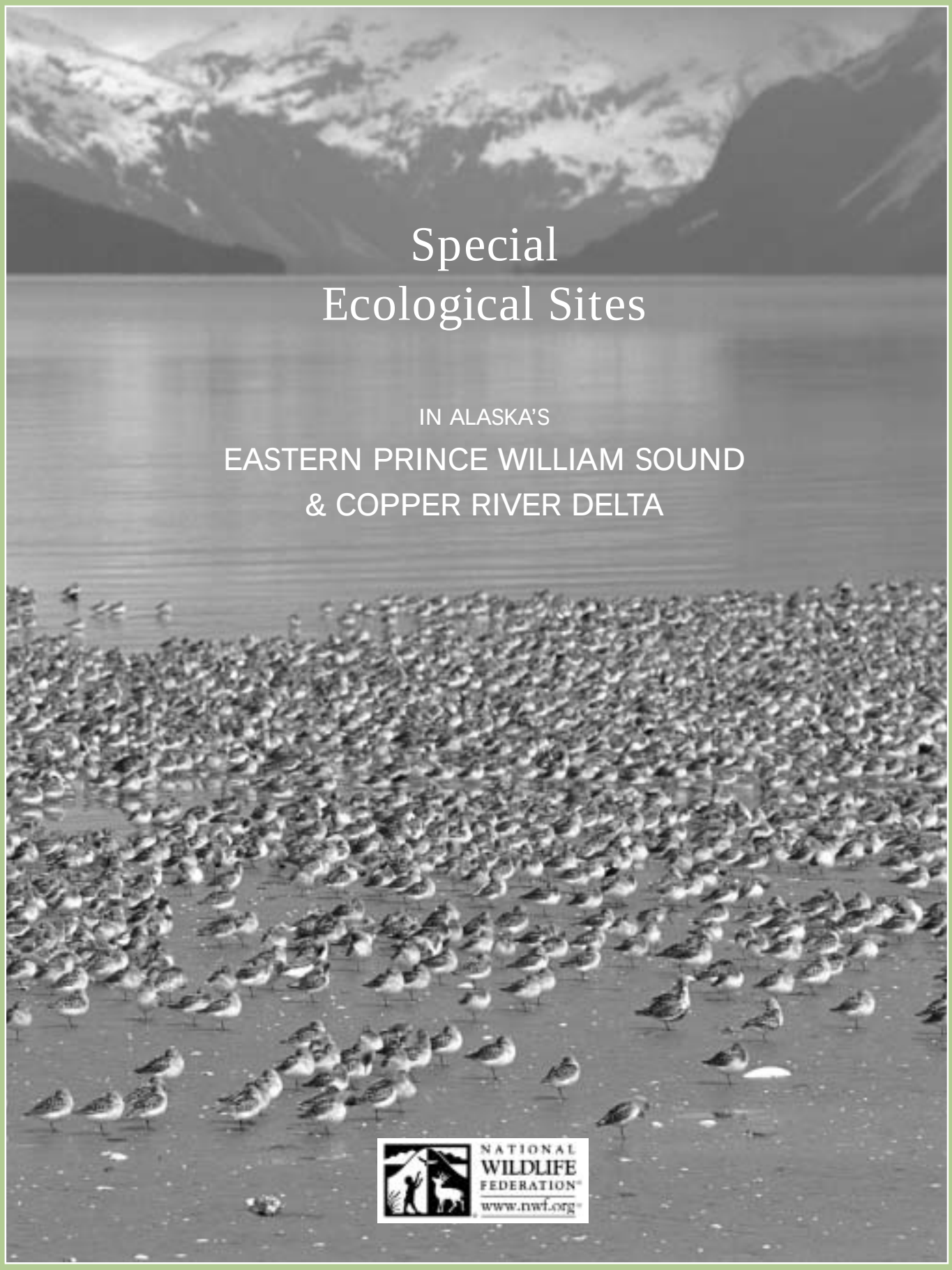

Special Ecological Sites

IN ALASKA'S

EASTERN PRINCE WILLIAM SOUND & COPPER RIVER DELTA

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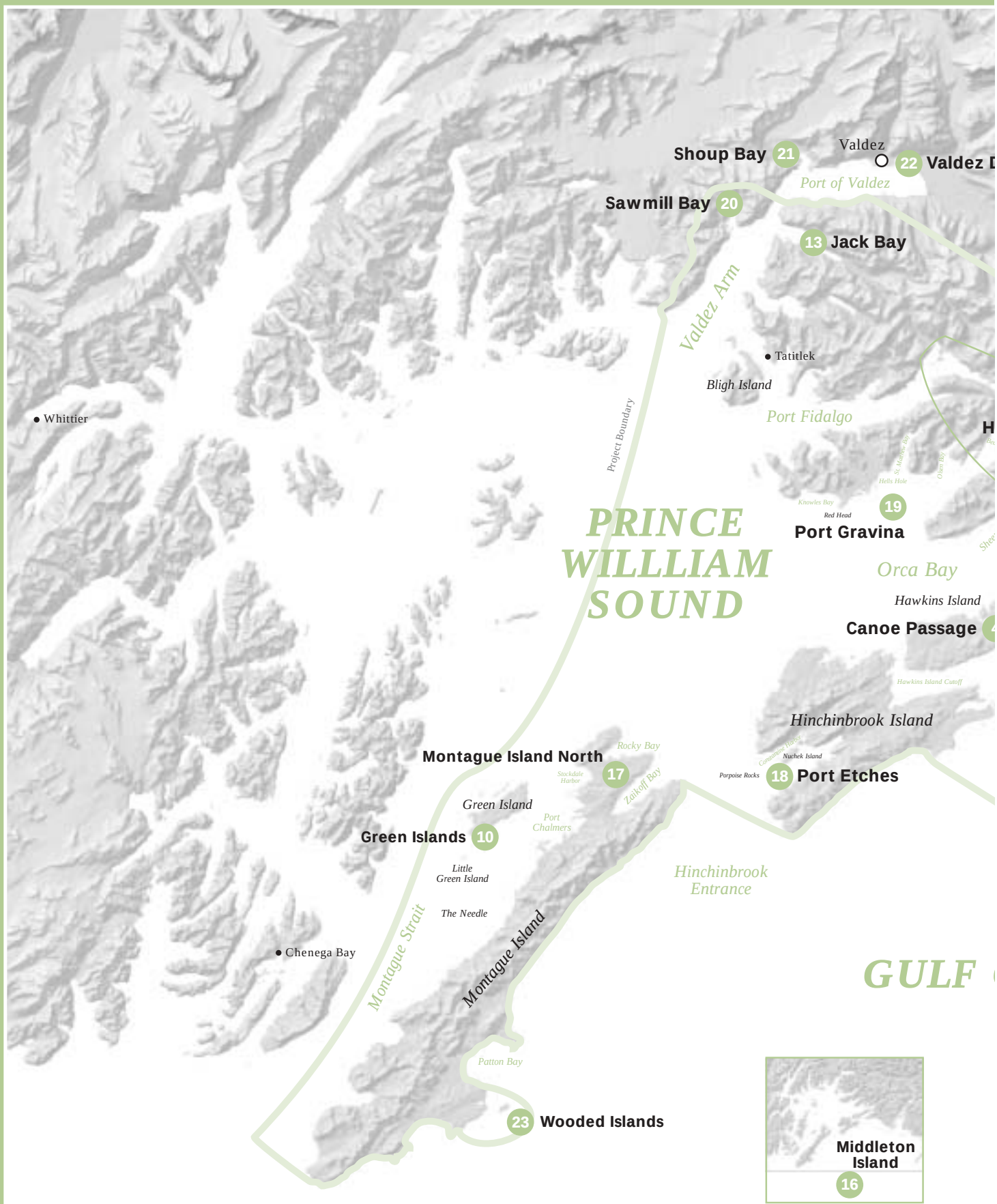
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Cover photo: Shorebird migration

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Special Ecological Sites in Alaska's Eastern Prince William Sound and Copper River Delta

May 2005

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Dave's 34 years of professional conservation work in Alaska has centered on the design of citizen strategies to protect some of the last great wildlife and wild land spectacles in our nation. This has included helping secure establishment of more than 100 million acres of national parks, wildlife refuges, and wilderness areas in Alaska including the 48,000-acre Alaska Chilkat Bald Eagle Preserve. Dave is the recipient of several national awards for his outstanding contributions to conservation: 1986 Chevron Conservation Award, 1986 Olaus Marie Award, 1994 National Audubon Charles Callison Award, 1996 Pew Fellowship in Marine Conservation, U.S. Fish and Wildlife Service 1998 Refuge Hero Award, and 1998 American Bald Eagle Foundation Meritorious Service Award.

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Foreward

For more than 70 years, National Wildlife Federation has worked to protect and restore wildlife and wildlife habitat across the nation and especially in key ecosystems such as the Everglades, Great Lakes, Red Desert, and Gulf Coast of Texas and Louisiana. It is part of our commitment to being responsible stewards of the world we will leave to our children.

NWF has a special attachment to Alaska, one of the few places on earth where mankind still has the opportunity to show that economic prosperity and a healthy environment are complementary conditions. One of our priorities in the Great Land is the Chugach National Forest of southcentral Alaska. The Chugach is the second largest national forest and arguably its most beautiful and pristine. Located only 500 miles south of the Arctic Circle, the Chugach is a forest of thundering glaciers, towering mountains, primeval coastal rainforest, and fog-shrouded fjords. While best known as the site of ecological wonders such as the Copper River Delta and Prince William Sound, almost all of the 5.6 million acre forest is spectacular and unspoiled.

