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Miller Creek Demonstration Forest

A Forest Born of Fire

A Field Guide

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In cooperation with
The University of Montana

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Acknowledgments and Cooperators

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Contents

Cover photographs: Visitors attending a field workshop in 1987 receive information from Ray Shearer at the top of unit South-8 before they walk the Wildfire Trail, Miller Creek Demonstration Forest.

In the evening of August 7, 1968, a prescribed fire on clearcut East-3 reduced the amount of slash, litter, and duff and enhanced quick establishment of a new forest by natural regeneration.

We want to hear from you!

Please send us your:

- Comments on results of past and current research at Miller Creek
- Comments on management of this Demonstration Forest

Interested in a group tour? Interested in having the traveling display come to your school? Let us know.

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Miller Creek Demonstration Forest
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A Field Guide

Principles of Ecosystem Management Emerge From Research and Adaptive Forestry

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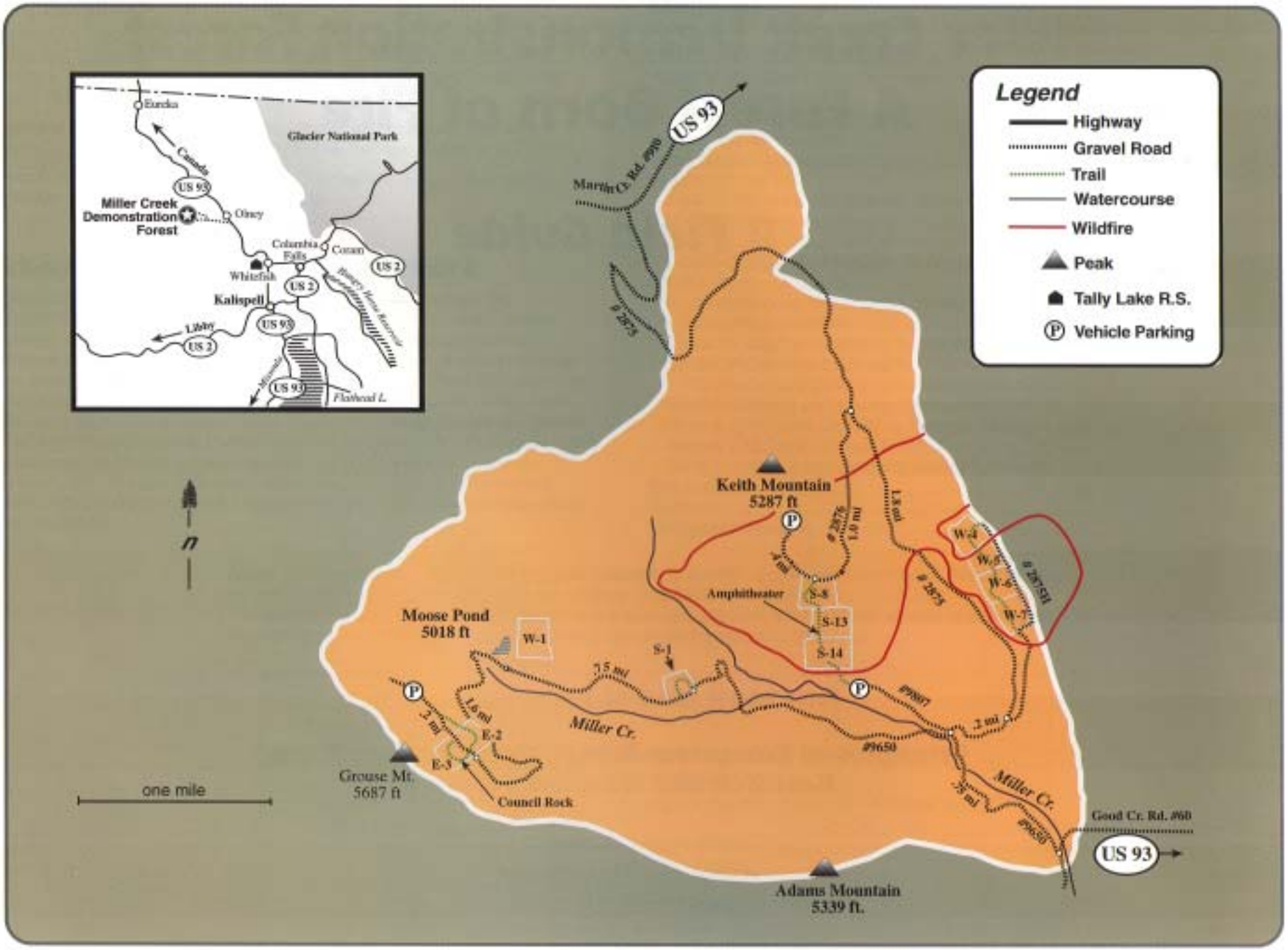

Legend
Highway
Gravel Road
Trail
Watercourse
Wildfire
Peak
Tally Lake R.S.
Vehicle Parking
Eureka
Glacier National Park
Canada
US 93
Miller Creek Demonstration Forest
Olney
Columbia Falls
Coram
Whitefish
US 2
Kalispell
Libby
Missoula
Flathead L.
Martin Cr. Rd. #910
2875
Keith Mountain
5287 ft
1.0 mi
.4 mi
1.8 mi
Amphitheater
S-8
S-13
S-14
W-2
W-3
W-4
W-5
W-7
Moose Pond
5018 ft
W-1
S-1
7.5 mi
Miller Cr.
#9807
#9650
.2 mi
.35 mi
1.6 mi
2 mi
E-2
E-3
Council Rock
Grouse Mt.
5687 ft
one mile
Good Cr. Rd. #60
Adams Mountain
5339 ft.

