Maybeso Experimental Forest

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Water and land intertwine.

Introduction

The Maybeso Experimental Forest is in southeast Alaska within the Tongass National Forest, the largest national forest in the United States and home to the Northern Hemisphere's largest temperate rain forest. Located about 42 miles west of Ketchikan, Alaska, it is on Prince of Wales Island, the largest island of the Alexander Archipelago and the third largest island in the United States. The Maybeso watershed, near Hollis, was chosen in 1956 as an experimental forest to investigate the effects of timber harvesting on salmon streams, forest regeneration, and tree growth because it was a spruce-hemlock old-growth forest with commercial timber. The 11,000-acre Maybeso watershed experienced the first large-scale industrial clearcut logging in southeast Alaska. Past and current research within the Maybeso watershed has focused on growing managed forests, on studying landslides and slope stability, and on understanding the effects of timber harvest on the watershed, yielding much that managers can apply to other watersheds.

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Hollis was the first logging camp established on the east coast of Prince of Wales Island.

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Windthrow and landslides—the major forces of disturbance on the Maybeso.

Environment

If there is one striking feature in the environment of Maybeso, it is water. Like intertwined fingers, the land and sea of southeast Alaska mesh in multitudinous contacts. Moisture-laden storms from the Pacific introduce considerable precipitation—for Maybeso as much as 120 inches per year. Water drips as rain, hangs as overcast and fog, and clings as dampness, which means that all organisms here must face the ever-present wet.

Very little water is lost from the forests through evapotranspiration—the transfer of moisture from the earth to the atmosphere by evaporation of water and transpiration by plants. The majority of the year, a buffering blanket of clouds covers the area, which keeps the climate temperate, rarely exceeding 70 °F in summer and seldom below 10 °F in winter, and frost free from roughly the middle of May to the beginning of September. Huge amounts of heat flow to the region through ocean currents. Waters of tropical origin warm southeast Alaska; clouds keep in the warmth. This interplay of sea and storm enables a temperate rain forest to exist at a latitude where frostier conditions exist in other parts of the world. Coastal water plays an important role in creating the unique and globally significant environment that supports southeast Alaska's temperate rain forests.

Just as the presence of water distinguishes southeast Alaska, so does the absence of throngs of people. For millennia, native peoples held a special relationship with Prince of Wales Island. Archaeologists have found signs at prehistoric sites of human presence dating back approximately 10,000 years. The Kasaan Haidas in the southeast, Klawock Tlingits in the west, and Stikine Tlingits in the northeast relied on the offerings of land and sea. The Kasaan used the Maybeso River drainage as a source of game, fish, and plants. When hopeful European and American miners arrived in 1900, staking claims near present-day Hollis and within Maybeso, they found the Haidas and Tlingits living on the island. Human population burgeoned when industrial logging began in the 1950s. Although no mining occurs in the area now, several mining claims still exist within the experimental forest and in the upper part of Puyallup Creek, a tributary to Maybeso Creek.

Forest Types

The long, rainy coastline from Mon- terey, California, to Kodiak Island, Alaska, is often described as a single ecologic unit, or biome. The marine influence of rain and humidity keeps things cool in summer and warm in winter, and allows the plant and animal communities that thrive on this environment to stretch as far inland as the moisture does. In many areas along this biome, mountains present a barrier to Pacific storms and create a rain shadow—an abrupt change in precipitation east of their crests. Dense, wet, coniferous forest—from redwoods in California to Douglas-fir in Oregon and Washington, to western hemlock and Sitka spruce in British Columbia and southeast Alaska—characterizes the Pacific temperate zone. Unlike the rest of the Pacific rain forest and most places in the contiguous United States that dry out in summer, it is wind, not fire, that disturbs the forest in southeast Alaska, sometimes toppling acres of trees at a time. Disease and landslides also alter the forest. Owing to commercial logging activity, most of the present forest in Maybeso is 40- to 50-year-old second-growth Sitka spruce or western hemlock. Other conifers include Alaska yellow-cedar and mountain hemlock.

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Salmonberry.

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Trees reveal their ages; crew extracts a pencil-thin cylinder of wood from Sitka alder to count tree rings and determine age.