Our efforts focus on helping decision-makers and concerned citizens find common ground and common sense approaches to safeguarding the natural resources essential to wildlife and healthy communities. This requires a foundation of sound science and a keen understanding of the resources involved. Special Ecological Sites in Alaska's Eastern Prince William Sound and Copper River Delta was created to provide those concerned about the region with a common understanding of its ecology and the specific areas most critical to its astounding biological productivity and diversity. The report examines the coastal habitats of an area loosely defined as the eastern Chugach National Forest and supplements NWF's 2002 Prince William Sound Biological Hot Spots Workshop Report which looked at the marine and coastal areas of Prince William Sound.

Special Ecological Sites in Alaska's Eastern Prince William Sound and Copper River Delta is not intended to address conservation needs or strategies. Instead, it will serve as a policy-neutral resource in the ongoing public discussion about the region's future. NWF will continue to play an active role in this discussion, working to ensure that the end product reflects science, common sense, and community values—the hallmarks of lasting conservation solutions.

Larry Schweiger
President and CEO
National Wildlife Federation

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Moose in meadow

Introduction

In 2001, National Wildlife Federation hosted a workshop with 29 of Alaska's most knowledgeable fish and wildlife professionals and researchers in order to delineate the biological "hot spots" of Prince William Sound. This distinguished group of experts identified 14 major hot spots, which were defined as marine or coastal areas critical for keystone species or fundamentally important to the physical and biological health of the entire Sound. Their conclusions were published in 2002 in the Prince William Sound Biological Hot Spots Workshop Report. While explicitly recognizing that no area of Prince William Sound should be sacrificed to careless destruction, the hot spots report has been invaluable in helping NWF objectively establish priorities and work with local residents to build a sense of community stewardship.

Special Ecological Sites in Alaska's Eastern Prince William Sound and Copper River Delta builds on that effort by looking at the terrestrial and nearshore areas of the eastern Sound and Copper River Delta. More specifically, the report examines the region within the 2.3 million acre Cordova District of the Chugach National Forest, including the inland waters and submerged lands of the Copper River Delta State Critical Habitat Area, as well as the submerged lands adjacent to Controller Bay and Kanak, Wingham, and Kayak Islands. As before, the purpose of the project is to help NWF establish conservation goals that foster the long-term health of Prince William Sound communities and their extraordinary natural environment.

The special ecological sites of the eastern Prince William Sound and Copper River Delta were chosen after consultation with 43 of the most knowledgeable experts in the region. These natural resource advisors come from a wide range of backgrounds and represent diverse agencies and organizations including the Alaska Department of Fish and Game, Alaska Natural Heritage Program, Alaska Sealife Center, Alaska State Parks, Cascadia Wildlands Project, Ecotrust, Eyak Preservation Council, Prince William Sound Regional Citizens Advisory Council, Prince William Sound Science Center, The Conservation Fund, The Nature Conservancy of Alaska, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, University of Alaska at Fairbanks, and University of Alaska Marine Advisory Program. We made a particular effort to interview those experts with intimate knowledge of the sites based on having lived or worked in the region for extended periods of time. Unfortunately, time and resources did not allow us to involve everyone with useful information or knowledge.

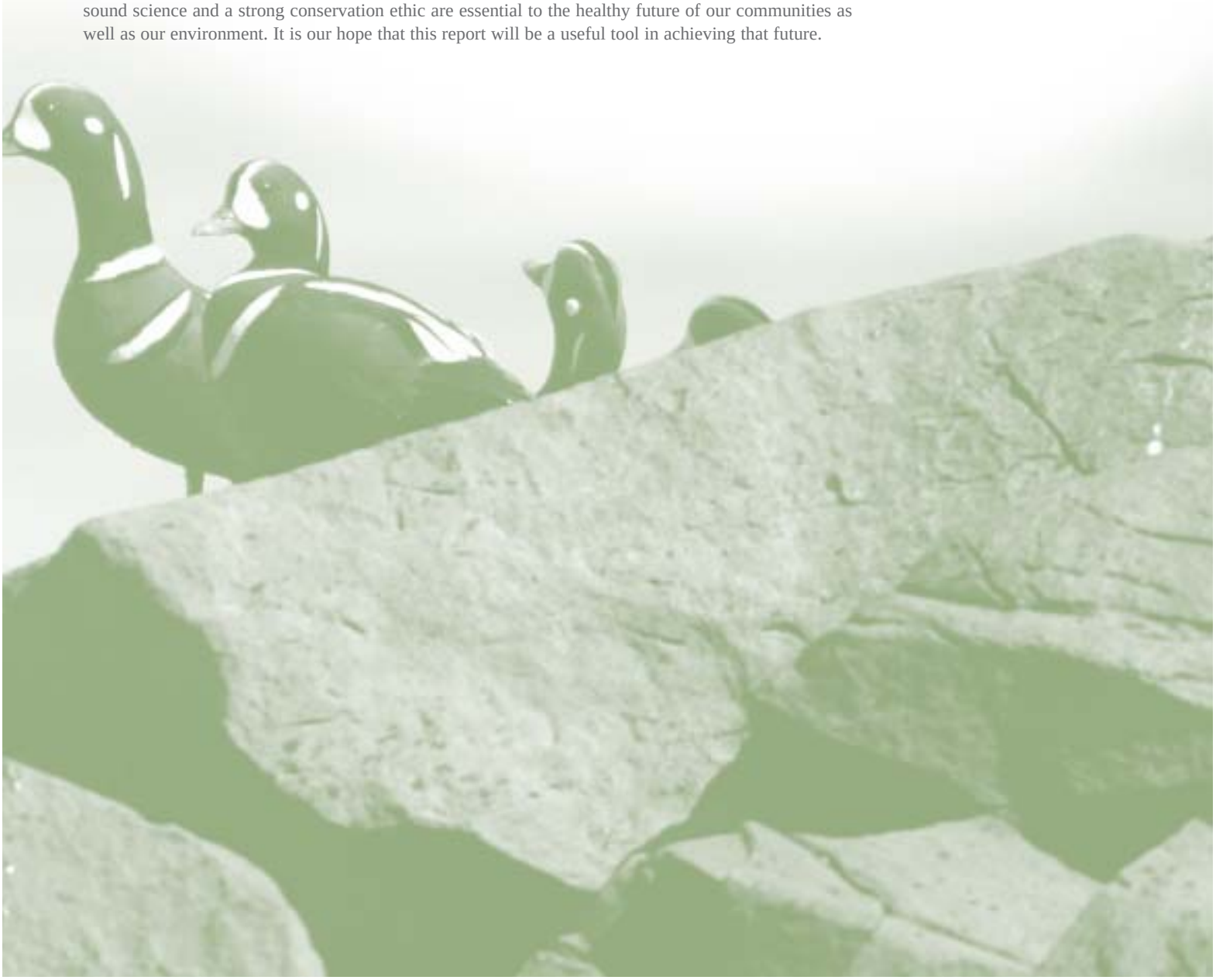
The basic criteria that were applied in site selection were as follows:

1) Provide critical habitat for keystone species;
2) Are critical for maintaining biodiversity;
3) Support fundamental physical and biological processes; and
4) Have unique ecological, scientific, or cultural characteristics.

Harlequin ducks

The 23 sites chosen for inclusion in this report were selected without regard to size, threats, land jurisdiction, current uses, or whether they are protected or not. Rather, primary emphasis was placed on identifying and describing their high value resource attributes. This effort was not intended to be all-inclusive and does not suggest that there are not additional sites deserving of special recognition. Instead, it should simply be viewed as another important step toward focusing NWF's conservation work in more effective ways.

We prepared this report fully recognizing that ultimate success in conserving the unique natural assets of the eastern Prince William Sound and Copper River Delta can only be achieved through the development of greater mutual understanding and respect among the region's diverse stakeholders. Of special importance in this regard is the need to more fully understand and appreciate the role of subsistence harvest, commercial fishing, and sustainable tourism to local communities. These activities are the lifeblood of most local residents and are directly dependent on the area's rich natural environment. We believe that sound science and a strong conservation ethic are essential to the healthy future of our communities as well as our environment. It is our hope that this report will be a useful tool in achieving that future.



Ecosystem Overview

Prince William Sound

Alaska's Prince William Sound is a semi-enclosed bay of the Gulf of Alaska, about twice the size of Chesapeake Bay. It is characterized by numerous large forested islands and offshore islets, sea stacks, glacier-cut fiords, mist-shrouded valleys, vast glaciers, coastal wetlands, temperate rainforest, and a convoluted 2,700-mile coastline. In the near distance are the rugged snow-capped peaks of the Chugach Mountains in the Alaska Range. This is the highest coastal mountain range in the world with 9 peaks over 16,000 feet. The Bering Glacier-Bagley Icefield bordering the Copper River Delta on the east is about the size of Rhode Island and is exceeded in size only by the polar and Greenland ice caps.

Much of the Sound's coastline is bordered by the northern-most reach of temperate rainforest in North America. Moss-laden Sitka spruce, and western and mountain hemlocks, among the slowest growing, largest, and longest living of trees, dominate a natural community with some of the highest standing biomass and species diversity for this latitude. The forest's importance to the nation was demonstrated in 1907 when President Theodore Roosevelt established the Chugach National Forest to protect its resources from being exploited by private corporations. At 5.45 million acres, the Chugach is second only to the Tongass as the largest unit in the National Forest System.

Marbled murrelet

The Prince William Sound ecosystem lies in a transition zone between temperate and subarctic biomes with complex interactions between clashing weather systems and turbulent and nutrient-rich ocean waters. This is a highly dynamic natural system continually being shaped by the forces of climate, glaciation, volcanism, erosion, tectonics, ocean currents, and human activities. These forces of change influence habitat diversity and quality, and species abundance and distribution. The ecosystem is shielded from drastic seasonal fluctuations in water temperature by the absence of ice cover.

