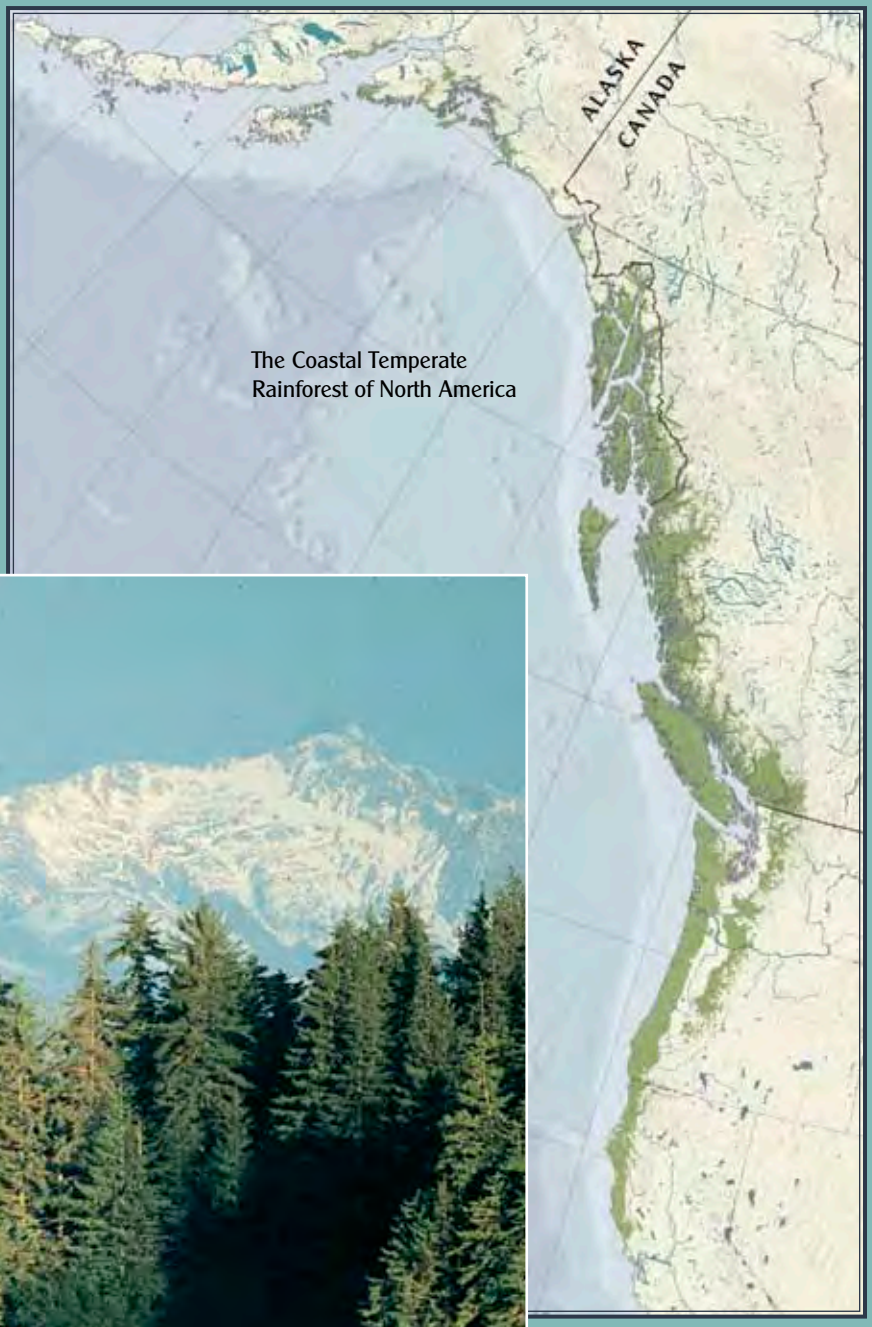
THE Alaskan Rainforest

Alaska Department of Fish & Game

The Alaskan rainforest: **natural history**

Southeast Alaska lies at the heart of the North American temperate rainforest — a forest that extends in a narrow 2,500-mile coastal strip from northern California, along coastal British Columbia, and to the eastern edge of the Kodiak archipelago in southcentral Alaska. Temperate rainforests are cooler, though just as wet as their tropical counterparts, receiving up to 200 inches of rain per year. Smaller temperate rainforests are found in southern Chile, Scandinavia, New Zealand and Tasmania.