Miller Creek Demonstration Forest
A Forest Born of Fire
A Field Guide

Miller Creek's Ever Changing Forests

Welcome to Miller Creek Demonstration Forest in the Northern Rocky Mountains. The Demonstration Forest is part of the Flathead National Forest in Montana. **Miller Creek tells a story about forest change and the role of disturbance, primarily fire, in that change.** The Northern Rockies contain "fire-dependent forests," meaning that **most of the plant communities here require fire for their continued existence** on the landscape. Several decades of forest practices and fire suppression have changed naturally occurring processes of fire disturbance, thereby altering the structure and composition of many of these forests.

Western larch, a key feature of Miller Creek forests, is a fire-dependent species. Larch, as with many other species in the Northern Rocky Mountains, have specific characteristics that allow them to survive and regenerate following fire. Mean fire-free intervals in western larch forests range from 24 to 130 years—a relatively short time in the life of a 300–700 year old larch tree.

In the mountainous terrain at Miller Creek, fire's variable effect has created forests now in many stages of development. The diverse plant communities and stand structures that result create habitat for many species from rare plants such as the tiny **moonwort** to large mammals such as **moose.** The long-term consequences of natural disturbances tend to enhance biological diversity.

Humans also played a role in structuring the forest. Scientists believe that early Native Americans had a major impact on North American ecosystems by repeatedly burning the vegetation. These fires, generally set at times other than naturally caused lightening fires, had varying effects on vegetation, contributing to the mosaic of plant communities and classes of development.

In recent years, trees recolonized sites too slowly following the use of prescribed fire. Forest managers wanted to know why. Research at Miller Creek explains the relationship between fire and regrowth in western larch forests and creates an understanding of how management practices such as clearcutting and prescribed burning mimic natural processes of disturbance.

The photographs in our mini-poster show forest development that began after a wildfire in Miller Creek on August 23, 1967, in virgin forest on a south-facing slope. They show an abundantly regenerating forest. Other forest stands at Miller Creek have different vegetation structures, thus creating a mosaic of diverse ecosystems. These forests of contrasting structures and disturbance patterns function differently and are suitable for meeting a range of ecological and management objectives. **While forest communities and structures continue to change, management that is tied to ecosystem integrity may help to retain disturbance processes such as fire that historically structured these landscapes.** Continued research and results of adaptive management practices enable forest managers to understand the effect of treatments on the land.

Native American fires, and this prescribed fire on September 5, 1968, on a west-facing slope (West-4), usually produced lower intensity fires.

History of the Miller Creek Demonstration Forest

Research began at the 5,000 acre Miller Creek area in 1966 to study the effect of prescribed fire and silvicultural treatments on regeneration. In 1989, the Flathead National Forest set this area aside as a Demonstration Forest to protect the study area and to encourage continuing research and education.

Past research at Miller Creek measured how prescribed fire, conducted over a range of fuel and site conditions, affected air quality, vegetation development, conifer regeneration, water quality, erosion, and small animal populations. **Current research** focuses on how conditions existing during stand initiation combined to affect forest processes (such as germination, seed dispersal, and competition) and subsequently, to produce different forest structures (different physical sizes and distribution of trees). Forest structures are important because they affect understory plant and animal habitat, biological diversity, and productivity. **Future research** will be concerned with extending studies of stand level (a large group of similar trees) to the even larger scales required for **ecosystem management—the management of many different kinds of stands over large landscapes that also encompass rivers and lakes and mountains and valleys and all the plants and animals inhabiting the area.**

How to Tour the Forest

Your best tour of Miller Creek Demonstration Forest starts with a **study of our map.** This map contains keys to study sites for easy reference and gives the approximate mileage between stops. Once you are in your vehicle and into the forest, you will find self-guiding trails with interpretive signs that explain points of interest. Keep this book handy for site-specific information. **After the self-guided field tours, the amphitheater in South-13 or Council Rock in East-3 are ideal places to have lunch and discuss what you've seen or just enjoy the view.** Group tours can also be arranged with the Tally Lake Ranger District (see inside front cover).

Forest Service guide Peter Stickney discusses changes in stand development at the amphitheater within the wildfire-burned South-13 .

This free-standing display describes the effect of disturbance treatments on stand development as a result of research at Miller Creek. Developed by the University of Montana's School of Forestry and the Rocky Mountain Research Station in Missoula, MT, this display is available for use by community and government groups (see inside front cover).

Providing public information is an important part of Miller Creek Demonstration Forest. A traveling display shows the intimate relationship between initial site conditions, disturbance, and forest development. A glossary at the end of this booklet explains forestry terms that may be unfamiliar.

Research at Miller Creek

Before the 1960's, prescribed fire was used in the Western United States to reduce fire hazard after forest stands were harvested. But managers did not have enough information about the effect of fire on vegetation to predict effects on tree regeneration and response of other plant life. Although scientists knew that western larch, a valuable timber species in the Northern Rocky Mountains, was associated with naturally occurring fire, adequate natural regeneration was difficult to obtain. Western larch was assigned the highest research priority.

Western larch is a key component of Miller Creek forests and an important resource for both humans and wildlife. It occurs naturally only within a relatively small area from southern interior British Columbia south into western Montana west of the Continental Divide, and in central Idaho and west through northern and central Idaho to the crest of the Cascades (see range map). This beautiful tree is well known for the quality of its wood, aesthetic appeal, and importance to wildlife. Research at Miller Creek shows that "fire is the most dramatic ecological force in western larch forests."