Marine waters from the Alaska Current sweep into the Sound out of the North Pacific through the Hinchinbrook Entrance. They then circulate in a counterclockwise gyre with intense local turbulence due to upwellings, uneven bottom topography, downwellings, eddies, and surface convergences. Strong currents then exit the Sound flowing southwest through Montague Strait and other western passages.

The combination of strong tidal ocean currents accompanied by frequent violent storms, high oxygen levels, and long periods of daylight results in seawater turbulence conducive to high biological productivity. Contributing to this productivity are tons of nitrates, phosphorus, carbon, ammonia, and microelements derived from decaying salmon carcasses, fish and bird guano, and other sources of organic detritus. Leaf fall from nitrogen-fixing shrubs such as Sitka alder and sweet gale growing on stream banks is another substantial source of nitrogen.

The Sound ecosystem provides vital habitat for more than 300 species of fish, 220 species of birds, 30 species of terrestrial mammals, at least 12 species of marine mammals, two species of amphibians, and untold numbers of marine invertebrates. Among the fraternity of marine mammal are 130 resident orcas, along with humpback, fin, sei, and minke whales, Steller sea lions, harbor seals, and sea otters. All are species of conservation concern because of declining populations, and each reaches some of its greatest numbers in Sound waters.

An estimated 200,000 seabirds spend the summer in the Sound, with marbled murrelets, black-legged kittiwakes, and glaucous-winged gulls the most numerous. The Sound is also an internationally important wintering area for a variety of colorful sea ducks numbering 80,000 or more. A total of 40 species or subspecies of birds have been identified by the U.S. Fish and Wildlife Service, U.S. Forest Service, Alaska Department of Fish and Game, or Audubon Alaska as "species of conservation concern." This means they require an extraordinary level of care either because they are declining in numbers, of small population size, occupy limited geographic range, or face threats such as habitat loss on their nesting, migration, or wintering grounds.

The eastern Prince William Sound is sometimes referred to by residents as the "Salmon Nation." This is because of the enormous and genetically distinct runs of Pacific salmon—chinook (king), chum (dog), coho (silver), pink (humpback), and sockeye (red)--that return each year to the more than 200 natal streams to spawn. Because the lower reaches of these streams are tidally influenced, they are frequented by a high diversity of fresh and saltwater fishes. Along with adjacent coastal waters, these delta waters are extremely important as feeding habitat for salmon smolt and cutthroat trout.

Salmon constitute a vital ecological link between land and sea. After spending a portion of their lives in the open ocean, millions of salmon return to their natal streams each year to spawn and die. Their carcasses release thousands of tons of nutrients boosting the productivity of the coastal systems. This nutrient base supports prey species that are vital to the survival of juvenile salmon prior to their journey to the sea. It also sustains top predators in the food chain including bears, wolves, otters, sea lions, harbor seals, orcas, and eagles. In addition to the vital role that salmon play in natural food webs, they are the foundation of the local subsistence and commercial fishing economies. The commercial salmon fishery alone contributes between $35 and $40 million annually to the state economy.

Copper River and Copper River Delta

The Copper River and its immense delta share many of the Sound's physical and biological attributes. At 290 miles in length and with a watershed of 24,200 square miles, the Copper River is the sixth largest river system in Alaska. It's watershed is 18 percent glaciated, contributing to the largest sediment load—69 million tons per year—of all rivers in Alaska. The Copper River has the distinction of being one of the largest rivers on the Pacific coast of North America that has not been significantly altered by man. It has no dams, levees, riprap, irrigation diversions, sewers, or heavy industry. Instead, it remains free flowing and free flooding and continues to support world-famous runs of wild salmon.

A rare combination of environmental factors makes this river system unique. Bisecting the Chugach Mountains, the river creates a corridor that allows cold air masses to sweep down from Alaska's interior. Upon reaching the coast, the cold dry air of the Polar High weather system clashes with the warm, moist, maritime weather pattern of the Aleutain Low weather system. The resulting microclimate is characterized by strong winds (50 to 70 miles per hour with winter winds sometimes reaching 90 miles per hour), wildly fluctuating air temperatures, frequent fog, and high precipitation (an average of 100 inches annually). The winter period is extended, with some snow banks persisting throughout the summer.

The dominant landscape feature of the northeast coastline of Prince William Sound is the 700,000-acre Copper River Delta. The Delta's mosaic of shallow ponds, lakes, marshes, and stream and river channels is the largest contiguous wetland complex on the Pacific coast of North America. These diverse wetlands support some of the highest density of nesting waterfowl in the state of Alaska. As a result of the 1964 earthquake, uplifted marshes and outwash plains are now interrupted by a myriad of ponds ranging in depth from 35 to 45 inches and freshwater streams and tidal creeks that form a dendritic pattern along the coast.

The Copper River's sediments, along with those of the Scott, Sheridan, and Bering rivers, have also created 193 square miles of mudflats that extend 65 miles east from Orca Inlet to Controller Bay. These major rivers serve an important ecological function by delivering nutrients to nearshore waters. Especially high nitrate and ammonia concentrations result in high chlorophyll production that fuels a rich benthic invertebrate community, including small clams, amphipods, polychaete worms, and chironomid larvae. Macoma clams comprise 90 percent of the biomass and constitute the primary food source for millions of migrating shorebirds. Major runs of sockeye, chinook, and coho salmon rely on the shallow coastal waters surrounding the Delta first as smolt when they leave the freshwater streams and rivers for the sea, then again when they return as adults to seek out their natal streams to spawn.

A strong westward-flowing nearshore current carrying a high sediment load from the Copper River has created a string of treeless sandy islands that extends for 70 miles from Controller Bay west to Orca Inlet. These islands represent the best developed barrier island system on the North Pacific coast. Raised 8.6 feet by the 1964 earthquake, the islands are the site of shifting sand dunes and a natural vegetative succession that is of great interest to ecologists.

Controller Bay is the largest and most important staging area for migrating shorebirds east of Copper River Delta. From late April through May, an estimated four to five million shorebirds of some 36 species restore their energy needs by feeding on the mudlats before continuing their northward migrations. From late April through May, an estimated 5 million shorebirds of some 36 species restore their energy needs feeding on the mudlats before continuing their northward migrations. Dominating this grand avian assemblage is 70 to 90 percent of the world population of dunlins and most of North America's western sandpipers. They are joined by significant numbers of least sandpipers, pectoral sandpipers, lesser yellowlegs, short-billed dowitchers, long-billed dowitchers, marbled godwits, black-bellied plovers, Pacific golden plovers, and American golden plovers. Far less numerous are bristle-thighed curlews, Hudsonian godwits, and red knots. This abundance of avian prey attracts winged predators that include merlins, peregrine falcons, northern harriers, bald eagles, and parasitic jaegers. Thousands of migrating sandhill cranes also visit the bay's extensive mudflats in migration. The Delta supports one of the world's largest populations of nesting trumpeter swans, is an important staging and nesting site for many species of ducks, and provides the world's only nesting habitat for dusky Canada geese.

The ecosystem also provides essential habitat for many species of mammals, including brown bear, black bear, moose, wolf, coyote, wolverine, mountain goat, pine marten, lynx, river otter, muskrat, and beaver. The area's populations of beavers and sea otters are the densest in the world. The marine waters that ebb and flow at the river's mouth support thousands of harbor seals, sea lions, several species of whales, and a diverse community of shellfish and fishes.

Because of its unique combination of physical and biological attributes, the Prince William Sound/Copper River Delta ecosystem is globally significant to the conservation of biodiversity. Its spectacular beauty and unmatched opportunities for adventure and outdoor recreation have given the Sound the reputation as one of the world's greatest water parks. By any measure, the unusually rich diversity and abundance of wildlife in a spectacular natural setting set this special wild place apart as a great natural wonder.

Copper River Delta

Priority Conservation Sites

1 Abercrombie Rapids

© Milo Burcham

Brown bear chasing salmon

Spectacular Abercrombie Rapids, 37 miles north of Katalla, is a choke point on the Copper River just above where it enters 3.5 mile wide Miles Lake. The rapids were named in 1903 by W.C. Mendenhall and E.C. Schrader of the U.S. Geological Survey, probably for Army Captain William Abercrombie who organized a resupply expedition out of Valdez to save 500 miners during the 1898 Gold Rush.

The quarter-mile-long boulder-strewn rapids are bordered by waterfalls cascading from steep, green-sided mountains on the east side of the river. For most whitewater rafting parties seeking adventure on float trips down the untamed Copper River, running the surging Abercrombie Rapids is a memorable wild river experience.

Dense schools of salmon that gather in shallow eddies among the huge boulders make inviting prey for brown bears, wolves, and bald eagles. Abercrombie Rapids has the reputation as being the best place in the entire region to view these magnificent predators. As many as a dozen bears at one time have been seen fishing the rapids for salmon. The bobbing heads of harbor seals reveal that these marine mammals follow the salmon and eulachon runs far upriver. Some seals have been sighted at the village of Chitina, 120 miles from saltwater.

2 Alaganik Slough

© Milo Burcham

Dusky Canada geese

Fifteen mile long Alaganik Slough is undoubtedly the most diverse and productive wetland complex on the vast Copper River Delta. Located 12 miles southeast of Cordova, this ecological site was named for a former local Native village. The slough is accessible by side road from the Copper River Highway, and has a boardwalk for viewing marsh wildlife. It is possible to launch boats at the road terminus for trips out to the mudflats to witness the spring shorebird migration, or to fish.

Massive changes in the site's wetland communities occurred as a result of being uplifted 6 to 12 feet by the 1964 earthquake. Former coastal tidal marshes dominated by sedges and mixed grass/forb communities evolved into rare landscape features and associated rare community types. In total, some 75 community types and 42 successional sequences have been identified by ecologists across the Delta. Lyngby's sedge/vetchling, sweetgale/Lyngby's sedge, sweetgale/fireweed, and arctic willow/Lyngby's sedge, as well as horned pondweed are considered the rarest of these community types.

