

The
Mendenhall
a globally
recognized **Wetlands**
Important Bird Area



Robert H. Armstrong • Richard L. Carstensen • Mary F. Willson • Marge Hermans Osborn

The
Mendenhall
a globally
recognized **Wetlands**
Important Bird Area



Robert H. Armstrong
Richard L. Carstensen
Mary F. Willson
Marge Hermans Osborn

Acknowledgements

We are especially grateful to Jim King for allowing us to excerpt from his book *Attending Alaska's Birds* information on the establishment of the Mendenhall Wetlands State Game Refuge. Jim also reviewed the entire book and provided several insights on the Wetlands. Others that reviewed the book and provided useful comments included Rich Gordon, Matt Kirchoff, Paul Suchanek, and Mark Schwan.

Paul Suchanek graciously provided us with his bird database for the Wetlands that included more than 15,000 entries on the numbers of birds by species. Rich Gordon gave us his notes on bird abundance by species that included information he had gathered on the Wetlands for over 40 years. Pauline Strong produced the monthly summaries of this data on pages 33-40. Patty Rose and Gus van Vliet reviewed the phenology chart and made several useful corrections.

Rich Gordon and Steve Zimmerman helped prepare the application for the establishment of the Wetlands as an Important Bird Area. This designation was the seed that grew into this book.

We also thank Matt Knutson of InterDesign for his help with design issues and pre-press work.

Diane Mayer, the executive director of Southeast Alaska Land Trust, helped obtain the funding needed to print this book. Her help, and the board of trustees for SEALTrust, were instrumental in making this book a reality.

Text © 2009 - Robert H. Armstrong, Richard L. Carstensen, Mary F. Willson, Marge Hermans Osborn; *Illustrations* © Richard L. Carstensen; *Photographs* © Robert H. Armstrong except as noted.

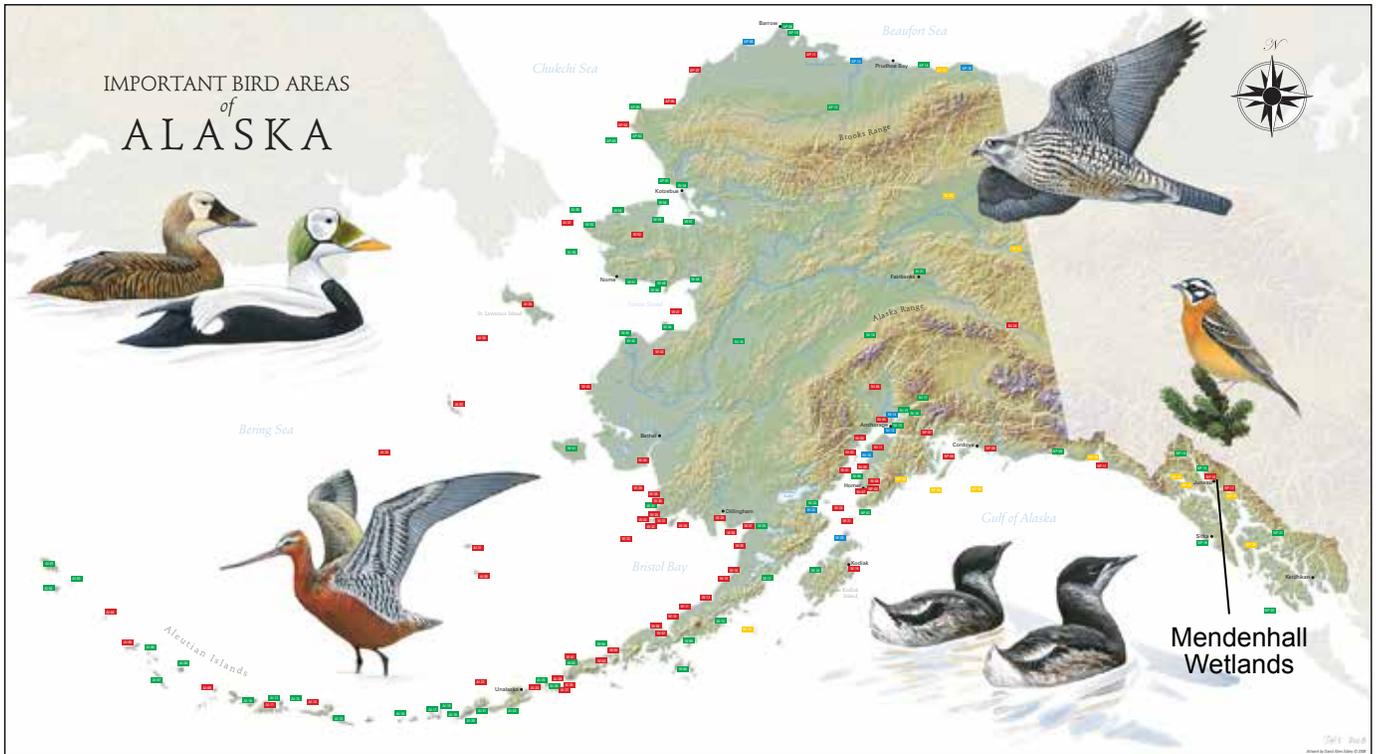
ISBN: 9781578334438

Printed by Samhwa Printing Co., Ltd., Seoul, Korea

First printing, May 2009

Published by:
Nature Alaska Images
5870 Thane Road
Juneau, AK 99801
(907) 586-6811

Cover: Surfbird feeding amongst the mussel beds.



As of 2009, Alaska has 145 Important Bird Areas. The majority of these, including the Mendenhall Wetlands, are also recognized as globally or continentally significant. In fact, Alaska has almost half of all globally significant Important Bird Areas identified in the United States.

To showcase these habitats, Audubon Alaska is offering beautiful, poster-sized maps suitable for hanging on the wall or in a classroom. To order a free copy of one of these maps visit the Audubon Alaska website at <http://www.audubonalaska.org/>



The Southeast Alaska Land Trust is a private, non-profit organization supported by local memberships, private foundations and public grants. *Our mission is to work with communities and private land owners to ensure that vital natural areas remain in place for the benefit of each generation.*

The Mendenhall Wetlands are vital to a significant and diverse population of birds. This salt water, tidal marsh area is the third largest in Southeast Alaska and provides critical rest and replenishment for both migrating and resident birds.

Although the Mendenhall Wetlands fall largely within the defined boundary of the State's Game Refuge, the protections of that designation are vulnerable—not only to the effects of surrounding land uses, but, surprisingly, to the land's natural uplift caused by glacial retreat. Much of the property surrounding the Refuge is legally defined in a way that allows the upland owners to progressively make claim to lands extending out to the retreating mean-high tide line—to lands within the original Refuge boundary. For each upland owner, these "accreted lands" are measured in acres. Claims of one or two acres are typical and up to 15 acres have been claimed in a single case. As the rebound continues, additional claims may be made.

The Southeast Alaska Land Trust is working to convert this moving Refuge boundary into a fixed, stable boundary, or to provide conservation protections on the private, "accreted lands." Using mitigation fees paid to compensate for unavoidable wetland impacts from Juneau airport projects, we will offer to purchase these "accreted lands" outright or, alternately, conservation easements from willing upland owners. Accretion claims will, otherwise, slowly privatize lands around a shrinking Refuge perimeter, and over time give way to urbanization.

The Mendenhall Wetlands provide a glimpse into the timeless cycle of life on the planet. We congratulate the authors on their work. Each of us is grateful to you for making your observations of this place so brilliantly accessible to inform our experience. Thank you.

We are grateful for the generosity of an anonymous SEALTrust donor who has funded printing of this book, and we are committed to assist in the long-term protection of this vital, natural area. May each generation share our experience of this wondrous place!

Diane Mayer
Executive Director
Southeast Alaska Land Trust
www.southeastalaskalandtrust.org

Table of Contents

Background.....	6
Establishing an Important Bird Area.....	7
Mendenhall Wetlands State Game Refuge.....	8
Establishing a Refuge.....	10
Birds.....	11
Areas of Special Importance to Birds.....	23
Our Favorite Wetlands Birding Walk.....	29
Map of Mendenhall Wetlands.....	30
Chart of Highest Daily Counts by Month.....	32
Origins of Birds Seen on Mendenhall Wetlands.....	41
Vegetation.....	45
Fish.....	51
Invertebrates.....	57
Mammals.....	63
Ecological Interactions.....	67
Threats to Birds and Their Habitats on Mendenhall Wetlands.....	73
Reports and Studies on Mendenhall Wetlands.....	77

Background

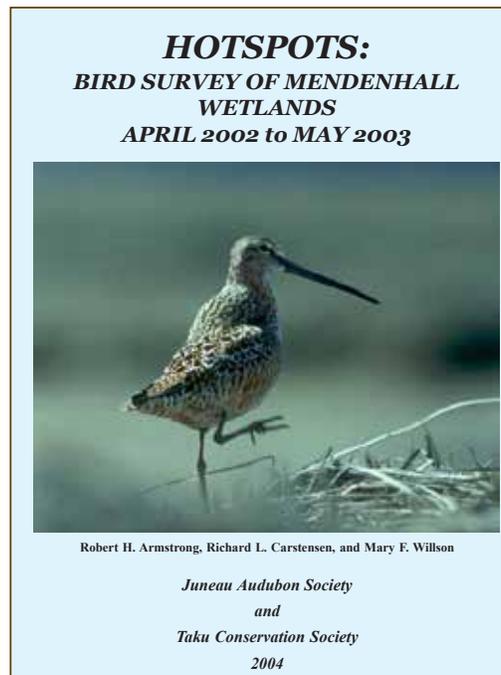
Our interest in the Mendenhall Wetlands began in 1960, long before much of it became established as a refuge. Bob especially liked to go birding in the area that is now the floatplane basin. The area had a wonderful mosaic of habitats that attracted birds. Waterfowl nested there, Arctic Terns had a colony and even nested along the airport runway, Least and Spotted Sandpipers were also common nesters.

Later he met Frank Glass and they often spent time together on the Wetlands looking at birds. Frank especially liked to census the songbirds during breeding season. Bob liked to photograph birds and sat in blinds or wandered about the area with his huge Leicaflex telephoto lens complete with shoulder stock that resembled a military weapon. Once a security officer, with lights flashing, came across the runway and made him return to the terminal for interrogation. It took a while to convince the officer that his “weapon” was really a camera. Frank and Bob eventually produced the first checklist of birds for the Mendenhall Wetlands.

It was a sad day for birds and birders when they dredged the float plane basin. During dredging they were about to plow under the Arctic Tern nests complete with eggs and chicks. Bob contacted Rick Reed, the habitat coordinator for Fish and Game, and the Department stopped any further construction of the basin until the terns finished nesting.

In 1987 Bob and Richard teamed up with Dan Bishop and conducted an environmental analysis of lower Jordan Creek and the nearby wetlands. Dan was a hydrologist, Richard specialized in vegetation, and Bob was a fishery biologist. Bob remembers walking the tidal sloughs at night with Coleman lanterns and seeing abundant salmon young, which were not visible during daylight.

Bob, Richard, and Mary did bird surveys of the entire Wetlands in 2002 and 2003. This study was funded by the U.S. Fish and Wildlife Service



to compare the results to an earlier similar study conducted by the service in 1986. The entire report, known as the “Hotspot Report,” was later published by the Juneau Audubon Society and Taku Conservation Society.

Mary also teamed up with Aaron Baldwin and conducted invertebrate surveys at several places on the Wetlands. Their report was added to the hotspot report.

Earlier observations got Mary, an ecologist, interested in the birds feeding on sand lance and the gulls feeding on salmon eggs and carcasses. These studies were later published.

Richard and Bob later teamed up and did breeding bird surveys on airport property for the consultants working on the Environmental Impact Statement for the recent planned expansion of the airport.

In 2004, Richard produced a detailed vegetation map and assessed implications of glacial rebound and development for SEALTrust.

Bob and his friend Rich Gordon have spent a considerable amount of time birding together on the Wetlands. Rich always kept detailed notes of what he saw. They eventually put together the second checklist of birds for the Mendenhall Wetlands. In 2005 they filed the application, with support from Juneau Audubon, to establish the Wetlands as an Important Bird Area. When the Mendenhall Wetlands was officially established as an Important Bird Area of global significance, we all knew we had to write a book about the area.

Bob and Marge have a long history of collaborating on articles and books dealing with Southeast Alaska’s natural world. Marge’s skill at making things look good in both layout and words was an important addition to this book.

We are so fortunate to have such a wonderful place in our backyard. We hope this book contributes to the protection of the Mendenhall Wetlands.

Establishing an Important Bird Area

IN 2005, JUNEAU AUDUBON SOCIETY applied to Audubon Alaska to have the Mendenhall Wetlands classified as an Important Bird Area (IBA). The application was reviewed by the Alaska Technical Committee and in 2006 the Wetlands were recognized as an IBA at the state level. The nomination was then sent to the National Technical Committee for their assessment of the site's continental and global significance. In 2007 the Mendenhall Wetlands was officially recognized as globally significant by the U.S. IBA Committee.

The Important Bird Area program is an international effort to identify, conserve, and monitor a network of sites that provide essential habitat for bird populations. BirdLife International began the IBA program in Europe in 1985. Since that time, BirdLife partners in more than 100 countries have joined together to build the global IBA network. Audubon, the BirdLife Partner in the U.S., has been working since 1995 to identify and conserve hundreds of IBAs all across the United States.

In order to qualify for a globally or continentally significant IBA a site must support a significant portion of the flyway population of a particular species. In general, to qualify the site must have supported over one percent of the North American population at one time, or more than five percent of the population for the season.

At the time of application there were more than 10,000 documented observations of the number of birds, by species, that occurred on the Mendenhall Wetlands at one time. Several species fell within the IBA qualifying criteria. They included Greater White-fronted Goose, Canada Goose (Vancouver subspecies), Surfbird, Thayer's Gull, Surf Scoter, American Golden-Plover, Lesser Yellowlegs, Ruddy Turnstone, Black Turnstone, Western Sandpiper, Pectoral Sandpiper, Rock Sandpiper, Dunlin, Short-

billed Dowitcher, and Bonaparte's Gull. Some of these species were also on the Audubon WatchList because of concerns about their conservation status. Those included Surfbird, American Golden-Plover, Rock Sandpiper, and Short-billed Dowitcher.



The Surfbird is an Audubon WatchList "Species of High Conservation Concern" because its worldwide population is estimated at only 70,000, and that is suspected to be declining. More than a thousand Surfbirds at a time have been seen on Mendenhall Wetlands in April, May, and July.

Mendenhall Wetlands does indeed provide food and/or resting space to a remarkable variety and abundance of birds. We know this because of more than 40 years of records by birding enthusiasts, and two major studies that have documented the variety and abundance of birds in the area.

As of November 2008, observers had recorded sightings of 256 different species of birds. That's 83 percent of the 308 species seen in the entire Juneau area (from Taku Inlet to Berners Bay) and 73 percent of the 352 bird species seen in all of Southeast Alaska (from Dixon Entrance to Yakutat).

Because of the variety and complexity of its habitats, Mendenhall Wetlands is widely acknowledged to be one of the key stopover points for migratory waterfowl and shorebirds in coastal Alaska.

Mendenhall Wetlands State Game Refuge

Most of Mendenhall Wetlands is owned by the State of Alaska and is included in the 3,764-acre Mendenhall State Game Refuge, managed by the Alaska Department of Fish and Game. A much smaller portion falls under the jurisdiction of the Juneau City and Borough, and is managed by the Juneau Airport. About seven percent of the Wetlands (350 acres) is privately owned. That portion includes Miller-Honsinger Pond, an important area for waterfowl and other birds, and the Juneau golf course.

The following description and history is adapted from the State of Alaska's Mendenhall Wetlands State Game Refuge Management Plan.

LOCATED BETWEEN DOUGLAS ISLAND AND THE MAINLAND at Juneau in northern Southeast Alaska, the 3,764-acre refuge stretches along nine miles of Gastineau Channel and is accessed via the Egan Expressway, Sunny Drive, North Douglas Highway, Fritz Cove Road, Mendenhall Peninsula Road, and the Airport Dike Trail. Gastineau Channel was originally formed by glacial scouring and later filled by marine and river sediments. Today it is fed by silt-laden water from Mendenhall and Lemon Glaciers, as well as numerous smaller clear-water systems, notably Fish, Jordan, Switzer, and Salmon Creeks.

History

Prior to the creation of the State Game Refuge on the Mendenhall Wetlands by the 1976 Alaska State Legislature, the general area played a part in the development of the Juneau area. Captain George Vancouver's party charted Douglas Island and Gastineau Channel in 1794, but other white men had evidently been in the area, as local natives had blunderbusses and muskets. Vancouver's journals mention ice blocking the passage through Gastineau Channel.

European fur traders visited the area from at least 1799 through the 1860s; trading was apparently carried on with the Auk tribe who lived along and gathered natural resources from the wetlands.

In 1879 naturalist John Muir and Presbyterian minister S. Hall Young traveled through "the flats," as the area has often been called throughout its history. Muir noted the Mendenhall Glacier was in the "first stages of decadence" and observed the mineralization of the mainland shore. This latter fact was borne out in the following year when Juneau's "founding fathers," Richard Harris and Joe Juneau, discovered gold in the Silverbow Basin. The city of Juneau was founded in 1900, and mining was active in the area through 1944. While mining

may not have had much of a direct impact on what today are refuge lands, in the early teens one miner reported finding gold in the "Mendenhall Mud Flats." This turned out to be a practical joke but resulted in a stampede to the intertidal area by miners looking for the salted lode.

Impacts on the intertidal areas followed the growing population associated with development of the area. The Northwest Trading Company steamer *Favorite* carried passengers from Sitka to Fritz Cove, then passengers crossed the Mendenhall River Bar via "big dugout canoes." In 1911 the Salmon Creek dam and two powerhouses were built by the Alaska Gastineau Channel Mining Company.

In 1924 and 1925, marten, mink, and fox farming was conducted on what is today refuge property. And in 1926 the Mendenhall River was bridged. In the late teens and early 1920s, Thomas Knudsen had a dairy at the present site of the Juneau Municipal Airport. This operation was taken over by the Kendlers in 1922 (the same year that four navigation lights were installed to mark the Mendenhall Bar) and operated until 1965. The year 1934 marked the first use of Joe Kendler's fields as a runway, and around 1936 the United States Army used the fields for this purpose.

In 1938/39 part of this farm was sold to Pan American Airways for use as an airfield, which was in turn enlarged by the Army in 1940/41. After the city of Juneau obtained the airport property, the runway was eventually extended to 8,468 feet in length. Airport construction destroyed salt marsh habitat, but ponds dredged during the project created loafing habitat for waterfowl.

The Golden North Salmon Derby, which began in 1938, has relied in part on fish originating from streams that drain into the wetlands.

