



Natural Notes

Dealing with Climate Change

A GLANCE THROUGH this edition of Natural Notes may prove eye-opening: floods, fires and the increasing loss of glacier mass. Change is inevitable and events such as fires and climate change are inherent processes of nature. Recently, however, studies show an increasing rise in temperature and researchers have concluded that both natural and human actions are factors.



Upper Lake Chelan in the Stehekin Valley

The earth's surface temperature has risen 1.4 degrees in the last 100 years, with 20 percent of that change occurring in the last decade, according to a report by researchers at Glacier National Park. Research also shows that higher elevation areas, such as where glaciers are located, and northern environments are being affected most by warmer weather. These changes are having noticeable effects in national parks. The high number of glaciers in the North Cascades National Park Service Complex (more than 300) can serve as indicators of climate change.

Researchers study the park to monitor the impact of global climate change through projects such as glacier monitoring (see page 2) and weather stations. At the Marblemount weather station, weather is documented by recording precipitation, snow depth, snow water content, temperature, relative humidity and wind speed and direction; ultimately, this record of daily weather measurements contributes to understanding climate change.

The National Park Service is taking action to reduce its carbon impact, and thus reduce the anthropogenic factor contributing to climate change. With support of the U.S. Environmental Protection Agency, the Park Service has started the Climate Friendly Parks Program. The National Park Service has pledged to reduce its fossil fuel use by 20 percent in 2008.

North Cascades National Park Service Complex is taking strides to reduce its carbon footprint by using solar energy, electric hybrid cars, bio-based fuel and lubricants, and composting. The park is also implementing green building techniques, such as using recycled wood and carpet, for numerous buildings, including the North Cascades Environmental Learning Center, which is certified by Leadership in Energy and Environmental Design. Through these measures, the park complex can move into the future with nature as its guide to reduce human impacts.

For more information on global climate change, visit:
www.nature.nps.gov/criticalissues/globalclimatechange.cfm
www.nps.gov/climatefriendlyparks

Minimize Your Impact

- Use energy efficient light bulbs and appliances.
- Wash clothes in cold water and air dry clothes during summer.
- Unplug electronic devices when not in use.
- Make use of public transportation, walk, bike or carpool.
- Keep vehicles well-tuned to reduce emissions.
- Buy local and avoid products with unnecessary packaging.

For more ways to reduce your impact, visit:
www.climatesolutions.org
www.pewclimate.org

Studying Parks, Making Partners

DYNAMIC CHANGES ARE VISITING THE North Cascades. Three of the five largest recorded floods of the Stehekin River have occurred within the last 12 years. Throughout the park, an estimated 13 percent of glacier area has melted since 1971. Large wildfires burned more acres in 2006 than anytime in the last 45 years. Along with damage from insects and disease to native plants, non-native invasive plants are penetrating wilderness along streams and roadways.

With these changes and more, park researchers are finding ways to study the ecosystem and document long-term trends along with the North Coast and Cascades Network. NCCN joins Pacific Northwest parks to assist each other in monitoring and research projects. For example, North Cascades and Olympic and Mount Rainier National Parks ended a collaborative study in 2004 on high elevation archeological sites (see page 7). 2006 proved to be an innovative year for research in the North Cascades, with completion of several species inventories and monitoring protocols. Park researchers are currently working on projects that address floods, fires and glacier loss, and others that study threatened and endangered species and restore native plants to the area.

North Cascades has also been working to share its research with the community through partnerships. In partnership with North Cascades Institute, the National Park Service has participated in Mountain School, a national award-winning three-day program that shares what researchers have learned about the North Cascades with elementary school students. The school, which is held at the North Cascades Environmental Learning Center, offers students the chance to participate in field-based science projects that mirror those of researchers, and is expanding to high school and middle school students.

Looking forward to the National Park Service's Centennial in 2016, new studies and partnerships will flourish. These will help North Cascades National Park Service Complex staff discover better ways to care for the 684,313 acres of mountainous landscape comprised of trails, lakes, streams and abundant wildlife at the heart of this world-class ecosystem.
www.nps.gov/noca/nature-science/index.htm

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Melting Away: Glaciers Indicate Climate Change

THREE TIMES A YEAR, PARK geologist Jon Riedel and his team travel to four glaciers in North Cascades National Park and record snow accumulation and melt. Each spring, they use a steam drill to melt the stakes into the ice about 30 feet and take measurements of the snow density.