Alaganik Slough is noted for its diversity and abundance of fish. Strong runs of coho, pink, and sockeye salmon occur along with round whitefish, eulachon, and Dolly Varden. The mudflats between Alaganik Slough and Pete Dahl Slough support the highest densities of shorebirds on the Delta each spring. Several colonies of nesting arctic terns occur on river sandbars.

Forty species of birds that may frequent the site are considered of conservation concern. A unique population of 21,800 dusky Canada geese, a medium-sized dark subspecies of Canada geese, nest almost exclusively on Alaganik Slough and adjacent Delta wetlands. Duskys depart the Delta in October and migrate to their wintering grounds in southwestern Washington and Oregon where they can be easily confused with 250,000 Canada geese of five other subspecies.

Dusky nesting habitat was seriously degraded by the invasion of woody vegetation, and they were made more vulnerable to predation as a result of the earthquake-caused uplifting. Wolves, coyotes, brown bears, and bald eagles have increased predation rates on eggs, goslings and adults. In response, state and federal management agencies and Ducks Unlimited have instituted an intensive research and management program to aid the bird's recovery.

In addition to swans and geese, Alaganik Slough and Delta wetlands support some of the highest duck nesting densities in Alaska. Among the dabbling ducks, the most common nesters are mallards, northern pintails, green-winged teal, American widgeon, gadwalls, and northern shovelers. Nesting diving ducks include greater scaup, ring-necked ducks, Barrow's goldeneyes, common goldeneyes, common mergansers, red-breasted mergansers, buffleheads, and canvasbacks. In addition, thousands of migrating ducks of 13 species (nine divers and four dabblers) frequent Delta wetlands in fall and spring.

Moose are well established after having been introduced to the Delta between 1949 and 1958. The population is fairly stable at over a thousand animals. Habitat conditions for this highly popular big game species are deteriorating as mixed willow communities mature, stagnate, and convert to alder, cottonwood, and conifer types.

3 Bering Lake and River

Trumpeter swans

Bering Lake drains into Bering River 50 miles east-southeast of Cordova. It was given a local name by G.C. Martin of the U.S. Geological Survey in 1903. Terrain surrounding the 5-1/2-mile long lake is dominated by broad lowlands and sediment-filled valleys bordered by glacially carved ridges and scenic mountains up to 3,500 feet in elevation.

The 120-mile-long, 2,250 square mile Bering Glacier-Bagley Icefield to the east and north is the largest ice complex outside of the polar regions and Greenland. Heavy sediment loads deposited during outburst floods from the glacier's Berg Lake have reduced the size of Bering Lake by 50 percent in the last century.

Because it is remote, shallow, and sheltered, Bering Lake provides ideal habitat for migrating waterfowl. The lake is a major spring and fall staging area for swans, geese, and ducks and provides secure summer molting habitat as well. Trumpeter swans have been known to reach peak numbers of between 400 and 800 during a four- to six-week fall staging period. Swan nesting habitat in the basin is closely associated with beaver ponds and lakes.

The Bering River system supports strong runs of coho and sockeye salmon. Coastal cutthroat trout and Dolly Vardens are also present in the river and lake. Together with nearby Martin, Little Martin, Kushtaka, and Tokum lakes, Bering Lake provides important rearing habitat for sockeye salmon.

Brown bears, moose, and wolves are reported common in the area, with black bears frequently sighted along the lake's north shore. The latter's preferred habitats are grassy slopes and muskegs interspersed with conifer forests. Mountain goats range the rugged Don Miller Hills south of the lake.

4 Canoe Passage

© Milo Burcham

Bald eagle

Located 11 miles west of Cordova, Canoe Passage divides Hawkins Island in half and connects Orca Bay with Orca Inlet. The passage is surrounded by open coastal wetlands with Sitka spruce and hemlock forests covering most of the uplands. The 2,500-acre Canoe Passage State Park encompasses the majority of this site, including several small upland lakes. A number of private homes are located adjacent to the park along the bay's northwest coast.

The passage and its numerous streams serve as important spawning and rearing habitat for chum, coho, and pink salmon along with Dolly Varden and cutthroat trout. Both brown and black bears are commonly sighted when salmon are present.

Canoe Creek is recognized as an important bald eagle molting area. The passage is an attractive wintering area for sea ducks, with harlequins and goldeneyes especially numerous. It also serves as a major migration corridor and temporary stopover habitat for waterfowl and shorebirds migrating north from the Copper River Delta.

There are significant concentrations of sea otters at the east end of the passage on Orca Inlet. Important haulouts for harbor seals occur at both ends of the passage. Brown bears and Sitka black-tailed deer inhabit upland habitats.

5 Cape St. Elias

© Kevin Schafer

Tufted puffin

Towering Cape St. Elias (1,620 feet) protrudes into the storm-tossed waters of the Gulf of Alaska at the southern-most tip of Kayak Island south of Controller Bay in the far eastern edge of the Sound. Named by Captain-Commander Vitus Bering of the St. Peter in 1771, this spectacular promontory is within a two-mile-long Lighthouse Reserve intended to protect the Cape St. Elias lighthouse, built in 1915 and abandoned in 1973. The lighthouse was constructed of bricks made on site and local wood. This unique structure is on the National Registry of Historic Sites and looked after by the Cape St. Elias Lighthouse Association.

An even more important landmark in Alaska history is located about ten miles up the island's western coast. This is believed to be the site of the first European landing in North America when Captain-Commander Vitus Bering reluctantly allowed a shore party led by the now famous scientist Georg Wilham Steller, a few hours to explore the island. It was on this occasion that Steller discovered the bluish-black-colored jay named in his honor.

Pinnacle Rock, lying just off the tip of the cape, is the site of a major seabird colony of 6,000 tufted puffins and 2,460 common murres. Three species of cormorants along with glaucous-winged gulls are also present. Up to 2,000 Steller sea lions hauled out on the pinnacle's rocky shores prior to the species' severe population decline. The current sea lion population is estimated at less than 500.

Since Cape St. Elias marks the narrowest distance between land and the edge of the continental shelf, the combined effects of ocean upwellings and strong tidal currents make for a highly productive marine environment. This is considered superior habitat for mussels, which reach 6-8 inches in size in nearshore waters. Dense schools of sandlance, eulachon, and herring attract phenomenal numbers of foraging seabirds and mammals. It is an ideal site to view humpback whales and orcas, and the passage of several thousand gray whales on their annual migrations to northern feeding grounds.

Millions of salmon also pass the cape enroute to spawning streams throughout the Sound and even as far away as Cook Inlet. Once the site of an intercept fishery, the cape's waters remain closed to commercial fishing to allow the salmon stocks to sort themselves out and fishery managers to meet their escapement goals for each spawning run.

6 Controller Bay

Dunlins and western sandpipers

This broad shallow indentation in the far eastern reaches of the Sound is a flat plain of sand and mud at low tide. The bay extends for 15 miles southeast from the mouth of Bering River to Okalee Spit. It was named "Controllers Bay" by Captain James Cook in 1785, probably for Maurice Suckling, controller for the English Royal Navy.

Approximately 25 percent of the 4 to 5 million shorebirds stopping on the Copper/Bering River mudflats visit Controller Bay.

The bay's Wingham and Kayak islands are characterized by mountainous terrain dominated by coniferous forest, along with high gradient streams and rocky beaches. There is a major colony of 14,000 black-legged kittiwakes and 20,000 common murres on Wingham Island. Okalee Spit, which extends for 11 miles west into the bay from the base of the Suckling Hills, supports colonies of Arctic terns and glaucous-winged gulls. Brown bears have been known to prowl the spit in search of beach strawberries.

Sand bars in the bay are used as haulouts and for pupping by harbor seals. Sea otters have reportedly increased significantly in number in recent years. Prolific zooplankton populations associated with the large gyre in deeper waters west of the bay attract large schools of herring, needlefish and capelin. Foraging humpback, minke, fin, and sei whales along with orcas also seek out the gyre's food abundance.

In past years, waters adjacent to the bay's Kanak Island supported commercial Dungeness crab and razor clam harvests with Tanner crabs taken in deeper waters. These depleted shellfish stocks can no longer support commercial exploitation.

7 Copper Sands

Sandhill cranes

One of the string of barrier islands along the coast of the Copper River Delta was named Copper Sands by mariners and fishermen. Because of the island's unique ecological features, it has been designated a Research Natural Area. These features include a recently emerged and shifting barrier island, high densities of molting dusky Canada geese, extensive tideflats utilized by foraging shorebirds, nesting colonies of glaucous-winged gulls, biota of sandy coastal regions, and examples of ecological succession processes on small sandy islands.

The island's vegetative communities are dominated by salt-tolerant succulent plants. Early pioneers include beach rye grass mixed with cow parsnip and beach peas. These and other plants help stabilize island dunes. Beach strawberries appear later along with seaside arrowgrass.

The extensive tidal mudflats were uplifted 6 to 12 feet by the 1964 earthquake and are now developing into tidal marshes. As vegetative succession proceeds, the island's attractiveness to migrating shorebirds will be diminished.

Eleven species of mammals are known to occur on Copper Sands. Harbor seals forage on large spawning runs of salmon and eulachon in nearby shallow waters, and haul out on island shores in late winter and early spring. Brown and black bears have been known to walk across the tideflats from Pete Dahl Slough to graze on beach greens and prey on nesting and molting glaucous–winged gulls along with their eggs and young. Just up the coast on Egg Island is found the largest glaucous–winged colony in the world with 10,000 birds.

