



**Activity Guide Study Manual  
2023**

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## **Ketchikan, Alaska Facts:**

Ketchikan (pronounced /'kɛtʃɪkæn/) is a city in Ketchikan Gateway Borough, Alaska, United States, the south easternmost sizable city in the state.

Ketchikan was incorporated on August 25, 1900. The initial population was just 800 residents.

With an estimated population of 13,991 in 2021, it is the fifth most populous city in the state. Approximately 8500 people live within the city limits with the remainder of the population living within the borough.

Ketchikan is only accessible by boat or seaplane. If you fly to the Ketchikan International Airport, you will still arrive to Ketchikan by boat, as the airport is located on Gravina Island on the other side of the Tongass Narrows and a ferry transports people and vehicles on the five-minute journey (current price is \$6 each way).

Ketchikan is located on Revillagigedo Island. It is known locally as "Revilla." Revilla is the 12<sup>th</sup> largest island in the United States and named by Captain George Vancouver in 1793.

Ketchikan's economy is based upon tourism and fishing, and the city is known as the "Salmon Capital of the World." The Misty Fjords National Monument is one of the area's major attractions.

Ketchikan is named after Ketchikan Creek, which flows through the town. Ketchikan comes from the Tlingit name for the creek, Kitschk-hin, the meaning of which is unclear. It may mean "the river belonging to Kitschk;" other accounts claim it means "Thundering Wings of an Eagle."

Ketchikan's secondary post office box ZIP code, 99950, is the highest ZIP code ever assigned in the United States. Most residents use the ZIP code 99901.

Ketchikan also has the world's largest collection of standing totem poles, located at three major locations: Saxman Village, Totem Bight, and the Totem Heritage Center.

Ketchikan is positioned 55.35 degrees north of the equator and 131.65 degrees west of the prime meridian.

Ketchikan is 680 miles north of Seattle by air, is Alaska's "first city," and as the first port of call for many cruise ships, its historic downtown, wedged between water and forested mountains, becomes saturated in summer with tourists. Beyond the souvenir shopping it can be a delight, built into steep hills and partly propped on wooden pilings, with boardwalks, wooden staircases and totem poles dotted throughout. By 1886, white settlers had opened the first of dozens of canneries in what was soon to be the "salmon capital of the world." Forests of cedar, hemlock, and spruce, which had provided timber for Tlingit homes and totems, also fed the town's sawmills.

Marine and freshwater sport fishing opportunities abound. Southeast Alaska is a place where the sport angler can stay busy year around fishing for wild trout, all five species of Pacific salmon, halibut, and a variety of other species. Roadside salmon fishing opportunities exist near most towns and cities.

Average annual rainfall is 153 inches (3,900 mm); annual average snowfall is 37 inches (94 cm). In 1949 more than 202 inches of rain fell to hold the record.

Ketchikan was in the Guinness Book of World Records for the largest rainboot race (mostly in Xtratufs) with 1976 people participating in 2013. The record is now held by Killarney, Ireland.

The average high temperature in July is 65°F (18°C), and the average high temperature in January is 39°F (4°C). The hottest temperature on record was 96°F (35.5°C) in 1913. The coldest temperature of -8°F or (-22°C) was recorded in 1916.

The ½-mile-wide channel called the Tongass Narrows separates Ketchikan from Gravina Island, where Ketchikan International Airport is located. In August 2005, the 2005 Highway Bill provided for \$223m to build the Gravina Island Bridge (nicknamed “the Bridge to Nowhere” by its critics) between Ketchikan and Gravina Island. The bridge would have connected the island of Ketchikan to Gravina island where the airport is located so one can drive to the airport rather than taking the ferry across the waters. After years of national and international ridicule over the expense of this project, the Alaska government ultimately chose not to build the bridge and will spend the appropriated funds elsewhere.

Metlakatla Indian Community is located on Annette Island, it is the only Indian Reserve in the State of Alaska. The Reserve is 20 miles south of Ketchikan and typically reached by seaplane, boat, or ferry. Current population is 1460 primarily made up of Tsimshian; however other tribal affiliations such as Tlingit, Haida, Aleut, Yupik call Metlakatla home. Visitors wishing to stay longer than 24 hours are required to apply for a visitors permit.

Several movies and television shows have been filmed in Ketchikan, including *The Silver Horde*, *Spawn of the North*, *Timber Tramps*, *Cry Vengeance*, *The Love Boat* and *Baywatch* (yes, *Baywatch* season 8 episodes 21 & 22). Most recently a film short called *The Ladder* was filmed here with some local actors and can be viewed on YouTube.

During the logging heyday during the '70s and '80s there were 56 bars in town. Today, there are approximately 20 bars active.

Between 1903 and 1953, there were 30 brothels along Creek Street. Dolly's House being one of the most famous and now a museum.



# Ward Cove Shuttle Map

Distance: 7 mi.  
One-way ETA: 15 - 20 min.