Red alder is the most common deciduous tree in the watershed. Red alder takes advantage of disturbed soils, growing in the places that have been upset by landslides, log-dragging, tractor usage, road construction, and streambank change. Because these events create gaps in the forest canopy, shade-intolerant red alder finds a place to grow, usually in linear patterns owing to the nature of these disturbances. With rapid juvenile height growth, red alder in Alaska usually occurs as a pioneer species,

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Red alder was once considered a weed tree, but research shows it has many ecological roles.

along with Sitka spruce and western hemlock. In almost all sites where these trees occur, the biggest diameter and tallest trees are conifers. Individual alders rarely live longer than 100 years, and when they die, they leave small openings among the long-lived conifers, which creates a patchy canopy. The patchy canopy allows shrubs and other plants to grow on the ground, adding diversity to the forest and providing critical winter forage for Sitka deer. Most mortality occurs in young, small-diameter conifers and alders. In younger, mixed red alder-conifer stands, a richness of understory plants can be found in higher numbers than in pure conifer and predominantly alder stands. Recent logging has contributed to the increase in red alder numbers in the forests of southeast Alaska. The 40-year-old mixed red alder-conifer stands currently found in Maybeso provide abundant and diverse understory plant communities.

Plant and Animal Species

Red alder, salmonberry, stink currant, devil's club, and blueberry, mixed with new growth of Sitka spruce and western hemlock dominate the streamside, or riparian, areas in Maybeso. Delighting in the moist environment, myriad flowers spring up—western skunk-cabbage, deer-cabbage, marshmarigold, yellow violet, copperbush, false hellebore, laceflower, twisted-stalk, single delight, ground dogwood, five-leaved bramble, fernleaf goldthread, deerberry. Damp-loving ferns include clubmoss, deer-fern, bracken-fern, oak-fern, and sword-fern.

Maybeso supports anadromous, or seagoing, fish—fish that migrate from freshwater to the ocean and return—as well as resident fish. Anadromous pink, chum, and coho salmon, and Dolly Varden char, steelhead, and cutthroat trout are the salmonids that travel throughout the main stem of Maybeso Creek, as well as its tributaries. Pink and chum salmon spawn in freshwater in late summer, and the fry migrate to the ocean immediately after they emerge in spring. The others—coho salmon, cutthroat trout, and Dolly Varden—all spend several years in freshwater before they migrate. Some juvenile salmonids can be found in small, high-gradient creeks, although few in number at these locations. Resident cutthroat trout also live in the Maybeso Creek system. Maybeso also is home to black bear, Sitka black-tailed deer, marten (introduced), wolf, ermine, mink, dusky shrew, northern flying squirrel, Keen's mouse, long-tailed vole, and bats. River otter and beaver take advantage of water and land locales. Serenading all is an avian chorale composed of Townsend's warbler, Pacific-slope flycatcher, golden-crowned kinglet, winter wren, Swainson's thrush, chestnut-backed chickadee, hermit thrush, and varied thrush.

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Juvenile coho salmon—starring role in a study on forest management practices.

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Wildlife research provides new information about relations between predation on bird nests and habitat factors.

Water

Fed by many small tributaries that rush from steep slopes, the main stem of Maybeso Creek flows approximately 5 miles, drains a U-shaped valley, and delivers freshwater to the sea at Twelve Mile Arm. During fall storms, streamflow can be 10 times the low summer flow. Fallen trees are swept into logjams, and boulders and gravel accumulate, forming pools and gravel bars, creating habitat for fish. Beavers build dams, which have created numerous ponds on the valley floor.

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How is water processed through the land and into streams? Studies in Maybeso are yielding data.

Geology

The forces of plate tectonics and glaciation have wrought the physical characteristics of Prince of Wales Island. As a conveyor belt moves objects, plate movement brought fragments of land to the island and accreted, or joined, the masses. Rocks of the Alexander Terrane, a large accretionary fragment consisting of granodiorites, greywackes, conglomerates, limestones, and sandstones, dominate the island. Prince of Wales Island also bears the effects of past glaciers—rivers of ice that stretched down from the mountains or vast sheets that buried expanses of the North American

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Years of data have been recorded on stream changes in relation to forest processes.

continent. During the major ice ages, so much of the world's water was locked up in glacial ice that sea levels dropped. But in areas that supported glaciers, the weight of vast glacial ice had the opposite effect, and pressed the land down, in some places twice as deep as the lowered global sea level. Several thousand years after the ice retreated from the Alexander Archipelago, the ancient shorelines were cut off from sea contact. Today, they can be found hundreds of feet above sea level, and in some cases, miles inland. With the weight of the ice removed, land eventually rebounded, much as a mattress does when a sleeper arises. Coupled with continuing glacial rebound are the forces of plate tectonics that continue to create uplift, to shape, form, and shape again southeast Alaska. The Maybeso Experimental Forest exists within this shifting context.