8 Eyak Lake and River

© State of Alaska

Sockeye salmon

Spectacularly beautiful Eyak Lake is located immediately adjacent to the community of Cordova. It was named by Captain W. R. Abercrombie in 1888 for a nearby Native village. This three-armed starfish shaped waterbody is surrounded by steep-sided forested mountains that rise to peaks from 2,000 to 4,000 feet high. The lake drains a 40.5 square mile watershed and has 41 tributary steams. The largest of these is Power Creek, a glacially fed stream at the head of the lake's northern arm. A weir at the lake's outlet maintains an average lake depth of eight feet and maximum depth of 20 feet.

The area is characterized by mixed land ownership and receives the greatest human use of the 23 ecological sites since it is road-accessible from nearby Cordova. There are numerous private residences on the lake's southern and western shores.

At least seven of the lake's tributary streams support spawning runs of sockeye, pink, chum, and coho salmon, Dolly Varden, and cutthroat trout. Some of the latter two species are believed to be year-round residents. There are late runs of sockeye and coho salmon in Power Creek. Some 180 miles of shoreline on Eyak Lake contribute vital spawning, rearing, and wintering habitat. Other fish species present include eulachon, humpback whitefish, and three-spine stickelbacks.

Five-mile-long Eyak River provides a corridor between the ocean and Eyak Lake for anadromous adult salmonid spawners and smolts. The river's gentle flow with overhanging vegetation, fallen trees, and sheltering banks provides excellent rearing habitat for juvenile fish. The river receives intensive use by bald eagles for feeding and perching.

Thirty-one species of mammals have been documented in the vicinity of Eyak Lake including 10-20 brown bears. The bears can be viewed close to seven-mile-long Power Creek road when feeding on sockeye salmon during their mid-June to mid-August spawning runs. Mountain goats inhabit surrounding mountainous areas. The Heney Range has been closed to goat hunting in hopes that the animals will return to provide viewing opportunities.

This ecological site has been well examined by ornithologists who have identified 186 species of birds. Especially noteworthy are three to four pairs of nesting swans on Eyak Lake and Power Creek. There are normally a number of swans that spend the winter in open water areas near the lake's outlet, the most northern winter concentration area for swans. During periods when Eyak Lake is frozen over, the swans, along with wintering ducks, commonly seek the open water of Eyak River. Bald eagles are year round residents with up to 400 birds feeding on spawned out salmon around Eyak Lake. Because of late season salmon runs in Power Creek, bald eagles concentrate there in fall and winter.

The Eyak Mountains are the southern most range of the key flower, a beautiful violet to purplish-colored orchid whose primary distribution is in the Aleutian and Kodiak archipelagos.

9 Gandil River

© Craig Ely

Tule white-fronted goose

A restricted 10-square-mile-wide wetland complex adjacent to the Gandil River and between Bering Glacier and Bering Lake is the site of a migration and staging area for one of the rarest waterfowl in North America, the tule greater white-fronted goose. Aerial telemetry surveys in 1996 and 1997 by research biologists with the U.S. Geological Survey revealed that the majority of the tule goose population (8,000 to 10,000 birds) spends up to a month or more here in fall as they migrate from their breeding grounds in wetlands along the west side of upper Cook Inlet in southcentral Alaska to wintering areas in central California.

Scouring of the Gandil River floodplain by cataclysmic breaching of the sidewall of Berg Lake has resulted in early plant successional stages characterized by graminoid and aquatic vegetation. This habitat apparently is very attractive to the migrating geese. In addition, the open character of the surrounding landscape may make the birds quite secure from mammalian predators. Moose, brown bears, and wolves are commonly seen in the area.

10 Hartney Bay

© Jim Fritsch

Shorebird flock

Only six miles by road from Cordova, Hartney Bay on the southeast coast of Orca Inlet is the favored destination for birders who gather during the annual Cordova Shorebird Festival to view the spectacular shorebird migration for which the area is so famous. This three-mile-wide bay is sheltered by the adjacent Heney Mountains from the prevailing southeast storm tract, and is bordered by extensive sedge marsh between the high tide line and rocky shore.

The clear and nutrient-rich waters of Orca Inlet result in much higher species diversity and biomass than the sediment-laden waters of the Copper River Delta. Dense clam beds characterize intertidal waters and attract feeding sea otters. In winter, various sea ducks gather to feed on the abundance of mussels, clams, and snails.

The prolific abundance of Baltic macoma clams, 90 percent of the mudflat biomass, together with corophid amphipods, polychaete worms, and other invertebrates, attract the astounding numbers of shorebirds. During the peak of migration in early May, birders can observe as many as 20,000 to 70,000 shorebirds at a time. Although the dense flocks are dominated by western sandpipers and dunlins, there is the chance to spot up to 34 additional shorebird species along with their principal winged predators—peregrine falcons, jaegers, and eagles.

There is also a fall gathering of migrating birds at Hartney Bay including thousands of waterfowl. These include dusky Canada geese, cackling Canada geese, white-fronted geese, and on occasion, snow geese. The geese are especially fond of grazing on goose tongue and arrow grass to boost their energy reserves.

Several small streams enter the bay with Hartney Creek supporting modest runs of pink, chum, and coho salmon. Some salmon spawning takes place in intertidal waters. Small numbers of coastal cutthroat trout and Dolly Varden are also present. Since the area is road-accessible it receives fairly high human use for subsistence gathering and sport fishing for salmon and trout.

11 Green Islands

© Milo Burcham

Western toad

This ecological site is located between Montague and Knight islands in Montague Strait 60 miles southwest of Cordova. The islands were named by Captain James Cook on May 18, 1778, during his voyage of discovery in search of the Northwest Passage. According to Cook, "being entirely free form snow, and covered with wood and verdure, on this account they were called Green Islands."

A Research Natural Area (RNA) has been established on the east side of seven-mile-long Green Island. The RNA also encompasses Little Green Island, the Needle (an isolated rock 6.5 miles to the southwest), and Channel Rocks just off Green Island's eastern shore.

Green Island is covered with a mosaic of closed Sitka spruce-mountain hemlock forest, dwarf mountain hemlock forest, mountain hemlock woodland, treeless muskeg, and blanket bog. Some of the Chugach National Forest's largest Sitka spruce and hemlock trees occur on Little Green Island.

Up to 161 species of plants, or 20 percent of the total Alaska flora, are suspected to occur on the Green Islands RNA, a high percentage for such a small area. Two plant species, the truncate quillwort and choris bog orchid, are on the Forest Service's regional list of the 10 most sensitive species.

A distinctive ring of beaches on island shores uplifted by the1964 earthquake provides opportunities for the study of invading grasses, sedges, forbs, and shrubs. Meanwhile, shallow bedrock shelves that surround the islands support highly productive and species-rich intertidal and subtidal kelp communities. Coastal kelp forests are an especially important habitat for a diversity of marine life. The leaf-like vegetative blades of this large form of brown algae provide food and shelter for diatoms, bryozoans, hydroids, snails, and sea urchins. Many species of fish inhabit this shadowy undersea world. Pacific herring and kelp greenling spawn there and attract predatory fish that include halibut, lingcod, skulpins, and rockfish. Octopus are reported common in these waters. The trailing frond mats and inflated floats that rise and fall in ocean swells serve as resting platforms and shelter for sea otters and seabirds.

Two species of amphibians occupy favored habitats on the islands, the wood frog and western (boreal) toad. The latter reaches the most northern limit of its range here. The toads prefer open marshy areas near freshwater while wood frogs seek more diverse habitats that include grasslands, forests, muskegs, and tundra.

A total of 24 species of mammals have been documented on the islands or in adjacent marine waters. The Green Island RNA contains some of the most significant habitat for marine mammals in the entire National Forest System. This is because it is free of major mainland predators, possesses near pristine coastal habitats, and is adjacent to highly productive marine foraging areas.

The Green Island RNA avifauna of 118 species includes old-growth forest indicator birds like the bald eagle, brown creeper, and marbled murrelet. Among the shorebird group, black oystercatchers nest on open gravel beaches and winter here in the hundreds. Migrating surfbirds and black turnstones concentrate their foraging activities on the abundant herring roe deposited by the highest spawning densities of Pacific herring in the Sound. Harlequin ducks reach some of their highest winter densities along the rocky coasts of the Green Islands. Island nesting Canada geese also occur.

Nesting colonies of tufted puffins and pigeon guillemots occupy Channel Island, and the Needle supports a colony of black-legged kittiwakes.

12 Heads of Bays

© Ralph Hocken

Yellow-billed loons

Because of their close ecological linkages, the heads of Nelson, Simpson, Sheep, Beartrap, and Olson bays and their surrounding uplands along the Sound's northeastern coast are together considered a single ecological site. All the bays have freshwater streams that support spawning runs of pink and chum salmon. The abundant salmon runs attract fish-eating predators that include bald eagles, wolves, river otters, and black and brown bears.

This site is suspected to support the largest brown bear population in the Sound. These large predators utilize a variety of terrain and habitat types including riparian areas, old-growth forest, and high alpine meadows. During summer salmon runs, the bears are known to move seasonally from bay to bay along well-worn coastal trails. Maintenance of escape and resting cover adjacent to riparian habitats is deemed vital to the sustainability of such a large bear population.

Eelgrass beds on soft bottoms at the heads of the sheltered bays constitute especially important nearshore communities. They provide habitat for a diversity of invertebrate sea life including diatoms, barnacles, snails, sea squirts, bryozoans, and polychaete worms. Dungeness crabs migrate to these secluded habitats to molt and mate. Herring spawn here and deposit their eggs on eelgrass blades where they provide a rich food source for a variety of fish and bird species. They also serve as important nursery grounds for juvenile salmon, herring, sand lance, crabs, and mollusks. Eelgrass meadows contribute to the enrichment of coastal ecosystems through the release of tons of nutrients from their leaves including carbon, nitrogen, and phosphorous. Extensive popweed communities that are especially rich in invertebrate life may constitute 90 percent of a bay's biomass.