## DOWNTOWN WALKING TOUR

◆ **Ketchikan Visitors Bureau.** Nearby is "The Rock," artist Dave Rubin's representation of Ketchikan's first peoples and pioneers. A Historic Ketchikan Inc. history kiosk and the famous "rain gauge" marking our remarkable precipitation are near the Tour Center, which has information on visitor activities and facilities. *1 minute to next site.*

◆ **Welcome Arch.** The first arch in the early 1920s welcomed visitors on steamships. An arch with neon was put up by the Chamber of Commerce in the 1950s. This replica arch was erected by Historic Ketchikan Inc. in 1996. *3 minutes.*

◆ **Yates Memorial Hospital.** Built in 1905 as the Clergy House for the Episcopal Mission, the building was re-purposed in 1909 as a hospital in Ketchikan's boom years. The building later housed *Alaska Sportsman*, forerunner of *Alaska* magazine. The Yates is being restored by Historic Ketchikan Inc. and houses the non-profit's offices.

◆ **St. John's Episcopal Church.** St. John's, built in 1902, is the oldest church building in Ketchikan. The sanctuary, paneled in cedar from a Saxman mill, originally stood on pilings above the sea. *2 minutes.*

◆ **Whale Park and Chief Kyan Totem Pole.** A site with greenery, a history kiosk and a bench for rest and people-watching. Chief Kyan totem pole, carved by Israel Shotridge in 1993, replicates a pole raised in 1898 for a Tlingit chief. Billingsley Clock is our oldest public timepiece. Note the new home of Ketchikan Fire Department across Mill Street. *1 minute.*

◆ **Chief Johnson Totem Pole.** A replica of a pole raised here in 1901 by Tlingit Chief Johnson in honor of the Kadjuj House of the Raven Clan; the original is at Totem Heritage Center. Israel Shotridge carved the replica in 1989. *1 minute.*

◆ **Bayside Hotel.** First known as Thomas Basin Rooms, Bayside Hotel was built in 1927 by Forest and Harriet Hunt. It was a cafe/pool hall and boardinghouse for fishermen and cannery workers and became a "sporting house" in Creek Street's brothel era. It's being restored with help from Historic Ketchikan Inc. Adjacent is a deck with views of Ketchikan Creek, salmon runs, birds and seals. *1 minute.*

*Tour Creek Street Historic District now by following Points 23 to 25 (Dolly's House and Creek Street). You may then rejoin the full tour at the pedestrian bridge near Point 8 or, for a briefer tour, you may then follow Dock Street in front of the museum to Point 26.*

◆ **Tongass Historical Museum.** See artifacts, text and photos from our history as a Native fish camp, mining hub, salmon-canning capital and timber town. (Fee.) Centennial Building commemorates the purchase of Alaska from Russia in 1867. In front is the Raven Stealing the Sun pole, carved by Dempsey Bob in 1983. *4 minutes.*

◆ **Grant Street trestle.** From a safe vantage on the sidewalk, note how Ketchikan conquers terrain with ingenuity and lumber. Near the trestle are several houses, dating from 1900 to 1920, on the National Register of Historic Places. American Legion Post Home 3 across Park Avenue was built in 1932; the post dates to 1919. *3 minutes.*

◆ **Water warehouse and creek overlook.** Built in 1912, the warehouse is one of Ketchikan's oldest remaining commercial structures; it was reclaimed in a project by Historic Ketchikan Inc. and is used by Ketchikan Youth Initiative. A view platform is at creekside above the creek; see salmon schooling for their swim up the falls. *1 minute.*

◆ **Fish ladder.** Salmon struggle back to their native streambed, fighting lower falls and then using a concrete fish ladder to avoid the roughest white water. *1 minute.*



Boaters gave way to batters at low tide at the creek mouth in the early 1900s, under the original Chief Johnson pole. This game was played in 1916 against a team from Prince Rupert, B.C., Canada. Dredging for Thomas Basin boat harbor let the sea take the field. LIBRARY OF CONGRESS PHOTO

◆ **Ketchikan Creek.** Rainfall, springs and mountain snowpack keep the creek flowing clear and cold year-round. In summer, see salmon by the thousands spawning in the gravel beds where they were born years before. *10 minutes.*

◆ **Harris Street Bridge.** An excellent overlook for salmon in season. *5 minutes.*

◆ **Hatchery.** Hatcheries operated along the creek since the 1930s, augmenting natural salmon runs. A nonprofit aquaculture group took over in 2015. *1 minute.*

◆ **City Park.** Small ponds in the park go back to the early 1900s, when they were holding ponds for salmon in the city's first hatchery. The lighted fountain, originally built in the 1930s, was restored by volunteers in 1989. *2 minutes.*