The Coastal Temperate
Rainforest of North America

Map reprinted by permission of Ecotrust
www.ecotrust.org

John Schoen

Deep green and lichen draped, these forests cloak the islands and mainland along the southern coast of Alaska. They are generally found below elevations of 2,500 feet and grow largest in broad river valleys with well-drained soils. In some areas, extraordinary forests have developed with giant cedar, hemlock and spruce trees up to 12 feet in diameter, over 200 feet tall and 1,000 years old. Such forests have the greatest amount of living plant life per area of any forest in the world.

Sitka spruce tip Norio Matsumoto

trees

The temperate rainforests of coastal Alaska are often referred to as Sitka spruce-western hemlock forests because these particular species are the most common. Sitka spruce is uniquely dependent on the rainforest's climate. Unable to regulate water loss through its needles, it can live only in places where perpetual rain (or fog) supplies it with abundant year-round moisture. Other notable trees include Alaska yellow cedar, western red cedar, mountain hemlock and shore (lodgepole) pine. These trees are less common and less widely distributed. Western red cedar is a prominent tree in the southern islands but is rarely found north of Petersburg. Mountain hemlock, the graceful favorite of famous naturalist John Muir, is found predominantly at higher elevations. Alaska yellow cedar and shore pine favor wet, poorly drained sites.