Some people saw great potential for agriculture in the Wetlands' well-drained meadows fringed with big trees. As Joe Kendler stated, "Only land that produces giant timber . . . will make good farm land." Other changes followed awarding the bid for airport construction in 1941; two million cubic yards of material were moved during this project. More people settled in the area. One attitude expressed at that time was, "Another happy consequence . . . was that the wildlife moved deeper into the woods, and no longer bothered us or endangered our cattle."

In the early 1940s the Juneau Gun Club was first located at Salmon Creek and then moved to Mendenhall River at the present-day site of the float plane pond. In the fall of 1944, federal game wardens found many waterfowl dead at this site from lead poisoning. This area, located at the floatplane pond, was closed and \$70,000 in public funds were spent in rehabilitation.

In 1959/60, \$750,000 was spent by the Army Corps of Engineers dredging a navigational channel between Gastineau Channel and Fritz Cove/Stephens Passage. By 1971, the channel had silted in and a "natural equilibrium between deposition and erosion" had been re-established, and the wetlands were again navigable only at high tide by small craft, similar to 90 years earlier. The sand islands created by the dredging are now sparsely vegetated with alder, cottonwood, willow, and young spruce bordered by thick mats of beach rye.

Dredging associated with the construction of the Egan Expressway was also conducted in the 1970s. General recognition of the importance of the Mendenhall Wetlands began in 1965 (It is interesting to note that in 1913 the Juneau Commercial Club, forerunner of the Chamber of Commerce, had as its keynote address a speech entitled "Redemption of the Tide Flats"). Public concern fully matured in

the mid- to late 1960s in relation to two subjects; 1) the first consideration of a land-management plan for the area, and 2) the routing of the Egan Expressway across the flats. In addition to the above-mentioned habitat loss, acreage has also been lost due to gravel extraction.



This early view upriver shows the Mendenhall River flood plain before substantial river downcutting began with the continuing retreat of Mendenhall Glacier and formation of Mendenhall Lake.

Garbage and sewage disposal have also impacted the wetlands.

In 1976 the refuge was established. The primary values of the refuge were recognized as fish and wildlife habitat and the associated human uses of these resources. Alaska Statutes, Title 16 (Sec. 16.20.020) states, "The purpose . . . is to protect and preserve the natural habitat and game populations in certain designated areas of the state." Section 16.20.034(e and f), which addresses the Mendenhall Refuge, states that within most of the refuge "the taking of game is expressly permitted" and "Recreational activity is expressly permitted."

Establishing a Refuge

James G. King of Juneau was a survey pilot in Alaska for the U.S. Fish and Wildlife Service for 30 years. He was instrumental in the establishment of a number of U.S. wildlife refuges and state parks, including Pt. Bridget State Park and Ernest Gruening State Historic Site.

*In his memoir **Attending Alaska's Birds**, published in 2008, King describes his role in promoting the establishment of Mendenhall Wetlands State Game Refuge. Here is an excerpt from his book:*

I became involved in promoting the Mendenhall Wetlands State Game Refuge for personal as well as professional reasons. When Mary Lou and I moved to Juneau in 1964 we were able to buy the old Hendrickson home on the edge of the Mendenhall tide flats. We have enjoyed living close to the wetlands ever since.

In 1965 I talked with old friend Bob Weeden of the Alaska Department of Fish & Game (ADF&G) about the possibility of getting Mendenhall flats for a state refuge. This led to a 1966 report by ADF&G biologists Pete Shepherd and Ron Somerville proposing such a refuge. There was substantial support at several city assembly hearings, but this idea was rejected at that time.

Next a controversy developed over locating the new four-lane highway to the airport. The engineers and city fathers preferred a direct route bisecting the tide flats. Conservationists, duck hunters, and the resource agencies wanted to keep the road as close to the upland as possible. I wrote a detailed letter stressing four responsibilities of the USFWS: 1) airport safety, 2) recreation provided by birds, 3) responsibilities under international treaties, and 4) environmental protection. In each case I showed an inner or upland route would be more favorable. My regional director in Portland, Oregon, signed the letter, and I read it at the hearing in March 1969. Joe Greenough of the Steller Society effectively challenged the highway engineer's cost-benefit figures. The middle route was selected, though it did get pushed out on the wetlands a bit.

Since the Mendenhall wetlands had attracted so much attention it seemed like a good time to bring up the refuge proposal again. Mike Miller, who had been on the Juneau assembly during the earlier hearings regarding the refuge, was now in the state legislature. Mike eventually introduced and strongly advocated

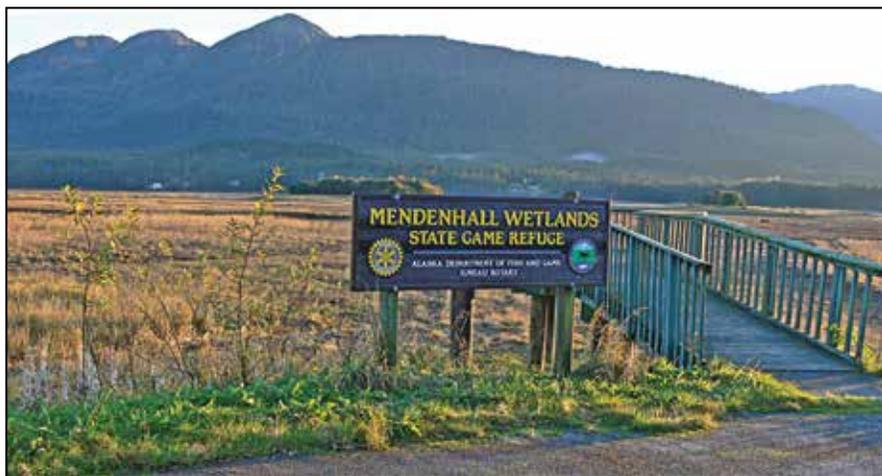


Photo by Mary Lou King

a bill to create the refuge. The Juneau Chamber of Commerce loudly opposed it, but the public that had favored the more upland highway route continued strong support. I testified at several legislative hearings. John Hope, Juneau's most eloquent Tlingit elder of the time, provided his support. The FAA was quite pointed in their preference for a wildlife refuge rather than any community development in the airport area. The resource agencies were all favorable.

The 3,764-acre Mendenhall Wetlands State Game Refuge, in the middle of the city of Juneau, became a reality on May 1, 1976. This refuge, less than half the original 8,000 acres of earlier tidelands, is greatly appreciated. Commuters on their way to and from work see flocks of ducks and geese and cruising eagles. Urban residents can hunt ducks in season without the sort of commute required in most places. Bird-watchers enjoy the scene from the airport dike trail year round. Visitors from Alaska's more northerly population centers, locked in frozen whiteness all winter, enjoy the scene of some birds on the water just as I did on my first visits before moving here. The airport people still worry about the birds, but they do their best to accommodate to community values without compromising safety. The future of this refuge is not secure, as there is continuing talk of airport expansion and the need for highway crossings.

Birds



AMONG THE BIRDS SEEN ON THE WETLANDS, waterfowl and shorebirds are of special importance. Nearly every species of waterfowl and shorebird that occurs in Southeast Alaska has been seen on the Wetlands at one time or another. To date that includes 38 of the 42 species of waterfowl found in Southeast Alaska, and 41 of the 45 shorebird species found in the region. The Wetlands also host a number of grassland and wet-meadow songbird species, as well as a variety of migrating raptors, including Short-eared Owls and Northern Harriers.

Even more impressive than this variety, however, is the sheer abundance of birds at various times. Numbers of birds on the Wetlands reach their peak during spring migration, especially the five weeks between mid-April and late May. At that time the numbers of birds can reach a daily high of more than 16,000 individuals.

Bird numbers are also substantial during fall migration, which is spread over a longer

period than spring. During the nine weeks of July and August, up to 4,000 individual birds might be seen per day. Even in winter, from 2,000 to 5,000 individual birds have been counted on the Wetlands in a single day.

Shorebirds

What is it about the Mendenhall Wetlands that makes the area attractive to so many shorebirds? For one answer we can consider what birds need. According to Scott Weidensaul, the author of *Living on the Wind*, a book about bird migration:

Most of the world's surface is useless to a shorebird—too wet, too dry, too forested, too mountainous, too farmed, too urban, too this or that. Much of the wetland habitat on which many species depend has been lost. So the relatively few places that still suit the birds' needs are important beyond measure.

The Mendenhall Wetlands are indeed important beyond measure because they

Long-billed Dowitchers sometimes occur in flocks of a couple hundred individuals on the Wetlands, especially during spring migration.

Surfbirds have been seen on the Wetlands numbering up to 2,500 individuals at one time.



are one of very few places in Southeast that provide enough food and habitat that migrating shorebirds need. Along their migration routes, which may extend for thousands of miles, shorebirds depend on relatively few stopover sites for refueling and resting. Those sites are usually separated by considerable distances, and during stopovers, food is often available for only a few hours around low tide. For a small bird traveling thousands of miles between its wintering and breeding ranges, efficiency in refueling and quality of resting time can mean the difference between life and death, or between succeeding or failing to reproduce in a given year.

Western Sandpipers are the most abundant shorebird on the Mendenhall Wetlands during spring migration. Observers have counted up to 5,000 individuals at one time.

Migratory shorebirds on their way north typically reach the Wetlands in peak numbers from mid-April through the third week in May. The fall migration south takes place over a greater number of weeks, with substantial numbers of birds moving through in

July and August. The fall migration of most shorebird species is over by early October.

Western Sandpipers are the most numerous shorebirds. Up to 5,000 individuals have been counted in a single day. More than 1,000 Ruddy Turnstones and 2,000 Surfbirds have also been counted during one day.

The Wetlands are also important for Black-bellied Plovers, Greater Yellowlegs, Lesser Yellowlegs, Black Turnstones, Semipalmated Sandpipers, Least Sandpipers, Pectoral Sandpipers, Rock Sandpipers, Dunlins, Short-billed Dowitchers, and



Long-billed Dowitchers. Counts for these species have typically been in the hundreds per day.

Among migrant shorebirds, Greater Yellowlegs are often the earliest to arrive in spring, beginning around the first of April. The latest of the fall-migrant shorebirds is the Pectoral Sandpiper, sometimes still moving through in early November.

Some shorebirds winter on the Mendenhall Wetlands (Killdeer, Rock Sandpiper, Dunlin, and Wilson's Snipe). Dunlin and Rock Sandpipers often number more than 100 individuals.

A few species of shorebirds nest in the Juneau area and no doubt use the Wetlands for feeding and rearing of their young. The local nesters include Killdeer, Semipalmated Plover, Greater Yellowlegs, Spotted Sandpiper, Least Sandpiper, and Wilson's Snipe. Over the years we have found nests of Killdeer, Spotted Sandpiper, and Least Sandpiper on the Wetlands and have also observed nesting Greater Yellowlegs and Wilson's Snipe in nearby bogs. Nesting Least Sandpipers have not been observed in recent years.



Surfbirds and one Dunlin forage for food in a patch of mussels on the Wetlands.



American Golden-Plovers are one of the species that have experienced apparent population declines. They are generally uncommon on the Wetlands, and typically occur in numbers between one and 25.



Ruddy Turnstones occur in significant numbers on the Wetlands during the month of May. This species is listed in the U.S. shorebird conservation plan as one that is in decline.



Both Dunlins (above) and Red Knots (below, right) are shorebird species that are considered to be in decline.

Shorebird Conservation

Throughout the Western Hemisphere many shorebird populations are in serious decline, yet many of their stopover sites continue to be degraded and destroyed.

To help identify, monitor, and prevent further degradation of shorebird stopover areas, the Western Hemisphere Shorebird Reserve Network has been established. Administered by the Manomet Bird

Observatory, this program is a collaboration of more than 140 public and private organizations in seven countries. Part of the Network's work has resulted in the establishment of a U.S. Shorebird Conservation Plan whose primary goals are maintaining adequate shorebird habitat, and maintaining or restoring shorebird populations at the continental and hemispheric levels.

A complementary strategy called a Conservation Plan for Alaska Shorebirds was completed in 2000 and revised in 2008. It, too, was a collaboration and included the Alaska Department of Fish and Game, Audubon Alaska, Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, U.S. Forest Service, USGS Alaska Science Center, and Wildlife Conservation Society.

A number of shorebird species that occur on Mendenhall Wetlands have experienced apparent declines in continental populations since 1970. For 16 of these species the declines are statistically significant. Those species include:

Whimbrel • Marbled Godwit • Surfbird • Dunlin • Buff-breasted Sandpiper
Short-billed Dowitcher • Black-bellied Plover • American Golden-Plover
Killdeer • Ruddy Turnstone • Red Knot • Sanderling • Semipalmated Sandpiper
Least Sandpiper • Wilson's Snipe • Red-necked Phalarope.

The Alaska plan recognizes only three important shorebird sites in all of Southeast Alaska the Stikine River Delta, Yakutat Forelands, and Mendenhall Wetlands. These sites are currently under consideration for inclusion within the Western Hemisphere Shorebird Reserve Network.



Canada Geese

Canada Geese are essentially year-round residents on the Mendenhall Wetlands, favoring the sedge meadows and ponds near the dike. The resident subspecies is the Vancouver Canada Goose (*Branta canadensis fulva*), which lives and nests from northern Southeast Alaska southward to northern Vancouver Island, British Columbia. Within this area it is considered to be a nonmigratory subspecies.

Adults leave the Mendenhall Wetlands in early April for nesting, and adolescents leave in late June to go to remote areas for molting. In August they all begin returning to the Wetlands, where they remain until they're chased out by hunters or extreme freeze-up.

During hunting season these intelligent birds usually leave the Wetlands each morning before hunting begins and fly to Auke Lake or to areas near Horse and Colt Islands, where they spend the daylight hours. After sunset, when hunting ends for the day, they return to the Wetlands and feed under cover of darkness.

We estimate that between 500 and 700 Vancouver Canada Geese use the Wetlands. This figure is based on counts covering the entire Wetlands when we were fairly sure the geese had not been disturbed.



Other Geese

We know that Cackling Geese use the Wetlands during migration, though our records for numbers of this species are fairly sparse. The Cackling Goose was recently split out as a separate species from the Canada Goose. Also, one of the subspecies of the Cackling Goose overlaps in size with the Canada Goose, so it is difficult to distinguish them in the field. Nevertheless, small flocks of up to about 100 Cackling Geese have been recorded using the Wetlands.

Greater White-fronted Geese have been observed on the Wetlands in the hundreds during late April and early May, especially in recent years. Snow Geese also occur in small numbers during this period.

Vancouver Canada Geese are some of the most easily observed birds on the Wetlands. Flocks of several hundred can often be seen feeding near Egan Expressway and along the Dike Trail.



Up to 600 Greater White-fronted Geese have been counted on the Wetlands in the spring.

Mallards are the duck most commonly seen on the Wetlands. Many are year-round residents that nest in the numerous ponds and lakes within the Mendenhall Valley and a few nest within the Wetlands.

Northern Shovelers were once seen in a flock of up to 800 birds on the Wetlands. We used to find nests of these birds on the Wetlands, but we have not in recent years.

Up to 5,000 Surf Scoters have been counted just off the mouth of Mendenhall River. These birds use the area for staging before migrating to their more northerly breeding grounds.

Mallards

Mallards occur in greatest numbers on the Wetlands from December through April, when up to 2,000 individuals have been seen in a single day. In most other months the numbers range from 200 to 1,000 individuals.

Banding studies have shown that winter Mallards on the Wetlands are not the same as summer Mallards. Young produced in Juneau go mostly down the coast to Washington and California. The winter birds have come from nesting habitat in the Yukon River Valley.

The Mendenhall Wetlands are an important wintering area for these birds, and judging from the peak numbers documented in April, they're also an important stopover for migrating Mallards. The Mendenhall Wetlands provide summer food and a limited amount of nesting habitat for Mallards. Every year at least one brood has been observed within the floatplane basin and we have seen Mallard nests in the vicinity of Wigeon Ponds near Mendenhall Peninsula.

Other dabbling ducks

Green-winged Teal, Northern Pintail, Northern Shoveler, and American Wigeon have been recorded in the hundreds, especially during April and May and again in August and September. Gadwall and American Wigeon overwinter regularly on the wetlands in small numbers of 10 to 100. The peak of spring migratory passage on the Wetlands is from the last week in April through mid-May. Fall passage is more protracted, lasting from August through October.

Diving ducks

The adjacent saltwater areas of Fritz Cove and Gastineau Channel, as well as ponds within Mendenhall Wetlands, provide



habitat for several species of diving or sea ducks. The most numerous of these is the Surf Scoter, which occurs in the thousands in April and May. Other species that typically number in the hundreds include Greater Scaup, White-winged Scoter, Common Goldeneye, Barrow's Goldeneye, Bufflehead, and Red-breasted Merganser. Diving ducks almost completely abandon the Wetlands from June through September, with the majority travelling far inland to nesting grounds. Returning in October, most of these species occur regularly throughout the winter, although overwintering Surf Scoters have been fewer in recent years.



Bald Eagle

In 2008, about 68 Bald Eagle nests were close enough to Mendenhall Wetlands that the resident pairs could forage there; but only about 35 percent of those nests are active in any given year. The Wetlands have probably been essential to the nesting success of these birds.

Bald Eagles can be found on the Wetlands essentially any day of the year, although their spatial distribution differs among seasons. Usually 10 or so eagles can be seen on any given day. Assemblies of 100 or more eagles may gather to feed on Pacific sand lance and capelin – usually during April and May.

Despite the late-summer abundance of salmon on the Wetlands, our eagle counts in August and September have been relatively low. At this time eagles are probably widely dispersed on salmon streams throughout Southeast Alaska, and foraging on higher reaches of streams than the portions we observed in our surveys.

Other raptors

A variety of hawks, falcons and owls are attracted to the Wetlands, where they feed on rodents and other birds. The two species we see most often are Northern Harriers and Short-eared Owls.

The most commonly seen falcons are American Kestrel and Merlin, although Gryfalcon and Peregrine Falcon have occurred. The most commonly seen hawks are the Goshawk and Sharp-shinned Hawk, but some Rough-legged and Red-tailed Hawks have been sighted as well.



The most obvious pair of Bald Eagles are the two that hang out along the Dike Trail. This photograph was taken at one of their nests within the floatplane basin. In this year the eaglet hatched about May 22. The photo was taken on June 14, and the eaglet is in its second coat of down plumage.

Northern Harriers are one of the most common birds of prey seen on the Wetlands during their migration. Here they hunt primarily for voles and smaller birds.

Northern Goshawks have been seen hunting on the Wetlands during nearly all months of the year. These fierce predators sometimes nest in the adjacent forest. This female goshawk was photographed at her nest on a hillside overlooking the Wetlands. She is still in immature plumage. According to those who study goshawks a small percentage of the females nest in their second year, before they achieve full adult plumage.



Gulls and Terns

Gulls are present on Mendenhall Wetlands year-round. The two common overwintering species, Mew Gull and Glaucous-winged Gull, sometimes number more than a thousand individuals. Both species concentrate at the Salmon Creek estuary in fall to feed on salmon eggs and carcasses. Bonaparte's Gulls also occur regularly in the hundreds, and occasionally more than 1,000, from mid-April to early October.

