



*Nature is not a place to visit. It is home.*

Gary Snyder, poet, 1952

## Mounting Effects of Incremental Change

North Cascades is studded by glaciers and lakes, blanketed by forests, and threaded by rivers. Steep, nearly vertical slopes converge in narrow river valleys that offer ways into the wilderness. You may think it is an immutable place, outside time. But in the remote reaches of the park and its inhabited areas, ecosystems and the species at home in them now show effects of human intervention or actions.

By altering Earth's atmosphere, we are physically and biologically transforming our world. Viewed in the continuum of the planet's 4.5-billion-year history, the changes of the last few decades are sudden and extreme.

How trees and plants respond to changes in climate will vary depending on elevation, direction of exposure, and other factors. At lower elevations, warmer and drier summers may result in increased tree mortality. Smaller trees are likely to succumb first.

At higher elevations, warmer temperatures will melt snow earlier. The longer growing season will allow trees like sub-alpine fir to establish up-slope. The tree islands characteristic of subalpine park-

land will expand, displacing flower fields and changing animal habitats. As snowfields melt, some shrubs and herbaceous plants may also move up in elevation—if they can find enough soil.

Drought and higher temperatures will stress many trees, allowing diseases, native insects, and non-native pests to spread more quickly. For example, almost two-thirds of the park's whitebark pine, an important tree in subalpine meadows, now suffer from a non-native blister rust.

While some changes may be hard to see, one looms large. The glaciers of the North Cascades range are shrinking (*right*). As less ice and snow build up in winter, more melting occurs in summer.

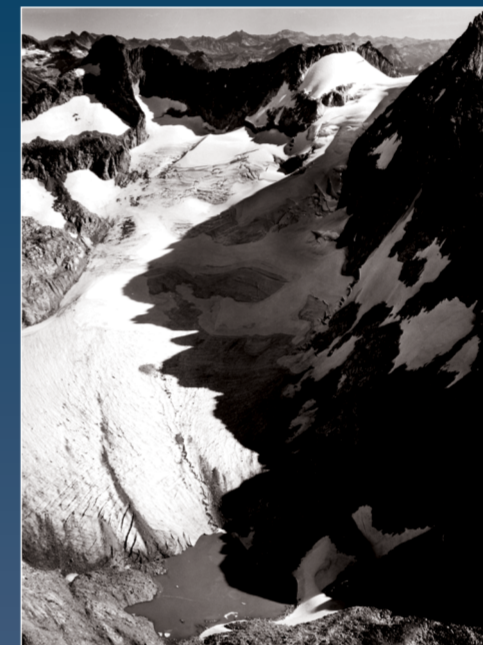
This leads to less water in the Skagit and Stehekin rivers in summer and to further local and regional repercussions.

Stakes are high. Rivers, lakes, forests, and wildlife depend on snow and glacial melt, as do people. In the Pacific Northwest, snow and ice are critical resources that contribute water for drinking, irrigation, hydropower, recreation, and life.

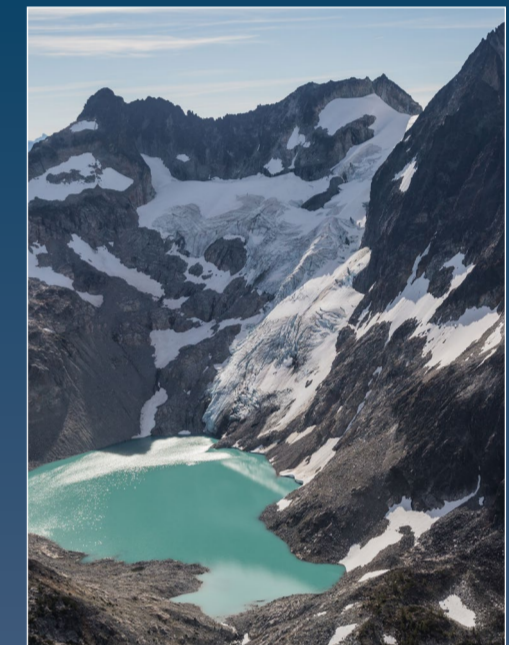
Photos (*right*) show that Banded Glacier melted back dramatically between 1960 and 2016. The park's glaciers have been closely monitored since 1993. In Skagit Valley, which makes up 75 percent of the park, glacial volume has decreased by 800 billion gallons of water since 1959.