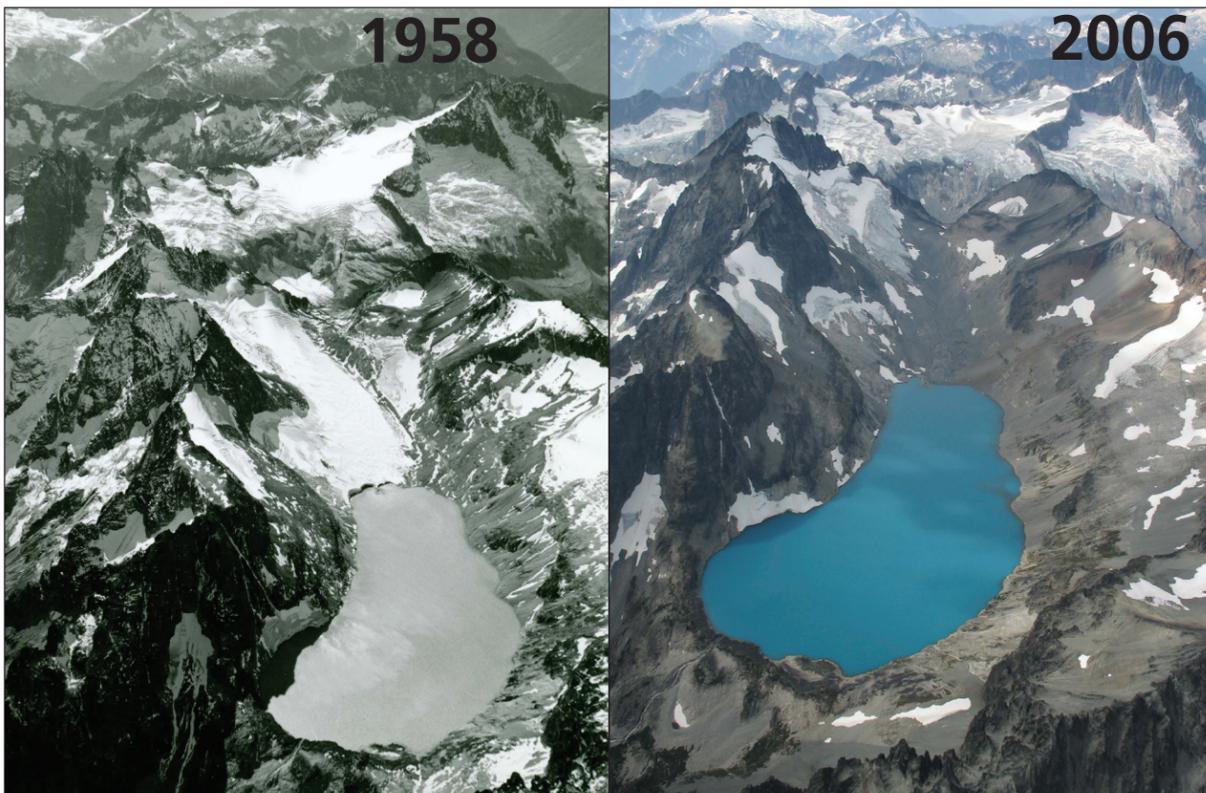
This April the team was greeted by a blanket of last winter's snow as they arrived at the glaciers and recorded a snow pack that was about average. Although the measurements were normal, Riedel said the glaciers need more than typical snowfall to combat the increasingly warmer summers.

"In order to break even, we need to get 120 to 130 percent of normal snowfall," Riedel said, "because the summers are that warm."

The team records snowfall at Silver Glacier, which is the northernmost of the four glaciers—Noisy Creek, North Klawatti and Sandalee glaciers are the others. They began monitoring in 1993, and have found that all the glaciers have lost more mass than they have gained during the period.

Glaciers serve important roles in global ecosystems by supplying the earth with 88 percent of its fresh water. Locally, glaciers contribute about 210 billion gallons of fresh water to rivers and lakes, which helps native species, such as salmon and Bull Trout. Water reaches streams and rivers when it is most needed, late in the summer.

Glaciers also reflect the climate—as winters bring less precipitation, the glaciers receive less snow, and as summers grow warmer, more of the snow on the glaciers melt. "This is one of the reasons why glaciers are a great indicator of climate change," Riedel said, "because they are affected by both seasons."



The pictures above show Silver Glacier at North Cascades National Park in 1958 (left) and 2006 (right).

In September, Riedel's team will head out to the glaciers again and take the last measurements of the year before the next snowfall. Then they will know if the glaciers have retained enough snow this year to build more glacial mass. Last year, when the team measured at Sandalee Glacier, they didn't see any snow remaining from the previous winter.

"2006 was the worst year we've seen since 2003," Riedel said. "All of [the glaciers] have lost more [snow] in the summer than they have gained in the winter since 2002."

Researchers estimate the North Cascades has lost about 40 percent of its glacier area in the past 150 years.

The North Cascades National Park Service Complex boasts the most glaciers of any park in the lower 48 states, with 312 glaciers gracing its landscape. The glaciers cast brilliant reflections of sunsets during the evenings and brighten the lakes and rivers with intense blues and greens from their run-off during the summers.

They also act as silent indicators of where the climate is heading in the future. Current trends record warmer summers and winters, which leaves the glaciers melting faster than they can accumulate, and creates an uncertain future for the livelihood of rivers, lakes and native species.

For more information on glacier monitoring, visit: www.nps.gov/noca/massbalance.htm

Public can Review Plans for Ross Lake

North Cascades National Park Service Complex is planning for the future of Ross Lake National Recreation Area and is seeking public input. North Cascades received more than 750 comments from more than 80 individuals and organizations on a draft of its planning ideas. The topics that received the most comments include: recreation (269), natural resources (150), visitor experience/use (106) and education and interpretation (87). Folks expressed interest in wanting the complex to offer more day-hiking, climbing and camping opportunities, and requested the complex maintain the ecological integrity of the biological, air and water resources in the recreation area.

A planning team will use the comments to develop a range of preliminary management alternatives, which it will use to develop a draft of a general management plan for public review and comment. The plan will address issues of resource protection, recreation and access, and will comply with all applicable laws and policies. By the summer of 2007 the team will have finished a list of preliminary alternatives to include in the plan, and will send out newsletters with the alternatives for public review. For more information on the Ross Lake National Recreation Area General Management Plan, visit: <http://parkplanning.nps.gov/rola>

Redside Shiners Present Uncertain Future for Bull Trout in Ross Lake

ROSS LAKE IS HOME TO THE federally-threatened bull trout. Recently, a school of dark olive-colored fish not naturally found in Ross Lake were discovered in this reservoir, which was formed from the Skagit River. The Washington State Department of Fish and Wildlife recently confirmed a population explosion of this new group of fish—the redbase shiners.

Redside shiners make their homes in slow flowing, shallow rivers and lakes, and are known to overcrowd areas where they are not naturally found. In some lakes and rivers, their presence has reduced trout populations. And, it is nearly impossible, and very costly, to get rid of them.

Park researchers are unsure how the redbase shiners got into the lake. They think the fish were probably introduced into the area, since the fish have never before been documented in the upper Skagit watershed. Now, there are hundreds of thousands of redbase shiners in the lake, and the main concern is the impact they will have on the native species, particularly bull trout.