Glaucous-winged and Herring Gulls have a nesting colony on the rock face near Mendenhall Glacier, and they use the Mendenhall Wetlands for foraging.

Arctic Terns also use the Wetlands for feeding from late April to late August. The former spoil-island nesting colony

in the central wetlands has been recently abandoned and we observed no nesting there in 2002 or 2003. In 2007, however, we found several pairs nesting at their old



site. A number of terns presently nest near the Mendenhall Glacier Visitor Center, and these birds probably use the Wetlands for foraging.



In recent years an estimated 75 pairs of Glaucous-winged Gulls have nested on the rock face in front of Mendenhall Glacier. These gulls and their offspring forage for food on the Mendenhall Wetlands.



A colony of Arctic Terns used to nest in the vicinity of the floatplane basin, then later on one of the treeless sand islands. In recent years, except for 2007, they have not used the Wetlands for nesting.

Crows and Other Corvids

Northwestern Crows are common year-round residents on Mendenhall Wetlands. In winter and early spring, hundreds of crows use the Wetlands. We suspect these are aggregations of several flocks that gather together after the breeding season. We observed nesting crows in smaller groups during our 2002-2003 study on some of the spruce-covered islands on the Wetlands.

Other corvids frequently seen on the Wetlands are Common Ravens and Steller's Jays, which are year-round residents. Black-billed Magpies nest elsewhere, but small numbers of them come to the Wetlands in late fall and spend the winter.



Black-billed Magpies are most often seen in the Wetland area around the golf course.



As the tide recedes, flocks of Northwestern Crows gather to feed. We often see them turning over small rocks and probing in the rockweed looking for invertebrates.

Other songbirds

Other songbird species utilize Mendenhall Wetlands in large flocks for feeding. Hundreds of Tree Swallows, Violet-green Swallows, and Bank Swallows sometimes hawk for insects from late April through July. A colony of Bank Swallows has nested in the vertical sand banks along Mendenhall River in Brotherhood Park for a number of years. The Wetlands appear to be an important

feeding area for flocks of American Robin, American Pipit, Savannah Sparrow and Lapland Longspur during spring and fall migration, when these birds may occur in the hundreds. Flocks of Pine Siskins and Common Redpolls, numbering in hundreds of individuals, have also been seen using the Wetlands, often in late fall and early spring.



Mendenhall Wetlands is a magnet for swallows. The open vegetated portions seem to attract large numbers of insects on which various species of swallows can feed. In this photo a number of Tree Swallows have gathered to take a break.



Savannah Sparrows are the most common songbird that nests in the higher meadows. At times up to 100 of these birds have been counted.

The woods around the floatplane basin north of the Dike Trail are a magnet for migrating songbirds. This area is one of the best places in Juneau to see northbound warblers, thrushes, and sparrows in April and May.

There are two explanations for this phenomenon. The first relates to the character of the habitat and the second to its location.

Deciduous habitat is much less common in Southeast Alaska than coniferous forest. While deciduous belts are often found along Juneau's coastlines, development has displaced most patches large enough to attract large numbers of stopover migrants. The floatplane woodland, with its rich mix of coniferous and deciduous trees and shrubs, is outstanding in this regard.

The numerous Nootka lupine plants that occur in the upper Wetland meadows serve as handy perches for small ground-nesters such as this Lincoln's Sparrow.

The second reason songbirds are drawn to the floatplane woodland is its “island” character. Birders refer to the phenomenon as “the Central Park effect,” a term used to describe the concentration of migrating songbirds in New York City’s only large natural area.

Birds migrating through Southeast Alaska follow straits and corridors like Gastineau Channel, especially in spring when uplands are still snowy. Songbirds that prefer deciduous habitats pass northwestward over Mendenhall Wetlands, naturally gravitating to the floatplane basin’s wooded “island” rather than the salt marsh on one side



Song Sparrows are one of the few small songbirds that live on the Wetlands year-round.



In summary, migratory shorebirds and waterfowl are the species most often discussed in association with Mendenhall Wetlands. But there is no question that the Wetlands are equally important to many other groups of birds, including gulls and terns, a number of migrating songbirds and the raptors that travel with and prey on them, and local resident species such as Mallards, Bald Eagles, Northwestern Crows, and Common Ravens.

(which lacks protective cover) or the areas of intensive development on the other.

Other than corvids, the only songbirds that are true Wetland residents year-round are Song Sparrows. A number of them nest on the fringes of the Wetlands and stay throughout the year.

Areas of Special Importance to Birds

See locations on map on pages 30-31.

The area around the Mendenhall River mouth is the most important feeding habitat for ducks and shorebirds on the Wetlands. At times Western Sandpipers, Surfbirds and Ruddy Turnstones have been seen here in the thousands. Northern Shovelers, Mallards and American Wigeon also feed in the sloughs and among the area's rockweed beds.

This area is also the premier spot to look for less common shorebirds such as American Golden-Plover, Pacific Golden-Plover, Whimbrel, Hudsonian Godwit, Bar-tailed Godwit, Marbled Godwit, Red Knot, and Baird's Sandpiper.

Fritz Cove is an important feeding and staging area for a variety of sea ducks and other water birds. We have observed 3,000 to 4,000 Surf Scoters and up to 600 White-winged Scoters here. We've also seen sea ducks including Bufflehead, Barrow's Goldeneye, Common Goldeneye, Long-tailed Duck, and scaup in numbers of 20 to 100. Marbled Murrelets, Horned Grebes, Red-necked Grebes, and Red-breasted Mergansers also gather and feed in the cove, along with a few Pelagic Cormorants and Pigeon Guillemots.

The western mudflat area near the mouth of Fish Creek is one of the top hotspots of bird activity for the entire Wetlands. Birds that feed within this area include Dunlins, Ruddy Turnstones, American Wigeon, Mallards, scaup, Lapland Longspurs, American Pipits, and hundreds of Western Sandpipers.

This is also a burrowing area for Pacific sand lance, which attract large concentrations of Bald Eagles, gulls, crows, and ravens.

Mendenhall River Mouth



The mouth of Mendenhall River offers a variety of food-rich habitats for birds including sand, mud, barnacle/mussel/rockweed beds, algal mat communities, and a mix of fresh water and salt water.

Fritz Cove



Fritz Cove is an important staging area for thousands of Surf Scoters.



Burrowing Pacific sand lance attract numerous Bald Eagles and crows to come and feed on them.

Lower Fish Creek Estuary



As part of their research in 2002-2003, Aaron Baldwin (left) and Mary Willson conducted a timed sample for invertebrate species and abundance at the mouth of Fish Creek.

Upper Fish Creek Estuary



In April 2002 we counted 540 Mallards resting at high tide in the Fish Creek upper intertidal area.

Salmon Creek Estuary



At the mouth of Salmon Creek ducks often rest on the sedge flats. Gulls concentrate here in August when spawning salmon return.

At low tide the mouth of Fish Creek is an important feeding area for **American Wigeon, Green-winged Teal, and Mallard**. This may also be an important feeding area for swallows; up to 150 Barn Swallows and 100 Violet-green Swallows were reported hawking for insects here in July of 2002. This is also one of the best places in Juneau to observe Vaux's Swifts.

Gulls often use this area for resting. Eighty Bonaparte's Gulls were counted here in May 2002. Three hundred fifty Mew Gulls and 120 Glaucous-winged Gulls were counted in March 2003.

The area is also popular for feeding Northwestern Crows. We observed 200 of them in January 2003.

The upper Fish Creek estuary is an important resting area for **Mallards and other ducks at high tide**. Ducks commonly feed in the lower estuary during low tides and rest in the upper area at high tides. We have also observed American Wigeon, Gadwall, and Northern Pintail using this area in numbers of 10 to 30.

Dowitchers, Dunlin, and Lesser Yellowlegs often feed in this area in groups of 10 to 50 individuals.

Salmon Creek estuary is an important feeding and resting area for **ducks, shorebirds, and gulls**. The area is heavily used for feeding by Mallards, scoters, and American Wigeons. Dunlin feed here in winter and early spring. When salmon are spawning, numerous Mew Gulls, Glaucous-winged Gulls, Bonaparte's Gulls, and Herring Gulls come to feed on their eggs. The spawning salmon also attract Bald Eagles, which feed on their carcasses.

Otter Pond is an important feeding and resting area for waterfowl.

A variety of both dabbling and diving ducks are often seen feeding and resting here. We have seen Green-winged Teal, American Wigeon, Northern Shoveler, Northern Pintail, Blue-winged Teal, Bufflehead, Common Goldeneye, Canvasback, scaup, and Red-breasted Mergansers. These birds are usually in small numbers, but occasionally in groups of 10 to 30 per species.

Otter Pond is one of the best areas to observe birds from the Dike Trail. At its northeast end is a covered observation bench (“the Gazebo”).

Otter Pond



Otter Pond is often used as a resting area for Canada Geese. From here they can easily access the sedge flats for feeding.

Sedge Flats west of Otter Pond

These sedge flats are a very important feeding area for Canada Geese, especially in winter and spring. We have counted more than 600 Canada Geese feeding here during those times. High tides wash the snow away, exposing the sedge tips geese depend upon. Substantial numbers of Northwestern Crows and Western Sandpipers also occasionally feed in the intertwining muddy areas.



This area is one of the most extensive areas of Lyngbye sedge on the Wetlands. This sedge is an important food for Canada Geese and some other waterfowl.

Gastineau Channel and the flats in front of the Era heliport on Douglas Island are an important feeding area for waterfowl and gulls. Up to 1,000 Surf Scoters, 200 Mallards, 500 Mew Gulls, 130 Bonaparte’s Gulls, and 100 Glaucous-winged Gulls have been counted feeding here. All feed in the barnacle/rockweed/mussel habitat but at different stages of the tide.

Ducks that feed in the area in smaller numbers (10-20 per observation) – American Wigeon, Bufflehead, Common Goldeneye, Green-winged Teal, and Northern Shoveler.

Neilson Creek



This area includes a mudflat with barnacle/mussel/rockweed beds and the mouth of Neilson Creek.

Western Gastineau Channel



This area of deeper water is especially attractive to waterfowl.

Western Gastineau Channel is an important feeding and loafing area for a variety of waterfowl, especially in late winter and spring. We have counted up to 1,700 Surf Scoters, 160 scaup, 150 Mallards, 90 Red-breasted Mergansers, 80 American Wigeon, and 70 Green-winged Teal in this area. Up to 350 Bonaparte's Gulls and numerous Mew and Glaucous-winged Gulls use this area.

Lower Mendenhall River



Mendenhall River looking southwest from the Dike Trail.

Lower reaches of the Mendenhall River are important for seaducks and dabblers, especially in spring. Most of our records here are of birds resting and preening rather than feeding. The northern banks opposite the collapsed barge are a favored duck assembling area (elsewhere the river cutbanks rise more steeply from the water, restricting views of approaching predators). Dabblers use this area throughout the summer as well.

Wigeon Ponds



Wigeon Ponds are the only natural ponds on the Wetlands. All the others were formed by dredging or obstructions of stream flow.

Wigeon Ponds are important for several reasons. They are a resting area for Mallards, especially in April and May, when we have counted up to 500 of those birds at a time. They are also important as a feeding area for Canada Geese. We have counted over 100 geese here in June and have documented them feeding on Lyngbye sedges.

The ponds area also offers nesting habitat for waterfowl, and it supports the only known breeding population of western toads on the entire Wetlands.

Phalarope Slough

Phalarope Slough is an important feeding area for Lesser Yellowlegs and dowitchers. We have counted more than 100 of each species feeding here. The slough is loaded with small amphipods, which may be the main attraction for these shorebirds. Other species often seen feeding here include Greater Yellowlegs, Green-winged Teal, and Northern Shovelers.

Phalarope Slough is adjacent to the Dike Trail and is a popular spot for bird watching. It was named for the occasional Wilson's Phalarope seen here.



Large numbers of Lesser Yellowlegs often feed in Phalarope Slough.

Junk Car Slough

This small slough just to the east of the Gazebo usually attracts a small assemblage of feeding birds. We have counted up to 33 Long-billed Dowitchers, 25 Lesser Yellowlegs, 40 Mallards, 47 Lesser Snow Geese, and 10 each of Golden-crowned and White-crowned Sparrows feeding in or immediately adjacent to this slough.

The slough was named for the number of junk cars that used to line its landward bank. Like other sloughs along the Dike Trail it is a popular spot for watching birds.



Dowitchers are especially attracted to Junk Car Slough.

Miller-Honsinger Pond

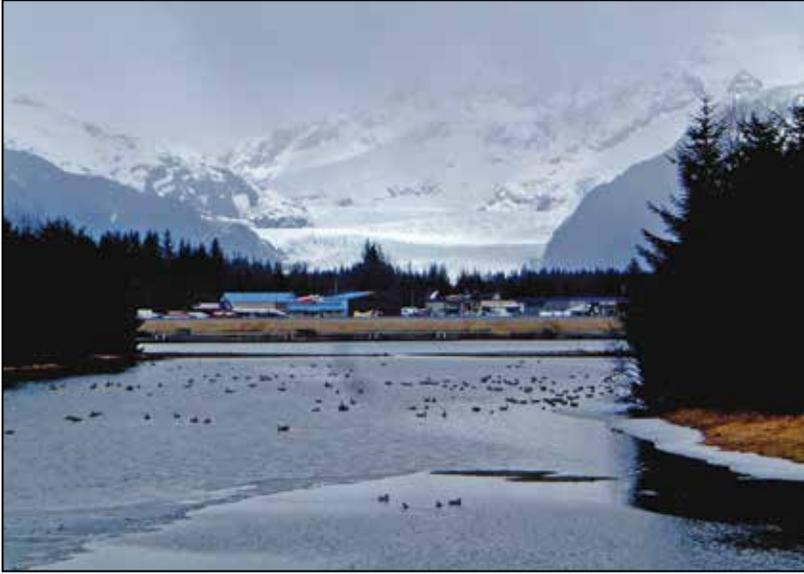
Miller-Honsinger dredge pond is an important resting and feeding area for small groups of waterfowl, although on occasion we have counted up to 225 Greater-white Fronted Geese, 72 Canada Geese, and 60 Mallards. We have also occasionally seen pairs of Trumpeter and Tundra Swans, and small numbers of American Wigeon, Bufflehead, Greater Scaup, Canvasback, Hooded Merganser, and Redhead.

Local birders sometimes come here to see raptors such as American Kestrel, Gyrfalcon, Northern Harrier, and Rough-legged Hawk. Adjacent brush and small trees on the surrounding dikes attract songbirds.



Miller-Honsinger Pond near the Temsco heliport has a variety of habitats that attract waterfowl and song birds.

Floatplane Basin



Canada Geese and other waterfowl often concentrate in the floatplane basin to feed on ditch-grass just as soon as the ice is out in spring. This area is currently being dredged to eliminate the ditch-grass.

Pioneer Marsh



Pioneer Marsh as viewed from the Juneau Pioneers' Home. Note the number of Mallards resting and feeding.

The floatplane pond and attached “fingers” an important feeding area for Canada Geese and other waterfowl during April and May, when we have observed up to 230 geese and 160 Mallards. A variety of other birds also feed here in spring, including American Wigeon, Bufflehead, Green-winged Teal, Greater Scaup, Northern Shoveler, Ring-necked Duck, Tundra and Trumpeter Swans, and Greater White-fronted Geese.

The woodland-meadow mosaic surrounding the ponds provides nesting habitat for a variety of songbirds. During point counts for a project in 2001 we determined that 13 bird species nested in the area, and estimated they consisted of 496 individuals (female and male). The most common species of nesting songbirds were Ruby-crowned Kinglets, American Robins, Hermit Thrushes, Wilson’s Warblers, Yellow Warblers, and Yellow-rumped Warblers.

Pioneer Marsh is an important feeding area and refuge for Mallards and scaup during fall hunting season. In surveys between October and December, we have counted some 150 Mallards hiding in the tall grasses here. We have also observed up to 100 scaup diving and feeding in the more open waters of the nearby Twin Lakes in October and November.

Great Blue Herons frequently hunt for fish in this marsh, and Red-winged Blackbirds often nest here.

This is a good place to look for the less common waterbirds. We have seen American Coot, Hooded Mergansers, Ring-necked Ducks, Canvasbacks, a Ruddy Duck, and a Pied-billed Grebe. A pair of Sora Rails has probably been nesting here. It’s the best place in Juneau to find American Coot and Hooded Mergansers; several of each species have been observed in recent years.

Our Favorite Wetlands Birding Walk

THE DIKE TRAIL NEAR THE AIRPORT is the premier birding spot in Juneau for waterfowl and shorebirds. It is also a good place to look for songbirds, particularly during the spring migration. The 1.5-mile Dike Trail begins at the end of Radcliffe Road. It is extremely popular and is used by birders, joggers, people walking dogs, and from September through December, duck hunters.

Simply walking along this trail can be a rewarding birding experience. Freshwater marshes on one side, and intertidal ponds and sloughs on the other attract a number of waterfowl and shorebirds, especially during high tides, when much of the Wetlands is covered with salt water. Also, various songbirds flit about the willows, alders, and spruce that line this trail.

A favorite birding adventure on the Wetlands takes about two to three hours. Begin this walk one to two hours before low tide for ease of following birds as well as maintaining dry feet (rubber boots are recommended). Start at the parking area at the end of Radcliffe Road and walk along the Dike Trail to the first and very obvious left turn in the trail. Instead of turning left, walk down a steep bank toward the river to find a well-worn path into the Wetlands. Head toward the mouth of Mendenhall River, paralleling the river.

During spring and fall migrations, look for Lapland Longspurs, American Pipits, and occasionally, Horned Larks in the vegetated areas. Check the tidal sloughs for waterfowl, including Northern Shovelers, American Wigeon, Northern Pintails, Green-winged Teal, and occasionally Cinnamon Teal, Eurasian Wigeon (rare), and Blue-winged Teal. In winter, look for Snow Buntings.

The greatest number of shorebirds (particularly in May) can be seen at the mouth of the river. When walking near the river mouth, be very aware of the tides—you can easily become trapped here on an

incoming tide. Soft mud can also present problems.

You may see quite a variety of shorebird species, including Western, Least, Pectoral, Rock and Baird's Sandpipers. Other shorebirds to look for include Surf-birds, Dunlin, Whimbrels, dowitchers (both species), and Black-bellied and American Golden-Plovers.



From the river mouth, turn northeastward toward the tree-covered high spots (islands at high tide). You will cross sloughs where shorebirds and dabbling ducks can be seen.

On the other side of the outermost dredge island (the one without any vegetation) look for concentrations of gulls, Arctic Terns, Bald Eagles, and sometimes Caspian Terns. These species concentrate here to feed on sand lance, Dolly Varden, and other fish.

From here turn toward the Dike Trail and follow the series of dredge islands. Watch for raptors, including Northern Harriers, Short-eared Owls, Peregrine Falcons, American Kestrels, and Merlins during migration. Look for Northern Shrikes perched on top of the spruce trees. In spring and summer you will see Lincoln's and Savannah Sparrows on the "islands." In winter you may see Snow Buntings. Just before arriving back at the Dike Trail, look for shorebirds in the sloughs. These are favorite feeding areas for both species of yellowlegs and dowitchers.