The 11 study sites on the tours show different combinations of silvicultural and fire treatments. The original research plan was to study the effect of clearcutting and prescribed fire. However, before all the treatments were completed, a wildfire on August 23, 1967, created a great natural experiment. Some of the units burned in the wildfire had been cut but not broadcast burned, others had been cut and burned, while still others had not yet been clearcut. Now scientists could compare the effects of wildfire on tree regeneration and subsequent vegetation development to those of prescribed fire.

Range map of western larch.

Research simultaneously began in many disciplines to study the effects of the treatments. For example, scientists studied changes in small mammal populations and smoke dispersal. This book discusses only those studies pertaining to tree regeneration, changes in stand structure, and the development of understory vegetation following disturbance. Regeneration and understory development studies continued for 30 years, and the stand structure and vegetation succession research will continue indefinitely.

All 60 of the original study sites are in a 200 to 250 year old forest, on similar sites with similar fuels, and were equally distributed on north-, south-, east-, and west-facing slopes. The selected 10 acre study sites were scheduled for clearcutting and broadcast burning under different conditions in 1967 and 1968.

Scientists counted new seedlings in small temporary plots systematically placed throughout burned study areas. They measured the heights of the tallest seedlings of each species, and later measured the stem diameters when the trees were large enough. These researchers also collected data related to fire intensity and the effectiveness of the treatments in preparing the site for tree regeneration. Tally Lake Ranger District crews—sometimes with students from nearby towns—planted western larch, Douglas-fir,

and Englemann spruce on 13 clearcuts (three of the demonstration areas) to compare height growth of planted versus naturally regenerating conifers. Fifty seedlings of each species were planted in May of four consecutive years, 1970 through 1973.

Researchers measured the vegetation development on five of the demonstration areas along two adjoining transects, which were subdivided into blocks of different sizes. Height of trees, shrubs, and herbs within each block was recorded. No treatment other than the initial harvest-fire treatment was allowed on these transects.

In 1990, the researchers established permanent plots to study stand development and its effect on species composition and abundance of the understory plant community. These plots are on five of the demonstration areas (see table). The plots were thinned to six trees per plot, keeping the best trees of each species. Shrubs were removed on half of the plots (weeding) in a 20 foot radius around the plot

Descriptive information and permanent study plots located on selected units, by tour, Miller Creek Demonstration Forest.

Tour/unit	Phase of subalpine fir/beadlily	Treatments		Kind of regeneration	Permanent plots		
		Harvest	Fire		Soil water	Succession	Stand development
Prescribed Fire Tour							
East-2	Fool's huckleberry	Clearcut, slash	None	Advance, natural	No	Yes	Yes
East-3	Fool's huckleberry	Clearcut, slash	Prescribed burn	Natural, planted	No	Yes	No
South-1	Beargrass	Clearcut, slash	Prescribed burn	Natural	Yes	Yes	Yes
West-1	Beadlily	Clearcut, slash	Prescribed burn	Natural, planted	No	No	No
Wildfire Tour							
South-8	Beargrass	Clearcut, slash	Prescribed burn, wildfire	Natural	Yes	No	No
South-13	Beargrass	Uncut	Wildfire	Natural	No	Yes	Yes
South-14	Beargrass	Uncut, salvage, windrow	Wildfire, burn windrows	Natural, aerial seeding	No	No	No
West-4	Beargrass	Clearcut, Slash	Prescribed burn	Natural	Yes	No	No
West-5	Beargrass	Uncut, salvage	Wildfire	Natural	No	No	No
West-6	Beargrass	Uncut	Wildfire	Natural	No	Yes	Yes
West-7	Beargrass	Clearcut, Slash	Wildfire	Natural, planted	No	No	Yes

center; weeding will continue at each 5 year measurement. An unthinned 1 acre plot was established within each study site to compare differences between vegetation development on thinned and unthinned plots. **Researchers monitor conifer regeneration, development of shrubs and herbs, growth of natural and planted trees, and soil moisture.**

How the Forest Develops

After disturbance—such as fire or harvesting—forests go through a series of changes. Early ecologists thought that one or a few species became established on a newly disturbed area and then dominated that site until conditions were sufficiently changed by their presence so they could no longer reproduce. These "pioneer" species were then replaced by other species until a self-sustaining "climax" plant community developed. Disturbance was regarded as an event that interrupts this orderly progression or succession of species. The climax plant community is similar to all other undisturbed, old forests on like sites with similar climates.

Since ecologists became aware that disturbances are a vital part of naturally functioning ecosystems, they now embrace a broader view of "succession" or stand development. In this view, the species present on a newly disturbed site are the result of the disturbance. Further vegetation change then depends upon the unique characteristics of each species present and the advantage each has at different times. **Chance events such as destructive storms, droughts, bad seed years, and severe wildlife browsing affect developing vegetation. This gives an advantage to some plant species over others.** Long-lived trees such as western larch, ponderosa pine, and white pine persist in old forests. These trees were traditionally labelled "early successional species" and were thought to be replaced at climax.

While ecologists generally agree that long-term and short-term vegetation change can occur in forest ecosystems, they also now increasingly accept forest development based on individual characteristics of plants. As overstory trees interact with each other and their environment, they go through periods of development defined by ecological processes, such as germination, establishment, and competition. Processes change as the stand develops, as does the stand's structure—that is, the physical size and distribution of trees.