The heads of bays are known to attract thousands of wintering sea ducks that include scoters, goldeneyes, mergansers, buffleheads, greater scaup, long-tailed ducks, and harlequins. Yellow-billed loons can on occasion be encountered here in winter. Resident populations of Canada geese nest across the site.

Uplands surrounding the bays are dominated by mature spruce-hemlock stands inhabited by rainforest birds such as the Townsend's warbler, varied thrush, winter wren, and Steller's jay. Because of their preference for coastal old-growth forested habitat with large trees for nesting, especially inland from bays, marbled murrelets may also be attracted to the site.

13 Jack Bay

© John Good, NPS

Barrow's goldeneye

This 7-mile-long scenic bay lies on the east side of Valdez Arm, 12 miles from Valdez by boat. It was named in 1898 by W.R. Abercrombie, presumably after a local prospector, W.G. Jack. The bay's northern arm, including an island and peninsula, has been designated the 1,520-acre Jack Bay State Marine Park. There are extensive private inholdings in the Chugach Forest along the bay's shores. This is a popular recreation destination for boaters from Valdez. The bay has been designated a "Potential Place of Refuge" because it is adjacent to heavily used oil tanker lanes and is capable of providing anchorage for deep draft vessels.

There are nine streams that enter Jack Bay with runs of spawning pink and chum salmon in Gregoreoff and Levshakoff creeks and spawning silver salmon in Levshakoff Creek and Naomoff River. The broad shallow estuary in the bay's north arm supports extensive eelgrass beds identified as crucial and sensitive in the state's park plan. This is critical habitat for salmon, herring, Tanner crabs, and bivalves, and is a prime nesting and feeding area for sea ducks.

The broad sand intertidal zone of the Levhsakoff Creek estuary supports extensive beds of eelgrass with thriving bivalve populations. The bay's high biological productivity attracts foraging sea otters, harbor seals, river otters, and Steller sea lions, as well as a variety of sea ducks, with Barrow's goldeneyes, buffleheads, scoters, and common and red-breasted mergansers being most abundant. Gregoreoff Creek is especially attractive to nesting harlequin ducks. Bald eagles nest throughout the area with up to 50 observed at Vlasoff Creek during the June to September salmon runs.

Black bears are seasonally abundant around Gregoreoff Cove and its salt marsh, and mountain goats range throughout the surrounding mountains.

14 Katalla

Mountain goat

This is an old village site on the Malaspina coastal plain, 50 miles southeast of Cordova. Nearby Katalla Bay extends 15 miles from Palm Point to Strawberry Point. The 12-mile-long Katalla River flows from the north between the scenic Ragged Mountains on the west and Don Miller Hills on the east before emptying into Katalla Slough. The Katalla River supports unusually prolific salmon runs because of high rainfall along the coast. Coho salmon are the most abundant with annual escapements of between 5,000 and 10,000 fish. There are more modest runs of sockeyes, pinks, and chums. Coastal cutthroat trout and Dolly Varden are also present in good numbers.

Because of its high biodiversity values, The Nature Conservancy of Alaska has purchased a 158-acre private tract on Point Martin. This is important habitat for birds and mammals migrating between the Copper River Delta to the west and the Katalla and Bering river valleys to the east. Since the 25-mile-long Ragged Mountains reach almost to the coast at this location, wildlife is forced to travel in a narrow coastal corridor.

Brown bears are common in the area and are most commonly seen on alder-covered south facing slopes and avalanche chutes in the spring and along salmon streams in summer and fall. Several hundred mountain goats range the Ragged Mountains and Don Martin Hills. Although normally preferring high mountain crags and alpine tundra habitat, goats may move as low as 400-500 feet on slopes with southern exposures. Pockets of old growth forest in steep terrain are especially critical as wintering habitat.

Major seabird colonies occur on the Martin Islands a short distance offshore. Fox Island supports a colony of 13,000 black-legged kittiwakes and 2,000 tufted puffins. Two to three peregrine falcon eyries are known to occur on cliffs along the adjacent coast.

15 Martin River and Lake

Rainbow trout

Named in 1899 by Captain W.R. Abercrombie of the U.S. Army, Martin Lake is an east delta lake located 19 miles north of Katalla in an extremely scenic setting near the Ragged Mountains. The lake drains into Martin River which begins at the terminus of the Martin River Glacier before flowing 22 miles west and emptying into the Copper River.

In addition to major runs of sockeye and coho salmon, the Martin River system supports robust and unique populations of steelhead/rainbow and cutthroat trout. These fish populations are characterized by a high degree of hybridization, with cutthroat/rainbow hybrids comprising 60 percent of the total population. Some adult sea-run steelhead/rainbows reach 25.5 inches in length. Also of special interest are the healthy populations of sea-run coastal cutthroat trout, a species that reaches the northernmost and westernmost limits of its range in the Sound. This beautiful trout is silvery to brassy in color with yellowish tints, and is covered with irregularly shaped dark brown or black spots on the body, head, and fins.

Trumpeter swans stage on Martin Lake during migration and nest and molt on this and other secluded lakes in the area. With a wingspan of eight feet and weighing up to 35 pounds, trumpeters are the largest North American waterfowl. Swans mate for life and are very sensitive to disturbances during the nesting season. Because of their specific nesting and brood rearing preferences, only a small percentage of Delta lakes are suitable as swan nesting habitat. Moose, brown bears and wolves occur throughout the area.

16 Middleton Island

Abandoned radar tower

Named by explorer Captain George Vancouver in 1794, probably after Sir Charles Middleton, a rear admiral in the British Royal Navy, this remote storm-battered island of maritime tundra in the Gulf of Alaska is located near the edge of the continental shelf 80 miles southwest of Cordova. Middleton Island is a relatively flat, 2,200-acre island and is only about 4,300 years old, having been created by the uplift of marine glacial deposits during a series of tectonic events. The most recent of these events was the 1964 Alaska earthquake that created 1,000 acres of uplifted tidelands.

Middleton Island's remote location in a stormy and biologically-rich marine environment makes it especially attractive to both migrant and nesting birds. Ornithologists have documented 220 species of birds on the island, including 20-25 species that nest there. Of special note is the colony of seabirds—black-legged kittwakes, common and thick-billed murres, pelagic cormorants, rhinocerous auklets, and glaucous-winged gulls—now thriving on an abandoned Air force radar tower. Biologists have made the tower even more attractive to the birds by the installation of nest ledges and boxes. A second artificial colony of nesting kittiwakes, cormorants, and puffins occurs on a shipwreck on the island's southwestern shore.

For reasons not well understood by biologists, seabird populations undergo more dynamic fluctuations on Middleton Island than perhaps anywhere else in Alaska. For example, the island's population of black oystercatchers has exploded from a single pair sighted in 1981 to some 700 birds today. This is believed the densest population of oystercatchers in the world! Middleton Island is also one of a limited number of oceanic islands inhabited by nesting Canada geese.

Middleton Island is fast gaining an international reputation for its innovative research on marine birds and other wildlife. The site has outstanding potential as a biological and geological showcase for coordinated research, public education, and ecotourism.

17 Montague Island North

Black turnstone

Diverse coastal habitats in a chain of bays on the north end of Montague Island—Port Chalmers, Stockdale Harbor, Rocky Bay, and Zaikof Bay—are some of the most productive for marine wildlife in the Sound. The National Oceanographic and Atmospheric Administration (NOAA) has designated the island's northwest coast as a sensitive biological area for forage fish, seabirds, waterfowl, and marine mammals.

Port Chalmers, located 30 miles northeast of Chenega, was named Chalmers Harbor in 1787 by Captain Portlock of the English Royal Navy. Rocky Bay is a descriptive name given by Ferdinand Westdahl of the U.S. Coast and Geodetic Survey in 1902 because of its rocky shoreline. Captain Tebenka named Zaikof Bay in 1852, presumably after Stepan Kosmovich Zaikof, chief of the trading post at St. Nickolas on the Kenai Peninsula.

This site's high biological productivity is attributed to nutrient rich ocean waters circulating out of Hinchinbrook Entrance, coastlines sheltered from prevailing southeasterly storms, and broad shallow shelf areas conducive to development of kelp forests and eelgrass beds. In fact, the most extensive canopy-forming kelp beds in the entire Sound occur along these coasts, and the low-gradient shores of Stockdale Harbor and Zaikof Bay support some of its most prolific eelgrass communities. Surf grass, although somewhat similar in appearance to eelgrass, grows in more high-energy, rocky intertidal areas such as those in Zaikof Bay.

The northwest Montague kelp forests and eelgrass beds attract prolific populations of spawning Pacific herring, capelin, and sand lance. This super abundance of forage fish is much sought after by seabirds that include black-legged kittiwakes, marbled murrelets, horned and tufted puffins, and pigeon guillemots. Dense concentrations of herring roe, especially in Rocky Bay, provide a highly nutritious food source for thousands of migrating surfbirds, black turnstones, and rock sandpipers. Sea ducks that include scoters, long-tailed ducks, and goldeneyes also gather by the thousands to feed on herring roe. Studies of harlequin ducks found that some birds travel to the Brooks Range of northern Alaska and as far away as the Anadyr River on the Russian side of the Bering Sea to nest. They then return to the coastal waters of Montague and Green Islands in winter.

Montague's extensive coastal kelp forests are ideal habitat for sea otters. Transient pods of orcas frequently visit these nearshore waters stalking harbor seals and Steller sea lions near their haulouts. Groups of as many as 30 humpback whales seek out a preferred feeding area off the island's northern coast during periods of high herring biomass in late summer and early fall.