Birders at the mouth of Mendenhall River look for birds during the Juneau Audubon annual Christmas Bird Count.



Golf Course

Casa del Sol Creek

Wigeon Ponds

Mendenhall Peninsula

Mendenhall River

Dike Trail

Juneau International Airport
Floatplane Pond

Otter Pond

Junk Car

Phalarope

Western Mudflat

Gastineau Channel

Fritz Cove

refuge boundary

Ninemile Creek

Fish Creek

Cove Creek

MENDENHALL



MAINLAND



DOUGLAS ISLAND

WETLANDS
2001

2 miles



Chart of Highest Daily Counts by Month

THE CHART ON THE FOLLOWING PAGES shows the variety and seasonal abundance of birds on Mendenhall Wetlands since 1986. It compiles data from 17,400 observations. (One observation, for example, could be 30 crows counted on a particular date.) The observations were gathered from a variety of sources that included the following:

- Paul Suchanek's observations from 1990 through 2008. Paul has recorded more than 15,000 observations of birds on the Wetlands. His observations form a solid foundation for the phenology data base.

- Cain, S.L., J.I. Hodges, E. Robinson-Wilson. 1988. *Bird use of the Mendenhall Wetlands in Juneau, Alaska*. U.S. Fish & Wildlife Service. Juneau Office. These researchers conducted bird surveys from February 19, 1986 to February 12, 1987. They visited study units near the airport twice a week, and more distant units twice a month. Their emphasis was on waterfowl and other highly visible species, but they counted all birds seen.

- Bob Armstrong and Richard Carstensen's point counts of birds on airport property from January through December 2002. This work was done for SWCA, consultants hired to produce the Environmental Impact Statement for expansion of the Juneau Airport. Counts were conducted monthly throughout the year, with additional surveys during the breeding season.

- Armstrong, R.H., R.L. Carstensen, and M.F. Willson. 2004. *Hotspots: Bird survey of Mendenhall Wetlands, April 2002 to May 2003*. Complete bird surveys of the Mendenhall Wetlands were conducted monthly or more often.

- Observations by local birders: Laurie Craig, Richard Gordon, Patty Rose, Mark Schwan, Gus van Vliet, and Steve Zimmerman.

Most Numerous Birds

To date, 15 species have been observed on the Wetlands in numbers greater than 1,000 at a time:

Canada Goose • Mallard • Surf Scoter • American Golden Plover (one-time event) • Ruddy Turnstone • Surfbird • Semipalmated Sandpiper • Western Sandpiper • Least Sandpiper • Pectoral Sandpiper • Bonaparte's Gull • Mew Gull • Glaucous-winged Gull • Northwestern Crow • Common Redpoll

Nine other species have been counted in numbers greater than 500 at one time:

Greater White-Fronted Goose • American Wigeon • Northern Shoveler • Greater Scaup • White-winged Scoter • Black Turnstone • Dunlin • Short-billed Dowitcher • Lapland Longspur

Symbols on the chart

Different size circles, squares, and rectangles represent the highest number of birds seen on at least one day during a particular month. These figures give a good sense of bird numbers by month, and demonstrate the real and potential value of Mendenhall Wetlands for accommodating birds.

Wi+, Sp+, Su+, Fa+ In a few cases, when observations were taken for the Birds of Mendenhall Wetlands *Checklist*, we have records that a species was present, but we don't know how many individuals were seen or in which month. For these observations we assign a (+) sign rather than a number, and indicate season using the abbreviations used in the *North American Birds* monographs: **Wi** (winter - December through February), **Sp** (spring - March through May), **Su** (summer - June through July), and **Fa** (fall - August through November).

Birds

of Mendenhall Wetlands Checklist



JUNEAU AUDUBON SOCIETY

To learn which birds you might see at various seasons of the year, pick up a free copy of the Birds of Mendenhall Wetlands Checklist from the small plastic box attached to the large refuge sign at the start of the Dike Trail.

Highest Daily Count of Birds on Mendenhall Wetlands - by Month, 1986-2008

Month	• = 1 - 9 ● = 10 - 99 ● = 100 - 499 ■ = 500 - 999 ■ = 1000 or more											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SWANS, GEESE, DUCKS												
Greater White-fronted Goose				●	■	●		●	●	●		
Emperor Goose				●								
Snow Goose				●	●	●			●	●	●	
Ross's Goose					●							
Brant	●				●	●	●	●				
Cackling Goose				●	●	●			●	●		●
Canada Goose	■	■	■	●	●	●	●	●	●	■	■	■
Trumpeter Swan	●	●	●	●	●			●	●	●	●	●
Tundra Swan			●	●					●	●		
Wood Duck	●				●							
Gadwall	●	●	●	●	●	●	●	●	●	●	●	●
Eurasian Wigeon	●	●	●	●	●	●			●	●	●	●
American Wigeon	●	●	●	●	●	●	●	●	■	■	■	■
Mallard	■	■	■	■	●	●	●	●	■	■	■	■
Blue-winged Teal				●	●	●	●					
Cinnamon Teal				●	●	●				●		
Northern Shoveler	●		●	●	■	●	●	●	●	●	●	●
Northern Pintail	●	●	●	●	●	●	●	●	●	●	●	●
Green-winged Teal	●	●	●	●	●	●	●	●	●	●	●	●
Canvasback	●	●	●	●	●	●			●	●	●	●
Redhead				●	●	●				●	●	
Ring-necked Duck	●			●	●				●	●	●	
Greater Scaup	●	●	■	■	●	●	●	●	●	●	●	●
Lesser Scaup	●	●	●	●	●	●	●	●	●	●	●	●
Scaup spp.	●	●	●	●	■	●	●	●	●	●	●	●
Steller's Eider						●						●
King Eider					●							
Harlequin Duck			●	●	●	●			●	●	●	●
Surf Scoter	■	■	●	■	■	●	●	●	●	●	●	●
White-winged Scoter	●	●	●	●	■	●	●		●	●	●	●
Black Scoter			●	●	●					●		
Long-tailed Duck	●	●			●	●	●			●	●	●
Bufflehead	●	●	●	●	●	●	●		●	●	●	●
Common Goldeneye	●	●	●	●	●	●	●	●	●	●	●	●
Barrow's Goldeneye	●	●	●	●	●	●	●	●	●	●	●	●
Hooded Merganser	●	●	●	●	●	●	●	●	●	●	●	●
Common Merganser	●	●	●	●	●	●	●	●	●	●	●	●
Red-breasted Merganser	●	●	●	●	●	●	●	●	●	●	●	●
Ruddy Duck				●	●					●		



Canada Goose



Mallard



Surf Scoter



Common Goldeneye

Highest Daily Count of Birds on Mendenhall Wetlands - by Month, 1986-2008



Red-throated Loon



Great Blue Heron



Bald Eagle

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
• = 1 - 9 ● = 10 - 99 ● = 100 - 499 ■ = 500 - 999 ■ = 1000 or more												
Month												
GROUSE, PTARMIGAN												
Willow Ptarmigan			•									
Rock Ptarmigan		Wi+										
Sooty Grouse			•	•	•	•						
LOONS												
Red-throated Loon	•	•	•	•	•	•	•	•	•	•	•	•
Pacific Loon	●	●	●	•	•	•				•	•	•
Common Loon	•	•	•	•	•	•				•	•	•
Yellow-billed Loon	•	•	•	•	•					•	•	•
GREBES												
Pied-billed Grebe					•				•	•		
Horned Grebe	•	•	•	●	•	•	•	•	•	•	•	•
Red-necked Grebe	•	•	•	•	•				•	•	•	•
Eared Grebe					•							
Western Grebe			•	•	•						•	
CORMORANTS												
Pelagic Cormorant	•		•	•						•	•	•
HERONS												
Great Blue Heron	•	•	•	•	•	•	•	•	•	•	•	•
Great Egret	•					•						•
Snowy Egret					•							
Green Heron							Su+					
Black-crowned Night-Heron						•	Su+					
NEW WORLD VULTURES												
Turkey Vulture									•			
HAWKS, EAGLES												
Osprey					•		•	•	•	•		
Bald Eagle	•	•	•	•	•	•	•	•	•	•	•	•
Northern Harrier			•	•	•	•		•	•	•	•	•
Sharp-shinned Hawk	•		•	•	•	•	•	•	•	•	•	•
Northern Goshawk	•		•	•	•	•		•	•	•	•	•
Swainson's Hawk					•							
Red-tailed Hawk				•	•	•		•	•	•	•	•
Rough-legged Hawk					•					•	•	•
Golden Eagle												
FALCONS												
American Kestrel	•		•	•	•			•	•	•	•	•
Merlin			•	•	•	•	•	•	•	•	•	•
Gyr Falcon			•	•	•				•	•	•	•
Peregrine Falcon				•	•		•	•	•	•	•	•

Highest Daily Count of Birds on Mendenhall Wetlands - by Month, 1986-2008

Month	• = 1 - 9 ● = 10 - 99 ● = 100 - 499 ■ = 500 - 999 ■ = 1000 or more											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
RAILS, COOTS												
Virginia Rail										•		
Yellow Rail							•					
Sora				•	•		Su+					
American Coot				•	•					•	•	
CRANES												
Sandhill Crane				•	•	•			●	•		
PLOVERS												
Black-bellied Plover				•	●	•	•	•	•			
American Golden-Plover				•	■	•	•	•	•			
Pacific Golden-Plover				•	•			•	•	•		
Semipalmated Plover				•	•	•	•	•	•			
Killdeer	•	•	•	•	•	•	•	•	•	•	•	•
OYSTERCATCHERS												
Black Oystercatcher				•	•	•						
AVOCETS												
American Avocet						•						
SANDPIPERS												
Spotted Sandpiper					•	•	•	•	•			
Solitary Sandpiper				•	•		•	•	•			
Wandering Tattler					•		•	•				
Greater Yellowlegs	•		•	•	•	•	•	•	•	•		
Lesser Yellowlegs				•	•	•	•	•	•	•		
Upland Sandpiper					•		•	•	•			
Whimbrel					•	•	•					
Hudsonian Godwit				•	•	•	•	•				
Bar-tailed Godwit					•	•	•	•	•			
Marbled Godwit				•	•	•						
Ruddy Turnstone				•	■	•	•	•				
Black Turnstone				•	■		•	•	•			
Surfbird				■	■		■	•	•			
Red Knot					•	•	•					
Sanderling					•	•	•	•	•			
Semipalmated Sandpiper					•	•	■	•	•			
Western Sandpiper				■	■	•	■	•	•			
Long-toed Stint					•							
Least Sandpiper				■	■	•	•	■	•			
White-rumped Sandpiper					•							
Baird's Sandpiper				•	•		•	•	•			
Pectoral Sandpiper				•	■		•	•	•	•		
Sharp-tailed Sandpiper					•		•	•	•			



American Coot



Black-bellied Plover



Lesser Yellowlegs



Ruddy Turnstone

Highest Daily Count of Birds on Mendenhall Wetlands - by Month, 1986-2008



Wilson's Snipe



Bonaparte's Gull



Lesser Black-backed Gull



Caspian Tern (large)
Arctic Tern (small)

Month	• = 1 - 9 ● = 10 - 99 ● = 100 - 499 ■ = 500 - 999 ■ = 1000 or more											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rock Sandpiper	•	●	●	●	●			•		●	•	•
Dunlin	●	●	●	■	■	•				●	●	●
Curlew Sandpiper					•							
Stilt Sandpiper				•			•	•				
Buff-breasted Sandpiper					•			•	•			
Ruff					•			•	•			
Short-billed Dowitcher				●	■	•	•	•	•			
Long-billed Dowitcher					●	•	●	●	●	•		
Dowitcher spp.				•	•		•	•	•			
Wilson's Snipe	•		•	•	•	•	•	•	•	•	•	•
Wilson's Phalarope					•	•	•	•				
Red-necked Phalarope					•	•	•					
GULLS, TERNS												
Franklin's Gull						•	•					
Little Gull					•							
Black-headed Gull						•						
Bonaparte's Gull		•		■	■	■	■	■	●	●	•	•
Mew Gull	●	■	■	■	■	●	●	■	●	■	●	■
Ring-billed Gull				•	•	•	•	•	•	•		
California Gull			•	•	•	•	•	●	•	•		•
Herring Gull		•	•	•	•	•	●	•	•	•		•
Thayer's Gull		•	•	•	•	•	•	•	•	•		•
Lesser Black-backed Gull			•	•	•	•	•	•	•	•		
Slaty-backed Gull			•					•	•	•		
Western Gull							•	•				
Glaucous-winged Gull	●	■	■	■	■	●	●	■	●	■	●	●
Glaucous Gull			•	•	•	•	•	•				•
Sabine's Gull							•					
Black-legged Kittiwake					•	•	●	•	•	•	•	•
Caspian Tern				•	•	•	•					
Black Tern					•							
Arctic Tern				•	•	•	•	•				
JAEGERS												
Parasitic Jaeger					•							Fa+
ALCIDS												
Common Murre	•	●	•								•	•
Pigeon Guillemot			•	•	•	•	•	•				
Marbled Murrelet	•	•	•	•	•	•	•	•	•	•	•	•
PIGEONS, DOVES												
Rock Pigeon				•	•							
Mourning Dove							•					

Highest Daily Count of Birds on Mendenhall Wetlands - by Month, 1986-2008

• = 1 - 9 ● = 10 - 99 ● = 100 - 499 ■ = 500 - 999 ■ = 1000 or more												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
OWLS												
Western Screech-Owl						•	•					
Great Horned Owl			•			•		•			•	•
Snowy Owl										•		
Northern Hawk Owl												•
Northern Pygmy-Owl	•		•								•	
Barred Owl										•		
Short-eared Owl	•	•	•	•	•	•			•	•	•	•
Boreal Owl		Wi+									•	
Northern Saw-whet Owl		Wi+		Sp+								
NIGHTHAWKS												
Common Nighthawk								•	•			
SWIFTS												
Black Swift				Sp+								
Vaux's Swift					•	•	•	•	•			
HUMMINGBIRDS												
Rufous Hummingbird				•		•	•	•				
KINGFISHERS												
Belted Kingfisher	•	•	•	•	•	•	•	•	•	•	•	•
WOODPECKERS												
Red-breasted Sapsucker			•	•	•	•	•	•	•			
Downy Woodpecker	•	•	•	•	•			•		•	•	•
Hairy Woodpecker	•	•	•	•	•	•	•	•	•	•	•	•
Northern Flicker				•	•	•	•	•	•	•	•	•
FLYCATCHERS												
Olive-sided Flycatcher					•	•		•	•			
Western Wood-Pewee						•	•	•	•			
Alder Flycatcher						•	•	•				
Hammond's Flycatcher					•			•	•			
Pacific-slope Flycatcher					•	•	•	•	•			
Say's Phoebe										•		
Western Kingbird						•	•					
Eastern Kingbird						•						
Scissor-tailed Flycatcher				Sp+		•						
SHRIKES												
Northern Shrike	•	•	•	•						•	•	•
VIREOS												
Cassin's Vireo					•							
Warbling Vireo					•	•			•			



Short-eared Owl



Downy Woodpecker



Western Wood-Pewee

Highest Daily Count of Birds on Mendenhall Wetlands - by Month, 1986-2008



Common Raven



Chestnut-backed Chickadee



American Dipper



Hermit Thrush

• = 1 - 9 ● = 10 - 99 ● = 100 - 499 ■ = 500 - 999 ■ = 1000 or more												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
JAYS, MAGPIES, CROWS												
Steller's Jay	●	●	●	●	●	●	●	●	●	●	●	●
Black-billed Magpie	●	●	●	●	●	●	●	●	●	●	●	●
Northwestern Crow	●	■	●	●	●	●	●	●	●	●	●	●
Common Raven	●	●	●	●	●	●	●	●	●	●	●	●
LARKS												
Horned Lark	●	●	●	●	●	●	●	●	●	●	●	●
SWALLOWS												
Tree Swallow	●	●	●	●	●	●	●	●	●	●	●	●
Violet-green Swallow	●	●	●	●	●	●	●	●	●	●	●	●
Northern Rough-winged Swallow	●	●	●	●	●	●	●	●	●	●	●	●
Bank Swallow	●	●	●	●	●	●	●	●	●	●	●	●
Cliff Swallow	●	●	●	●	●	●	●	●	●	●	●	●
Barn Swallow	●	●	●	●	●	●	●	●	●	●	●	●
CHICKADEES												
Mountain Chickadee	Wi+	●	●	●	●	●	●	●	●	●	●	●
Chestnut-backed Chickadee	●	●	●	●	●	●	●	●	●	●	●	●
Boreal Chickadee	●	●	●	●	●	●	●	●	●	●	●	●
NUTHATCHES												
Red-breasted Nuthatch	●	●	●	●	●	●	●	●	●	●	●	●
CREEPERS												
Brown Creeper	●	●	●	●	●	●	●	●	●	●	●	●
WRENS												
Winter Wren	●	●	●	●	●	●	●	●	●	●	●	●
DIPPERS												
American Dipper	●	●	●	●	●	●	●	●	●	●	●	●
KINGLETS												
Golden-crowned Kinglet	●	●	●	●	●	●	●	●	●	●	●	●
Ruby-crowned Kinglet	●	●	●	●	●	●	●	●	●	●	●	●
THRUSHES												
Mountain Bluebird	●	●	●	●	●	●	●	●	●	●	●	●
Townsend's Solitaire	●	●	●	●	●	●	●	●	●	●	●	●
Swainson's Thrush	●	●	●	●	●	●	●	●	●	●	●	●
Hermit Thrush	●	●	●	●	●	●	●	●	●	●	●	●
Eye-browed Thrush	●	●	●	●	●	●	●	●	●	●	●	●
Dusky Thrush	●	●	●	●	●	●	●	●	●	●	●	●
American Robin	●	●	●	●	●	●	●	●	●	●	●	●
Varied Thrush	●	●	●	●	●	●	●	●	●	●	●	●
MOCKINGBIRDS												
Northern Mockingbird	●	●	●	●	●	●	●	●	●	●	●	●