Science—and scientists—keep progressing by seeking information on larger, more complex systems called ecosystems. Now, scientists study forests over larger landscapes such as entire National Forests, watersheds, and river basins. And in these studies, they look at four broad stages or classes of development—all of which are common on the Miller Creek Demonstration Forest. **Follow along with us by studying the computer rendering of the four classes in our mini-poster.**

Tours of the Demonstration Areas

You can see the Miller Creek Demonstration Forest in two tours. One tour illustrates the effects of clearcutting and associated activities with and without prescribed fire. The other tour emphasizes effects of wildfire. Trails provide access to both areas, and signs give additional ecological information.

We selected the demonstration areas to compare the development of vegetation on similar sites after different types of disturbance. Harsh site conditions (as seen on south and west aspects) and severe plant competition sometimes combine to favor some species over others. Plant communities in the south and west units, however, are more the result of different development patterns of species that started growing after the disturbance. While the disturbance helped determine which species would grow first, once the initial vegetation was established, most changes were limited to species abundance and height and crown development.

Prescribed Fire Tour

The three stops on the prescribed fire tour demonstrate differences in forest development on four clearcuts that were either broadcast burned or left unburned. Be sure to take with you a separate that describes what you will see on these trails.

South-1: Clearcut and Slashed, Burned May 18, 1968—In the three decades after clearcutting, much of the area within unit South-1 is still in the stand initiation stage. Following clearcutting, the prescribed fire left a continuous layer of duff on the soil surface and killed only the aboveground portions of herbs and shrubs. Duff is decomposing organic matter lying over mineral soil on the forest floor. As most conifers need mineral soil for germination, this surface layer encouraged the development of surviving vegetation, mostly herbs. The dominant shrub before disturbance was blue huckleberry, which is slow growing and thus unable to regrow quickly enough to dominate the new vegetation.

Stocking on South-1 is low but slowly increasing. Regeneration density is greatest on the north and east sides nearest to the seed source.

As the burned duff disintegrated with time, more growing space became available, and conifer seed dispersed from nearby seed sources then germinated. This process will continue as long as growing space is available. Delaying conifer establishment prolongs the period that valuable wildlife shrubs such as Scouler's willow, serviceberry, and buffaloberry remain in the stand.

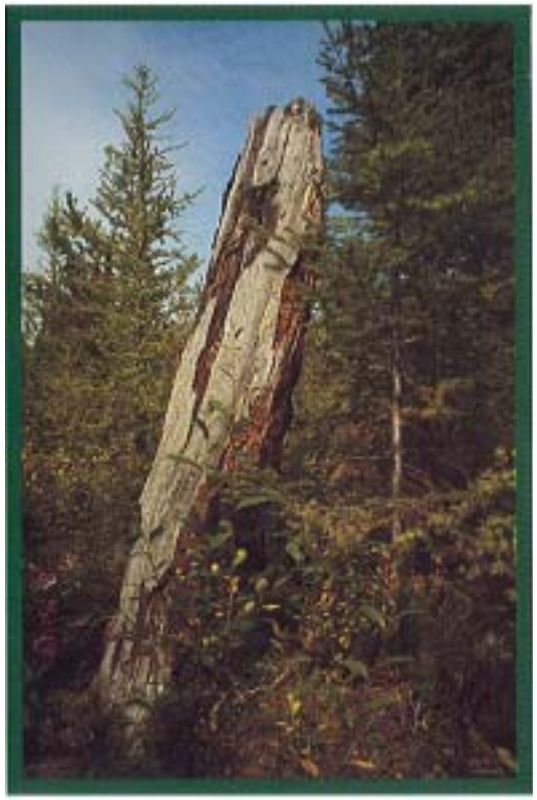
West-1: Clearcut and Slashed, Burned July 27, 1967—Moose Pond and Old Forest—This area demonstrates the contrasts in vegetation and structural diversity that can occur within a limited area in mountainous terrain.

Diverse habitat such as this riparian forest complex surrounding Moose Pond is ideal for the large moose population at Miller Creek. Smaller species limited in their mobility may be restricted to a small portion of Miller Creek.

The vertical and horizontal patterns produced due to the species diversity of a forest stand are important for a variety of wildlife species and are part of what makes forests fascinating to humans. Disturbances such as fire, wind, or insect epidemics can cause similar contrasts in habitats undisturbed by humans.

Research at Miller Creek helped define the processes that allow different vegetation types to develop. Future research will address these questions:

- Can desirable old forest attributes be obtained sooner by silvicultural practices that encourage large trees, or move a forest stand through the stages of development more quickly?
- What species composition and spacing will lead to structures beneficial for biological diversity, wood production, and aesthetic appeal?



This decomposing snag is a structural legacy from the previous forest. Such features allow wildlife use to continue while stands regenerate.