Sitka spruce

western hemlock

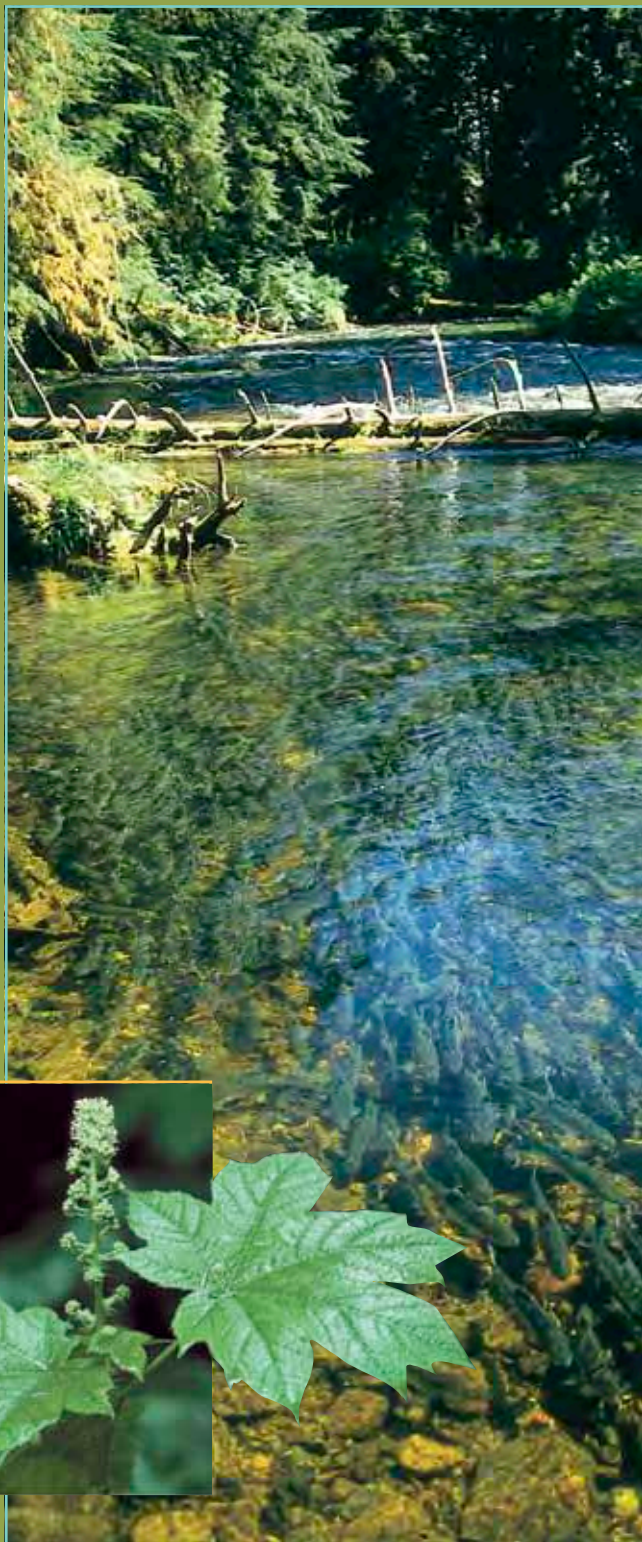
western red cedar

shore (lodgepole) pine

rainforest: Craig Flatten, ADF&G

The Alaskan rainforest: **an ecological web**

The Alaskan rainforest is home to a complex web of ecological inter-relationships that scientists are just beginning to understand. Although large predators, like the grizzly (brown) bear and the gray wolf have been eliminated from most of their historic North American range, they still occur in the Alaskan rainforest in densities that are unrivaled anywhere. Most research attention has focused on these charismatic wildlife species. But scientists are beginning to unravel the web of inter-relationships between lesser-known species that may, in fact, be vital to the well-being of the rainforest itself.



(center) Pink salmon returning to their natal streams to spawn are easy pickings for a host of eager piscivores.
John Hyde, ADF&G

Riparian (streamside) vegetation like devils club benefit from the carcasses of half-eaten salmon that fertilize the soil.

Bob Armstrong

Jon Lyman, ADF&G

piscivores

John Hyde, ADF&G

brown bear

Gail Blundell

marten

Norio Matsumoto

bald eagle

Jeff Nichols

angler

Researchers have found unusually rich populations of invertebrates, such as stoneflies and mayflies, in fresh-water streams where salmon spawn. It turns out that Pacific salmon, which return to their birth streams to reproduce and then die, carry stores of nutrients accumulated in their bodies during years of life in the open ocean. Upon their death, these nutrients are released into the freshwater, fertilizing and enriching the stream and all its associated life. Even the streamside trees and shrubby vegetation benefit. Bears, eagles, marten, wolves and other piscivores (fish eaters) haul thousands of carcasses each year onto stream banks, where they are partially consumed and left to fertilize the forest.

"scuzz"

Less obvious, but no less important, are the inter-relationships that exist on a microscopic level. Looking closely at the individual needles of old trees reveals a complex community of single-cell algae, yeasts and bacteria coating the surface. Inelegantly referred to as "scuzz" by the scientists who discovered it in the Pacific Northwest, this material is the food source for an assemblage of tiny grazing invertebrates, such as mites and springtails. Moving one step up the food chain, larger invertebrates, such as spiders, prey upon the mites and springtails. Here, finally, is a species that the average hiker in the forest will notice. Scientists speculate that the existence of this microscopic community of grazers and predators accounts for the temperate rainforest's remarkable resistance to attack by insect pests.

Worm fungus. Jeff Nichols

Just as "scuzz" grows on needles at the top of a towering 200-foot tree, an entirely different microscopic community is at work on the other end of the tree — its roots. Branching ever more finely, rootlets eventually terminate in millions of filamentous "hairs" that are barely visible to the human eye. This is where nutrients and water transfer from soil to tree. In a healthy forest, the soil is replete with microscopic organisms, including a special type of mycorrhizal fungi that coat the surface of the tiniest root hairs. These fungi aid in the absorption of nutrients and water by the tree, and in return receive nourishment from the tree. In the absence of these fungi, tree growth is limited.

So from the tips of needles to the tips of root hairs, and on every surface between, complex ecological relationships are playing themselves out in the Alaskan rainforest. It is the complex interweaving that contributes to the stability and vitality of this unique ecosystem. Untold secrets of the Alaskan rainforest will undoubtedly be discovered by future generations of scientists. We've only begun to scratch the surface.