Highest Daily Count of Birds on Mendenhall Wetlands - by Month, 1986-2008

• = 1 - 9 ● = 10 - 99 ● = 100 - 499 ■ = 500 - 999 ■ = 1000 or more												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
STARLINGS												
European Starling	•		•	•	•	•	•	•	•			•
PIPITS												
Eastern Yellow Wagtail						•						
Red-throated Pipit									•		•	
American Pipit	•	•	•	•	•	•		•	•	•	•	•
WAXWINGS												
Bohemian Waxwing	Wi+										Fa+	
Cedar Waxwing				•		•	•				Fa+	
WOOD WARBLERS												
Tennessee Warbler					•	•	•	•	•			
Orange-crowned Warbler				•	•	•	•	•	•	•		
Yellow Warbler				•	•	•	•	•	•			
Magnolia Warbler								•				
Cape May Warbler					•							
Yellow-rumped Warbler				•	•	•	•	•	•	•		
Townsend's Warbler				•	•	•	•	•	•			
Palm Warbler				•							•	
Blackpoll Warbler					•	•		•				
American Redstart					•	•		•	•			
Northern Waterthrush					•			•	•			
Mourning Warbler								•				
MacGillivray's Warbler								•	•			
Common Yellowthroat					•	•	•	•	•	•		
Wilson's Warbler					•	•	•	•	•	•	•	•
TANAGERS												
Western Tanager					•			•				
SPARROWS, BUNTINGS												
American Tree Sparrow	•	•	•	•	•				•	•	•	•
Chipping Sparrow						•		•	•			
Brewer's Sparrow					•	•		•				
Savannah Sparrow	•		•	•	•	•	•	•	•	•		•
Fox Sparrow			•	•	•	•	•	•	•	•		•
Song Sparrow	•	•	•	•	•	•	•	•	•	•	•	•
Lincoln's Sparrow				•	•	•	•	•	•			
Swamp Sparrow					•	•						
Harris's Sparrow	Wi+									•		
White-crowned Sparrow				•	•			•	•	•		
Golden-crowned Sparrow				•	•			•	•	•		
Dark-eyed Junco	•	•	•	•	•	•	•	•	•	•	•	•
Lapland Longspur	•	•	•	•	•		•	•	■	•	•	•



American Pipit



Yellow-rumped Warbler



Savannah Sparrow



Song Sparrow

Highest Daily Count of Birds on Mendenhall Wetlands - by Month, 1986-2008



Snow Bunting



Common Redpoll



Pine Siskin

• = 1 - 9 ● = 10 - 99 ● = 100 - 499 ■ = 500 - 999 ■ = 1000 or more												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Smith's Longspur					•			•				
Chestnut-collared Longspur					•							
Snow Bunting		●	●	●	•					•	●	●
McKay's Bunting	•											•
CARDINAL ALLIES												
Lazuli Bunting						•	•					
Dickcissel					•							
BLACKBIRDS												
Red-winged Blackbird	•	•		•	•	•	•	•	•	•	•	•
Western Meadowlark										Fa+		
Yellow-headed Blackbird				Sp+	•							
Rusty Blackbird	•		•	•	•			•	•	•		•
Brewer's Blackbird										•		
Brown-headed Cowbird					•	•		•				
FINCHES												
Brambling				•								
Gray-crowned Rosy Finch				•								
Pine Grosbeak	•	•			•						•	•
Red Crossbill	•	•	•	•	•	•	•	•	•	•	•	•
White-winged Crossbill	•	•	•	•	•		•	•	•		•	•
Common Redpoll	•	■	•	■	•				•		•	•
Hoary Redpoll		•	•									
Pine Siskin	•	•	•	•	•	•	•	•	•	•	•	•
American Goldfinch					•					•		

Origins of Birds Seen on Mendenhall Wetlands



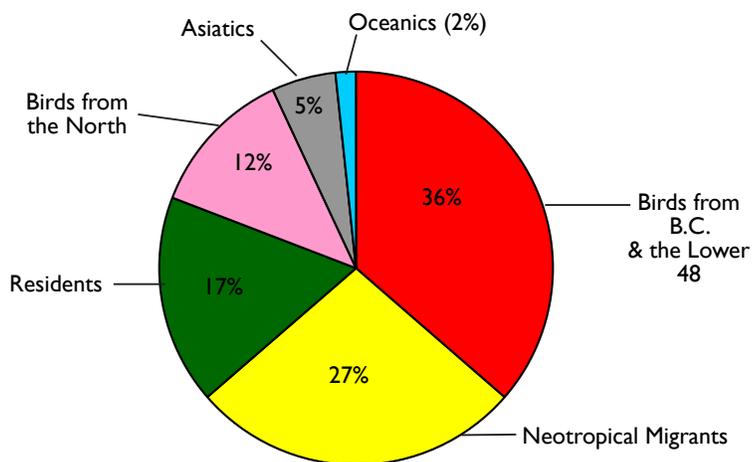
This Greater Yellowlegs just finished bathing in a pool on the Wetlands. These birds are neotropical migrants and may have flown more than 9,000 miles from Tierra del Fuego at the southern tip of South America to Mendenhall Wetlands.

MOST OF THE 256 SPECIES OF BIRDS SEEN ON MENDENHALL WETLANDS are found on the Wetlands for only part of the year. Most (83 percent) of those are migrants who stop on the Wetlands to rest and feed on their way north or south,

or come to the region to nest or spend the winter. Only 17 percent of the species live here as year-round residents.

The pie graph below shows what we know about these various groups. The narrative on the next pages tells more.

Where the Birds Come From



Some 256 species of birds have been seen on Mendenhall Wetlands. This chart groups those species according to where we think most of their members come from.



Rock Sandpipers nest farther west and north in Alaska in the Aleutians and islands of the Bering Sea. Up to 250 at a time have been seen on the Wetlands in winter.

● **Neotropical Migrants (70 species):**

These birds winter in Mexico, Central America, or South America, then migrate to Southeast Alaska to breed or travel farther northward. They include Greater Yellowlegs, Cinnamon Teal, American Golden Plover, Hudsonian Godwit, Rufous Hummingbird,

Olive-sided Flycatcher, and Yellow Warbler.

● **Birds from British Columbia and the Lower Forty-eight (93 species):** In winter most swans and several species of dabbling ducks migrate only as far as farmers' fields, productive marshes, and national wildlife refuges to the south. Northern Pintails have strong ties to California, where an estimated 85% of the birds that breed in Alaska overwinter. Other birds that migrate only to B.C. or the Lower Forty-eight include many of the sparrows and blackbirds.

● **Birds from the North (31 species):** About an eighth of the bird species we see on the Wetlands breed in areas north and west of Southeast and migrate here to spend the winter.

Those include several of the diving ducks such as Bufflehead, Long-tailed Duck, Common and Barrow's Goldeneye, and White-winged Scoters; Rock Sandpipers, which winter in Southeast Alaska and usually fly west and north to nest in the Aleutians



This Arctic Tern nested on the Wetlands in 2007. It may have flown more than 9,000 miles from Antarctica, where these terns live during northern winters.

and islands of the Bering Sea; and perhaps Snow Buntings and the occasional Snowy Owl or Gyrfalcon.

● **Oceanics (4 species):** A small number of the species seen on the Wetlands come from or across the open ocean, often from islands and distant continents. Most common among these is the Arctic Tern. Rare Oceanic species on the Wetlands include Pacific Golden-Plover, Parasitic Jaeger, and Red-necked Phalarope.

● **Asiatics (14 species):** Only 14 of the 256 species seen on the Wetlands come from Asia, but these are the species that serious birders may find especially exciting. Though many species of Asiatics occur regularly in western Alaska, most of those seen on the Wetlands are vagrants. They have probably come by accident—perhaps lost or blown off course by a storm. However, at least one, the Eurasian Wigeon, seems to occur every year on the Wetlands in small numbers.

● **Residents (44 species):** Birds seen year-round on the Wetlands include Bald Eagles, Northwestern Crows, Common



Ravens, Glaucous-winged Gulls, Marbled Murrelets, American Dippers, and Song Sparrows.

This Bald Eagle with its young was photographed at a nest on one of the small islands on the Wetlands. Nesting eagles typically spend the entire year near their nest sites.



The Lesser Black-backed Gull originates from Asia. This bird was photographed at the gull nesting colony near Mendenhall Glacier. A Black-backed has been seen foraging on Mendenhall Wetlands for about 20 years.

Worldwide Connections

As one of only three well-documented staging areas for migrating birds in South-east Alaska, Mendenhall Wetlands is undeniably a crucial link in the yearly cycle of many species. We have evidence of its global connections in records for a variety of species:

■ A male Snow Goose seen on Mendenhall Wetlands May 3, 2002, had hatched in summer 2000 and been banded on July 14, 2001, on Wrangel Island, at 72 degrees N in Russia's Chukchi Sea.

■ A male Brant banded on Banks Island, Canada on August 1, 1992, was sighted during the 1997 spring migration in Nanvak Bay, Alaska, and during the winter of 1998 in Baja California. It was seen on the Wetlands on May 14-21, 2003.

■ Two banded Tundra Swans were seen by Paul Suchanek on October 19, 2008. One was marked as an adult male just south of King Salmon, Alaska, on July 22, 2006. The other was marked as an adult female northeast of Bethel, Alaska, July 24, 2008.

■ Two White-winged Scoters were captured in the Juneau area and tagged with satellite

transmitters in February 2001. One was captured at Middle Point and the Other at Spuhn Island. They were then tracked inland to various locations in Yukon Territory, Canada. One returned to Juneau on August 3 and the other on October 2, 2001.

■ A female Western Sandpiper was color-banded in her hatch years in La Paz, southern Baja, Mexico, in September 2001 by Daniel Galindo Espinosa, a Mexican university biologist. She was seen by Paul Suchanek on April 30, 2002, on Mendenhall Wetlands.

■ A radio-tagged Short-billed Dowitcher, initially tagged at San Francisco Bay by USGS biologist John Takekawa and others, was relocated at Gray's Harbor, Washington, on May 9, 2001, then on the Wetlands by Gwen Baluss on May 17, eight days later.

■ A Red Crossbill, banded by Ralph W. Williams near the Wetlands on May 13, 1991, was recovered in St. Albert, Alberta, Canada, on May 9, 1992.

■ A male Golden-crowned Sparrow was banded after his hatch year by Ralph W. Williams near the Wetlands on April 18, 1990. He was recovered in Victoria, B.C., Canada, on November 2, 1992.

More connections will undoubtedly be documented in years to come.

The male Snow Goose in the photo below was seen on Mendenhall Wetlands May 3, 2002. It had been banded July 14, 2001, and had hatched in summer 2000 on Russia's Wrangel Island in the Chukchi Sea.





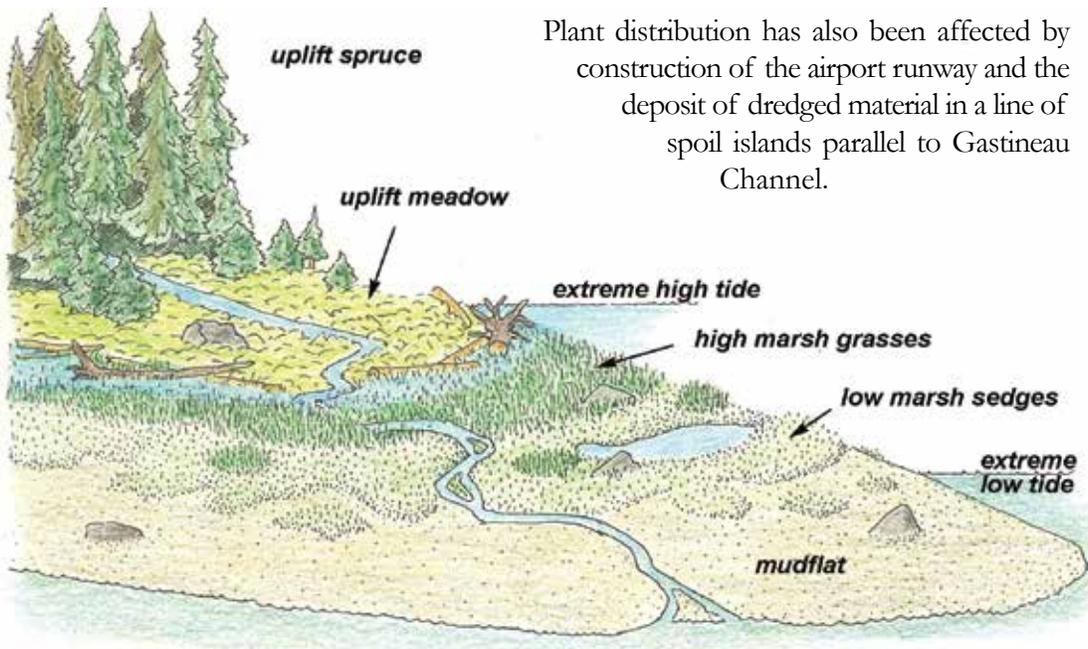
Vegetation

AS GLACIERS IN SOUTHEAST ALASKA RETREAT AND DECREASE THEIR WEIGHT ON THE LAND, the Mendenhall Wetlands area is “rebounding,” rising above sea level a little more than half an inch per year. This rate currently exceeds the global rise of sea level. Since wetlands plants are fine-tuned to living with the effects of tidal changes,

the distribution of vegetation types on the Wetlands has changed dramatically—and it continues to change. As the land rises, what we recognize as “zones” of typical plant distribution change. Plants typically found in meadows move into high marsh once exposure to tides there has decreased; high marsh plants invade low marsh, once exposure to salt water there has decreased, and so on.

Lyngbye sedge is the dominant plant in the low marsh zone of the Wetlands. It's an important food for Canada Geese.

Plant distribution has also been affected by construction of the airport runway and the deposit of dredged material in a line of spoil islands parallel to Gastineau Channel.

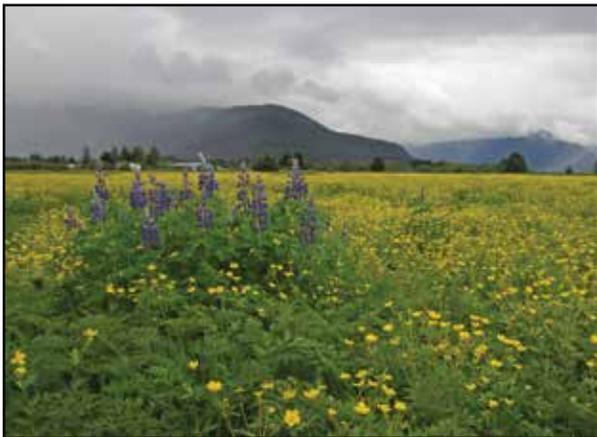


On the Wetlands you can see that plant types typically distribute themselves in “zones,” depending on exposure to the tides.



From the Dike Trail you can see Mendenhall Glacier in the distance, with fireweed and cow parsnip in the foreground.

An uplift meadow near the golf course is covered with lupine and buttercups.



Zones of vegetation

As part of Southeast Alaska’s temperate rainforest, the Mendenhall Wetlands are surrounded by conifer forest. In some places, old-growth forest on steep bedrock ends abruptly at the high tide mark. But more often mature forest dominated by hemlock is separated from the open meadows and marshes of the Wetlands by younger stands of Sitka spruce. Growing on land that has risen above the tides during the past century, these spruces grow either as a tight belt of even-aged forest, or as single or small groups of trees and saplings colonizing outward into the wetlands.

Closed spruce stands are the preferred nesting habitat for North-

western Crows. Scattered spruces serve as perches for birds such as Merlin. Smaller birds such as Song and Lincoln’s Sparrows nest in or near them. Below the spruce groves are uplift meadows, former tidelands that have risen above the high tide line. Uplift meadows foster a great variety of plants, and plant species vary from place to place, depending on the substrate and the source of seeds for initial colonists. Meadow plants provide habitat for Savannah Sparrows, which nest here in great numbers.

Although many meadow plants offer palatable grazing for mammals such as deer, bear, and porcupine, they are much less attractive to grazing birds such as geese, which cannot tolerate the tannins and other compounds the plants produce as a defense against being eaten.

Uplift meadows on the Wetlands end at the extreme high tide line, about 20 feet above zero tide level. Here the meadows give way to the salt marsh zone, an intertidal

community sheltered from waves. This is an estuarine environment where salt and fresh water mingle. Though this zone is substantially vegetated with grasses and sedges, it provides little hiding cover. Birds using this area tend to forage in large groups, where more pairs of eyes and ears can be on the alert for predators.

Wetland ecologists often divide the salt marsh into high marsh – dominated on the Wetlands by several species of grasses – and low marsh – dominated by Lyngbye sedge.

The high marsh extends from extreme high water to 16 or 17 feet above zero tide. It's populated mostly by three species of grasses: rye grass, hair grass, and foxtail barley.

High marsh grasses are used by migrating flocks of seed-eaters like Snow Buntings and Lapland Longspurs. Crows often forage among them, and grassy swards serve as resting habitat for birds such as geese and mallards.

The grasses also support long-tailed voles, which attract hunters like Northern Harriers, American Kestrels, and Short-eared Owls. High tides reach up into these grasses several times a month, forcing brief evacuation by voles, and destroying the eggs of ground-nesting birds that have placed their nests too far below the uplift meadow. In early spring, freshly sprouting



A Snow Bunting is feeding on the seeds of beach rye, one of the three most common grasses in the high marsh.

grasses attract migrant grazers like Snow and Greater White-fronted Geese. In general, though, grasses are more fibrous and less palatable to grazers than the sedges that dominate the low marsh.

Lyngbye sedge, the dominant plant in the low marsh zone, is an important spring forage plant for geese. It also produces large numbers of seeds. Even though the seeds rarely germinate in the salt marsh (the plant

spreads largely by vegetative propagation), sedge seeds make up a large part of the fall diet of resident Vancouver Canada Geese. The shift from spring sprouts to autumn seed consumption is driven by nutritional requirements as well as food availability. Protein and nitro-

These Lyngbye sedges in the low marsh have been nipped off by geese. Sedges are less fibrous and more palatable than grasses. They can be distinguished from grasses by stems that are triangular in cross-section. The stems of grasses are round.



Photo by Richard Carstensen



Sea milkwort (above) and arrowgrass are dominant plants in succulent marsh.

gen requirements of Canada Geese are highest in spring, while the need for carbohydrates increases in fall. Lyngbye sedge is also critical for geese in the winter; they would not survive on Mendenhall Wetlands without it. As its greenery fades in the fall, a good deal of the nutrient value of the sedge moves down to the top of the root stock, where it is available for the initial growth surge in spring. Geese dig out this high-quality food, which provides a good deal of their conditioning for nesting.

There is evidence that sedge seed also feeds mallards, teal and pintails: studies of the crop contents of birds on the Stikine River showed Lyngbye sedge was by far the most important food for these birds during autumn migration.

The Lyngbye sedge community also plays a role in marine food chains of the low marsh. Marine algae trapped in the stems and leaves of sedges form the food base for invertebrates that feed young fish rearing in the salt marsh. These include juvenile herring, stickleback, staghorn sculpin, starry flounder, and coho salmon, which often spend their first summer in the marsh estuaries before retreating into headwater

streams to overwinter. All of these species are potential prey for fish-eating birds from terns to mergansers.

Below the low marsh sedge zone are several types of vegetative communities, depending on whether the substrate is finer muds or coarser sands and gravels, and depending on exposure to tidal currents. Here you see broad expanses of mud, sand, and gravel, broken by patches of plants or small “lawns” of alkali grass, goosetongue, sea milkwort, and arrowgrass. This area may look barren, but in fact it’s extremely rich in food for specialized bird groups like shorebirds. Here you’ll find three distinctive community types amid the open sand and mudflats.