Prince of Wales Island is a recently deglaciated landscape. About 20,000 years ago at the height of the Wisconsinan Glaciation, almost all of southeast Alaska was covered by ice. Creeping like giant bulldozers, glaciers cut out broad, flat, U-shaped valleys as opposed to V-shaped valleys that are cut by fast-running water. The watershed of Maybeso Experimental Forest is a steep, wide, U-shaped valley—characteristic of formerly glaciated landscapes—with a single stream network. Land rises from sea level at the mouth of Maybeso Creek to roughly 3,000 feet in the north, and 2,500 feet to the south. Stream channels developed in the last 10,000 years. Varying thicknesses of till—mixed fine and coarse, poorly sorted rock debris, a legacy of glaciers—cover most of the bedrock below 3,000 feet on the island. Soil ranges from 1 to 3½ feet deep. Soils are well drained and sandy along the valley bottom, with raw humus and litter, typical of southeast Alaska hemlock-spruce forests, found elsewhere.

Past Research

When the Maybeso watershed was designated as an experimental forest in 1956, the original purpose was to investigate the problems involved in harvesting old-growth forests—characterized at the time as "overmature climax type"—to study forest regeneration and growth in southeast Alaska, and to understand the effects of clearcut logging on salmon spawning habitat. Logging in Maybeso Valley began in 1953 and continued through 1963, with nearly all commercial timber removed for 4½ miles along both sides of Maybeso Creek, and up the valley walls, comprising one-fifth of the forest. Studies of natural regeneration after harvest were begun, as well as research on silviculture treatments—the science, art, and practice of caring for forests with respect to human objectives—that were suitable for young, even-aged stands of Sitka spruce and western hemlock. Landslides were frequent on the steep, clearcut slopes, leading to the start of research on soil mass movement. Scientists studied the relations of root strength, soil saturation, soil depth, and slope steepness to hillslope stability.

Over the years, research on the watershed has evolved from studies of salmonid spawning habitat to a broader study of stream and riparian habitats as these environments move through successional stages—the cumulative change in types of plant species—following removal of large trees along the stream, and subsequent regrowth of conifers and alders. Scientists have worked to understand the effect these changes have on juvenile salmonid populations. These studies have established a long-term analysis of stream channel evolution by using physical measurements taken from 1949 through 1960, and expanded in 1984 to the present. A recently completed study of small, high-gradient streams in the Maybeso watershed has revealed that these streams are used by resident and anadromous fish, and may be important spawning areas for anadromous Dolly Varden.

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Legacy stump.

Clearcutting has been the primary timber management practice in forests of southeastern Alaska since commercial timber harvesting began in the 1950s. Conifer forests in southeast Alaska have no trouble regenerating after harvest and rarely need artificial planting. Although the amount of water limits the regeneration and proliferation of life in other areas, southeast Alaska has abundant water. The dense, uniform, even-aged conifer stands that develop after clearcutting can shade out other understory species that might provide browse or cover for wildlife; as a result, biodiversity can be limited in these stands. Forest canopy closure generally occurs 25 to 35 years after cutting and is followed by a nearly complete elimination of understory vegetation for 100 years or longer.

Research began in 1974 on the management of these young, dense, hemlock-spruce stands in coastal Alaska. Plots included in this study were established in the Maybeso, among other locations, and have been remeasured every 2 to 4 years since the study began. Some plots have been thinned according to regimes specified for the study. The long-term study is planned to last until the trees mature and are harvested sometime in the 21st century. Scientists have discovered that inclusion of red alder may provide more benefits than would thinning the even-aged conifer stands, although alder will not mitigate all wildlife habitat problems. Thinning to encourage understory plants often leads to more new conifer growth and little opportunity for understory species. Mixed red alder-conifer stands provided more

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Understory plant diversity is higher in mixed red alder-conifer stands (left) than in young, dense, pure conifer stands (right).

structural variety than pure conifer stands with different tree sizes, varying canopy layers, and similar numbers of large-diameter trees. Understory plant diversity and abundance were significantly higher in mixed red alder-conifer forests, and most of the increase was in plants important for deer forage and other small wildlife species. Mixed red alder-conifer stands also potentially provide more food for songbirds, more nest sites, and more safety for nests from predators. These interdisciplinary studies provide a significant information base from which to evaluate the evolution of an intensively managed landscape.