◆ **Totem Heritage Center.** A world-renowned collection of original, unrestored totem poles from Tlingit and Haida villages testifies to the artistry of 19th-century Native carvers. The center, part of the municipal museum department, exhibits Native arts. Guided and self-guided tours. (Fee.) *9 minutes.*

◆ **St. Elizabeth's Church.** The church was built by Ketchikan Native Episcopal Community around 1927, when congregations in Ketchikan were segregated. A church until 1962, it now serves as Ketchikan Mortuary. (Please note: the mortuary is a private business and is closed to everyone but customers. Visitors are not welcome.) *2 minutes.*

◆ **Ketchikan Indian Community.** K.I.C. is a federally recognized tribal government, organized in 1939 under the Indian Reorganization Act of 1934. K.I.C. is involved in health, education and culture issues for Tlingit, Haida and Tsimshian people, along with other Alaska Natives. Northwest Coast-style eagle and raven panels outside the building were produced by Tlingit artist Ernie Smetzer with high school students in 1983. *5 minutes.*

**STEDMAN / THOMAS NATIONAL HISTORIC DISTRICT** The *Stedman-Thomas* neighborhood was listed on the National Register of Historic Places in 1996. The area of historic properties on *Stedman* and *Thomas* streets extends to Ketchikan Creek. *Diaz Cafe, Union Machine Shop, Potlatch Bar* and the *New York Hotel* are historic properties still in use.

◆ **Sun Raven Totem Pole.** Tlingit artist Israel Shotridge in 2003 raised this replica of a pole dating to the early 1900s on Tongass Island, ancestral home of the Tongass Tribe of Tlingit Indians. Another Sun Raven replica from 1939 stands in Saxman. The carver gave this pole to the Tongass Tribe and community. It stands beside UAS Ketchikan campus' downtown facilities. *2 minutes.*

◆ **Thomas Street.** This wood-plank street fronts the site of an early Ketchikan dock; in the 1890s it was a makeshift log raft. Thomas Street has been home to boat yards, carpenters, machine shops, bars and bordellos. *2 minutes.*

◆ **Thomas Basin and viewing platform.** The Ketchikan Creek mouth was a broad tidal flat that served until the 1920s as a baseball field; local and visiting teams lined out a diamond at low tide. In 1922, pilot Roy Jones arrived here in a small seaplane; he was first to fly from Seattle to Ketchikan non-stop. The Corps of Engineers dredged the creek mouth in the 1930s for a harbor. A Historic Ketchikan Inc. kiosk has information on Ketchikan's fishing industry. The waterfront boardwalk extends out the breakwater for a spectacular look at Deer Mountain, the harbor and downtown. On *Stedman* Street is a privately commissioned totem pole carved by Haida artist Warren Peele; it depicts three watchmen, an eagle, a raven and a man with a talking stick. *2 minutes.*

◆ **Stedman Street bridge.** In season, see thousands of salmon gathering to run up the creek. Anglers fish from the wide sidewalk on the seaward side. *1 minute.*

**CREEK STREET NATIONAL HISTORIC DISTRICT** This area was placed on the National Register of Historic Places in 2014. It's been the scene of a Tlingit fish camp, sawmills bawdy houses. Design standards preserve much of the early 20th century charm.

◆ **Creek Street.** The area became a red-light district in 1902. More than 30 bar houses, most with one or two "working girls," lined the creek over the years. With Prohibition, some became speakeasies; rowboats slipped in at night on high tide a liquor rose through trap doors. The city outlawed prostitution in 1953 and Creek St became a mixed residential and commercial area. The Star House at No. 5 Creek St. once a dance hall and the only registered brothel in the Territory of Alaska, is on the National Register of Historic Places. *1 minute to next site.*

◆ **Dolly's House.** Dolly Arthur was Ketchikan's most famous madam in the hey of Creek Street. Her house, preserved much as she left it, features antiques, caches garish decor. Tours are provided. (Fee.) *5 minutes.*

◆ **Footbridge.** Observe unique Creek Street, where historic buildings on piling flank a salmon stream. See the historical kiosk at the head of the bridge. *5 minutes*

◆ **Ketchikan Daily News.** The lone survivor of more than a dozen papers published here since 1900, the Daily News was founded in 1935.

◆ **Edmonds Street.** Our steep terrain challenges engineering and construction techniques. This street is really a long set of wooden stairs to a great hillside view of lower downtown, the boat harbor and Tongass Narrows. *1 minute.*

◆ **Main and Dock streets.** Ketchikan's historic business center. The Heckman Building, from 1912, is one of the oldest concrete structures in Alaska. *2 minutes.*

*The alternate walking route along Dock Street to Front Street avoids a fairly steep climb to marker 33; this route rejoins the Downtown Walking Tour near the tunnel.*

◆ **Ketchikan Fire Department / KPAC** KFD's former downtown station; the department moved out in 2012. KFD was founded by volunteers in 1900. Next door the hill is the future Ketchikan Performing Arts Center, where First City Players is raising funds to renovate Elks Lodge 1429, built in 1949. *2 minutes uphill.*