We call the first type succulent marsh because it’s rich in succulent vascular plants like goosetongue and arrowgrass. Favorite foods of geese, these low-growing plants are found on coarser substrates than the pure mudflats that foster Lyngbye sedge. Arrow-grass (*Triglochin maritima* - not a true grass) is low in fiber and high in nitrogen, most important to geese in spring and early summer.

All the communities described to this point are dominated by essentially “terrestrial” plants that have evolved varying degrees of tolerance to salt water. In contrast, the lower limits of the salt marsh

Succulent marsh covers large areas of the Wetlands below the sedge-dominated low marsh.



Photo by Richard Carstensen



The barnacle/mussel/rockweed community at the mouth of the Mendenhall River is a hotspot of bird activity.

support two communities dominated by essentially marine organisms. Their residents — both plants and animals — live mainly in salt water, but to varying degrees they can tolerate being exposed to air.

The most diverse of these marine communities is patches of barnacles, mussels, and rockweed. These patches are found from zero tide level to about 12 feet above it. Barnacles, mussels, and rockweed cannot attach to pure mud, so they develop only where there is at least a partial mix of coarse gravel or cobbles—a substrate found at the mouths of Mendenhall River and several creeks on the Wetlands. In this “hotspot” of bird activity, larger birds like scoters and gulls forage on the mussels and barnacles, while smaller species like turnstones hunt for invertebrates that shelter under fronds of rockweed and in crevices between barnacles.

A second marine community is made up of bright green carpet-forming algae that in some places covers hundreds of square meters of sandy surface near the boundary between the low marsh and mudflats. The dominant genus in this felted mat is usually one of the yellow-green algae called *Vaucheria*. Other members of the community include diatoms, blue-green algae, and green algae. Because these plants lack roots or even the holdfasts of seaweeds

like rockweed, this mat community is the most ephemeral of the Wetlands vegetative communities. Still, the mats appear to grow in roughly the same positions from year to year. They’re frequented by Bonaparte’s Gulls and Surf-birds, which flip aside the algae in search of invertebrates to eat.

In addition to the mat-forming algae, a bright green tube-shaped genus called *Enteromorpha* is common, especially on the deltas of small intertidal streams. This seaweed has high concentrations of mineral nutrients that are not available in other marsh plants, and is therefore important to Canada Geese.

This Red Knot is feeding in the algal carpet zone.



Ditch-grass is a salt-tolerant aquatic plant that grows in dredge ponds near the airport and in brackish ponds near Walmart. Ditch-grass is essentially restricted to ponds of human origin, but for waterfowl it has been called one of the most valuable species of submerged aquatics in the whole United States. Geese of all species, swans, and many dabbling ducks consume the entire plant, from narrow leaves to seeds to rootstock. It also supports crustaceans and dense schools of sticklebacks that attract predatory birds such as mergansers and herons.



Canada Goose eating ditch-grass

Important Foods for Waterfowl

Lyngbye sedge may be the most important plant for Canada Geese and other waterfowl on the Wetlands. Geese graze the green stems and eat the seeds and roots. In spring they seem to especially like to nip off the protein-rich new growth that starts under the horny tips that emerge in the fall.



If you walk into the sedge zone, you can sometimes see where geese have been eating the new shoots, leaving behind the discarded tips.



Also important to geese on the Wetlands are goosetongue ...



... and arrow-grass.



More evidence that geese have been grazing: goose droppings and nibbled arrowgrass.

Fish



FIFTEEN FISH-PRODUCING STREAMS empty out onto the Mendenhall Wetlands. If we count their tributaries as well, 28 streams connect to the Wetlands. Salmon and Dolly Varden—anadromous fish that spend all or part of their adult lives in salt water then return to fresh water to spawn—access these streams through the Wetlands. They probably use the Wetlands for feeding and short-term rearing of their young as well.

The Wetlands also serve as a rearing, and in some cases spawning, area for other species of fish. Eulachon, capelin, Pacific herring, Pacific sand lance, Pacific staghorn sculpin, starry flounder, other flounders, and threespine stickleback are all found here. These are all fish that are eaten by birds.

Salmon

At least 31 species of birds in Southeast Alaska feed on adult salmon and/or their eggs and young. In addition to the direct benefits salmon provide to these birds, nutrients from carcasses of spawned-out salmon help sustain the productivity of stream and lake communities, often benefiting plants and invertebrates used by birds.

Most of the salmon found naturally on the Wetlands (coho, chum, sockeye, and pinks) use the freshwater and/or intertidal

portions of Wetland streams for spawning and rearing of their young. All four species also pass through the Wetlands during migration to and from the sea.

The Macaulay Salmon Hatchery, operated by Douglas Island Pink and Chum, Inc. (DIPAC) is located adjacent to Mendenhall Wetlands near Salmon Creek. Young and adult chum, coho, pink, and possibly chinook salmon from the hatchery also use tidal sloughs and streams around the Wetlands for early marine rearing and spawning. In most years the hatchery releases millions of young salmon into Gastineau Channel. Many returning adults stray into and spawn in streams associated with the Wetlands.

Coho salmon occur in most streams that flow into the Wetlands. Juvenile coho may rear for some time in intertidal portions of Wetlands streams.

Many Birds Eat Fish



A number of fish species spawn, feed, and rear on Mendenhall Wetlands and areas adjacent to it. These fish attract a variety of fish-eating birds, including:

- American Dippers
- Bald Eagles
- Belted Kingfishers
- Arctic Terns
- Bonaparte's Gulls
- Mew Gulls
- Herring Gulls
- Glaucous-winged Gulls
- Great Blue Herons
- Red-breasted Mergansers
- Common Mergansers
- Northwestern Crows
- Common Ravens
- Greater Yellowlegs

This Arctic Tern is feeding a juvenile coho salmon to its chick on Mendenhall Wetlands.



Spawned-out salmon carcasses often wash out into the Wetlands from streams and provide food for Bald Eagles.



Dolly Varden

Dolly Varden use most of the streams entering the Wetlands for spawning and for rearing of their young. In addition, Mendenhall Lake, 4.2 miles upriver from the Wetlands, is a major overwintering haven for Dolly Varden of the Juneau area. In spring, large numbers of Dolly Varden smolts, subadults, and adults leave the lake, migrating down the Mendenhall River and out to sea. During this migration we have

observed Bonaparte's Gulls feeding on the smolt and subadult Dolly Varden near the northwestern end of the airport runway.

Dolly Varden feed on other fish within the Wetlands, and their feeding activity attracts birds that then feed on the Dolly Varden themselves. For example, when Dolly Varden gather off the mouth of Fish Creek to feed on Pacific sand lance, birds such as Arctic Terns and gulls also gather to feed on both Dolly Varden and their prey.



Bonaparte's Gulls often capture Dolly Varden in Gastineau Channel off the mouth of Fish Creek.

Eulachon

Eulachon have been documented within the lower reaches of Mendenhall River during spring. These little fish are unusually high in fat, and they attract numerous predators. At Berners Bay, 35 miles north of Juneau Airport, observers have counted a daily average of 40,000 gulls and 600 Bald Eagles feeding on eulachon in the lower reaches of the rivers. Some of these birds may be individuals found on Mendenhall Wetlands at other times.

Capelin

Capelin, like sand lance, eulachon, and herring, are an important forage fish in Alaska. We have often observed numerous spawned-out capelin in some of the sloughs adjacent to the lower Mendenhall River. These dead and dying fish attract Bald Eagles and other birds that feed on them.

Pacific herring

We know that Pacific herring are an important food for Bald Eagles in the Juneau area because researchers have often



We found this spawned-out capelin on Mendenhall Wetlands. In recent years, numbers of these little fish seem to be increasing on the Wetlands.

found herring cached in Bald Eagle nests. Eagles also concentrate to feed on spawning herring wherever they occur in Southeast Alaska. We have observed both juvenile and adult herring trapped in small tidal ponds on the Mendenhall Wetlands. Studies also have shown that occasionally large numbers of juvenile herring use the Wetlands for early feeding.

Pacific sand lance

Pacific sand lance are small, thin, silver-sided forage fish that grow six to eight inches long as adults. They typically form dense schools along tidal channels and also burrow in sand. They are extremely important in the diet of several species of birds.

Bald Eagles are attracted to the dead and dying capelin within a Wetlands slough.

At night or when they are not feeding, Pacific sand lance burrow into the sand to conserve energy and escape from predators. This sand lance is just emerging from sand on the Wetlands and is under about three inches of water.



On Mendenhall Wetlands, at least two areas of sand lance burrowing activity have been noted. One is straight out from the mouth of Fish Creek near channel marker 19A. The other is up the channel near marker 18. In the area near marker 19A we have observed numerous gulls, ravens, crows, and up to 85 Bald Eagles feeding on sand lance during low tides. We have also observed Arctic Terns bringing sand lance to their young at the colony on the Wetlands.

Burrowing sand lance attract a flock of eagles and gulls on the Wetlands.



Pacific staghorn sculpin

Pacific staghorn sculpin are abundant in the Wetlands' shallow intertidal areas, and they are easy prey for Greater Yellowlegs, Great Blue Herons, Arctic Terns, Common Mergansers, and Belted Kingfishers. Juvenile staghorn sculpins are especially abundant within the Wetlands' intertidal channels, and we have sometimes caught up to 200 of them per seine haul.



Juvenile Pacific staghorn sculpins are common in the sloughs of Mendenhall Wetlands.



A male Belted Kingfisher holds a sculpin in preparation for feeding its young at a nest along Mendenhall River.

This river otter, photographed on the Wetlands, is eating a starry flounder.

Starry flounder

Starry flounder were the most common flounder captured on Mendenhall Wetlands during a study in 2002 by Lynn Mattes. They were also numerous within the intertidal channels near the airport in 1986. We have observed Great Blue Herons feeding on them, and one Southeast study found they were common prey items brought to eaglets by their parents. We have also observed river otters feeding on them within the Wetlands, and we've watched American Dippers eating juvenile flounder within the lower reaches of Switzer Creek.



Great Blue Herons often capture juvenile flounders in sloughs on the Wetlands.

We often observe Greater Yellowlegs capturing threespine stickleback in Wetlands sloughs and ponds.



Threespine stickleback

Threespine stickleback provide a source of food for Arctic Terns, mergansers, diving ducks, and Great Blue Herons.

Two forms of threespine stickleback occur in southeastern Alaska—a marine

form and a freshwater form. Both forms occur within Mendenhall Wetlands streams and sloughs. In a survey of Jordan Creek in 1970 we estimated 10,000 stickleback occurred in decreasing numbers from the mouth to the headwaters.



Feasting on Sand Lance

In 1987 we found a sand lance burrowing area on Mendenhall Wetlands. We saw some 85 Bald Eagles feeding on something in a sandy area not far from the mouth of the river. Through a spotting scope we were able to see that the eagles were walking around and rapidly moving their feet up and down, almost as if they were dancing. Hundreds of sand lance, apparently panicked by the activity, were popping up out of the sand and lying on the surface exhausted. The eagles were having a feast.



Several years later we saw Northwestern Crows digging sand lance in the same area. They generally captured sand lance in eight digs or fewer.

Invertebrates



THE LARGE EXPANSES OF SAND AND MUDFLAT on Mendenhall Wetlands may look barren, but in fact many of them are treasure-fields of marine invertebrates that provide important food for wetland birds. Buried in mud and sand, or tucked among rocks and clumps of seaweed, is an amazing variety of small creatures such as amphipods (small, shrimp-like invertebrates), tiny clams, snails, worms, and other creatures often invisible to people casually visiting the area. Even the larger more obvious invertebrates such as mussels and barnacles are important food for certain birds.

In addition, hordes of insects venture onto the Wetlands in search of algae to eat. These bugs in turn attract predatory insects that feed on them. The vegetated portions of the Wetlands also attract numerous insects looking for flower nectar.

We don't know a lot about the diversity, distribution, and density of invertebrates in Southeast Alaska wetlands. But in 2003 Mary

Willson worked with Aaron Baldwin, then a graduate student at the University of Alaska School of Fisheries and Ocean Sciences, to sample the abundance and distribution of invertebrates in six widely separated areas of Mendenhall Wetlands. Amongst and under beds of mussels and rockweed, and buried in areas of mixed sand and mud, they found polychaete worms, isopods, snails, small clams, and amphipods—types of organisms that provide important food for ducks and shorebirds.

Bare sediments hosted the greatest diversity of invertebrates all year round, averaging several hundred per square meter. Small clams were the most numerous, except in winter, when marine worms predominated. Rockweed and mussel beds held fewer invertebrates than bare sediments. Snails were the most common invertebrates there, along with isopods and amphipods in some seasons.

A rockweed isopod, about an inch long, was photographed crawling about on a patch of rockweed at the mouth of Salmon Creek.



Pseudoscorpions live beneath the rocks in the upper intertidal barnacle zone near freshwater streams.



Barnacles and Mussels

Barnacles and mussels are key players in the Wetlands ecosystem. Mussels are an important food for huge rafts of scoters that visit the mouth of Mendenhall River, and several species of shorebirds eat barnacles. Barnacles and mussels also provide shelter for other invertebrates that are important food for birds.

Northwestern Crows (above) drop mussels on the rocks below to break the shells. White-winged Scoters (right) swallow them whole and let their gizzards grind them up.



When barnacles (top right) are covered with water, the shell opens and pairs of appendages called "cirri" extend into the water above. Cirri make sweeping movements to strain fine food particles from the sea water.

When the tide goes out and barnacles are exposed, some birds such as this Surfbird eat them.



Amphipods

Amphipods can be amazingly abundant in certain areas of the Wetlands, especially under rockweed and among beds of mussels.

Certain species of tiny amphipods build double-ended U-shaped tubes in the sediment of sloughs. The tubes appear to be slightly sticky and stick up above the sediment a short distance, so debris collects around them, making a fuzzy mat. These amphipods feed from one end of the tube by sweeping the surrounding area for algae and plant debris with their antennae. These tube-dwelling amphipods are an extremely important shorebird food in some areas. One study concluded that Semipalmated Sandpipers prefer these amphipods over other food, and a part of the Wetlands where these amphipods are abundant is a favored feeding spot for several species of shorebirds.



This Northwestern Crow is carrying a fairly large amphipod that it has captured.



Large numbers of amphipods can be found beneath clumps of rockweed, where gulls and crows forage on them.



Dowitchers probe into the mud with their long beaks, searching for tube-dwelling amphipods and other organisms.



The Sanderling above is feeding on a juvenile macoma clam.

Snails (far right) can be quite abundant on rocks and in mussel beds.

Tiny juvenile macoma clams are important food for probers such as dowitchers.



This Oregon pillbug is the most abundant easily observed isopod around Juneau.

Isopods
Isopods tend to live amongst the fucus and barnacle/mussel communities on the Wetlands. They are primarily nocturnal and are known to be eaten by intertidal fishes such as sculpins. Their role as food for birds is not as clear as that of amphipods because they often wedge themselves into inaccessible crevices.

Snails
Small snails can be quite abundant on the Wetlands, especially wherever there are rocks and barnacles. Some species are known to be eaten by diving ducks such as Buffleheads, goldeneyes, scaup, scoters, and Harlequin Ducks. Snails also occur in the diets of some shorebirds.



Worms
Various marine worms can be important food for intertidal fish. They also appear in the diets of several species of shorebirds.



Marine worms such as this sand worm are often pulled out of the sediments by shorebirds.



Insects

Insects can be abundant along the edges of intertidal sloughs on the Wetlands. Some are algae-eaters and run about feeding on the surface of sand and mud. Others come onto the Wetlands to feed on the algae-eaters. As the tide advances, these insects seem to get momentarily trapped in the surface tension of the advancing water. Shorebirds take advantage of this, darting this way and that, feeding on them.

There are often large numbers of insects flying about on the Wetlands, too. Some are no doubt searching for mates, while others are looking for food. The fliers attract insect-eating birds, and you can usually observe various species of swallows hunting over open mudflats, sedge and uplift meadows. The mouth of Fish Creek is a good place to find Vaux's Swifts searching for flying insects, and various species of warblers can be found foraging among the alders that usually grow at the edges of the Wetlands.



Western Sandpipers probe the Wetlands for invertebrates.



Numerous flies forage on algae in the Wetlands.



Birds eat other invertebrates not mentioned here, such as the tunicate this gull has captured.

Insects are attracted to the abundant blossoms of cow parsnip growing at the margins of the Wetlands.



Checking for Contaminants on the Wetlands

Urban wetlands like the Mendenhall face severe challenges to their ability to remain healthy and support the wide variety of life within them. One example of how people are looking out for wetlands is a Tree Swallow study being conducted on and near Mendenhall Wetlands by Deborah Rudis, a U.S. Fish and Wildlife Service environmental contaminants biologist.

Nesting Tree Swallows typically feed on insects within a 400- to 500-meter radius of their nest. They eat mostly adult insects, which spend their larval stages rearing in nearby streams and ponds. If the insects have picked up contaminants from nearby water and soil, those substances could be traced in the swallows, their eggs, and their young. The birds and their success or failure at nesting could be early indicators of problems with pollutants.

In 2006 Rudis installed some 50 Tree Swallow nest boxes in five locations around Juneau—from ponds near the Juneau landfill to the banks of the Mendenhall River. The focus of her study is the area around the landfill and former incinerator site, which is immediately adjacent to Mendenhall Wetlands.



After three years, swallows had successfully nested and laid eggs in 25 of the boxes. Rudis is monitoring the birds, checking the health of adults, banding chicks, and collecting any eggs that do not hatch. The collected eggs were frozen to be analyzed for contaminants at some later time.

Mammals



A VARIETY OF MAMMALS HAVE BEEN SEEN on Mendenhall Wetlands. On rare occasions, moose and brown bear have been among them, but the most commonly seen are Sitka black-tailed deer, black bears, harbor seals, and smaller mammals such as river otters, mink, and short-tailed weasels.

The most important mammals for birds are small rodents and insectivores. Voles, mice, and shrews are important prey for Short-eared Owls, Northern Harriers, and American Kestrels.

Long-tailed voles (*Microtus longicaudus*) are the most common year-round mammals on the Wetlands. They inhabit sedge and grass areas, where they feed on roots, seeds, and the tender bases of stems.

These small rodents are considered “irruptive;” that is, every five to 10 years their population reaches very high densities on the upper perimeter of the Wetlands. Then, shortly after, the population drops to more normal levels.

Long-tailed voles are excellent swimmers, so the tidal sloughs do not necessarily restrict their movements; but during higher tides, they are often forced to swim. At those times we have observed Bald Eagles, Short-eared Owls, and gulls taking advantage of the voles’ vulnerability.



River otters (above) frequent Miller/Honsinger Pond, especially in winter. They may be attracted to the staghorn sculpins and starry flounders living in the pond.



Rodents such as this red-backed vole (left) and the Keen's deer mouse (below) are eaten by a variety of predatory birds and mammals.