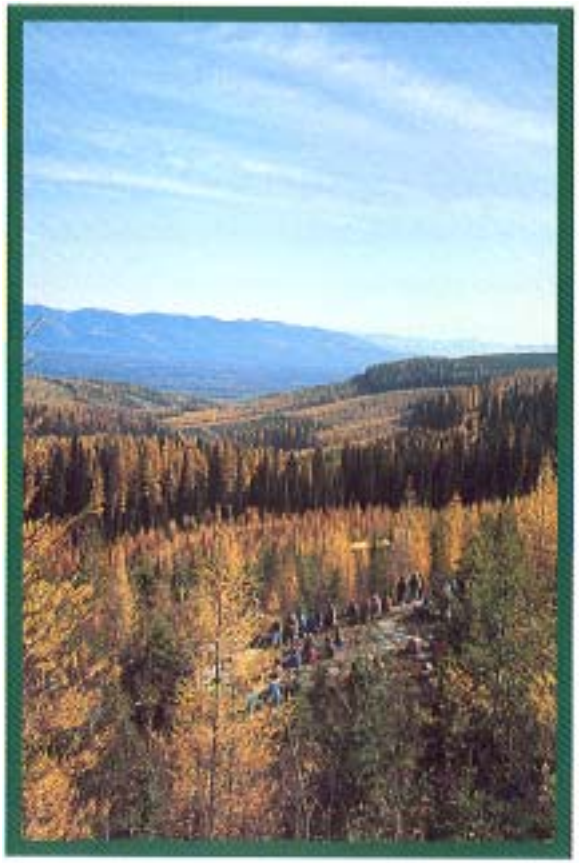
• How can a landscape approach to forest management help sustain healthy forest ecosystems?

East-2: Clearcut and Slashed, Unburned—Since the harvest and slash treatments in East-2 were completed in 1968, new conifer establishment has been slow because of the absence of fire. The soil was covered with a nearly continuous thick layer of litter and duff. The surface was shaded by an increasing cover of fast-growing shrubs and other vegetation. Unlike the hot and dry conditions found on unit South-1 that limits conifer establishment, East-2 is cool and moist, but the intense competition for light limits tree survival. Both units receive abundant seedfall from adjacent mature forests. Seedling subalpine fir and Engelmann spruce that were not slashed were released and now form the major tree component on the area. Because shrubs were abundant in the forest before disturbance, and burning did not occur, shrubs dominated immediately after clearcutting. The age range of regenerating conifer trees will be wide. Competition in the developing stand is among all vegetation rather than only between trees. Only a few western larch and lodgepole pine trees regenerated. As a result, the structure of East-2 differs from stands that regenerate following stand-replacing fire.

Larger spruce and subalpine fir have primarily grown from advance regeneration too small to slash after harvest. Open-grown larch and some spruce and fir may also have initiated after clearcutting.

Monitoring of the vegetation development plot will allow scientists to determine the effect of this pattern of overstory development on the structure and diversity of the understory plant community.

East-3: Clearcut and Slashed, Burned August 7, 1968—East-3, in contrast to East-2 or South-1, has abundant tree regeneration. Yet all received similar seedfall. Burning in mid-summer reduced shrub competition and duff on the forest floor allowing herbs, quickly followed by conifer seedlings, to establish. The surrounding forest abundantly produced spruce seed, so when East-3 was clearcut and burned, that nearby forest contributed the



At Council Rock in East-3 you will have a good place to view the Miller Creek landscape, have lunch, and discuss the implications of research results for ecosystem management.

large number of spruce in the natural regeneration. Stand development has been rapid but not uniform within the unit.

Portions of the stand have been artificially thinned and can be contrasted with the unthinned control. Light thinning during the stem exclusion stage may prolong the time a stand is in that stage as vigorous trees may reclaim growing space. Heavier thinning may accelerate the stand into a prolonged or temporary understory reinitiation stage with development of more complex overstory structures.

Stands in this stage provide habitat for many animal species.

Wildfire Tours

The two stops on this tour show differences in forest development on clearcut and uncut units affected by the August 1967 wildfire. One series of units occurs on a south-facing slope while the other series is on a west-facing slope. One of the west-facing units, West-4, was broadcast burned and did not burn in the wildfire.

The south-facing units are connected by a trail at the top of South-8 (on Road 2876), which extends to Road 9807 below unit South-14. Be sure to take with you the separate that describes what you will see on this trail. You will need to arrange for shuttle transportation back to the top of South-8 once you are through or simply return along the same trail.

The trail through the west-facing units is a loop that begins near the bottom of the units and returns along the road at the top of the units to the parking area. There is not a separate for this trail.

South-8: Clearcut and Slashed, Broadcast Burned on August 8, 1967; Later Reburned by Wildfire on August 23, 1967—The broadcast burn under dry summer conditions reduced most of the forest floor layer to ash and killed or set back the existing understory vegetation.

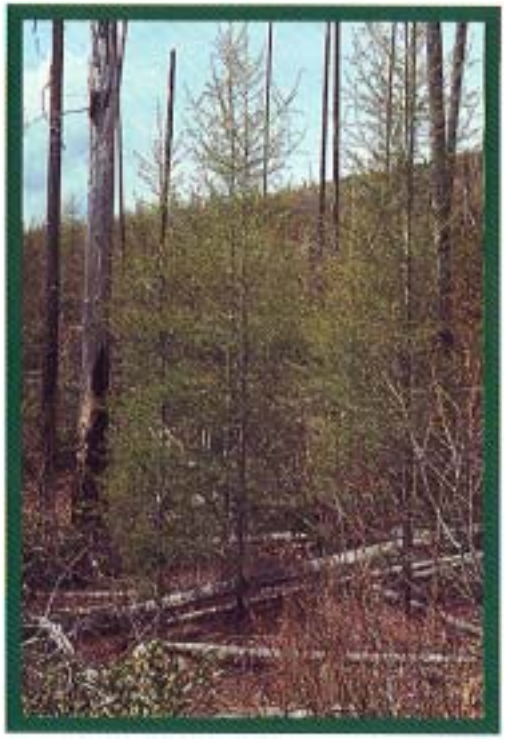
Water-can analogs such as this unused one allowed researchers to measure fire intensity on sites receiving prescribed burns.