Bull Trout

Ross Lake is oligotrophic, meaning it has very low productivity and therefore limited food resources available for fish. The presence of thousands of redbase shiners in the lake may mean more competition for those limited resources. Many bull trout do not get enough food to make it to adulthood. It is currently unknown if adult bull trout will use the redbase shiners as a food source.

Non-native species, such as the redbase shiners in the lake, can threaten ecosystems because they harm the ecological integrity of the area. Humans often don't realize the harm they do when they release bait fish or other non-native species.

As of now, National Park Service and Washington State Department of Fish and Wildlife biologists are uncertain how the redbase shiners will affect the bull trout and other native species. "We just currently don't have enough information to determine the impacts of the redbase shiner in Ross Lake," park aquatic ecologist Ashley Rawhouser said.

CHANGING PLANT LIFE

Restoring the Ecosystem with Native Plants

PARK PLANT PROPAGATION staff and volunteers head into the North Cascades National Park to gather plant cuttings and seeds to be used for restoration. Then, they take the plants back to the park nursery in Marblemount.

North Cascades National Park Service Complex has been working to ameliorate the effects of human impacts, such as foot traffic on vegetation, for more than 30 years. Dedicated plant propagation staff and volunteers restore native plant cover in bare, over-used campsites and trails with plantings they grow in the nursery. Park staff and volunteers also remove invasive, non-native plants, which can out compete or choke-out native plants.

The park's goal is to restore plant life to the way it would be without the impact of foot traffic or non-native species, said Michael Brondi, who has worked in the park complex plant propagation program for 10 years.

"We work in areas disturbed by human actions," Brondi said. "Our work includes teaching people to move in the park while creating minimal disturbance to the plant community."

Minimize Your Impact

- Avoid restoration sites—sites that are set off with stakes, signs, shade cloth or aspen bark shavings.
- Stay on the trail, and try not to sidestep mud or snow, cut switchbacks or widen trails.
- When resting off the trail, sit on a rock or bare ground.
- Camp only in designated areas.
- Volunteer. Contact Michael.Brondi@nps.gov, or call 360.854-7275.

Restoring Vegetation

The Park Complex is home to more than 1,700 known plant species—a number that keeps growing as botanists discover more species through species inventory, said park botanist Mignonne Bivin, who manages all the vegetation projects in the park.

Revegetation begins each fall when seeds and cuttings are collected. In the nursery each plant is tagged with its collection location so that it can be returned to the same area. The in-park rule is that plants must be replanted as close to where they were collected and not more than one half mile from where they were found. "Particularly in the wilderness, we are very careful to avoid taking action if it could cause another problem. . .we are careful to reduce the risk of bringing in pests and non-natives," Brondi said. It is a Park Service policy to retain the genetic integrity of native plant communities.

This year the nursery has 90 different species, Brondi said. The nursery caretakers try to mimic the natural soil conditions by going onsite to gather soil, and litter, which they incorporate into the potting soil.

Limited funding is one of the impediments to revegetation projects, Brondi said. Assistance from volunteer and friends groups is critical for success.

Clearing out Invasive Plants

When non-native plants, such as reed canarygrass at Ross Lake, are allowed to persist, often, native species can be replaced by a monoculture of non-native species, thus reducing species diversity.



Native plant steward working on a revegetation project in the park

So, park botanists have to focus not only on replanting, but also on removing plants to ensure the survival of native plants. To combat the reed canarygrass in Ross Lake, they employ herbicides as well as innovative approaches, such as the use of woody debris to create shade and replenish nutrient-rich wetlands.

"One reason we're concerned [about the canarygrass] is because it could spread into more pristine areas like Big and Little Beaver Creeks," Brondi said.

In 2004, the park crew used wood to mimic naturally occurring wetlands and riparian areas around Ross Lake. The new areas allowed a diversity of native plant species to thrive, and helped shade out the reed canarygrass.

Global climate change will have a dramatic effect in this park, which is greatly affected by snow pack. "Parks offer an area that is less humanly altered than less protected lands, so it should allow us to see direct effects of climate change on plant life," Bivin said. "It benefits the public to have these places to study."

Plant Studies

- Forest monitoring and vegetation mapping programs will continue in cooperation with Mount Rainier and Olympic National Parks.

- As botanical forays continue in 2007, more new plant species may be discovered in North Cascades.

- Researchers from North Cascades and Mount Rainier National Parks will continue studies on whitebark pine populations during the summer of 2007 to determine their current status.

- The North Cascades mountain monkeyflower will be studied to see how the flower adapts to high elevation environments and to find out the evolutionary history of the species.

- Cheatgrass mapping in two areas of the park--the Stehekin area and east side of Ross Lake--will help control this fire-adapted, non-native species.

- Alpine and sub-alpine plant monitoring protocols will be developed for the North Coast and Cascades Research Learning Network.



How Climate Change Impacts Butterflies and Red Paintbrush

People hear about the changing climate's effects on glaciers and polar bears, but rarely does one hear about climate's effects on the smaller plants and creatures. But, as researchers understand, changes that impact one species will in turn affect another species and so on. A recent study by Western Washington University student Susan Imholt shows the interdependency of species through its investigation into the effects of climate change on one of the North Cascade's smaller species, the Anicia checkerspot butterfly.

Imholt studied the effects of day length, soil moisture, and stream proximity of the

red paintbrush, which is a host plant of the butterfly, at two sites in the park. She found that second to day length, soil moisture served a key role in plant growth rates. Imholt discovered the growing season length for the red paintbrush in moist soils is 9.5 days longer than those in dry soils. So, as climate warms and soil becomes drier, the red paintbrush will experience shorter growing periods, which will in turn affect the Anicia checkerspot, who thrive on the plant. This small chain reaction shows how interconnected plant species and nature are, and how important it is for park caretakers and visitors to protect the area.