The island supports a high population of brown bears and the Sound's highest density of Sitka black-tailed deer. Little is known of the rare Montague marmot and Montague tundra vole. Western toads inhabit the island's coastal wetlands.

18

Port Etches

Harbor seal

Located on the southeast end of Hinchinbrook Island 30 miles southwest of Cordova, this highly scenic bay sheltered by forested mountains was named by Captain Portlock of the English Royal Navy in 1787, presumably for fur trader John Cadman Etches.

The northward-flowing Alaska Current through nearby Hitchinbrook Entrance delivers extremely rich ocean waters into Port Etches. Extensive kelp beds provide ideal spawning habitat for Pacific herring and capelin. The large concentrations of forage fish, including walleye pollack found further offshore, in turn attract large concentrations of feeding seabirds, some of which nest on Porpoise Rocks at the port's entrance. Marbled murrelets feed in offshore waters in company with humpback whales and orcas. Porpoise Rocks also serve as a Steller sea lion haulout.

Nuchek Island separates Port Etches from Constantine Harbor along the port's northwestern shore. The island's rocky shores and gravel beaches serve as haulouts for harbor seals and its highly productive tidal mudflats, kelp beds, and eelgrass forests provide ideal habitat for large numbers of forage fish as well as feeding and pupping areas for concentrations of sea otters. A variety of seabirds, shorebirds, and waterfowl adjust their feeding regimes to shifting tides in these sheltered and productive waters. Tufted puffins, Arctic terns, black oystercatchers, and pigeon guillemots all nest along the coasts of Constantine Harbor.

Parts of Port Etches have been designated as sensitive biological resources for both sea otters and harbor seals, and as a year-round sensitive area for waterfowl because of the large concentrations of mallards, goldeneyes, and scoters along with Canada geese. Harlequins nest, molt, and winter in abundance here.

Spawning runs of pink, chum, and coho salmon in the port's streams attract brown bears and eagles. Hinchinbrook Island reportedly has a high population of Sitka black-tailed deer and brown bears. Bears seek out new plant growth in avalanche chutes and tidal grass flats in spring, then shift to salmon and berries in summer and fall. Of special note are beach dwelling hoary marmots that have been known to tunnel into sandy banks at the coastal shrub-timber transition zone. Marmots are normally associated with alpine mountain habitats.

19 Port Gravina

Surf scoter

This nine-mile-wide coastal bay, located at the edge of Orca Bay 22 miles northwest of Cordova, was named by Salavdor Fidalgo in 1790, probably for Frederrico Gravina, a prominent Spanish naval officer. The prevailing currents bring nutrient-rich ocean waters to Port Gravina and other parts of the northeastern Sound. The mountain slopes above the bay have not been logged and continue to support old growth forest. Mountain goats range the high crags and both brown and black bears are common in forested coastal habitats. Coyotes are abundant and wolves are known to frequent the area as well.

Early spring (mid-April) herring spawning at Knowles Head and Red Head on the west and Gravina Point on the east provides a food bonanza for wintering sea ducks that include long-tailed ducks, Barrows goldeneyes, greater scaup, harlequin ducks, and three species of scoters. They are joined in the feeding frenzy by humpback whales, sea lions, bald eagles, and glaucous-winged gulls.

Major coastal bays such as Port Gravina are of international importance to wintering sea ducks. Employing satellite transmitter technology, the Alaska Department of Fish and Game has discovered that surf scoters and white-winged scoters travel to wetlands of interior Alaska and the Northwest Territories in Canada to breed. They then move either to the Beaufort Sea coast or Yukon-Kuskokwim Delta of western Alaska to molt before returning to favored wintering areas in the Sound such as Port Gravina and Orca Inlet.

Extensive tidal flats and productive eelgrass beds characterize Hells Hole, a shallow water bay on the northwest coast of Port Gravina near the entrance to St. Mathew Bay. A major run of coho salmon attracts bald eagles and brown bears. Hells Hole is also an important molting area for harlequin ducks, and its eelgrass beds and flooded tidal flats are frequented by an abundance of wintering sea ducks. A few endangered Steller's eiders and yellow-billed loons have been infrequently sighted in winter as well as the yellow-billed loon. Both are species of conservation concern. There is also a small Aleutian tern breeding colony at Hells Hole.

Salmon sharks are attracted to the abundance of salmon entering Port Gravina. This area has become the target of an increasingly popular sport shark fishery.

20

Sawmill Bay

© Milo Burcham

Black bear

This northern extension of Valdez Arm lies 16 miles west of Valdez. The entire bay and parts of the surrounding uplands are within the 3,841-acre Shoup Bay State Marine Park. The bay's steep eastern shore rises to 2,000-foot peaks and is bordered by old growth spruce-hemlock forest. Twin Falls Creek flows across the quarter-mile-wide valley at the head of the bay. The riparian zone, with its extensive mudflats, constitutes the site's is most biologically rich habitat and has been classified by the state as critical habitat. Eelgrass beds serve as nursery areas for juvenile fish, making a major contribution to the health of local fisheries.

Twin Falls Creek supports spawning runs of pink and chum salmon. Black bears and Sitka black-tailed deer are commonly seen along the open shores. Surrounding mountain slopes provide important winter habitat to mountain goats. Waterfowl include mallards and mergansers that feed in the shallows of the upper bay. Canada geese are reported numerous. Open shoreline habitats are especially important to nesting Bonaparte and mew gulls.

21

Shoup Bay

© USFWS

Black-legged kittiwake

Only seven miles west of Valdez lies another northward branch of Valdez Arm–Shoup Bay. This is the site of the 4,560-acre Shoup Bay State Marine Park. A tidal lake at the head of the bay is fed by calving of Shoup Glacier. The lake is separated from the lower bay by a reversing tidal river. Two salmon streams, Uno and McAllister, support runs of spawning pink salmon. Except for the relatively low flat tract of land between the lake and bay, steep alder-covered slopes predominate on surrounding mountains that rise to 2,000 to 3,000 feet. A low vegetated rock and sand spit that once constituted a terminal glacier moraine separates the bay from Valdez Arm.

A unique mix of glacial dynamics, plant succession, and wildlife habitats not found elsewhere in the area offers opportunities for the study of ecological succession. Sessile-leafed scurvy grass, a narrow endemic found principally on Kodiak Island, occurs on Shoup Bay spit. Georg Wilhelm Steller reportedly gathered this plant to help relieve the Saint Peter's crew from scurvy during Vitus Bering's 1741 voyage of discovery to America.

Parts of Shoup Bay are classified as critical habitat by the Alaska Department of Fish & Game. The tideflats and moraines around the lake are considered especially sensitive and important habitats since they are used as migration, nesting, and feeding habitats by a variety of waterfowl and shorebirds. Thousands of migrating scoters visit the bay in the spring. The largest and fastest growing black-legged kittiwake colony in the Sound is located on lakeside cliffs.

Harbor seals forage for fish in marine park waters and rest with their pups on ice flows in Shoup Lake. Mountain goats are commonly sighted on the adjacent steep mountain slopes.

22 Wooded Islands

© Yuri Artukhin

Fork-tailed storm petrel

The rugged Wooded Islands, consisting of Wooded, Tanker, and Fish islands, total 290 acres and lie off the southeast coast of Montague Island 75 miles southeast of Seward. Wooded Island was first described by Captain George Vancouver in 1794. The island is characterized by rocky headlands and dominated by dense grass-umbel and salmonberry plant communities. The northward-flowing Alaska current forms a large eddy in nearby Patton Bay delivering high concentrations of zooplankton, attracting immense schools of juvenile herring and capelin in summer. These forage fish are in turn favored by a host of seabirds, sea lions, and harbor seals.

The Wooded Islands support one of the largest seabird colonies in the North Gulf of Alaska. Tufted puffins, fork-tailed storm petrels, black-legged kittiwakes, Leaches storm petrels, glaucous-winged gulls, three species of cormorant (pelagic, double-crested, and red-faced), pigeon guillemots, common murres, parakeet auklets, and horned puffins are all present. The number of storm petrels alone is estimated at 40,000.

Steller sea lions are also attracted by the abundance of favored forage fish. Fish Island is used as a major haulout. Large numbers of sea otters inhabit the lush kelp forests that surround the Wooded Islands.

23 Valdez Duck Flats

© David Menke, USFWS

Northern pintail

Just one-half mile from Valdez, adjacent to the Richardson Highway, is a 1,000-acre state critical habitat area consisting of intertidal mudflats and salt marsh. Intertidal mixing of freshwater inflow from seven streams and saltwater in Valdez Arm produces a highly productive estuary environment. The estuary is a nursery area for millions of salmon fry, and provides nesting, molting, and/or staging habitat for 52 species of marine birds, 8 species of waterfowl, and 18 species of shorebirds.

Harbor seals seek out the local abundance of forage fish and sea otters dive throughout the flats for mussels and clams.

Conclusion

Preparing this report reconfirmed that the eastern Prince William Sound/Copper River Delta ecosystem is of immense importance to local people and of global significance to the conservation of biological diversity. It is important to note that all 43 of the resource experts we turned to for advice and guidance gave generously of their time and talent. Especially appreciated was the high level of cooperation provided by the professional staffs of the resource management agencies: U.S. Forest Service, U.S. Fish and Wildlife Service, Alaska Department of Fish and & Game, and Alaska Division of State Parks and Outdoor Recreation. Not only did agency staff go out of their way to be helpful, but they demonstrated an extremely high level of commitment to the stewardship of the public resources entrusted to their care.