Current Research

Current research in the watershed is focused on the management of second-growth forests and on the development and evaluation of watershed restoration methods. Studies on silviculture, fish habitat, and hydrology will yield information vital to these goals.

Forest management and silviculture. The long-term growth-and-yield studies started in 1974 continue in the second-growth hemlock-spruce forests. The first 25 years of data have produced worthwhile results, and scientists plan to continue the study until 2074, a century after it began. Long-term data sets such as these are extremely valuable in forest science and useful to forest managers. For example, forest managers could discover that the volume of pure conifer timber may decrease with increased volumes of alder, but alder as a timber resource has become valuable in the Pacific Northwest. Managing to increase red alder would supply market trends. Giving up a small amount of timber production to provide for the needs of deer by selecting mixed-species conditions is another possible management strategy. Management decisions can be made to favor one resource over another to reflect evolving values and objectives. By understanding resource amounts produced in stands with different amounts of red alder, managers may apply what they learn at Maybeso to watersheds or larger tracts as they develop forest plans. Scientists are evaluating low- to moderate-intensity partial-cutting of old-growth hemlock-spruce forests as a way to provide for many values such as wood production, wildlife and fish habitat, and aesthetic quality. The effectiveness of a wide range of alternatives to clearcutting will continue to be tested by experimental studies in Maybeso.

Fish habitat. The Maybeso watershed is part of a study that uses coho salmon to monitor the effects of forest management on stream habitat throughout the Tongass National Forest. Long-term data from Maybeso provide a historical record of riparian changes in a young-growth forest watershed, and how those changes relate to salmonid abundance and distribution. Detailed scale maps of the main stream were made before timber harvest began in 1953 and updated annually during timber harvest. These maps, combined with low-level aerial photography during many subsequent years, provide roughly 50 years of recorded changes in channel shape and habitat quality for fish. Forest managers can use information from past and current studies on these relations within young-growth forests to restore watersheds affected by timber harvests.

Hydrology. Despite the significance of water in southeast Alaska, hydrologic processes in these watersheds are poorly understood. For example, when it rains, how long does water reside in the subsurface soil, bedrock, and till layers? What are the relations between tree species and water chemistry? How does rainfall amount vary with elevation? Streamflow and temperature data have been collected intermittently during the past 40 years, and a stream gauge was recently re-established on the stream. Data collection helps researchers investigate these questions; eventually the answers will help scientists and managers to better predict streamflow, soil saturation, and nutrient concentrations not only in the Maybeso watershed but also in watersheds throughout Alaska and the Pacific Northwest.

Nearby Research Natural Areas

Research natural areas (RNAs) are designated on national forest lands to represent different types of naturally occurring terrestrial and aquatic ecosystems. The RNAs protect examples of terrestrial or aquatic ecosystems for comparison with similar areas influenced by people. Two RNAs in various stages of forest succession on Prince of Wales Island are valuable study areas for comparison with the Maybeso, adding to the significance of studies on the experimental forest itself.

Old Tom RNA. This RNA is located in the Skowl Arm area and is accessible by boat or floatplane. It can provide an old-growth control for some aspects of studies in the Maybeso. Old Tom is approximately 15 air miles south, 25 miles by saltwater from Twelvemile Arm to Old Tom Bight.

Rio Roberts RNA. Portions of this RNA have natural second-growth stands, and its riparian flood plain has Sitka spruce. Rio Roberts is about 15 miles west of Thorne Bay and 15 miles northwest of Maybeso Experimental Forest. It is accessible from Route 929 or by helicopter.