Bob Armstrong

Because of shallow soils and high water tables, the roots of 200-foot tall trees often extend no deeper than 24 inches into the soil. Trees are particularly prone to tipping over during the rainy fall season, when soils are saturated, and winds more than 50 miles per hour sweep onshore from the Gulf of Alaska. These fallen trees, and the canopy openings they create, are essential elements of the Alaska rainforest.

(detail) Microscopic views of mycorrhizal fungi.
Dr. Robin Rose

The Alaskan rainforest: **wildlife**

The rainforest environment of Alaska is home to at least 40 species of land mammals, more then 200 species of birds, 5 amphibians and a single reptile species (the garter snake). The ways in which these species make a living in the rainforest are as fascinating as they are varied.

The **northern flying squirrel** is a small nocturnal mammal known widely for its ability to glide on specialized flaps of skin up to 100 yards through the forest canopy. This secretive creature eats lichens found in the forest canopy and truffles, an aromatic underground fungi. Different than the seed-eating diets of most squirrels, this diet is perfectly matched to the moist environment of the Alaskan rainforest with its diversity and abundance of lichens and fungi.

Jeff Nichols

Jeff Nichols

Another denizen of the Alaskan rainforest is the **rough-skinned newt**. Considered the most poisonous salamander on earth, glands under its skin contain a toxin ten times more potent than cyanide. Predators give this salamander a wide berth! Despite looking like a miniature dragon as it creeps through the old-growth understory and emerges from its favored haunts beneath rotten logs or small seeps, the four-inch-long newt is really a non-threatening creature of the rainforest (as long as you don't eat them!)

The rainforest is also an important place for larger animals, which, not surprisingly, have been more intensively studied. Beginning in the 1970s, state biologists initiated studies on the role old-growth forest plays in providing habitat for **Sitka black-tailed deer**. Among other things, biologists learned that the multi-layered canopy of the old-growth forest intercepts most of the winter's snow, making food plants on the ground below available to deer. And the larger the trees, the more snow they intercepted. Biologists also discovered that plants which were grown in the shade of the forest were more nutritious and digestible than the same plants grown in open clearcuts.