Aerial view of Mt. Goode in winter (*above*).  
 © STEPHEN MATERA

1960



2016



## The Pulse of Two Rivers

### Skagit River

**WEST SIDE** Over 370 glaciers now feed the Skagit River in late summer, when little other runoff occurs. The glacial melt helps fill Gorge, Diablo, and Ross Lakes (*map, other side*). All three lakes are dammed, with hydroelectricity generating stations that power the city of Seattle. But the dams block the downriver movement of sediment and large debris, like tree roots and limbs, which contribute to salmon habitat.

**FISHERIES** The Skagit River supports all five Pacific salmon species—chinook, coho, sockeye, chum, and pink. The salmon runs—when the fish leave the Salish Sea and swim upriver to spawn—have declined, in part because of shifts in river temperatures and volumes. Other factors are tide gates that block passage by young salmon and dikes that prevent salt water from overwashing former marshlands, which are prime salmon habitat.

The culture, economy, and community life of the Upper Skagit, Sauk-Suiattle, Swinomish, and other Pacific Northwest tribes are closely linked to the periodic salmon runs, which bring rhythm and a sense of plenitude to people's lives. To help stabilize the salmon populations, sport, tribal, and non-tribal commercial fisheries have reduced their catches. More measures may be needed before the populations return to healthy levels.

### Stehekin River

**EAST SIDE** East of the Pacific Crest, snowfields and 19 named glaciers, which cover 4,875 acres, feed the Stehekin River (*map, below right*), which rushes into Lake Chelan. With a depth of 1,459 feet, the lake is 359 feet below sea level. As storms become more frequent and intense, increases in the Stehekin's volume can cause severe spring floods in the river valley.

The availability and timing of water affect delicate cycles of growth for trees, herbaceous plants, and pollinators in the Stehekin valley. Apple farming is a mainstay of central Washington's economy. When fruit trees blossom, mature insects must be available to pollinate them, or the trees will not set fruit. Flooding can interrupt these cycles.

business into the 1950s. It continues to produce Common Delicious apples (*below*) and two other original varieties: Red Rome Beauty and Jonathan. The National Park Service manages the 50-acre orchard with the Buckner Homestead Heritage Foundation and the Stehekin community. The orchard's gravity flow irrigation system, fed by snowpack, is still in use today. Drought may become a bigger threat to Buckner Orchard as climate change leads to a reduced volume of water.

Stehekin is home to Buckner Orchard, planted in 1912 and managed as a family



Cedar trees along the Skagit River  
 © EVERYONE'S TRAVEL CLUB

Coho salmon  
 © 2002 JOSEPH TOMELLETTI

Pacific Northwest tribes fishing the rivers with gill nets  
 UNIVERSITY OF WASHINGTON LIBRARIES, SPECIAL COLLECTIONS, UW 39065

Sockeye salmon  
 USFWS/TIM KNEPP

Pre-contact stone weight for gill net  
 NATIONAL MUSEUM OF THE AMERICAN INDIAN



The opaque blue water of Diablo Lake comes from glacial 'flour' (pulverized rock), carried to the Salish Sea by the Skagit River  
 © SOON KIM



Stehekin River  
 NPS/OBRY DIXON

Pink salmon  
 USFWS/TIM KNEPP



Above: Picking Common Delicious apples (*left*) at Buckner Orchard  
 BUCKNER HOMESTEAD HERITAGE FOUNDATION

## Power in Wilderness

In the last century, civil engineers realized the potential of the Skagit River to generate power for the region. They yoked the wild river to technology, damming the river in three places along State Route 20 (*other side*) and created Gorge, Diablo, and Ross lakes (1924, 1930, and 1949). The original Gorge Dam was small, built from rocks and logs; the present dam dates from the 1960s. The Diablo generators (built 1930), had the greatest capacity of any in the world. The publicly owned Seattle City Light hydropower project continues to operate today.

As you step off the paved highway, the infrastructure and technology that link North Cascades to nearby urban areas quickly recede from sight and mind. You enter a spectacular landscape, its terrain ever more difficult as you hike deeper into the Stephen Mather Wilderness (*map, other side*). Its more than 680,000 acres, with nearly limitless opportunities for solitude, discovery, and exploration, are part of everyone's legacy.

In the exhilarating wilderness of North Cascades, you can also find evidence of the interdependent nature of species. Here and elsewhere, dramatic, human-induced changes in Earth's atmosphere have led species, including our own, to respond in a chorus of adaptations.

For decades scientists have inventoried and monitored species and their habitats in the North Cascades range. The compiled record of change shows that some will adapt and survive, others may die—and that the outcome is uncertain.