Two weeks after treatment, this stand was reburned by a wildfire that burned the residual duff and all of the surrounding area killing most trees and dramatically reducing the available seed source from offsite trees. Yet regeneration on South 8 is no better than on South-1.

Today, most of the unit remains in the stand initiation stage of development. At distances greater than 300 ft from a conifer seed source, only a small proportion of sound seed is dispersed. The hot and dry south-facing aspect confined the limited conifer regeneration to shaded microsites producing individual or groups of trees. A small patch of western larch regeneration developed at the top of this unit adjacent to a group of larch trees that survived the wildfire. Finally, the presence of fast-growing ceanothus shrubs has provided strong competition for existing and subsequent tree seedlings years after the disturbance.

Three decades later, the continued dominance of shrubs on South-8 confirms the importance of an onsite or nearby seed source for conifer regeneration.

South-13: Old Forest Burned by Wildfire August 23, 1967—In contrast to South-8, which is located immediately above South-13, conifer regeneration is abundant because mature seed was present in the crowns of trees killed by the wildfire. The seed fell from the cones into the soil soon after the fire. Shade provided by the standing dead trees, called snags, further aided germination and survival of tree seedlings. Fast-growing lodgepole pine and western larch



Western larch, while requiring full sunlight, often regenerates in the shade provided by standing snags, by down wood from the previous forest, and by rocks. Temporal shade is particularly important on hot, south-facing slopes.

were able to grow above the ceanothus shrubs that appeared following wildfire, thus avoiding overtopping by the shrubs.

Three decades after disturbance this stand is dense and growth is slowing in many areas and, like East-3, has been thinned. The area immediately surrounding the vegetation development transects (near the amphitheater) has not been thinned and provides a contrast with the thinning treatment. In this early period of stem exclusion, most tree canopies are at the same height, giving a uniform structure to the stand. Competition thrives, tree growth is reduced, and some trees are dying because this stand was not thinned.

South-14: Old Forest Burned by Wildfire, Salvage Logged, Windrowed and Burned, and Helicopter Seeded With Western Larch— South-14, like South-13, was uncut at the time of the wildfire, but the fire-killed trees were subsequently salvaged. Bulldozers piled the slash into windrows, and then the slash was burned. Intense heating of the soil occurred under heavy concentrations of woody debris along the burned windrows, sterilizing the soil and delaying colonization of these areas for years. Nitrogen-fixing shrubs and herbs still predominate these strips. Helicopter seeding with western larch produced a dense larch stand that is now slowing in growth. Mortality of understory species is beginning. While western larch predominates, Englemann spruce and other species grow in large enough percentages to begin forming a more complex, stratified, mixed-species stand.

Plants are slowly revegetating windrows caused by slash piling and intense burning following salvage logging.

West-4: Clearcut and Slashed, Prescribed Burned September 5, 1968—West-4 is the only site on the wildfire tour that escaped the wildfire on August 23, 1967. After clearcutting, it was broadcast burned in late-summer 1968 when the site was wet. The outcome of harvest and fire treatment on West-4 was similar to South-1, which received a spring prescribed burn. Moist conditions during the burn resulted in a patchy fire and little duff reduction. Conifer seedlings occurred on less than 25 percent of the area.

Larger subalpine fir, Douglas-fir, and spruce have developed from trees too small to cut during clearcutting (advanced regeneration) and that survived the fire treatment. Diameter growth of these conifers has been good after release from competition by the overstory trees, but height growth is slow.

West-4 remains open and it continues in the stand initiation stage. A large local moose population heavily browse the study site. Several more years will pass before this induced edge provides thermal or hiding cover for large mammals in addition to browse the stand now provides.

Ecosystem “edges” are created by differences between two ecosystems. Forest harvesting, wildfire, avalanches, and strong winds change the amount of edge. While increased edge may favor species such as moose or white-tailed deer, some species that live near edges are more susceptible to predation.

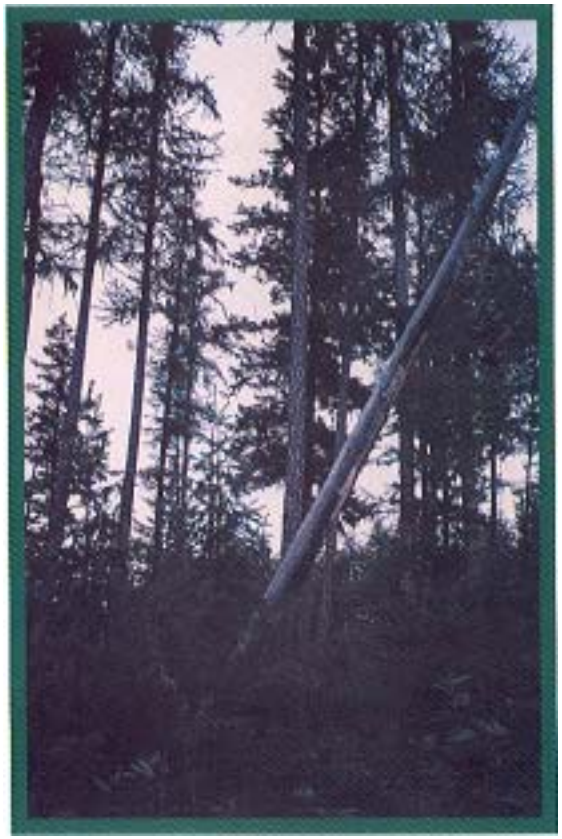
Lodgepole pine canopies develop quite uniformly and decrease vertical foliage diversity in a stand. Mature seed in the crowns of such pine will eventually help regenerate the forest, even after fire.