◆ **Ketchikan Area Arts and Humanities Council.** KAAHC supports Ketchikan arts community and presents arts events. Main Street Gallery features visual art most local. The building was formerly a Christian Science church. *1 minute.*

◆ **Red Men Lodge.** Ketchikan's first fraternal organization dates to 1900 and featured many Ketchikan civic leaders. It was all-white until the 1960s. The original lodge building was at the corner of Mission and Main streets. *4 minutes.*

◆ **Burkhardt House.** This turreted Victorian was built in 1904 for H.Z. Burkhardt, a founder of Ketchikan Power Co., predecessor of Ketchikan Spruce Mill. It's among our last examples of the Queen Anne style popular in the early 1900s. Listed on the National Register of Historic Places in 1982. *4 minutes uphill.*

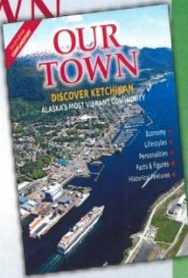
◆ **Knob Hill overlook.** This walkway offers a sensational view of Newtown, the waterfront and First Lutheran Church. Your walk takes you past Knob Hill homes of prosperous pioneers, dating as early as 1901. *4 minutes down the stairs.*

◆ **Eagle Park.** Across Front Street from this pocket park is the Gilmore Hotel, built 1927 and listed on the National Register of Historic Places. *2 minutes.*

◆ **Tunnel.** According to Ripley's Believe It or Not, this is the only tunnel in the state that can be driven through, driven around and driven over (on upper Front Street). Finished in 1954, it eased access to Newtown, for half a century before it, narrow streets on pilings skirted the rock. *4 minutes.*

# OUR TOWN

Pick up the most colorful and complete source for contemporary and historical views of Ketchikan. More than 100 pages of full color cover industries, businesses, personalities; economy, lifestyles; statistics; and much more. **OUR TOWN** is a publication of Historic Ketchikan Inc.



AVAILABLE FREE AROUND TOWN AND AT THESE FINE KETCHIKAN BUSINESSES:  
**Reading Best Western Plus** 3434 Tongass Ave.  
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**Canon Gallery** N3 / 318 Mission St. ♦ **Parnassus Books** P4 / 105 Steadman St.  
**Discovery Center** P3 / Mill & Main ♦ **Tatsuda's IGA** U4 / Steadman & Deermount

07

Historic Ketchikan Inc.

## NEWTOWN & WEST END WALKING TOUR

Newtown and West End Walking Tour points of interest. The two-mile tour, following points in order, can be walked in about 2.5 hours. Upper Water Street has a moderately steep grade.

- Newtown and West End Walking Tour
- Public streets
- Pedestrian ways: boardwalks, stairs, sidewalks, footpaths
- Waterfront Boardwalk

Map is not to scale. Projection was altered to improve ease of use.

### Key to symbols

- Historical information kiosk
- Business location
- Public restrooms
- Photo viewpoint
- Public facility
- Visitor-oriented business
- Auto or pedestrian bridge
- Elevation above sea level

**Rainbird Trail**  
 An easy 45-minute walk in the rain forest. Views are striking. Slope is gentle, but stairway entrance at north is long. Section above Third Avenue Bypass links to older trail.

**NEWTOWN & WEST END**  
**START HERE**



*Ketchikan Walking Tours* are programs of Historic Ketchikan Inc., a nonprofit organization that promotes economic development through historic preservation and heritage tourism.  
[www.historicketchikan.org](http://www.historicketchikan.org) 907-225-5515

**NOTE ON DISTANCES**  
 Maps are distorted for ease of use. Distances are not uniform in scale. The walking distance between blue dots at G3 and T4, using Water, Front, Mill and Steadman streets is about one mile.

## NEWTOWN & WEST END WALKING TOUR

◆ **Zimmerman House.** Built in 1902 by pioneer merchant Nick Zimmerman, this house was one of the finest in Newtown. *2 minutes to next site.*

◆ **Bayview Avenue.** Up the stairway is one of Ketchikan's last remaining wood plank streets. Houses here date from 1910. *1 minute.*

◆ **Hopkins Alley.** Wood-plank Hopkins Alley was started in 1902 and widened in 1907. It's the only area of Ketchikan that approximates the appearance of the town in its early days. During Prohibition, it was nicknamed Home Brew Alley and featured several speakeasies. The wedge-shaped building at the entrance, dating to 1912, housed the Horse Shoe Saloon and later a hand laundry. *5 minutes.*

◆ **Warren Street, G Street, Harding Street.** Many homes in this area date to the 1910s and 1920s. Street names commemorate the visit to Ketchikan of President Warren G. Harding in 1923. The president was on his way to the Interior to drive a spike completing the Alaska Railroad. Harding died in San Francisco on his way back to D.C. Legends variously ascribe his demise to inclement Alaska weather or to food poisoning. *5 minutes.*