Gail Blundell

Gail Blundell

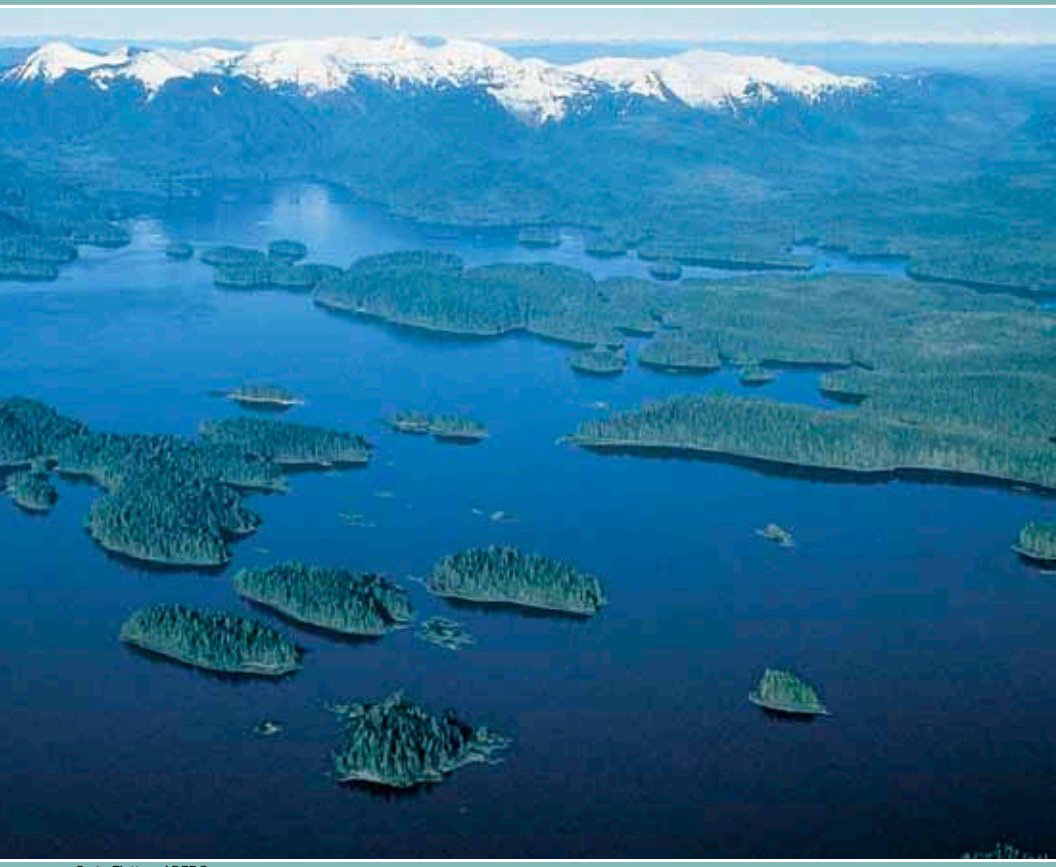
Healthy deer populations are important for many reasons, including as a food source for the **Alexander Archipelago wolf**. A smaller, darker-colored variant of its northern cousins, the Alexander Archipelago wolf is a subspecies inextricably linked to the rainforest environment. These wolves range over 100-square-mile territories in search of deer, their primary prey. However, they supplement this diet with some unexpected prey, including waterfowl, seals, salmon and even black bears! One study found wolves feeding heavily on salmon, foraging similarly to the celebrated bears of coastal Alaska.

birds

The Alaskan rainforest is a dynamic and diverse environment — a fact well-reflected in the array of birds that inhabit the rainforest. Whether experiencing the ethereal melody of the hermit thrush, the yellow flash of a darting Audubon's warbler, the ventriloquist-like hooting of a spruce grouse, the chatter of a streamside dipper or the whirr and flash of a rufous hummingbird, the observant visitor to the rainforest is struck by the diversity of avian design.

While many rainforest species are migratory (e.g., warblers, hummingbirds and thrushes), others like ravens, chickadees and winter wrens remain in the rainforest throughout the year. Some species such as the northern goshawk prefer undisturbed rainforest for foraging and successful breeding. The marbled murrelet, a seabird that spends most of its life on the ocean, nests on moss-covered limbs high in the forest canopy.

(clockwise)
great horned owl (Bob Armstrong)
marbled murrelet (Jeff Hughes, ADF&G)
yellow warbler (Bob Armstrong)
dipper (Jamie Womble)
spruce grouse (Craig Flatten, ADF&G)
goshawk (Craig Flatten, ADF&G)
bald eagle (John Schoen)
rainforest (Jeff Nichols)



Craig Flatten, ADF&G

The Alaskan rainforest: **conservation and use**

The Alaskan rainforest is large — and largely undeveloped. In Southeast Alaska alone there are hundreds of islands, 15,000 miles of coastline, over 19 million land acres, and over 5 million acres of pristine old-growth rainforest. Most important — over 90% of the land in Southeast Alaska is public land — managed for you. That invites vigorous public debate over the future of these lands. Some desire a greater emphasis on logging, mining or tourism developments; others want more wilderness or habitat protection for fish and wildlife. The Forest Service, and in some cases, the U.S. Congress, makes these land management decisions. Biologists with the Alaska Department of Fish and Game participate in the process by providing research information to ensure that decisions are made with the benefit of the best available science.

It takes over 200 years for new stands to acquire the uneven-aged tree structure and understory characteristic of old growth.