West-5: Old Forest, Burned by Wildfire, August 23, 1967, Salvage Logged—Less is known about West-5 than the other study sites. The intensity of the wildfire was reduced by the time it reached this unit in the early evening. Because conditions were not monitored on West-5, interpretation of its development is speculative. We do know that because lodgepole pine were the primary source of mature seed in crowns of the trees at the time of the wildfire, it became a major regeneration species.

Growth of trees on West-5 is beginning to decrease. Thinning would prevent stagnation and accelerate the stand

through the strongly competitive stem exclusion period. A low-intensity ground fire would have a similar beneficial effect within the stand.

West-6: Old Forest Burned by Wildfire, August 23, 1967—Both West-6 and South-13 were uncut and burned by the summer wildfire. The afternoon crown fire in South-13 killed all the trees in the surrounding area, whereas the evening ground fire in West-6 left much of the surrounding area unburned or lightly burned. Not all of the trees in West-6 were killed, which left a seed source. In contrast, on South-13, in the first year after fire, most conifers established from surviving seeds in the fire-killed tree crowns. In addition to seed from the fire-killed and surviving trees, West-6 received seed from nearby offsite seed sources and is developing a more complex overstory structure than South-13. By 1989, western larch density was 20 times greater on West-6 than on South-13, and total tree density was four times greater.



Vertical forest structure—the layering of herbs, shrubs, and tree canopies—contributes to the diversity of a forest. Variable tree canopies permit diversification of life forms in the understory.

West-7: Clearcut and Slashed, Burned by Wildfire, August 23, 1967—West-7 experienced more intense wildfire than the other west units. Unthinned areas are dense with western larch. A planting trial in this unit (as well as West-1 and East-3) helped scientists study the height growth of planted trees of three species versus height growth of natural regeneration. Natural regeneration on this warmer site is outgrowing planted trees, in contrast to East-3 where the natural regeneration is not doing as well. Crews installed permanent growth plots in 1990. The plots are adjacent to the trail. Most of the species in the original stand reappeared soon after the disturbance; however, Pacific yew, a shade-tolerant species present in the original stand, has not reappeared in the subsequent three decades.

Thinning left the best of each species on the permanent plots. Removing shrubs reduced competition.

The Future at Miller Creek

- Integration of research and management
- Education
- Public Information

Miller Creek Demonstration Forest offers an unusual opportunity to apply research results in ecosystem management. Study sites such as Miller Creek provide long-term information about the cause and effect relationships of forest development. Most studies of vegetation change use study sites in the same vegetation type but at different ages in different places, and differences in forest structure and composition are assumed to be due to time. But long-term studies at Miller Creek show that vegetation development differs in many ways as a result of stand history alone.

An imposing task: Managing our forests to preserve ecological integrity, diversity, and productivity for future generations. Information from research at Miller Creek will assist foresters here—and worldwide—in making more informed decisions to meet the objectives of ecosystem management.

Researcher Peter Stickney and volunteer Mary Sloan collect data on a vegetation development transect.

Glossary

Advanced regeneration—Inconspicuous, pre-existing but suppressed understory tree regeneration with the potential to release and grow when suppression factors are removed

Aspect—The direction a slope faces, such as north or east

Broadcast burn—A silvicultural treatment where the slash is scattered over the area, and then burned to reduce the fuel load and prepare the site for regeneration

Clearcutting—A method of regenerating a stand with a single age class, or cohort of trees develops in a fully exposed microclimate after removal of all trees in the previous stand in a single cutting

Climax plant community—The culminating stage in theory of plant or forest succession. This community theoretically develops and perpetuates itself in the absence of disturbance

Cohort—A group of trees arising after a single disturbance

Colonizer—A seedling plant germinating after disturbance

Duff—Decomposing organic matter on top of mineral soil

Forest structure—Abundance and distribution of species in addition to horizontal location and vertical layering

Fuels—Plant material on a site capable of carrying a fire

Germination—The initial growth and development of a plant from a seed, bud, or spore

Growing space—All the resources needed by a tree or other plant to exist on a site

Herb—An understory plant such as wildflowers or grasses without a woody stem

Induced edge—Transition zone between two ecosystems, artificially produced; such as the boundary between a clearcut and mature forest

Off-site seed source—Seed from plants outside the area of disturbance. May imply seed from plants not genetically adapted to site

Old growth, old forest—A structural condition or stage of stand development that is usually characterized by large, old trees, and structural diversity. May also be characterized by the absence of disturbance. However, for many forest types (such as ponderosa pine or western larch), disturbance is prerequisite to maintaining old forest features

On-site seed source—Seed within the area of disturbance and present at the time of disturbance

Pioneer species—Rapidly growing species adapted to invade open environments

Prescribed fire (burn)—The application of human-controlled fire to wildland fuels in a predetermined area to achieve resource management objectives

Regeneration—Seedlings or saplings in stand; or the act of establishing young trees naturally or artificially

Seedfall—Seed deposited naturally on a site either from existing trees or surrounding trees

Silviculture—The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis

Slash(ing)—Removal of noncommercial trees on a site, generally within some diameter limit

Stand—A spatially continuous group of trees similar in species composition and structure

Stand initiation—A stage or process during stand development when trees and shrubs invade a site following a disturbance and reoccupy the growing space

Stand structure—The distribution of trees and their crowns in a stand

Stem—A tree trunk (supporting tissue for a plant)

Stem exclusion—A stage or process during stand development when new seedlings are excluded from development by a pre-existing cohort of trees or shrubs