How Climate Change May Be Impacting High Elevation Fungi

As global temperatures rise, studies indicate that alpine floral communities are drastically changing and that certain alpine floral species are disappearing. These changes may be impacting the fungal species in the North Cascades as well--a study that University of Washington PhD candidate Amy Honan will begin, as part of a cooperative study with the North Coast and Cascades Research Learning Network.

Honan's study will be the first to research the response of alpine fungi to climate change. The study will establish baseline data on soil fungi from alpine and subalpine areas at three sites in the North Cascades.

A total of 72 soil samples will be drawn by the end of October 2007. The study will examine the roots and DNA of the fungi, and will inventory and photograph each specimen.

Other Park Fungi Studies

Emeritus Professor James Trappe of the University of Oregon began work in April 2005 on an ongoing study to inventory all the fungi in the Stehekin watershed, which is unique for its numerous fungi species. As of 2006, fungi inventories have yielded 480 collections of macrofungi in the Stehekin watershed, of which three species are new to science and two are extremely rare.

THREATENED SPECIES

Western Gray Squirrels Receive Attention

ONE MIGHT MISTAKE WESTERN gray squirrels for the introduced eastern gray squirrels that have invaded city parks throughout the Pacific Northwest. A closer look, however, would show that western gray squirrels are slightly bigger than the introduced gray squirrels with the reddish-brown wash to their faces, backs and tails. Western gray squirrels have longer tails and a more salt and pepper coat. And a look at the state's threatened species list would show that western gray squirrels have been listed since 1993.

Western gray squirrel populations in Washington are believed to be declining with only three isolated populations in the state—one of which can be found in the Stehekin Valley in the North Cascades. The state's review of the Stehekin population found no information on population numbers or trends, and concluded that it is highly vulnerable and may not survive without active management. Although western gray squirrels are common in California and Oregon where oak trees are common, park researchers do



not know how the population persists in Stehekin Valley where there are no oaks. The Valley's forests provide squirrels with conifer seeds, mushrooms, insects, berries, and canopies for nesting. But park researchers are concerned that park management in the Valley may be affecting the gray squirrel population.

Park researchers realize they know little about the gray squirrels' habitat requirements in the Stehekin Valley, according to park biologist Bob Kuntz. "Without better understanding

how the squirrels use resources in the Stehekin Valley, it is unknown whether, over the long term, they can continue to persist," Kuntz said. Their small, isolated populations, sensitivity to habitat change, and low reproductive rates (one litter per year) make them susceptible to extinction.

In partnership with the University of Washington and U.S. Geological Survey, North Cascades biologists hope to learn more about the squirrels through a three-year study planned to start in fall 2007. Researchers will capture and attach radio-collars to approximately 30 squirrels to assess vital demographic rates and habitat requirements on western gray squirrel populations in Stehekin. The study also seeks to determine how current park management and private land-owner's actions impact the Valley's western gray squirrel population. Biologists hope this study will help identify necessary management actions to maintain a viable population of western gray squirrels in Stehekin Valley.

Threatened, Endangered Species Find Refuge in North Cascades

According to fossil records, the current rate of species extinction is the fastest in history. Recovering rare and listed species is stated as the number one priority of North Cascades National Park Service Complex's Resource Management Plan, since the loss of one species affects the whole ecosystem. Eight known federally-threatened and endangered animal species persist in the Park Complex, though some of the species are rarer to spot than others. Habitat loss is the prime threat to species at risk of extinction, but poaching and invasive non-native species also cause numbers to dwindle. Research, in places such as North Cascades National Park, helps identify problems that rare species face.

Before a species is placed on the U.S. Fish and Wildlife Service's federal list of endangered and threatened wildlife and plants, a strict legal process determines the status of the species. An endangered species is one in danger of extinction throughout a significant portion of its range, whereas a threatened species is one likely to become endangered in the foreseeable future. The federal listing also records plants and animals that are candidates (proposed additions). Washington State Department of Fish and Wildlife maintains state specific listings for species.

For more information on the status of species, visit: <http://www.fws.gov/endangered> For North Cascades specific information, visit: www.nps.gov/noca/treas.htm



Northern Spotted Owl

Federal: Threatened
State: Endangered

These 17.5-inch owls, splashed with white spots among their brown feathers, prowl at night, and have large dark eyes. They rely on old-growth forests, nesting mostly in trees more than 200 years old, and they are rare in the park.

Bull Trout

Federal: Threatened
State: Candidate

These polka-dot backed fish have white trim around each fin with no black on their dorsal fins. They prefer cold waters with temperatures just above freezing. Females build nests in the gravel and lay up to 5,000 eggs. Added to the endangered species list in 1997, bull trout are now extinct in some previously inhabited lakes and streams.

See page 2

Chinook Salmon

Federal: Threatened
State: Candidate

The largest of the Pacific salmon, the king salmon weigh between 12 to 40 pounds and have a silvery, olive-brown and purple coloring. They prefer fresh water streams and deep pools, though they eventually migrate to the ocean. They persist in the Skagit River watershed, along with all five Pacific salmon species.

Western Gray Squirrel

State: Threatened

These squirrels use their bushy tails, which are as long as their bodies, for balance when jumping. They live in wooded areas, and build nests of sticks and shredded bark about 20 feet above the forest floor. A small population lives in the Stehekin Valley.

See above story

Canada Lynx

Federal: Threatened
State: Threatened

Lynx, a member of the cat family, have large padded feet for snow travel and heavy, brown coats for cold weather. Lynx depend primarily on snowshoe hares, but will prey on other mammals if necessary. When hares are scarce, the lynx population declines. A small number of lynx live in the Pasayten Wilderness east of Ross Lake.

Grizzly Bear

Federal: Threatened
State: Endangered

Grizzly bears can be difficult to distinguish from black bears. Grizzly bears usually have shoulder humps, dished faces and long, straight claws on their forefeet. Grizzlies often rear on their hind legs to get a better view of their surroundings. They require large territories to roam, breed only once every three to five years and produce a litter of one to two cubs. Grizzlies are extremely rare in the North Cascades.