◆ **Young Store.** (First City Saloon) The first commercial building in Newtown, this structure, built before 1905, was originally J.W. Young's store and has housed many businesses. *5 minutes.*

◆ **Schloth's Building.** (49er Bar) This structure arose with others in the late 1910s to the early 1920s, when Newtown expanded rapidly to serve the burgeoning fishing industry centered around City Float and nearby canneries. *3 minutes.*

◆ **Dunton Street Trestle.** The wood trestle on the hillside plainly shows how Ketchikan's civil engineering skirted difficult terrain to make more land accessible to a fast-growing population. The original street atop the trestle was wood planking; it's now concrete. *10 minutes uphill.*

◆ **Captains Hill neighborhood.** Most houses here were built between 1904 and 1925 as the fishing fleet grew in size and prosperity. From stately homes along the hillside, fishermen looked out on their boats tied at City Float. *10 minutes.*

◆ **Upper Water Street overlook.** See how Ketchikan snaked its way northward over the decades to the West End area, now a major commercial district. Expansion was rapid in the 1930s as canneries moved northward. A second growth spurt came in the early 1950s with the building of a world-class pulp mill at Ward Cove north of the city; many construction and operation workers settled here. *15 minutes.*

◆ **Hillside landscaping** and salmonberry bushes. See how Ketchikan warrants its description: "10 miles long and three blocks wide." Up close to the rain forest, you see verdant undergrowth. Black bears and other forest critters sneak down to scavenge around hillside homes and eagles perch in trees to survey the waterfront. *15 minutes.*

◆ **White Cliff Elementary School.** Built in 1927, it was the oldest operating school in Alaska at its closing in 2002. A developer renovated the school building, now home for most administrative offices of the Ketchikan Gateway Borough. *15 minutes.*



President Warren G. Harding stopped in Ketchikan just days before his death. Street names in Newtown commemorate to his visit. KETCHIKAN MUSEUMS PHOTO

◆ **Tongass Towers and Marine View.** Two 10-story concrete buildings were built in the early 1950s to house hundreds of workers who built and operated the pulp mill north of town. The residences are now condominiums. *15 minutes to next site.*

◆ **West End commercial district.** Where the sea once splashed close to today's Tongass Avenue, innumerable cubic yards of rock fill

trucked from local quarries in the 1960s and 1970s provided a foundation for today's business area. The Plaza mall and a supermarket; condominiums; a motel; retail, office and residential buildings; and acres of commercial land. *1 minute.*

◆ **E.C. Phillips and Sons.** One of Ketchikan's two remaining cold storage plants is still processing salmon and other seafood for export. Phillips flash-freezes and packages fish mostly for groceries and restaurants in the Lower 48. The company also markets smoked and canned seafood. *2 minutes.*

◆ **Cannery cottages.** These single-story cottages with one or two bedrooms apiece were built in the early 1920s to provide year-round housing for cannery workers who didn't bring families. *2 minutes.*

◆ **Elliot Street.** All the public streets in Ketchikan were originally wood planking or stairways. Elliot Street connects longass Avenue and upper Water Street. There was a small mine in this area in pioneer days. Elliot provides a good vantage to see the Water Street trestle, Ketchikan's longest. *5 minutes.*

◆ **Webber Air.** (ProMech) Originally an early cannery site, this area has been a hub for air taxi operations since the 1960s. Although flightseeing keeps air carriers busy in summer, transport of local passengers, supplies and mail sustains some operators in the off-season. *3 minutes.*

◆ **Ellis Hangar.** (Southeast Stevedoring) Ellis Air Transport was founded in 1936 by Bob Ellis, a Vermonter whose one-plane local operation grew into a major regional carrier, re-named Ellis Air Lines. Ellis merged with Alaska Coastal Airlines in the 1960s and Alaska Airlines acquired them thereafter. Ellis was posthumously inducted into the Alaska Aviation Pioneers Hall of Fame in 2004. Southeast Stevedoring is one of Alaska's biggest providers of shore-side and loading services to the merchant marine industry and cruise industry. *2 minutes.*

◆ **Alaska Outboard.** Props and politics have mixed here for decades. The business was founded by Oral Freeman, who was elected to the first Alaska State House of Representatives in 1959 and to five more terms 1972-82. He was among founders of the Alaska Permanent Fund and had a hand in creating the dividend program that spins off oil revenues to Alaskans. Aspirants for local and state offices have always been welcome to put campaign posters in the shop's windows; Freeman's sons Jim and Charlie (the latter a longtime City Councilman) hold onto decades' worth of posters for the losing candidates, keeping them in the back of the shop. *1 minute.*



Newtown's commercial buildings look much the same today as they did in the 1920s when volunteer firefighters took a fire truck for a spin. KETCHIKAN MUSEUMS PHOTO