Survivor—A plant subjected to but not killed by a disturbance

Understory reinitiation—A stage or process during stand development

Weeding—Shrub and small tree removal to reduce competition

Windrowing—The movement of logging slash into long rows that are usually burned; slash burning with behavior fuel concentrations usually creates hotter more severe fires than prescribed burns

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On July 16, 1987, current and retired personnel of the Intermountain Research Station (now called the Rocky Mountain Research Station) associated with the Miller Creek study area conducted a field workshop. They are shown on Council Rock, from left to right: Norbert V. DeByle, Paul E. Packer, Robert G. Hammer, William R. Beaufait, Peter F. Stickney, Curtis H. Halvorson, Rodney A. Norum, Raymond C. Shearer, Carter B. Gibbs, Wyman C. Schmidt, Alan E. Harvey, L. Jack Lyon, and Charles E. Hardey.

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Miller Creek, on the Flathead National Forest in northwest Montana, is a demonstration forest, showing up to 30 years of forest change after clearcutting and a wide range of fire treatments in 1967 and 1968. Differences in tree regeneration and vegetation development are explained for units that were clearcut and prescribed burned, clearcut and burned by wildfire, clearcut and unburned, and uncut and burned by wildfire. This guide discusses these changes, and visitors can see them as they walk the trails within the Miller Creek Demonstration Forest.

Keywords: clearcut, prescribed fire, wildfire, natural regeneration, vegetation succession, habitat type, stand structure, western larch, lodgepole pine

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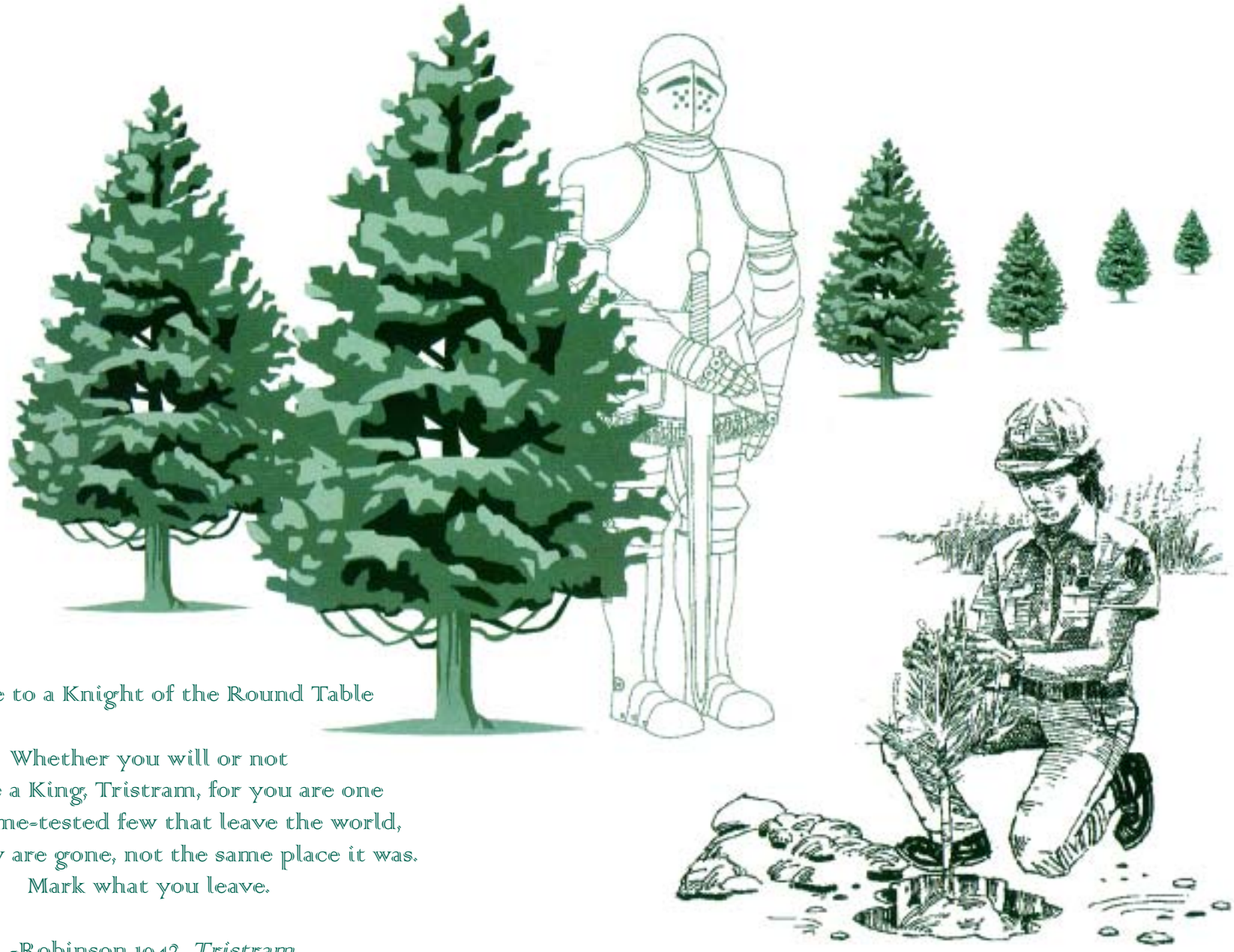

Advice to a Knight of the Round Table

Whether you will or not
You are a King, Tristram, for you are one
Of the time-tested few that leave the world,
When they are gone, not the same place it was.
Mark what you leave.

-Robinson 1942, *Tristram*