Several important findings have emerged. Clearcut logging creates two distinct stages of forest succession, both of which differ markedly from the original old-growth stands they replace. Young clearcuts, less than 30 years old, are relatively open and produce abundant understory growth. The value of these early clearcuts to wildlife depends on the species and the season. However, after 30-35 years, the young trees overtop the shrubs and shade out most of the understory. These older second-growth stands provide poor habitat for most wildlife species, and are very long- lasting. It takes over 200 years for these stands to reacquire the uneven-aged tree structure and understory characteristic of old growth. Because the effects of this habitat conversion are not realized until decades after logging, and then last for centuries into the future, the full effect on forest wildlife can be difficult to appreciate.

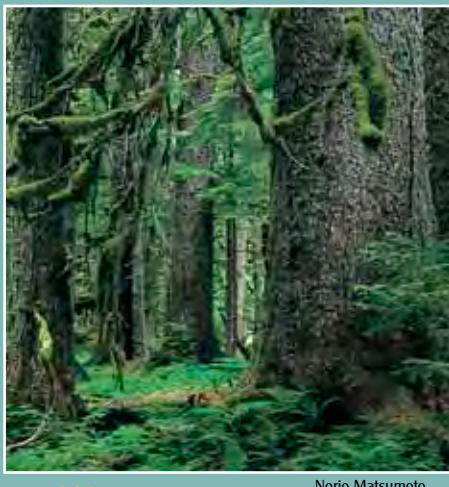
After logging

5-10 years

Craig Flatten, ADF&G

50-75 years

John Schoen



over 200 years

Norio Matsumoto

This lush rainforest at Trocadero Bay on Prince of Wales Island exhibits the essential attributes of a temperate rainforest: Large old trees, downed logs on the forest floor, and an abundant, diverse understory. Stands like these rival tropical rainforests in terms of the volume of living plant material they contain.

Norio Matsumoto

Although the amount of forest logged can be a useful indicator of ecosystem health in other places, in Alaska, biologists are concerned with logging rates in specific types of Alaskan rainforest. In particular, scientists are concerned with the depletion rate of so-called "big tree stands." These highly productive forests grow along the coastline and major river valleys, wherever soils are fertile and well-drained. Because of their composition, structure and position on the landscape, these areas are also among the most productive for wildlife. For example, on Admiralty Island researchers found 2/3rds of all deer use over four winters was in big tree stands, even though these stands made up less than 10% of their study area. The loss of that small forest type would have a disproportionate effect on deer populations, and would greatly reduce forest diversity.

Matt Kirchhoff, ADF&G

Large Alaska cedar trees like this one may exceed 1,000 years of age.

Data collected by ADF&G biologists studying deer populations compares snowdepths in forested and open areas.

Lichens can be filament-like (as in this picture) or leaf-like in appearance, but all lichens are the result of a symbiotic relationship between fungi and algae. The fungi provides the frame or body of the lichen, and the green algae provides the photosynthetic capacity to fuel the lichen' s growth. For reasons that are not fully understood, lichens are sensitive to air pollution, and so, are a useful ecological indicator of a clean environment.

Matt Kirchhoff, ADF&G

Biologists at the Alaska Department of Fish and Game have been doing research to better understand the forest's complex inter-relationships. They have communicated conservation concerns to policy makers and the public, and have studied ways to conduct logging in the Alaskan rainforest so that wildlife values are not unduly compromised. To this end, they have helped design a system of old-growth reserves across the forest to ensure the future of key wildlife species. Their research has helped managers minimize impacts on bears, marten, goshawks, deer and wolves by recommending protection of important habitats, and prescribing alternative tree harvest methods to clear-cut logging. Progress is being made towards a management plan that is truly sustainable, but more remains to be done. The Alaska rainforest is an incredible ecosystem — one we are all privileged to enjoy and use. We have the responsibility, and the opportunity, to preserve the same options for future generations.

Matt Kirchhoff, ADF&G

A biologist examines a blueberry plant for evidence of browsing by deer.

Jack Gustafson, ADF&G

This brochure was made possible with special Federal Outreach funding.

Cover photos
rainforest: Craig Flatten, ADF&G
deer: Gail Blundell
spruce tip: Norio Matsumoto salmon: Jeff Mondragon
goshawk: Craig Flatten, ADF&G

This brochure written and published by the Alaska Department of Fish & Game.