Clark's nutcracker (*below*) depends on the whitebark pine as a food source and the whitebark pine depends on the Clark's nutcracker to disperse

and sow its seeds. If a tree succumbs to blister rust and dies, the birds' food supply shrinks.  
 © PAUL WYMAN



Hikers on the Sahale Arm Trail (*right*).  
 © KATIE MILLS



### Stehekin Area Detail



Scale varies in this 3D perspective view.

# Alpine and Subalpine Species

Pikas, marmots, and wolverines are mammals that require higher elevation habitats with mild, short summers and long winters with deep snowpack. Pikas live in subalpine zones, on slopes covered with loose rock (talus) that gives them shelter from summer heat. They forage in surrounding meadows and gather 'haypiles' to eat in winter. Rising temperatures may prevent pikas from seeking and collecting food they need to survive the winter.

To survive long winters in hibernation, the marmot, a subalpine species, needs deep snowpack to insulate its den. One of its alpine predators, the wolverine, relies on the marmot as its main food source. Climate changes that alter the marmot's habitat could mean that its predators too must adapt, or die.

## Stephen Mather Wilderness



**Wilderness** Congress has protected over 94 percent of North Cascades National Park Service Complex as wilderness under the 1964 Wilderness Act. For information about the National Wilderness Preservation System, visit [www.wilderness.net](http://www.wilderness.net).

To learn about National Park Service facilities, activities, and trails, visit park headquarters in Sedro-Woolley or visitor and information centers in Newhalem, Marblemount, Stehekin, and Glacier. Books, maps, and gift items are sold at these locations.

**Trails and Hiking** Trails at lower elevations are usually free of snow from April to mid-October. Most trails at higher elevations are clear by mid-July.

**Camping** Vehicle-access campgrounds are at Goodell Creek, Newhalem Creek, Colonial Creek, Gorge Lake, and Hozomeen. Some sites may be reserved in advance, while others are first-come, first-served. For additional information check [recreation.gov](http://recreation.gov). For all boat-in campsites on Diablo and Ross lakes, backcountry permits are required year-round. See the park website for additional information.

**Accommodations** Lodging is available on Ross Lake, in Stehekin, and in nearby communities.

**Boating** Find boat launches for Gorge Lake near the town of Diablo, for Diablo Lake at Colonial Creek Campground, and for Ross Lake at Hozomeen (accessible only from Canada, not from State Route 20). • Ross Lake Resort rents canoes, kayaks, and small motorboats, and offers portage service between Diablo and Ross lakes. • Chelan, Manson, and Lake Chelan and Twenty-five Mile State Parks offer boat access to Lake Chelan. • Summer boaters on Lake Chelan must purchase dock passes to use US Forest Service or National Park Service docks.

**Fishing and Hunting** Washington state fishing and hunting licenses are required; state laws apply. • Hunting is allowed only in Lake Chelan and Ross Lake National Recreation Areas. • Trapping is prohibited.



To reach the park, drive scenic State Route 20 from Burlington to the west or Twisp to the east. The only vehicle access to Ross Lake is by

unimproved road, from Canada. You cannot drive to Stehekin; access is by passenger ferry, floatplane, or trail.

**Safety** In all seasons, weather can change quickly and lake water temperatures are extremely cold. • Treat all water from creeks, rivers, and lakes before drinking. • Use caution when crossing streams, especially in spring and during rainfall. • For firearms regulations check the park website.

**Food storage** Food and other odorous items (including toothpaste and fuel) will attract bears and other wildlife. Store items in park-provided containers or hard-sided vehicles. • If you plan to camp in backcountry sites, borrow a bear-resistant canister from a park information center, or hang items. • Do not feed wildlife.

**Accessibility** Park staff strive to make facilities, services, and programs accessible to all; call or check park website.

**Emergencies call 911**  
North Cascades National Park and Ross Lake and Lake Chelan National Recreation Areas are three of over 400 parks in the National Park System. To learn more about national parks, visit [www.nps.gov](http://www.nps.gov).

**More Information**  
North Cascades National Park Service Complex  
810 State Route 20  
Sedro-Woolley, WA 98284  
360-854-7200  
[www.nps.gov/noca](http://www.nps.gov/noca)

**National Park Foundation**  
Join the park community.  
[www.nationalparks.org](http://www.nationalparks.org)



### See State Route 20 Detail Below

**Boat-In Campsites**  
Ross Lake has 18 sites and Diablo Lake three. Backcountry permits are required.

### See Stehekin Area Detail Other Side

### State Route 20 Detail

**North Cascades National Park Visitor Center**

Scale varies in this 3D perspective view.