Ellis Air Lines' logo dressed Grumman Goose amphibious aircraft flying all over the region for decades. COURTESY BOB ELLIS AVIATION SCHOLARSHIP FOUNDATION

◆ **Amphibian Room.** (Shogun Restaurant) The Amphibian Room was a pop restaurant for three decades. Its name referred to Grumman Goose amphibious planes used by Ellis Air Lines, whose waiting room was next door. Ellis flew past around the Panhandle and to nearby Annette Island, where passengers caught and jet planes for flights out of state. (Ketchikan's airport wasn't built until 1971. *1 minute.*

◆ **Ellis Airlines Hangar.** (Carlin Air) In 1924, Tongass Trading Co. built this warehouse for its rapidly expanding business. American Can Co. later put in an office and shop associated with its sale and service of equipment for salmon cannery. In 1950s, the building was purchased by the expanding Ellis Air Lines. *1 minute.*

◆ **View of lower Captains Hill.** Looking up at houses perched on the cliffs you're standing on a section of longass Avenue once called Cliff Avenue; it was a plank street built in 1915 as Ketchikan grew northward. Along the water or on high above, the town's builders stubbornly and ingeniously challenged natural obstacles. A number of fine Craftsman-style homes remain in this historic area. *1 minute.*

◆ **The Exchange.** Henry Henn was a clerk at the Talbot's store when he opened his own shop across the street in 1920. It was originally a second-hand store featuring items he found on his rubbish-hauling route. The Exchange evolved into a hardware store that operated into the late 1950s. *2 minutes.*

◆ **First Lutheran Church.** The fishing industry boomed across Southeast Alaska in the 1910s-1920s and Scandinavians flooded in, Norwegians most numerous of these newcomers. They were principal founders of First Lutheran Church in 1925. This grand church on a rock promontory was finished in 1930 and anchored Newtown. *1 minute.*

◆ **Talbot's.** This former building supply store sits on dock frontage originally built early in the 1900s and used by the U.S. Lighthouse Service. Three generations of the Talbot family operated the business after World War I. The company's huge sign painted on the warehouse to advertise its wares was a landmark for decades and is still seen faintly underneath an overlay of paint.

◆ **Harbor View Park.** This wooden waterside park offers benches, tables and up looks at fishing, commercial and pleasure vessels—and sometimes seafood. ◆ **Casey Moran Harbor / City Float.** Used by commercial fishers, visitors at the local recreational fleet. In the 1920s and '30s, this harbor was home for what believed to be the world's largest fleet of halibut boats.



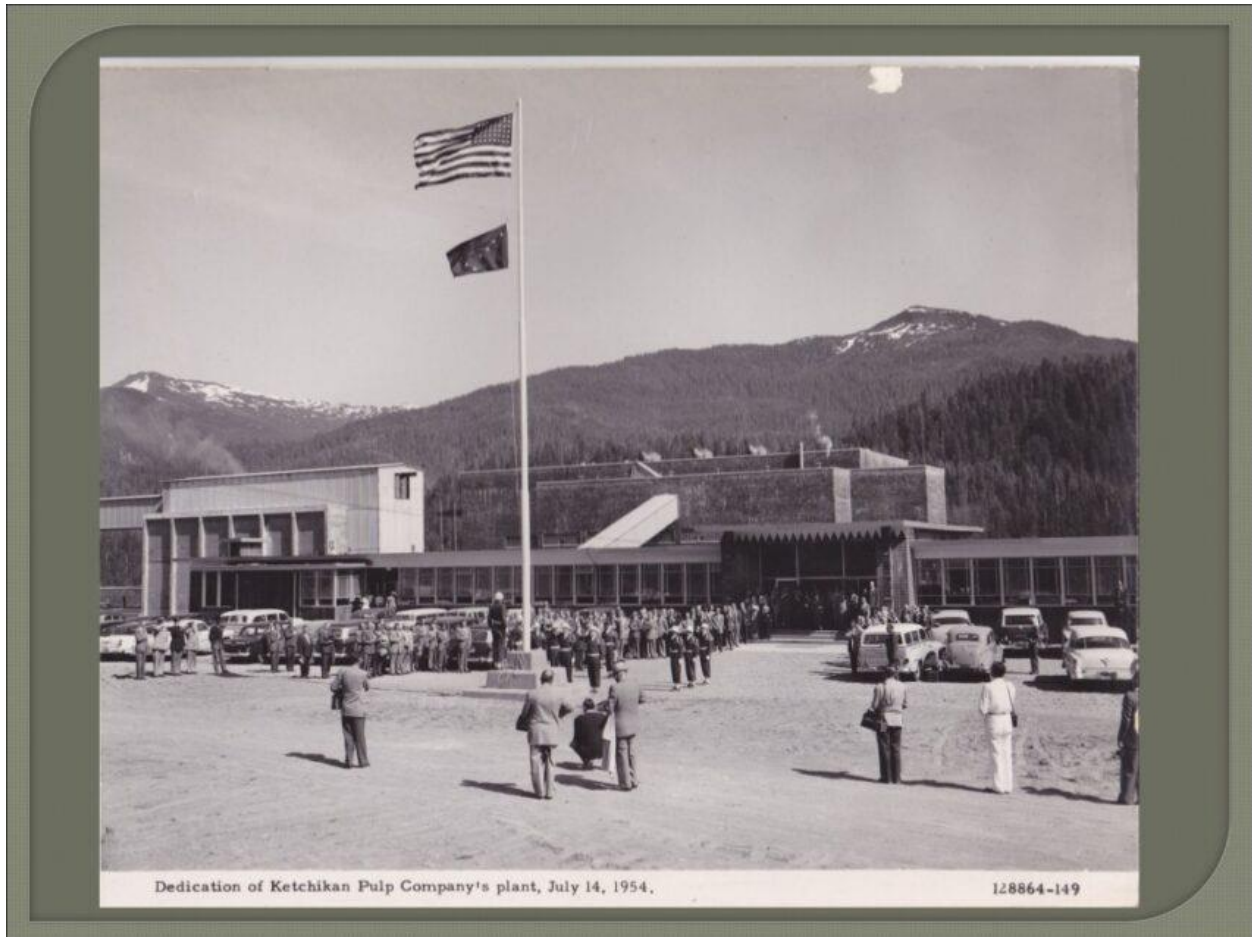
Built on a rock, First Lutheran Church's sanctuary and steeple have stood prominently in Newtown for more than 80 years. HISTORIC KETCHIKAN PHOTO