Marbled Murrelet

Federal: Threatened
State: Threatened

These robin-sized diving sea birds have wings that allow them to fly underwater. They lay only one egg each season, and the parents travel to and from the ocean to bring food back for their chick. Murrelets migrate from the sea to nest high in the trees of old-growth forests. They have been sighted near the west boundary of the park.

See page 8

Gray Wolf

Federal: Endangered
State: Endangered

These long legged and large footed wolves move quickly through snow and thick shrubbery. They live in open forests and tundra in families or packs, and are rare in the park.

Bald Eagle

Federal: Threatened
State: Threatened

As adults, bald eagles can grow to 3 feet tall with wingspans of more than 7 feet. Adults have dark brown bodies, yellow beaks and white heads and tails. The Skagit River watershed supports one of the largest wintering populations of bald eagles within the contiguous United States.

Fisher

State: Endangered

These carnivores belong to the weasel family, but can grow to over 3 feet and weigh more than 30 pounds. These elusive hunters once occurred throughout Washington, however, extensive surveys have been unable to confirm the existence of a population in the state.



Ravens' Aggressive Behavior is Unexpected

CLEVER, PERSISTENT, AND INTELLIGENT are words that come to mind when thinking of ravens. These silky black birds with large heads and sharp beaks have sparked countless pieces of literature, artwork and legends. They are known for their boldness, loud caws and their ability to adapt. A couple of ravens at the North Cascades National Park Visitor Center, however, are gaining a reputation for aggressive antics.

The antics began in May 2006 when an unusually riled raven showed up at the Visitor Center and starting pounding on the glass windows with its beak. After pounding for a while, the bird disappeared—only to return later with another mischievous raven. The ravens demolished bird kites and tore rubber from windshield wipers on cars parked near the Visitor Center. They have not, however, posed any threats to visitors or staff.

Their aggressive nature has surprised park staff—not that ravens are known for a meek temperament. Ravens, which are the largest member of the corvid or jay, magpie, and crow family, frequently scavenge through dumpsters and tear apart road-kill. They do not usually, however, act as impetuously as they have recently at the Visitor Center.

Their behavior provoked park researchers to begin monitoring ravens in the area. Researchers have tagged two pairs of ravens—one in the Diablo Dam area and the other at the Visitor Center. They hope the monitoring will help them better understand the rare behavior.

For further reading, see *In the Company of Crows and Ravens* by John M. Marzluff and Tony Angell.

Up-close with the Raven



Family: Corvidae
Life Span: 13 years in wild, 40-80 years in captivity
Height/Weight: About two feet/ four pounds
Breeding: Lays three to seven eggs, incubation lasts 20 to 25 days
Habitat: Diverse areas: forests, grasslands, deserts, mountains and human-occupied areas
Food: Omnivorous, eating a diverse diet; near people, anything from road-kill to leftover pizza

Upcoming Corvid Study

An undergraduate student from the University of Washington will study corvid abundance in the North Cascades this summer. This initial study will yield important baseline information for park managers to examine corvid population trends. Park resource managers and the student will choose a range of sites for the study: front country campsites and three different types of backcountry sites, including high visitor use, low visitor use, campgrounds and horse camps. The outcome may include a review of potential adverse effects of corvids on nesting songbirds.

Tuning in to Landbirds' Songs

AS DAWN BREAKS with a concert of birdsong, this spring specially trained researchers monitor between 30 and 40 different bird species in North Cascades National Park. Researchers walk off-trail for up to 1 km, stopping every 200 meters to stand in forests and meadows to record all the birds they can detect. They rely on their ears more than their eyes as they distinguish the birds, where they are and their distinct songs. “[For each location] they do a five-minute point count where they write down every species they see or hear,” park wildlife biologist Bob Kuntz said. “But, you hear more than you see.”



MacGillivray's Warbler

The North Cascades study records the density and frequency of occurrence of breeding birds. The long-term study culminates in reports every five years to present trends that can inform further research and management plans.

In 2001, the Institute for Bird Populations, Western Washington University, and park biologists conducted a two-year inventory of landbirds in the park in which they recorded 116 species. The study also found that only five species comprised more than half of the total number of birds inhabiting the park during the breeding season.



Bullock's Oriole

North Cascades is home to more than 200 species of birds, including winter wrens, hummingbirds, olive-sided flycatchers and several thrush species, each with its own distinct songs and calls. Approximately 30 of the landbird species in the Pacific Northwest have experienced significant recent declining trends. In a partnership with the Institute for Bird Populations,

North Cascades has been monitoring the abundance of these species as part of the National Park Service's long-term ecological monitoring program. Landbirds serve an important role in the ecosystem by dispersing seeds and controlling insects, and are therefore good indicators of the effects of local and regional changes in ecosystems.



Rufous Hummingbird

The current study is among several long-term monitoring projects North Cascades is conducting. Others include monitoring of glaciers, high lakes, alpine vegetation, and bald eagles along the Skagit River in partnership with The Nature Conservancy and the U.S. Forest Service.

Other parks, such as Mount Rainier National Park and San Juan Island National Historical Park, also conduct monitoring of their landbird populations based on the protocol that North Cascades is implementing.

Kuntz said the point of surveying is to look at how population trends in landbird species are changing to help determine:

- how human activities may affect species diversity, distributions and numbers
- how climate and environmental change may affect species diversity, distributions and numbers

This information will help improve understanding of the complex ecosystem and will assist land managers in making decisions that affect future generations of birds.

<http://www.nps.gov/noca/naturescience/birds.htm>

Park Complex Recovers from Floods

THE PARK COMPLEX EXPERIENCED extensive flooding in the fall of 2006. Floods have turned a portion of the Cascade River Road into a riverbed, caused damage to Company Creek Road in Stehekin, interrupted the Pacific Crest Trail at Agnes Creek and brought an estimated \$4 million in damages park-wide.