When viewed in an ecosystem perspective, the 23 special ecological sites identified in this report illustrate the tremendous natural diversity and productivity of this remarkable place. The sites also dramatize the need to place site-specific conservation actions in a much broader context. To effectively manage salmon, for example, we must protect not only their key freshwater spawning and rearing habitats, but vital habitats throughout their natural ranges in the ocean as well. Such fundamental ecosystem management techniques also apply to other wildlife, from hummingbirds to humpback whales. Ultimately, our response to these conservation challenges will be a measure of our value systems, both as a people and a nation.

© Milo Burcham

Winter wren

Copper River Delta wetlands

© Milo Burcham

Species Refered to in Text

Plants

Forbs

Alkali grass . . . . . .Puccinellia sp
Beach pea . . . . . .Lathyrus maritimus
Beach rye . . . . . .Elymus arenarius
Beach strawberry . . . . . .Fragaria chiloensis
Choris bog orchid . . . . . .Plantanthera chorisiana
Cow parsnip . . . . . .Heraoleum lantum
Eelgrass . . . . . .Zostera marina
Fireweed . . . . . .Epilobium angustifolium
Frogs-bit . . . . . .Elodea canadensis
Goose tongue . . . . . .Plantago maritima
Horned pondweed . . . . . .Zanichellia palustris
Kelp . . . . . .Agarum, Laminaria, & Nereocyctis
Key flower . . . . . .Dactylorhiza aristata
Lyngby's sedge . . . . . .Carex lyngbyaei
Northern horsetail . . . . . .Equisetum variegatum
Popweed . . . . . .Fucus gardneri
Seashore bluegrass . . . . . .Poa macrantha
Seaweeds . . . . . .Fucus sp
Sedges . . . . . .Carex sp
Sedge-vetchling . . . . . .Lathyrus palustris
Sessile-leafed scurvy grass . . . . .Cochlearia sessifolia
Skunk cabbage . . . . . .Lysichiton americanus
Surf grass . . . . . .Phyllospadix serrulatus
Truncate quillwort . . . . . .Isoetes truncata

Shrubs

Arctic willow . . . . . .Salix artica
Devil's club . . . . . .Echinopanax horridum
Salmonberry . . . . . .Rubus spectabillis
Sitka alder . . . . . .Alnus crispasinuata
Sweet gale . . . . . .Myrica gale
Willows . . . . . .Salix sp

Trees

Black cottonwood . . . . . .Populus trichocarpa
Mountain hemlock . . . . . .Tsuga mertensiana
Sitka spruce . . . . . .Picea sitchensis
Western hemlock . . . . . .Tsuga heterophylla

Invertebrates

Corophid amphipod . . . . . .Corophium salmonis
Dungeness crab . . . . . .Cancer magister
Mussel . . . . . .Mytilus endulis
Octopus . . . . . .Octopus dofleini
Phyllodocid polychaete . . . . . .Eteoue longa
Razor clam . . . . . .Siligua patula
Tanner crab . . . . . .Chionoecetes bairdi
Tellinid bivalve . . . . . .Macoma balthica
Weathervane or
giant Pacific scallop . . . . . .Pectin caurinus

Fish

Arctic grayling . . . . . .Thymallus arcticus
Capelin . . . . . .Mallotus villosus
Chinook (king) salmon . . . . . .Oncorhynchus tahawytscha
Chum (dog) salmon . . . . . .Oncorhynchus keta
Coastal cutthroat trout . . . . . .Oncorhynchus clarkii clarkii
Coho (silver) salmon . . . . . .Oncorhynchus kisutch
Dolly Varden . . . . . .Salvelinus malma
Eulachon (hooligan) . . . . . .Thaleichthys pacificus
Halibut . . . . . .Hippoglossus stenoleais
Kelp greenling . . . . . .Hexagrammous
Lingcod . . . . . .Ophiodon elongates
Needlefish . . . . . .Aulorrhynohus flavidus
Pacific herring . . . . . .Clupea harengus pallasi
Pink (humpback) salmon . . . . . .Oncorhynchus gorbuscha
Pink salmon . . . . . .Oncoryynchus gorburcha
Rockfish . . . . . .Scorpaenidae sp
Round whitefish . . . . . .Prosopinum cylindraceum
Salmon shark . . . . . .Lamna ditropis mykiss
Sand lance . . . . . .Ammodyte hexapterus
Sculpins . . . . . .Cottidae sp
Sockeye (red) salmon . . . . . .Oncorhybchus nerka
Steelhead/rainbow trout . . . . . .Oncorhynchus mykiss
Three-spine stickleback . . . . . .Gasterostteus aculeatus
Walleye pollock . . . . . .Theragra chalcogramma

Amphibians

Western (boreal) toad . . . . . .Bufo boreas
Wood frog . . . . . .Rana sylvatica

Birds

American bald eagle . . . . . .Haliaeetus leucocephalus
American golden plover . . . . . .Pluvialis dominica
Arctic tern . . . . . .Sterna paradisaeea
Barrow's goldeneye . . . . . .Bucephala islandica
Black oystercatcher . . . . . .Haematopus bachmani
Black turnstone . . . . . .Aenaria melanocephala
Black-bellied plover . . . . . .Pluvialis squatarola
Black-legged kittiwake . . . . . .Rissa tridactyla
Bonaparte's gull . . . . . .Larus philadelphia
Bristle-thighed curlew . . . . . .Numenius tahitiensis
Brown creeper . . . . . .Certhia americana
Bufflehead . . . . . .Bucephala albeola
Cackling canada goose . . . . . .Branta canadensis minima
Canvasback . . . . . .Aythya valisineria
Common goldeneye . . . . . .Bucephala clangula
Common loon . . . . . .Gavia immer
Common merganser . . . . . .Mergus mergaser
Common murre . . . . . .Uria aalge
Double-crested cormorant . . . . .Phalacrocorax auritus
Dunlin . . . . . .Calidris alpina
Dusky Canada goose . . . . . .Branta canadensis occidentalis
Fork-tailed storm-petrel . . . . . .Oceanodroma furcata

Gadwall	Anas strepera
Glaucous-winged gull	Larus glaucescens
Greater scaup	Aythya marila
Green-winged teal	Anas crecca
Harlequin duck	Histrionicus histrionicus
Horned puffin	Fratercula corniculata
Hudsonian godwit	Limosa haemastica
Leach's storm-petrel	Oceanodroma leucorhoa
Least sandpiper	Calidris minutilla
Lesser yellowlegs	Tringa flavipes
Long-billed dowitcher	Limnodromous scolopaceus
Long-tailed duck	Clangula hyemalis
Mallard	Anas platyrhynchos
Marbled godwit	Limosa fedoa
Marbled murrelet	Brachyramphus marmoratus
Merlin	Falco columbarius
Mew gull	Larus canus
Northern harrier	Circus cyaneus
Northern pintail	Anas acuta
Northern shoveler	Anas clypeata
Pacific golden plover	Pluvialis fulva
Parakeet auklet	Aethia psittacula
Parasitic jaeger	Stercorarius parasiticus
Pectoral sandpiper	Calidris melanotos
Pelagic cormorant	Phalacrocorax pelagicus
Peregrine falcon	Falco peregrinus
Pigeon guillemot	Cepphus columba
Red knot	Calidris canutus
Red-breasted merganser	Mergus serrator
Red-faced cormorant	Phalacrocorax urile
Red-throated loon	Gavia stellata
Rhinocerous auklet	Cerorhinca monocerata
Ring-necked duck	Aythya collaris
Rock sandpiper	Calidris ptilocnemis
Sanderling	Calidris alba
Sandhill crane	Grus canadensis
Short-billed dowitcher	Limnodromous griseus
Snow goose	Chen caerulescens
Steller's eider	Polysticta stelleri
Steller's jay	Cyanocitta stelleri
Surf scoter	Melanitta perspicillata
Surfbird	Aphriza virgata
Thick-billed murre	Uria lomvia
Townsend's warbler	Dendroica townsendi
Trumpeter swan	Cygnus buccinator
Tufted puffin	Fratercula cirrhata
Tule Canada goose	Anser albifrons elgasi
Varied thrush	Ixoreus naevius
Water pipit	Anthus spinoletta
Western sandpiper	Calidris mauri
White-fronted goose	Anser albifrons
White-winged scoter	Melanitta fusca
Winter wren	Troglodytes troglodytes
Yellow-billed loon	Gavia adamsii

Mammals

Marine

Dall's porpoise	Phocoenoides dalli
Fin whale	Balaenoptera musculus
Gray whale	Eschrichtius robustus
Harbor porpoise	Phocoena phocoena
Harbor seal	Phoca vitulena
Humpback whale	Megaptera novaeangliae
Minke whale	Balaenopyera acutorestrata
Orca (killer whale)	Orcinus orca
Pacific white-sided dolphin	Lagenorhynchus obliguidens
Sea otter	Enhydra lutris
Sei whale	Balaenoptera borealis
Steller sea lion	Eumetopias jubatus

Terrestrial

Beaver	Castor canadensis
Black bear	Usus americanus
Brown bear	Ursus arctos
Canada lynx	Lynx canadensis
Coyote	Canis latrans
European rabbit	Oryctolagus cuniculus
Gray wolf	Canis lupus
Hoary marmot	Marmota caligata
Montague Island vole	Microtus oeconomous elymocetes
Moose	Alces alces
Mountain goat	Oreamnos americanus
Muskrat	Ondatra zibethicus
Northern river otter	Lontra canadensis
Pine martin	Martes americana
Sitka black-tailed deer	Odocoilus hemionus sitkensis
Wolverine	Gullo gullo

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ABBREVIATIONS
ADF&G Alaska Department of Fish & Game
USFS U.S. Forest Service
USFWS U.S. Fish & Wildlife Service
USGS U.S. Geological Survey

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Steller's jay

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Nesting black oystercatcher

Sitka black-tailed deer

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Brown bears in old growth forest