Other small mammals such as red-backed voles, deer mice, and shrews live in the upland meadows, especially where the meadows meet the forest. On the Dike Trail we once saw a Northern Pygmy-Owl snatch a shrew and eat it while we watched from only a few feet away.

Raptors that Prey on Mammals



Most raptors, such as the Northern Harrier (above) hunt for small rodents and birds in the grassy high marsh and uplift meadows. Others, such as the Great Horned Owl, near right, hunt mostly at night.



American Kestrels (right) often sit on high perches around the Wetlands. They are probably on the lookout for small rodents and birds.



(Above) a Short-eared Owl on the Wetlands. After examining hundreds of Short-eared Owl pellets collected over many years, we have concluded that long-tailed voles are the owls' major, and sometimes only, prey on the Wetlands.



Mink (left) and short-tailed weasels (below left) prey on voles and mice. Weasels feed mostly on rodents.



Beavers are common in the upper Mendenhall Valley. Some disperse through sub-optimal habitat on the Wetlands.



We often see Sitka black-tailed deer foraging in the meadows around Wigeon Ponds.

Harbor Seal Rescue



One year a newborn harbor seal was found on the Wetlands. After a few days, when it appeared that the pup's mother was not caring for it, help was called in.

Marine mammal rescue coordinator for the National Marine Fisheries Service, Aleria Jensen (on the right) and Rachel Dziuba, a veterinarian, examined the pup and concluded that it would not survive without help.



The pup (later named Garnet) was shipped to the Sealife Center in Seward for rehabilitation.



Garnet was returned four months later and released in Fritz Cove. Fitted with a radio transmitter, he was tracked venturing up the Taku River, and eventually spending most of his time near Glacier Bay.

Ecological Interactions



MENDENHALL WETLANDS IS THE MEETING PLACE of marine, freshwater, and terrestrial ecosystems. It is one of the richest areas in Southeast Alaska, in terms of the variety and productivity of the organisms that use it. Some of this richness originates in the three major ecosystems and is brought to the Wetlands by flowing water and other means. Some of it originates in the Wetlands themselves. The Wetlands in turn, provides sustenance to each of the interacting ecosystems, perhaps to an even greater extent than it receives from them.

Input to the Wetlands

Numerous freshwater streams flow from the slopes of the coastal mountains and over the Wetland tideflats to salt water. They bring fresh supplies of sediment, which builds up the flats and increases their fertility. Zones of differing vegetation are inhabited by plants with differing tolerances for exposure

to salt water. The resulting diversity of vegetation provides habitats ranging from nearly bare mud in the lower zones to salt marsh with rooted vegetation in the upper zones.

Fresh water flowing over the flats supports several kinds of freshwater animals that can withstand being inundated by the tides. The streams also carry nutrients from decomposing leaves, dead fish, and leached soils out over the flats and into their estuaries.

Thus, streams make a link between terrestrial and marine systems. The estuaries enriched by this input are home to numerous kinds of crabs, snails, and fish. More direct input from terrestrial systems comes as wind-blown leaves and seeds and the excretions of animals that fed in forests and meadows.

Sockeye salmon travel through Mendenhall Wetlands when they migrate from the open ocean and return to spawn in Steep Creek near Mendenhall Lake. The spawning fish are important food for animals such as this small black bear. Young salmon of the next generation will migrate back through the Wetlands to the sea, feeding and/or resting in some part of the Wetlands.

Great Blue Herons often feed on Dolly Varden in Steep Creek near Mendenhall Lake. This fish would have migrated through Mendenhall Wetlands and may have spent time feeding there.



The sea provides the greatest input to the area. Tides wash the flats twice a day, their reach varying day to day and with the season. They wash nutrients and microorganisms across the flats and refresh the water in channels and sloughs. This input provides food for organisms that live on the tide flats and associated sloughs: small clams, worms of various types, amphipods and isopods, mussels and barnacles, algae, sedges and other rooted plants. These animals and plants in turn feed other creatures that visit the area daily or seasonally. Per-acre productivity of these wetlands far exceeds that of any place on Alaskan uplands.

The sea is also a source of fish that live much of their lives in salt water but use the intertidal area for part of their lives. Sand lance sometimes, especially in spring, bury themselves in loose sands near the northwest end of Gastineau Channel. Eulachon occasionally spawn in spring in the lower reaches of the Mendenhall River. Juvenile flatfish, such as starry flounder, and sculpins rear in the sloughs and tributary

streams. Salmon and Dolly Varden come in to spawn in several of the tributary streams, and their juveniles eventually pass through the Wetlands on their way to salt water.

The Wetlands as a feeding area

Invertebrates, fish, and plants on the Wetlands feed migratory and resident birds, otters and mink, and sometimes each other. Here are some examples:

Gulls gather on streams when mature salmon come in to spawn, and they use the salmon in different ways, depending on their body size. The small Bonaparte's Gulls typically forage for loose salmon eggs, either by hovering over the stream and then diving in, or by paddling on the surface and dipping down to grab eggs one by one. Middle-sized Mew Gulls forage on eggs and, more than the other gulls, on invertebrates in nearby algal mats; they avoid fish carcasses if the larger gulls are present. The large Herring and Glaucous-winged Gulls wade in search of eggs and salmon, dead or alive, but immature large gulls concentrate more on



Mendenhall Wetlands are a crucial resting area for thousands of birds during their long migration from southerly wintering areas to nesting sites farther north in Alaska. The resting birds in this photo are Snow Geese.

eggs than adults of the same species do. Large gulls, especially Glaucous-winged Gulls, sometimes pull live salmon to the stream edge, poking at the eyes and also at the vent area to force egg extrusion.

Buried sand lance attract predatory gulls, Bald Eagles, Common Ravens, and Northwestern Crows, which poke in the sand to extract these buried prey. The predators concentrate their activity in areas with high densities of sand lance. Eagles capture sand lance in two ways: by wading in the shallows and grabbing a fish with bill or feet, and by repeatedly patting the sands with their feet, causing the fish to emerge where they can be easily captured. Crows and ravens dig in the sand with sideways motions of the bill, sometimes making several digs before capturing a fish. Glaucous-winged Gulls are less successful at digging their own fish and probably get most of their sand lance by stealing them from other birds.

A common invertebrate in many parts of the tideflats is a small pink clam called *Macoma balthica*. It lies buried in the sediments with just its siphon reaching to the surface, where it gathers small particles on the surface or suspended in the water. Small flatfish of several species graze on *Macoma* siphons, nibbling off the upper end. This forces the clam to move closer to the surface, where it becomes more accessible to foraging shorebirds. Siphons can be

regenerated, more quickly in well-nourished clams than in hungry ones.

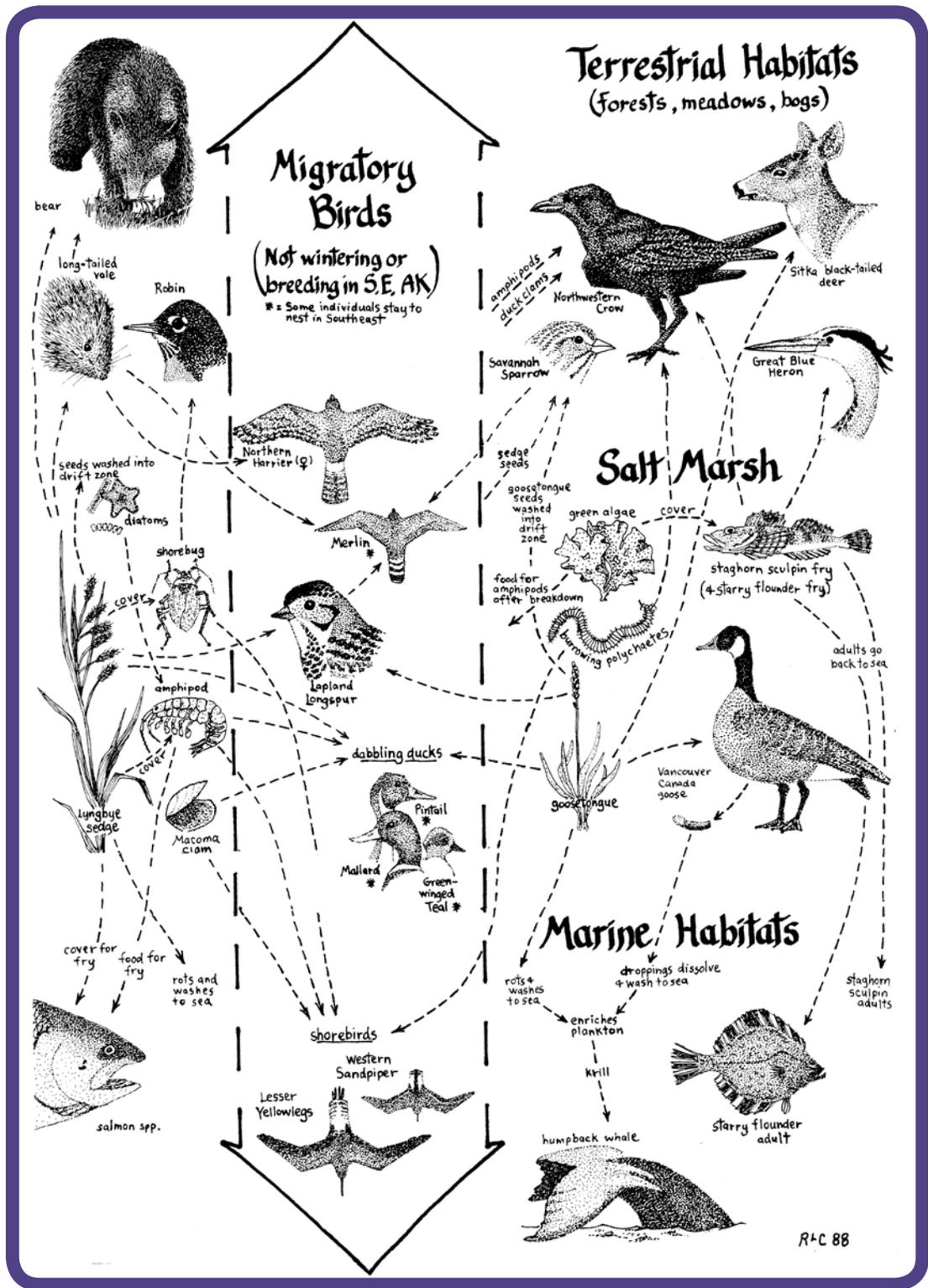
Many kinds of shorebirds use the Wetlands, and they range from tiny Least Sandpipers to large godwits and Whimbrels. Each species has a characteristic style of foraging that depends partly on the length of the bill. Long-billed species can probe more deeply into mud or water than short-billed ones, so each species has access to different kinds and quantities of invertebrate prey.

Bald Eagles nest in the trees surrounding the tideflats and on the spoil islands (formed by dredging) near Gastineau Channel. They prey on gulls, ducks, and fish. Eagles (and gulls) also gather by the dozen along the river when eulachon are running.

In winter, when the upper parts of streams are frozen, American Dippers look for food in intertidal areas of the Wetlands. At this time, most of the food they find is small amphipods. This dipper was feeding in the intertidal portion of Fish Creek.



Mendenhall Wetlands provides food for a remarkable variety of birds, mammals, fish, and invertebrates. Its value as a "provider of nutrients" extends well beyond its boundaries to nearby terrestrial and marine habitats.



Small fish abound in and near the Wetlands; there are sand lance, flatfish, sculpin, sticklebacks, juvenile salmonids, and occasionally capelin. Small fish are prey for many species, including the eagles just mentioned. Flocks of mergansers

sometimes gather near the Wetlands; their serrated bills are adapted for catching fish. Yellowlegs and Arctic Terns regularly capture small fish as well. Great Blue Herons stalk the shallows, usually looking for small fish but occasionally taking fish more than

a foot long. In addition, harbor seals cruise along the shores and sometimes follow the in-migrating salmon upstream.

Geese forage extensively on the underground parts of sedges in the saltmarsh, grubbing shallow depressions in the sediment. They also clip the tops of sedges and arrowgrass. Their scat is deposited on the flats, returning some of the nutrients to the system.

During migration season in spring and fall, songbirds and shorebirds are sometimes abundant on the Wetlands. They typically consume invertebrates and sometimes

seeds, but in turn they are prey to migratory raptors, such as Merlins, Northern Harriers, and Short-eared Owls.

Seeds from salt marsh plants often form windrows of seeds at the high tide line that attract seed-eating birds such as Common Redpolls and Snow Buntings.

Nutrient transfer to terrestrial areas

Some of the foragers on the Wetlands carry prey, digested or otherwise, to shore, thereby carrying nutrients from marine sources to the terrestrial ecosystem. Ravens and crows carry small fish to their nests or



Several hundred Herring and Glaucous-winged gulls nest in a colony in front of Mendenhall Glacier. This Herring Gull most likely flew down the valley to forage on Mendenhall Wetlands and obtain food for its chick.

*Humpback whales
bubblenet feeding
in Juneau's marine
waters may be
eating sand lance,
capelin, or herring
that reared on
Mendenhall
Wetlands.*



store them in trees or under clumps of vegetation for future consumption

Eagles carry fish and ducks to their nests. Terns carry small fish to their mates and chicks as far away as the shores of Mendenhall Lake. Bears visit salmon runs and haul their prey ashore, often leaving a good part of the carcass. Digested prey from all these and other predators is often deposited on land also, bringing additional nutrients to the terrestrial system. Research has shown that marine-derived nutrients from salmon are picked up by streamside vegetation and that the density of songbirds near salmon streams is greater than near streams that have no spawning salmon.

The Wetlands as a resting area

But the value of the Wetlands is not only about food and nutrients. The area provides important resting places, especially for migrants and overwintering waterfowl. Predators of such birds often lurk in trees or use trees as cover. They fly low over the flats with dark trees in the background, making it difficult for foraging birds to detect them. Prey species often prefer to rest in open areas, well away from trees, where they have better chances of detecting an approaching predator. Shorebirds vulnerable to predators are flightier in dim light than in bright light, so in low light conditions (not uncommon

in Southeast Alaska) they may lose foraging time.

Fear has a great impact on waterfowl behavior and distribution on the Wetlands, particularly during and just after hunting season. Ducks and geese are more easily disturbed from resting or foraging at that time, and some of them leave the Wetlands and fly to the relative safety of Auke Lake, sacrificing the good forage of the Wetlands for less threatening surroundings. To our knowledge, the effects of fear and disturbance on the body condition of waterfowl have not been studied. We do know, however, that body condition greatly influences birds' ability to breed and the number of eggs laid.

Ecological interactions on the Wetlands are many and complex, and most of them have never been studied. There is a wealth of fascinating research projects out there for curious naturalists to pursue.

Threats to Birds and Their Habitats on Mendenhall Wetlands

MENDENHALL WETLANDS MAY BE ONE OF THE MOST THREATENED Important Bird Areas in Alaska. It is surrounded by extensive urban development and has an international airport at its center. Also directly adjacent to the Wetlands are one of Juneau's primary sewage treatment plants, and the city and borough landfill and former incinerator site. A number of future plans and actions could also diminish the Wetlands' value for birds. Projects proposed or in various stages of planning include expanding the airport terminal and runways, a second bridge crossing Gastineau Channel, and efforts by adjacent land owners to claim land accreted as a result of glacial rebound.

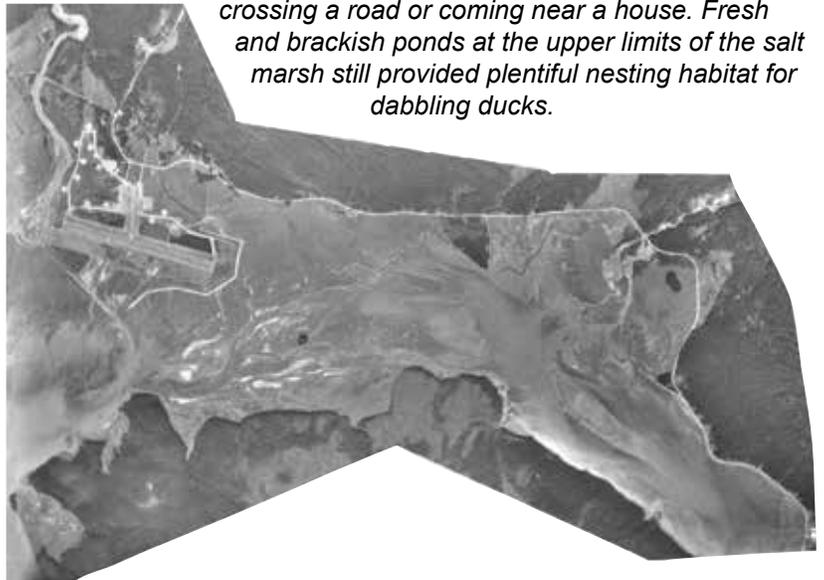
As a pocket of scenic and natural beauty within a large urban community, the Wetlands are frequented by numerous recreational users, some of whose activities can disrupt birds and alter their habitat. These include dog walkers, mountain bikers, fishermen, boaters, kayaking tour groups, bird watchers, horseback riders, and waterfowl hunters in fall.

Past Development

Much of Mendenhall Wetlands has already been lost to development. Areas of upland marsh, a transition zone between intertidal areas and the forest, are gone—a loss of habitat that once supported nesting waterfowl and a variety of other birds. These areas are now populated by the airport terminal, runways, and associated buildings; commercial and industrial businesses and activities along Industrial Boulevard; Fred Meyer and WalMart superstores; the Juneau Christian School; the four-lane Egan Expressway; and other encroachments. Much of this development required portions of the Wetlands to be filled, which directly destroyed feeding and resting habitat for birds.

Mendenhall Wetlands, 1948

The newly built airport and surrounding dike system severely impaired the estuaries of Duck and Jordan Creeks, but tides still flowed freely through the Wetlands. The extensive sedge flats of the Lemon/Switzer/Vanderbilt estuary were still an integral component of Gastineau Channel's fish and wildlife habitat. Deer and bear could access the entire Douglas Island coastline without crossing a road or coming near a house. Fresh and brackish ponds at the upper limits of the salt marsh still provided plentiful nesting habitat for dabbling ducks.



Mendenhall Wetlands, 2001

The most significant impacts to the Wetlands since 1948 have been the construction of Egan Drive, re-routing and channelizing streams, dredging of Gastineau Channel and the deposition of spoil islands, eastward extension of the airport runway, and dredging of ponds for fill material. Much of that fill later became road beds and building pads that further encroached on the Wetlands.

By 2001 the land had risen 2.3 feet since 1948. This uplift, combined with human impediments to tidal flow, fostered the rapid advance of vegetation into former mudflats.

The airport's floatplane basin is currently being dredged to remove ditch-grass, a food much sought after by Canada Geese and other waterfowl. This is one of several modifications planned to reduce the area's attractiveness to birds, which are considered a safety hazard.



Future Development

The proposed expansion of Juneau International Airport will require filling a portion of the Wetlands, destroying yet more feeding and resting habitat for birds. Removal of ditch-grass is one of several modifications planned on airport property to reduce its attractiveness to birds, which are considered a safety hazard.