## The Ketchikan Pulp Mill



Ward Cove is the site of the historic Ketchikan Pulp Mill, the longest operating pulp mill in Alaska, located just 7 miles north of downtown Ketchikan. Completed in 1954 and operated until 1997, the Mill was the economic heartbeat of Southeast Alaska.

The development of the Ketchikan Pulp Company began in 1953 with the creation of the Connell Lake Dam just 2 miles to the north. Freshwater was needed to supply the mill and once the dam was completed in October of that same year, it was capable of supplying millions of gallons of water each day that flowed through a 5-foot wide wooden stave pipeline. That pipeline still exists to this day and continues to supply fresh water daily.



The Ketchikan Pulp Company, a dissolving sulfite pulp mill, opened officially on July 14, 1954. It was originally built as a joint venture between Puget Sound Pulp & Lumber Company and American Viscose Corporation. Eventually, it would become part of Louisiana-Pacific Corporation.

The location in Ward Cove, just 7 miles from the city center of Ketchikan, Alaska, was chosen due to its proximity to a deepwater port as well as the abundance of timber in the Tongass National Forest. The Ketchikan Pulp Mill was the major economic engine for the town of Ketchikan and employed more than 500 people at the height of its productivity.



The pulp that was produced at the mill was used in many different products including rayon for apparel, tires, and what we all use daily medical masks. It was also used to make cellophane and avicel – which was used in products like cosmetics and even in the “fiber added” cereal we all find on our kitchen tables. If you ate cereal as a child, chances are you were eating parts of trees that came right out of this mill.

Today, you can still find many structures that were used in the production of pulp. The precipitator towers which were once used to clean wood chips now serve as an “archway” under which coaches and vans arrive to pick up cruise ship guests. The wood chip silos, which were used to sort the different varieties of wood, remain as a reminder of a bygone era and add to the industrial grittiness of this unique location.

