty of sunlight.

Broadcast Burning. Logging slash and understory vegetation were burned in September 1952. The fire exposed some soil, ash increased available minerals, and more water could infiltrate the soil. All this favored regeneration of larch.

Stop 4. Natural Forest Thinning—As you walk by the larch that regenerated after prescribed fire, see how skinny and close together they grow. This stand is "overstocked!" The original density was over 10,000 trees per acre. Because of the dense forest canopy, there is little sunlight. This results in suppressed tree growth, no cone production, sparse understory vegetation, and death of many trees.

Notice many larches are bent over. This happened in June 1995 when 6 inches of wet snow settled on newly grown foliage. Due to their small diameter, these larches were easily bent over and will not recover. The openings will favor eventual domination by the healthier, more shade-tolerant Douglas-fir already present in the understory. Along with wildfire, windstorm, insect infestation, and disease, snow causes natural tree thinning that creates new patterns of succession and species diversity in the forest.

Stop 5. Managing Forests by Thinning—Thinning increases the growth rate, size, and health of trees by enabling them to obtain more sunlight, nutrients, and water. Although thinning reduces the volume of wood fiber per acre, growth and timber yield are enhanced on a smaller number of larger trees. Greater tree vigor results in more resistance to insects, disease, wind, and snow damage.

This stand was thinned four times: 4-feet average spacing (2,720 trees per acre) in 1961, to 5-feet average spacing (1,740 trees per acre) in 1971, to 6.5-feet average spacing (1,040 trees per acre) in 1981 and to 8-feet average spacing (680 trees per acre) in 1991. Other conifer species were cut but understory vegetation was left intact. Compare this to the overstocked unthinned larch at Stop 4. These larch are larger and have much less snowbend.

Thinning also promoted abundant and diverse understory vegetation, especially huckleberry, thimbleberry, buffaloberry, serviceberry, maple, willow, and paper birch. Because this favorable habitat provides food for wildlife, forage for ungulates, and protective cover, you can occasionally see bear, elk, moose, deer, coyote, and mountain lion.

Stop 6. Tree Density Affects Everything—Here, larch were thinned in 1961 to an average spacing of 15 feet (200 trees per acre). This increased spacing has resulted in taller trees of greater diameter. Shrubs are also taller and fuller, providing better cover and more browse for ungulates. There are more paper birch, willow, serviceberry, huckleberry, and aspen. Looking closely, you can see antler rubs on some shrubs 2-4 feet above ground, probably made by deer. Elk rubs are usually higher and moose rubs can be 7 feet above ground.

Stop 7. Forest Values: Choices—In 1961, some larch were thinned to an average spacing of 20 feet between trees (110 trees per acre). Increased sunlight, water, and nutrients have produced larch that are taller and larger in diameter than on the other plots you visited. The shrub understory is also taller and denser, especially paper birch.

Western larch are often partially or entirely girdled by bears! These trees were damaged in May through mid June (mostly in the 1980's) by black bears stripping the lower bark and licking sap and chewing the underlying sugary and nutritious cambium. Long strips of bark and vertical tooth and claw marks on the sapwood are signatures left by bears. Deer and elk rubbings show abraded, thin and shredded bark strips. Squirrels bark trees and leave small rectangular strips, porcupines produce squarish chips and leave horizontal or oblique tooth marks; both animals may bark anywhere on a tree.

Now, consider forest values. Compare the stands you viewed today. Which management treatments created trees large enough to produce commercial wood products? Which forests foster the most biodiversity? Where can you find the most abundant wildlife and which species? Which stand is the most pleasing to you? Which stand do you prefer for forest recreation? How would you balance human needs and maintain healthy ecosystems into the future? Each choice affects how the forest will be managed.

Stop 8. Salvage Logged Old Growth Forest—Walking over a gentle ridge from the young larch forest, you enter another old-growth stand. This area was salvage logged in 1957 to remove trees that were felled or broken by violent winds in December 1955. Tall snags share the skyline with living old conifers. Some of the largest trees are over 300 years old, dating back to a stand-replacing wildfire. Understory vegetation is a mix of plants; openings are dominated by tall shrubs. Douglas-fir regeneration is increasing. The forest floor is littered with downed trees and coarse woody debris in various stages of decomposition.

The site has a southwest exposure and is drier, sunnier, and has shallower soil with less nutrients than the managed stands. Contrast these trees with the same age riparian old-growth on a northwest-facing slope above Abbot Creek that are taller and larger in diameter. Douglas-fir predominates here because it grows better in drier and poorer soils than larch. Many larger trees have curved or forked trunks, dead tops, and "wolfy" (dense, patchy and haphazard) branches caused by snow and other agents.

Stop 9. Dry Site Natural Recycling—Decaying logs play a vital role in regenerating this site by providing water and essential nutrients for seedlings and saplings. The progression of standing snags, recently fallen trees, downed trees with few remaining limbs and little bark, and decomposing logs seems to melt into the soil creating spongy humps on the forest floor, the ghostly shapes of ancient logs. After woody debris larger than 3 inches in diameter decays, it holds and slowly releases a steady supply of water, nutrients, and minerals. You may see colonies of carpenter ants breaking down wood into sawdust. Bears often rip logs apart looking for ants, a highly nutritious snack; examples of how insects and large animals help in the decomposition and nutrient recycling process.

Stop 10. Regenerating Paper Birch—Leaving the old-growth and returning to the cool shade of the regenerated unthinned forest, you see less understory vegetation and smaller diameter trees. Shade-tolerant Douglas-fir and spruce dominate the understory. The closed canopy of this suppressed stand provides excellent protection and good thermal cover for wildlife, even though its forage value is low.

Clumps of shade-intolerant paper birch represent two generations. The old, often decadent appearing birch survived harvest and scarification treatments in the 1950's. The young, more vigorous birch sprouted from roots of dying or cut trees after harvest and may persist for 100 years. Birch, with its thin bark, is sensitive to fire and is most abundant in early stages of succession. Because sprouts have established root systems, they grow faster than seedlings. Seed germination requires exposed mineral soil and sunlight.

Stop 11. Wind, A Natural Thinner—Observe the oddly tilted 6-foot stump of a western larch in front of you. What caused this? Intense windstorms in December 1955 blew over about 15 percent of the mature trees here, and up to 50 percent of them farther upslope. Probably this tree blew down and was salvaged in 1957. Note the large root ball mound with no roots exposed—after the trunk was sawed through, the release of pressure caused the stump to snap back at an upward angle. The holes in the root ball have been exploited by small animals, possibly martens, woodrats, or voles for den sites.