The flood that damaged Company Creek Road in Stehekin ranks as the third largest flood recorded for the area. Studies show that in recent years floods are occurring more often and with greater power in Stehekin than in past years. Of the five largest floods recorded for the Stehekin area since the early 1900s, three occurred since 1995. This trend beckons park managers to regularly deal with flooding and its aftermath, which this year includes three major projects—one at Cascade River Road, one in the Stehekin

Valley and the other at the Agnes Creek Trail footbridge along the Pacific Crest Trail. Damage to the Cascade River Road now adds about six miles round-trip to a hike up Cascade Pass, and that doesn't include the approximately 1,000 feet in elevation gain that accompanies the extra miles. The road is now closed beyond the Eldorado Creek parking area at milepost 20.

Park and Federal Highway Administration officials met on April 18 to discuss ways to repair the Cascade River Road area. Definite plans for road repairs were not finalized at the meeting, but they did decide to build a second bridge in the area that would be less susceptible to flood damage. The bridge would allow more water to flow past it, and pending permit approval, would be started in July 2008.

In Stehekin, North Cascades is seeking to repair the damage that occurred to Company Creek Road, and to restore the roadway at 8-mile along the Stehekin Valley Road, which is routinely plagued by floods.

Along the Pacific Crest Trail, a downed tree brought down the Agnes Creek Trail footbridge. The footbridge is located one half mile from the Agnes Creek Trailhead in Lake Chelan National Recreation Area, and serves as part of the popular Pacific Crest Trail, which allows hikers to travel from Canada to Mexico. North Cascades plans to install a temporary bridge by July 2007, and will discuss plans for a replacement bridge in the summer. The park plans to have the new bridge installed by July 2008.

For more on these projects and current updates, visit:
<http://www.nps.gov/noca/parknews>



Company Creek Road



Cascade River Road



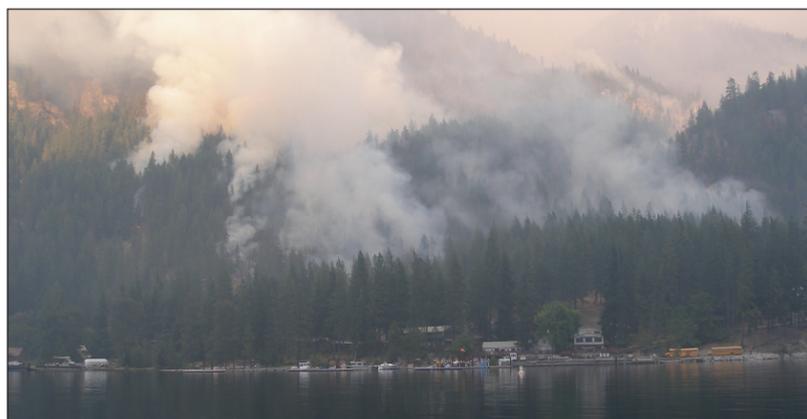
Agnes Creek Trail

Fire Management Plan Uses Fire to Maintain, Restore Park Ecosystems

Prior to the era of wildland fire suppression, lightning-caused fires maintained a diversity of plant and animal habitats in the park. As a natural and vital process, lightning serves an essential role in the park ecosystem. Fire helps to thin underbrush and disease-weakened trees, which allows new growth and helps prevent large, potentially-dangerous fires.

Due to past policies of wildfire suppression (which prevented the majority of natural fires from burning in the park), and the presence of structures and private property, a park fire team must now occasionally perform prescribed burns in order to mimic the role of fire in areas where fire has been absent.

Prescribed fire helps to reestablish a diverse forest mosaic and prevent negative impacts of large wildfires to property and valuable wildlife habitats. This and other fire management actions are detailed in the park's new fire management plan.



Flick Creek Fire in Stehekin 2006

The purpose of the plan is to provide clear guidance to park managers on meeting goals that include:

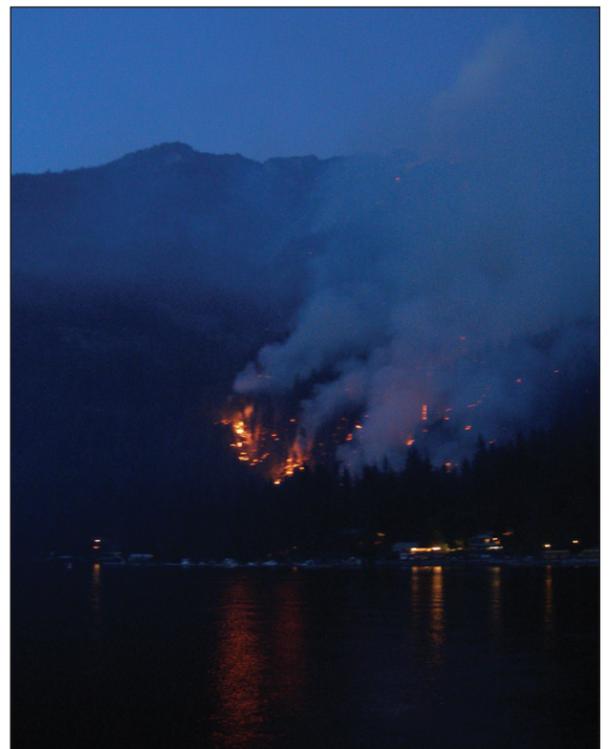
- Protecting human life and property.
- Restore or maintain park ecosystem functions
- Protect natural and cultural resources.
- Maintain natural fire processes.

In order to achieve these goals, park managers will use a mix of tools that include prescribed burning, allowing some lightning-caused fires to burn for ecosystem benefit, and suppressing all unwanted and human-caused fires. The park will continue to work

cooperatively with its neighbors in managing fire in and around the park complex.