Substantial planning has been completed for a bridge to cross Gastineau Channel and connect mainland Juneau with Douglas Island. The recommended crossing site is at the Vanderbilt and Egan Expressway intersection and would go from there across the Wetlands. This crossing would require filling and loss of more bird habitat on the Wetlands, and might also be disruptive to the movement of birds.

Also proposed is construction of a coastal bicycle trail adjacent to a portion of Egan Expressway and the Wetlands. Much of the trail would run through an area where humans seldom go and birds now forage undisturbed. Construction of the trail would allow birds to be disturbed in favor of expanding human recreational use.

Pollution

The Juneau landfill drains directly into the Wetlands in the vicinity of Lemon Creek. Pollution from this source could be dispersed to other parts of the Wetlands by Lemon Creek, Vanderbilt Creek, and Switzer Creek. The Tree Swallow study described elsewhere in this book is attempting to assess the presence and effects of contaminants. Raising further questions, we have noted in our surveys that birds use the area at the mouth of Lemon Creek less than they use other areas on the Wetlands. We found fewer invertebrates there as well. Potential effects of pollution from the landfill, however, have not been evaluated.

One of Juneau's primary sewage treatment plants is located adjacent to the Mendenhall River and the Wetlands near the Juneau airport. On occasion this plant has failed and discharged pollutants directly into the Mendenhall River. In addition, it has discharged chlorinated hydrocarbons directly into the Mendenhall River. The effect that these actions have on the Wetland birds or their food has not been studied.

There are two other possible sources of pollution. During winter, de-icing of

airplanes and runways at the airport releases chemicals that eventually leach into the Wetlands. The effect this may have on birds in the area has not been studied. Secondly, the DIPAC hatchery sometimes grinds up large numbers of salmon carcasses and deposits millions of pounds of ground salmon slurry into the middle of Gastineau Channel near the Wetlands. The effect this may have on invertebrates, fish, or birds is not known.



(above) The marsh near the Juneau Pioneers' Home is used by Mallards and other ducks as a sanctuary during hunting season.



(left) Uncontrolled dogs are one threat to birds that could be avoided. These two dogs flushed and chased a group of Snow Geese that were feeding on the Wetlands.

The Wetlands are bordered at either end by boat harbors and cruise ship docks. Some wastes and poisons such as anti-fouling paint, oil, sewage, and cleaning materials inevitably get into the water and are distributed across the Wetlands.

Other Disturbances

Many of the multiple uses of Mendenhall Wetlands displace birds. Low-flying helicopters, unleashed dogs, runners, cyclists, boaters, fishermen, hunters, photographers, and even bird watchers can disturb birds and cause them to flush. Two major heliports run numerous daily flights for tourists during the season. Power boaters use Gastineau Channel to travel between downtown Juneau harbors and northern Stephens Passage. Guided kayak tours from the North Douglas

boat launch take tourists into portions of the Wetlands where birds concentrate. Most of these activities are unavoidable and are considered normal and allowed uses of the area.

Some activities that disturb birds may be avoidable, however. Over the years we have documented numerous instances where unleashed dogs chase birds. On occasion we have observed dogs from adjacent landowners running loose and unattended, chasing birds on the Wetlands for hours at a time. There is a Juneau Borough leash law along the Dike Trail, and state and federal laws governing harassment of wildlife on and near the refuge, but these laws are seldom enforced.

Some landowners have received quiet title from the State of Alaska to accreted wetlands. The owners of this home have since granted a conservation easement to the Southeast Alaska Land Trust. Terms of the easement require that the accreted land be managed in a manner similar to the way the state manages land in the Mendenhall Wetlands State Game Refuge.

Waterfowl hunting on the Wetlands displaces Canada Geese and ducks. As noted elsewhere in this book, local populations of Vancouver Canada Goose and resident Mallards have learned to cope with hunting by flying to Auke Lake before hunting begins each day and returning to the Wetlands to feed at night. The effect this has on the



Photo by Bruce Baker

birds' overall condition is not known. Most wildlife refuges we are familiar with in the Lower 48 States have fairly large zones closed to hunting, where birds can forage undisturbed. The only sanctuary on the Wetlands, however, is the small marsh near the Pioneers' Home. This is used by some Mallards but not by geese.

In an effort to decrease the possibility of birds striking aircraft, wildlife control personnel at Juneau International Airport frequently harass and sometimes shoot birds on airport property. Similar control efforts also take place at the Juneau landfill because it is located under and near the flight paths of some jets.

Loss of Accreted Lands

As land in the Mendenhall Wetland area rises due to "post-glacial rebound," upland land owners have the right to seek title to accreted land adjacent to their property. Because of the very low gradient of the Wetlands, this accreted land sometimes totals several acres. Once owners obtain title to accreted

land, they have the right to certain types of development, which can displace birds or alter their habitat. Southeast Alaska Land Trust has been working with land owners surrounding the Wetlands in hopes of acquiring the accreted land and making it part of the Mendenhall Wetlands Game Refuge. SEALTrust also encourages owners to

consider attaching conservation easements to protect the newly exposed lands in support of birds.

Looking to the Future

The history of Mendenhall Wetlands repeats the continent-wide loss of coastal wetlands in North America. Wetlands in urban areas have been filled even when that depleted the resources that attracted the original settlers. Cities such as Boston, New York, Baltimore, New Orleans, San Francisco, and Seattle were built upon the country's largest and richest estuaries. Millions of dollars are being spent to repair a fraction of our national coastal wetlands. The values of these wetlands are now known to be the source of our nearshore seafood, as buffers against storm surges, their ability to filter many pollutants, and their importance in providing food and habitat for a wide variety of birds and other animals. In the past there have been attempts to fund a socioeconomic study of the Mendenhall Wetlands as a guide to current planning and activities in the area. It is not too late to do such a study.

Reports and Studies on Mendenhall Wetlands

- Adamus, P., D. Beers, K. Bosworth, R. Carstensen, and K. Munk. 1987. Juneau wetlands: Functions and values. Adamus Resource Assessment, Inc. Available from: CGJ, Dept. of Community Development, 155 S. Seward St., Juneau, AK 99801. 216 p.
- Alder House students, 2003. Tides, toads and topography; the natural and human history of the Lemon Creek watershed. Discovery Southeast student publication. 24 pp.
- Alaska Dept. of Fish and Game. 1990. Mendenhall wetlands state game refuge management plan. 52 pp.
- Armstrong, R.H., R.L. Carstensen and M.F. Willson. 2004. Hotspots: Bird Survey of Mendenhall Wetlands, April 2002 to May 2003. Juneau Audubon Society and Taku Conservation Society. 74 pp.
- Armstrong, R. and R. Gordon 1995. Finding Birds in Juneau. U.S. Forest Service.
- Armstrong, R. and R. Gordon, 2002. Birds of Mendenhall Wetlands, checklist, Juneau Audubon Society.
- Barnwell, W.W. and C.W. Boning. 1968. Water resources and surficial geology of the Mendenhall Valley, Alaska. U.S. Geological Survey Hydrologic Investigations Atlas HA-259. USDI Geological Survey, Water Resources Div., P.O. Box 21568, Juneau, AK. 99802.
- Beiharz, M. 1998. Duck Creek Hydrology Baseline Conditions. USDA Forest Service, Juneau Ranger District, Tongass National Forest.
- Bethers M., K. Munk, and C. Seifert. 1995. Juneau Fish Habitat Assessment. Alaska Department of Fish and Game, Division of Sport Fish, Douglas, Alaska. 128 p.
- Bishop, D. 1979. Draft environmental assessment of the Mendenhall Valley drainage study. Attachment to EMPS 1979. 20 p.
- Bishop, D.M. and R.L. Carstensen. 1986. Hydrologic investigation of Air National Guard hangar site. Environaid Report. Nov. 2.
- Bishop, D., R. Armstrong, and R. Carstensen. 1987. Environmental analysis of lower Jordan Creek and nearby wetlands in regard to planned airport taxiway extension. Environaid, Juneau, AK. 67 pp.
- Briscoe, R. 2004. Overwinter use of microhabitats by juvenile coho salmon in Jordan Creek. Alaska Department of Fish and Game, Southeast Sustainable Salmon Funds Project on Duck and Jordan Creeks, Juneau, Alaska.
- Cain, S., J. Hodges, and E. Robinson-Wilson. 1988. Bird Use of the Mendenhall Wetlands in Juneau, Alaska. USFWS, Juneau, AK. 72 pp.
- Carstensen, R. 1996. Vegetation mapping of lower Duck Creek, and comments on proposed channel relocation. Report to R&M Engineering, for Duck Creek Relocation EA.
- Carstensen, R. 2001. Mapping and environmental surveys of Fish Creek estuary. Report to City and Borough of Juneau.
- Carstensen, R. 2004. GIS Mapping for Mendenhall Wetland State Game Refuge. Report prepared by Discovery Southeast for the Southeast Alaska Land Trust. 18 pp.
- Carstensen, R., and R. Armstrong 2002. Bird surveys of the float pond woodland, lower Duck Creek, and lower Jordan Creek areas. Data sheets prepared for SWCA Environmental Consultants, December 2001 – August 2002.
- Carstensen, Richard and Bob Armstrong. 2004. Birds and plane safety at Juneau Airport. Juneau Audubon Society. 14 pp.
- Celewycz, A.G., A.C. Wertheimer, J.A. Orsi, and J.L. Lum. 1994. Nearshore distribution and residency of pink salmon (*Oncorhynchus gorbuscha*) and chum salmon (*O. keta*) fry and their predators in Auke Bay and Gastineau Channel, southeast Alaska. U.S. Dep. Commer., AFSC Proc. Rep. 94-05, 39 p.
- City and Borough of Juneau. 1997. Juneau Wetlands Management Plan. Community Development Department. Juneau, Alaska, February, 60 pp.

-
- City and Borough of Juneau 2002. Wildlife Hazard Management Plan for the Juneau International Airport. April.
- City and Borough of Juneau 2007. Wildlife Hazard Management Plan for the Juneau International Airport. August.
- Crowe, J.H. 1976. Salt Marshes of the Alaska Pacific Coast. In Proceedings of the Symposium on Terrestrial and Aquatic Ecological Studies of the Northwest. Eastern Washington State College, Cheney, Washington, March 26-27, pp 103-110.
- DIPAC. 2001. Chum survival rates studied. DIPAC Network News. Summer 2001, pp 3-4.
- Environmental Concern, Inc. 1972. Gastineau Channel Wetlands: Reconnaissance and Recommendation Report. Juneau, Alaska. 54 pp. JUN DOC 352.94232.
- Gerke, B., M. Lorenz, and K.V. Koski. 1999. Distribution of Pink and Chum Salmon Fry in Estuaries near Juneau. In Proceedings of the Northeast Pacific Pink and Chum Salmon Workshop, Juneau Alaska, June 1, 1999, NMFS, 11305 Glacier Hwy, Juneau, pp 73-79.
- Hession, Jack. 1971. The Mendenhall Wetlands Conflict. Institute of Social, Economic and Government Research Occasional Papers. University of Alaska, Fairbanks, Alaska. 44 pp.
- Hodges, J. I., and B. Conant 1986. Experimental Vancouver Canada Goose Survey – Northern Portion of Southeast Alaska. Waterfowl Investigations, U.S. Fish and Wildlife Service, Juneau, Alaska. 9 pp.
- Hoopes, D.T. 1978. An ecological reconnaissance of lands associated with the Juneau International Airport: Including an evaluation of the environmental impact of proposed development alternatives. Hoopes Environmental Consulting, P.O. Box 373, Clark Fork, Idaho 83811. Available from: CBJ, Dept. of Community Development, 155 S. Seward St., Juneau, AK 99801. 51 pp.
- Isbill Associates, Inc. 1987. Environmental Assessment for Airport Improvements, Juneau International Airport, Juneau, Alaska. Prepared for the City and Borough of Juneau, Alaska.
- Juneau International Airport Draft Environmental Impact Statement. 2005. Part I Chapters 1-3 and Executive Summary. Federal Aviation Administration and City and Borough of Juneau, Alaska.
- Juneau International Airport Draft Environmental Impact Statement. 2005. Part II Chapters 4 – 10, Appendices, and Index. Federal Aviation Administration and City and Borough of Juneau, Alaska.
- King, J.G. 2008. Attending Alaska's Birds. Trafford Publishing. 470 pp.
- Koski, K.V. 2009. The fate of coho salmon nomads: the story of an estuarine-rearing strategy promoting resilience. *Ecology and Society* 154(1): 4. [online] URL; <http://www.ecologyandsociety.org/vol14/iss1/art4/>
- Koski, K., and M. Lorenz 1999. Duck Creek Watershed Management Plan. Auke Bay Laboratory, NMFS, Juneau, Alaska. 54 pp.
- Larsen, C.F., Motyka, R.J., Freymueller, J.T., Echelmeyer, K.A., Ivins, E.R., 2005. Rapid viscoelastic uplift in southeast Alaska caused by post-Little Ice Age glacial retreat. *Earth and Planetary Science Letters*, 237, 548- 560.
- Mattes, Lynn A. 2003. Habitat usage by flatfish (Pleuronectidae) in the Mendenhall wetlands, Juneau, Alaska. M.S. Thesis, University of Alaska, Fairbanks. 76 pp.
- Merrell, T.R., Jr. 1987. Assessment of effects on anadromous fish habitat of development projects recommended in the Master Plan for the Juneau International Airport, with suggested mitigation and enhancement measures. Prepared for Coffman Associates—Airport Consultants. Available from: CBJ, Dept. of Community Development 155 S. Seward St., Juneau, AK 99801. 53 p.

-
- Mortensen, D.G., A.C. Wertheimer, J.M. Maselko, and S.G. Taylor. 2002. Survival and straying of Auke Creek, Alaska, pink salmon marked with coded wire tags and thermally induced otolith marks. *Transactions of the American Fisheries Society* 131(1):14-26.
- Motyka, R.J., C.F. Larsen, J.T. Freymueller and K.A. Echelmeyer. 2007. Post Little Ice Age Glacial Rebound in Glacier Bay National Park and Surrounding Areas. *Alaska Park Science*, 6(1), 36-41.
- Motyka, R.J., 2003. Post little ice age uplift at Juneau, Alaska reconstructed from dendrochronology and geomorphology. *Quaternary Research*, 59, 300-309.
- Motyka, R.J. 1988. Report of Investigations 88-6. Preliminary Results of Water-Quality Investigations in the Mendenhall Peninsula and Auke Bay Area, Juneau, Alaska. State of Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys. April.
- Neal E.G. and R.H. Host 1999. Hydrology, Geomorphology, and Flood Profiles of the Mendenhall River, Juneau, Alaska. Water-Resources Investigations Report 99-1450. U.S. Geological Survey.
- Noll, R. 1995. Hydrologic investigation of Duck Creek at the Juneau International Airport, Juneau, Alaska. Public Data File 95-27. State of Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys. July.
- Osgood, G.N. 1990. Simulation of the freshwater-salt-water interface in the aquifer at Mendenhall Valley, Alaska. University of Alaska, M.S. Thesis. Fairbanks: Alaska.
- Reed, R. and R.H. Armstrong. 1971. Dolly Varden Sport Fishery – Juneau Area. Federal Aid to Fish Restoration Research Project Segment. Project F-9-3, Study R-IV, Job R-IV-C.
- R&M Engineering 1996. Mendenhall Valley Drainage Study. Contract 89-130. CBJ. December.
- Schmidt, A., S. Robards, and M. McHugh. 1973. Inventory and cataloging of the sport fish and sport fish waters in Southeast Alaska. Alaska Department of Fish and Game. Annual Progress Report. Federal Aid in Fish Restoration. Project F-9-5 Job G-I-A. 62 p.
- Shepherd, P. and R. Somerville 1966. Preliminary land management proposals for the Mendenhall River Wetlands. Alaska Department of Fish and Game. 61 p.
- Southeast Alaska Land Trust 2003. Accreted Tidelands, A Special Situation for Southeast Alaska. 7 p.
- Stone, C. S. 1979. Reconnaissance botanical study of salt marshes in the Juneau, Alaska, area. Typewritten manuscript submitted to Fish 697 on May 3, 1979. 29 pp.
- Stone, C.S. 1983. Patterns in Coastal Marsh Vegetation of the Juneau Area, Alaska. Oregon State University, Ph.D. thesis.
- Stone, C.S. 1993. Vegetation of coastal marshes near Juneau, Alaska. *Northwest Science* 67:215-230.
- SWCA Environmental Consultants. 2002. Juneau International Airport Environmental Impact Statement Biological resources Affected Environment. Federal Aviation Administration, City and Borough of Juneau.
- Thrower, F.P. 1988. Migratory behavior of maturing pink salmon in Gastineau Channel, Southeast Alaska. Unpublished MS Thesis, University of Alaska.
- U.S. Department of Agriculture Wildlife Services 2001. Wildlife Hazard Assessment for the Juneau International Airport, Juneau, Alaska. April.
- U.S. Department of Agriculture Soil Conservation Service 1974. Soil Survey of Juneau, Alaska.
- U.S. Environmental Protection Agency 2000. Draft Total Maximum Daily Load for Dissolved Oxygen and Iron in the Waters of Duck Creek in Mendenhall Valley, Alaska. August.

U.S. Fish and Wildlife Service 2002. Fish and Wildlife Coordination Act Report for Aquatic Ecosystem Restoration of Duck Creek, Juneau, Alaska. Wildlife Hazard Evaluation. August.

Watson, S. 1979. Avian habitats and use of the Mendenhall Wetlands Wildlife Refuge, 30 April-30 June 1979. ADF&G unpublished report, Juneau, AK 28 pp.

Watson, S. 1979. Avian Habitats and Use of the Mendenhall Wetlands Wildlife Refuge. Prepared in partial fulfillment of graduate degree from Utah State University.

West, G.C. 2002. A Birder's Guide to Alaska (Steve Zimmerman wrote a section on the Mendenhall Wetlands on pp 425-429). American Birding Association.

Willson, M.F. 2005. Gulls foraging at salmon runs. Canadian Field-Naturalist 118: 442-443

Willson, M.F. and R.H. Armstrong 1998. Intertidal foraging for Pacific Sand Lance, *Ammodytes hexapterus*, by birds. Canadian Field-Naturalist 112(4):715-716.

Willson M.F. and A.P. Baldwin. 2004. Invertebrate surveys on the Mendenhall wetlands. pp 1-32. Report to USFWS.

Wilmoth, W.F., C. Rossi, M.A. Linnell. 2001. Wildlife Hazard Assessment for the Juneau International Airport, Juneau, Alaska. USDA Wildlife Services, Olympia, WA.

Birds come to Mendenhall Wetlands from many places



Bald Eagle
(resident)



Rock Sandpiper
(breeds in western and northern Alaska)



Trumpeter Swan
(winters in Lower 48)



Lesser Black-backed Gull
(vagrant from Asia)



Pectoral Sandpiper
(winters in South America)



Arctic Tern
(winters in Antarctica)

\$12.00