Travel

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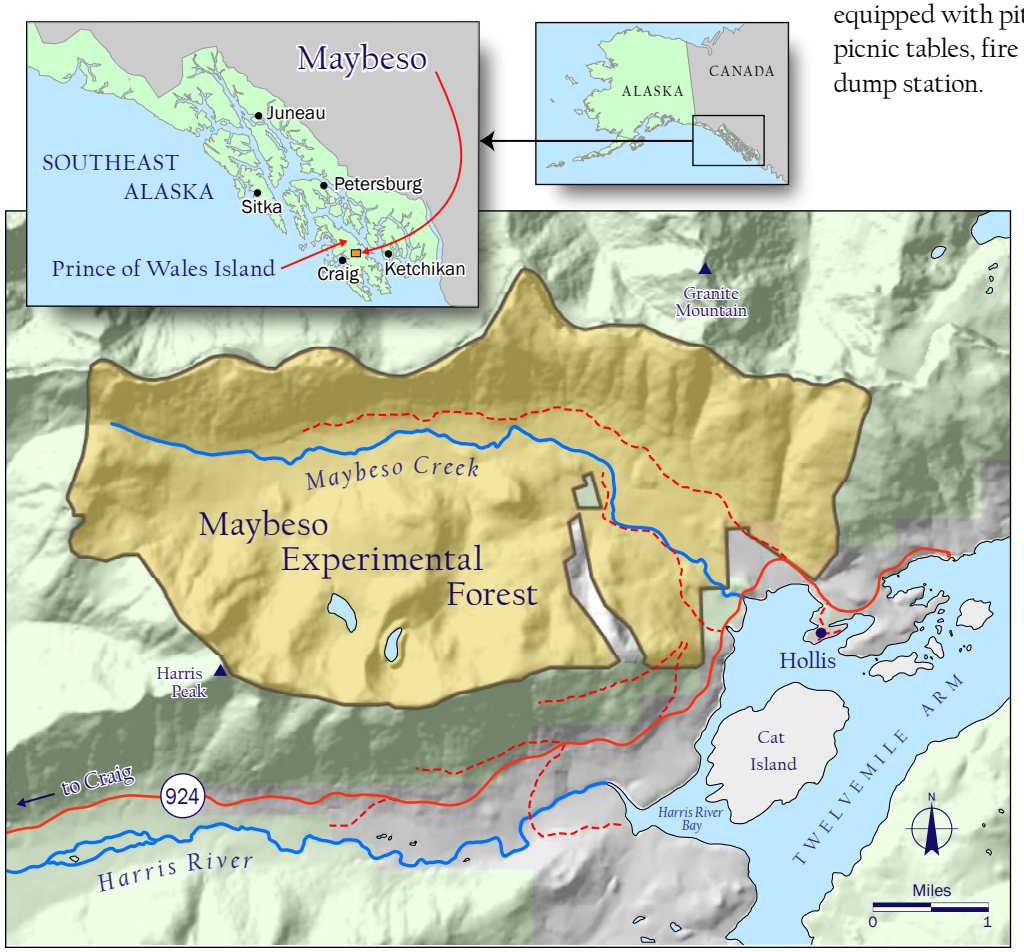
To visit Maybeso, travel to Prince of Wales Island. Daily ferry service is available from Ketchikan to the inter-island ferry dock in Clark Bay, Prince of Wales Island (http://www.inter-islandferry.com/calendar.html). Alternatively, charter airlines have regularly scheduled flights from Ketchikan to Prince of Wales Island. The Maybeso Experimental Forest is approximately 2 miles west of the Clark Bay ferry terminal on paved Route 924 toward Craig, Alaska. Two roads access the Maybeso Valley itself. These roads are located 1.8 and 2.3 miles from the ferry terminal (no signs). Route 924 crosses Maybeso Creek at approximately 2 miles from the ferry terminal. Ketchikan, Alaska, can be reached by air or ferry. Daily jet service is provided by Alaska Airlines from Anchorage and Seattle. The Alaska Marine Ferry schedule is available on the Web at http://www.akferry.com/pages/schedule.html.

Facilities

Maybeso Experimental Forest is day use only. A 12-person bunkhouse for researchers only was completed in 2002 at Hollis, 2 miles from Maybeso. Two older buildings at the Hollis site provide storage and work space for ongoing research at the forest. A Forest Service campground for other visitors is located 10 miles west of Hollis on Highway 924. The campground is equipped with pit toilets, drinking water, picnic tables, fire pits, picnic shelters, and dump station.



Map by Keith Routman and Frances Biles

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Resources on the Web

PNW Research Station. http://www.fs.fed.us/pnw. This site lists all publications by Station scientists, including those based on research at Maybeso Experimental Forest.

Maybeso Experimental Forest. http://www.fs.fed.us/pnw/exforests/maybeso.

U.S. Geological Survey site for real-time data on Maybeso Creek stream gauge. http://waterdata.usgs.gov/ak/nwis/current/?type=flow&group_key=NONE&search_site_no_station_nm=15085800.

USDA Forest Service experimental sites participating in HydroDB (hydrology database). http://www.fsl.orst.edu/climhy/hydrodb/.

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