Fires can affect park visitors and residents, cultural sites, vegetation and wildlife species that make their homes in fire-prone areas, such as the federally-listed spotted owl. The plan's strategies focus on maintaining and restoring fire's dynamic role in park ecosystems by allowing fire to burn under natural conditions as much as possible. This will aid in long-term habitat restoration and habitat protection.

www.nps.gov/noca/parkmgmt/firemanagement.htm



Flick Creek Fire in Stehekin 2006

The 2006 Flick Creek Fire covered an estimated 7,890 acres. This human-caused fire burned through an overstory of Douglas-fir and ponderosa pine, and although many structures were threatened, damage was primarily limited to trails and trail bridges.

The Park's fire team worked closely with the Stehekin community, the Chelan county Sheriff's department and several hundred emergency firefighters to protect life and property. There was minimal damage to natural and cultural resources, although the park remains concerned about potential debris flows in several watersheds and the possibility that invasive weed species may become established within the fire perimeter. Park staff will monitor these concerns in the coming years.

CULTURAL HISTORY

9,000-year-old Campfires Found at Cascade Pass

LOCATED AT NEARLY 5,400 FEET, Cascade Pass is a quintessential Pacific Northwest mountain meadow. Delicate wildflowers bloom after the snow melts and small rock slides litter the area with debris from glaciers on the surrounding mountains. For those who hike the 3.7 miles (6 km) of moderately steep switchbacks, the view and aura of the pass awakens the senses to one of the state's most cherished alpine landscapes.

For park archeologist Bob Mierendorf, though, the most intriguing aspect of Cascade Pass lies beneath the surface, in the layers of soil accumulated over thousands of years. Here he discovered Native American artifacts that date back more than 9,000 years, earlier than any previously studied high elevation archeological site in Washington. "Cascade Pass is unique in the Washington Cascades for the following reasons," Mierendorf said, "no other [archeological] site is on the hydrologic crest and also has a clear pre-Mazama cultural component."

Through careful scientific excavation, Mierendorf encountered at least five separate layers of volcanic ash. Each layer has its own chemical identity that can be traced back to the specific Cascade volcano that spewed it forth. The first half-meter of digging passed familiar ash layers: two from Mt. St. Helen's, one from Mt. Baker and one from Glacier Peak. At almost one-meter down, Mierendorf discovered ash from Mt. Mazama – a massive volcano in Oregon that exploded 7,650 years ago, creating today's Crater Lake.



Archeologist Bob Mierendorf excavates in the park

It is well-documented and known among archeologists that early civilizations from the coastal and inland side of the mountains crossed Cascade Pass, but never before have artifacts been found along the crest of the Cascade Range that pre-date the Mazama explosion. With this new information in hand, the National Park Service is working to preserve Cascade Pass and its cultural history. Several trails at the pass are scheduled to be re-routed and re-vegetated in hopes of reducing erosion.

"It's not just soil loss anymore," Mierendorf said, "it's loss of ancient history."

High Elevation Project Discovers Indian Camps and Travel Routes

Before archeologists from North Cascades, Olympic and Mount Rainier National Parks collaborated on their 3-year high elevation excavations, little was known about the native people's use of these mountainous parks. Now, with the ground-breaking research that concluded in 2004, they have discovered a wealth of information about the people who inhabited these landscapes thousands of years ago. The site surveys found short-term hunting camps, travel sites, tool-stone quarries, and base camps, suggesting a strong human influence in the areas.

Researchers used these new discoveries to determine ancient travel routes, and to learn more about the historic use of mountain goats and other subalpine and alpine fauna and flora. These discoveries uncovered exciting new findings about the effects of massive floods and climate change, such as volcanic eruptions and the Little Ice Age, on the native people. The research also has management implications for the parks, since 60 new archeological sites and isolated finds were discovered at high elevations. Preservation is imperative since these artifacts give researchers knowledge of the earliest people here and how these areas have changed.

Links to the Past

Excerpt from "North Cascades Days"

We wander the earth learning so much
Encountering a black bear who's just having lunch
He turns to face us wondering 'bout all the fuss
And awaits our departure before returning to munch

A little spotted fawn just a few days old
Has been left by her mom in a well protected fold
Fear not; Mother Nature's watching while moms away feeding
Nature's in balance, the fawn needs no keeping

Brondi searches for seeds to sow in the beds
And imparts his great wisdom to fill up our heads
He unveils the acers, pseudosuga and yew
Then reveals common maples, Doug firs and ferns, too

We find buried treasures on the forest floor
Pipsissewa, hazelnuts, wild ginger galore
Riding the Ross Mule into Earth's Great Green Church
We listen to stories Kerouac wrote from his perch

Now summer is scorching in the late August sun
As stewards hike Baker, just for the fun
We check in with Glacier, the call back's from McAloo
Then we offer awareness to folks with no clue

Leave no Trace is the ethic we impart
As we approach with a smile right from the start
We point out the mountain goats, pikas and marmots
The beauty, the hazards, the heathers and varments.

-From the memoirs of steward Terri Cloonan

For information on how to become a steward for the North Cascades National Park Service Complex, e-mail Charles_Beall@nps.gov, or see www.volunteer.gov/gov

STORIES OF THE PAST are embedded in the landscape of the park complex and nearby environments. These stories, uncovered by park researchers, date back more than 9,000 years and were revealed from more than 300 prehistoric and historic archeological sites. Recovered archeological sites include ancient hunting camps, food processing locations, fishing camps, rock art, tool stone quarries, historic mines and mining camps, fire lookouts, sheep herder camps, sawmills, homesteads and a "lost" hotel.

The Cultural Resources Branch of the Resource Management Division at North Cascades has been working to make the histories and artifacts of ancient days available for park visitors to view at several interpretive displays in park visitor centers and through a self-guided tour of a 1,500-year-old rock shelter at Newhalem. The artifacts tell a story of indigenous use of the mountains and their resources for the last 9,000 years, including a radiocarbon chronology and geologic record of Cascade volcano eruptions, which are used to mark the timing of both human and climatic events.

The Marblemount Curation Facility is a multi-park repository for the museum collections from North Cascades National Park Service Complex, Ebey's Landing National Historical Reserve and San Juan Island National Historical Park. The combined collections at the parks total over 1.2 million objects and grow with staff investigations and inventory, monitoring and academic research. Park visitors can view a sampling of the cultural resource collections at the North Cascades National Park Visitor Center near Newhalem, the American Camp Visitor Center on San Juan Island and the Burke Museum at the University of Washington in Seattle.

The museum collections include archeological, historical, ethnographic, and archival resources and geologic, biologic, and paleontologic specimens. Researchers can view historic artifacts that document early exploration and settlement of the area and examine project documents, historic records, park administrative documents, resource management records, maps, drawings, photographs, and oral histories.

For more information on the history of the national parks, visit: www.cr.nps.gov www.nps.gov/noca/historyculture/index.htm

WHAT'S NEXT?

Tracking Hoary Marmots



HOARY MARMOTS ARE WIDESPREAD mammals of sub-alpine and alpine habitats found throughout the Cascades and northern Rocky Mountains. Despite their extensive range and high visibility, little is known about the status of this alpine mammal in the Washington Cascades. The two closest relatives of the hoary marmot – the Vancouver Island and Olympic marmots – have experienced declines in recent years. This and possible ramifications of climate change raise concern that regional influences may be present that could also impact hoary marmot populations of the Cascades.

North Cascades National Park biologists will begin a systematic inventory of hoary marmot colonies in June and will continue through early September of 2007. Researchers will collect data needed to map locations of marmot colonies and describe minimum population counts of each colony. This baseline information is essential in estimating current population numbers and monitoring future trends.

NORTH CASCADES NATIONAL PARK SERVICE COMPLEX has new and ongoing research projects for the upcoming years. Many projects include monitoring threatened or endangered species, such as the wolverine and marbled murrelet. This page highlights some of the projects.

Looking for Marbled Murrelets

THE MARBLED MURRELET, A federal- and state-listed threatened species, forages for food in near-shore saltwater habitats and flies inland to nest in forest canopies. Current studies estimate that murrelet populations in Washington, Oregon and California are declining at a rate of 4 to 7 percent annually. North Cascades has data for all wildlife species on the endangered species list, except the marbled murrelet, according to park wildlife biologist Bob Kuntz.

North Cascades will begin a 3-year study on this small diving seabird in 2008, and will conduct radar surveys in drainages with suitable habitat along the western boundary of the park. Park biologists will survey potential nesting habitat to look for murrelets. If they locate murrelets, they will gather site-specific information to determine where and why the birds are present in those areas.



Courtesy of U.S. Fish and Wildlife Service

Although it was typically thought that murrelets did not nest far from the ocean, in recent years they have been spotted further from the ocean and on two occasions, in the park complex. Marbled murrelets have been found as far inland as 84 km from Washington's marine waters. This study will help park biologists understand how murrelets are adapting to the destruction of their original old-growth habitat near the ocean by using suitable nesting habitat further inland, which could help in recovering current murrelet populations in north Puget Sound.

Studying Mysterious Lives of Wolverines

WOLVERINES, THE LARGEST members of the weasel family, prowl through remote areas of the northern Cascades, sensitive not to cross paths with humans. Their elusive nature makes them a difficult species to study and therefore, researchers know very little about their distribution, habitat use and population status in Washington. They are one of the rarest mammals in North America, and are currently listed as a species of concern. The U.S. Forest Service and Washington Department of Fish and Wildlife, however, hope to learn more about the ecology of these carnivores through a cooperative study they began in 2005. The study area is located on Forest Service land adjacent to the eastern boundary of the North Cascades National Park Service Complex.

During the first year of the study (2005/2006 winter season) a yearling female and subadult male were captured approximately 60 days apart at the same trap site. A live-trap method, using a box configuration of native logs, was used to capture, immobilize and place radio collars containing both satellite and VHF radio transmitters on wolverines. They were both outfitted with radio transmitters and then released. The female's radio collar malfunctioned and detached after about one week of data collection. The collar was later recovered in Manning Provincial Park, B.C., some 36 air miles to the north. About two months later

the juvenile female was photographed via a remote camera at the original trap site, the same night the young male was captured. After approximately 70 days with several reliable locations along the North Cascades crest, his collar ceased transmitting. The fate of this wolverine and his collar is currently unknown.

Two more wolverines were trapped and equipped with radio transmitters in the winter of 2006/07. Data from these satellite transmitters showed the wolverines were using a substantial proportion of habitat within the heart of the park complex. In 2007, researchers recaptured three of the wolverines and outfitted them with new radio collars with fresh batteries that are scheduled to be operational beyond the 115-day period of the old collars—perhaps well into the summer.

The Forest Service and Department of Fish and Wildlife hope this study will shed light on the wolverine's seasonal movement patterns, home ranges and habitat preferences. Information gained may also provide evidence supporting a resident wolverine population in the North Cascades and offer insight on den site selection. This is the first-ever study on wolverines in Washington State, and will contribute information to help researchers unravel some of the mysteries of this vulnerable carnivore in order to develop long-range conservation strategies.



Wolverine

Courtesy of U.S. Forest Service

Web Based Resources

National Park Service
www.nps.gov

NPS Nature and Science
www.nature.nps.gov

North Cascades National Park
www.nps.gov/noca

North Cascades Natural and Cultural Resources
www.nps.gov/noca.nat.htm

Natural Notes (First and Second Editions)
www.nps.gov/noca/NatNotes/nn2002.htm
www.nps.gov/noca/NatNotes/nn2005-1.htm

Current Research
www.nps.gov/nwresearch

Homeward Bound
www.nps.gov/noca/journey/home.htm

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