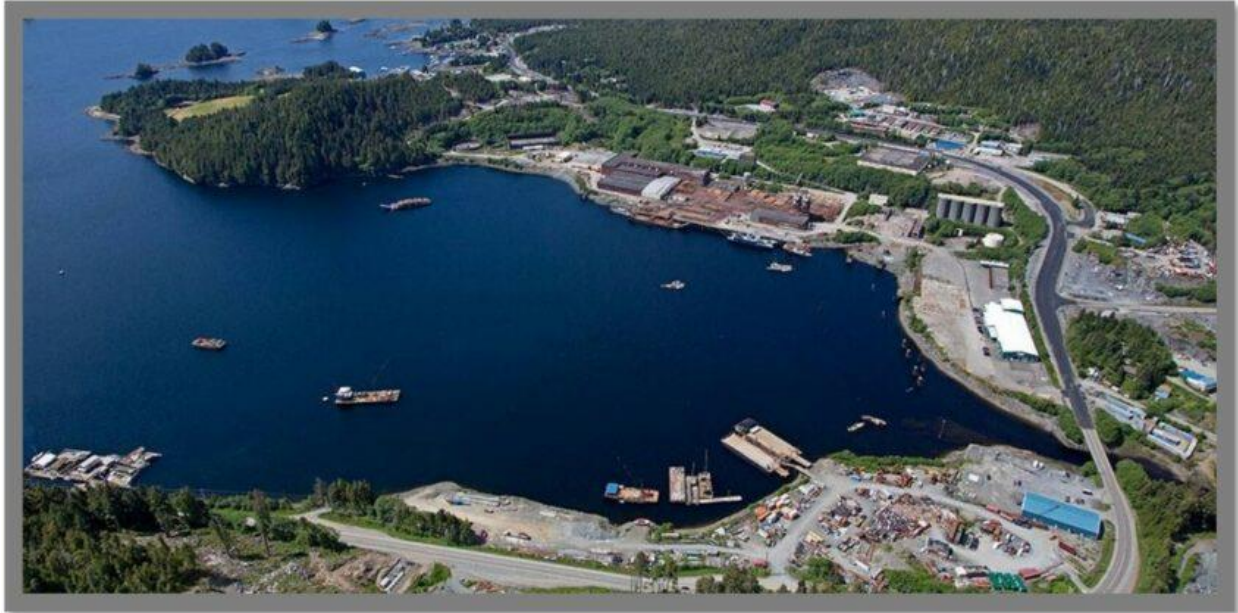


A rail barge loaded with box cars under tow by the M/V Comet leaving Ward Cove and headed south for Prince Rupert, BC.

The main brick structure, where giant bales of pulp were once rolled and sorted, is now our Welcome Center. Great care was taken to preserve the original colors and rustic interior while bringing new life to the building with modern restrooms, food service, and retail offerings.

One of our favorite features of the Mill is the train cars. Rail was the primary method of delivering the pulp products to what we call, “the lower 48”. The rail cars would be loaded with bales of pulp, then taken on the short track to the dock where they would be loaded onto a rail barge. Those trains would then continue their journey by water. A rail barge is simply a large flat vessel that has been fitted with train tracks. They line the tracks up from land to ship and the train cars roll aboard. They would then sail down to Canada where they would transition to the Canadian railroad lines and continue to their final destinations across North America. If you get a chance, walk into one of the rail cars which have been outfitted as restrooms and one is even a great stop for a quick bite to eat now!





On March 25, 1997, Louisiana Pacific announced the closure of the Ketchikan Pulp Mill, the main source of income for the city of Ketchikan for more than 40 years. The final bale of pulp – which is now on display at the Southeast Alaska Discovery Center – rolled off the production line that same day.

When the Ketchikan Pulp Mill was closed, Ward Cove was found to be contaminated with fuels, paints, and heavy metals as well as large quantities of sunken logs which affected the health of all local marine life. Thus, Ward Cove was then declared a Superfund site under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and was remediated with institutional controls under the oversight of the Environmental Protection Agency and the Alaska Department of Environmental Conservation.



In 2019, under the leadership of John Binkley and his family from Fairbanks and Dave Spokely and his family from Ketchikan, a partnership formed between Ward Cove Dock Group, LLC and Norwegian Cruise Lines Holdings Ltd. that saw past the stigma of a CERCLA designation and developed a plan to responsibly repurpose this previously remediated Superfund site.

Under this partnership, a two-berth, floating cruise ship dock was built and Alaska's newest cruise ship destination was created. The innovative design and construction of the Ward Cove project resulted in the receipt of the prestigious Associated General Contractors National Build America Award recognizing state-of-the-art projects that emphasize environmental sensitivity. The innovative design of the dock required fewer pilings to be drilled into the ocean floor, causing less impact on the sand cap. Additionally, the unique construction techniques preserve the sensitive marine environment. Today marine life is thriving in Ward Cove and Ward Cove Dock Group is committed to preserving this sensitive environment.



August 4, 2021, marked the arrival of the first cruise ship to dock at Ward Cove. This was both a momentous and challenging day. From the Covid surge that swept our country as the New Year was rung in, to the CDC slow rolling any hope of a 2021 season; to the miracle of a sure and effective vaccine; to the unanimous passage of the Alaska Tourism Recovery Act; to the Delta variants prolific and stubborn transmission; and too many ups and downs between to count, opening this port has been challenging to say the least.

Through it, all Norwegian Cruise Line has had our back in developing Ward Cove as a premier and unique destination in Alaska. When the Encore cruised silently into Ward Cove on a beautiful day in August, one word came to mind: “gratitude”.

From the economic engine of the timber industry to cruise ships bringing hundreds of thousands of guests to experience the Tongass National Forest, the renovated Pulp Mill has become a metaphor for the multiple uses of this national treasure. This project has transitioned a decaying brownfield site into a place the community takes pride in once again.

As a team, we look forward to providing our guests with once-in-a-lifetime experiences as we share this historic and significant landmark with them and provide economic opportunity to the residents of Ketchikan.

Additional links for more information about the Mill at Ward Cove:

[Ketchikan Pulp Company - Wikipedia](#)

[Ketchikan Pulp Company \(slideshare.net\)](#)

[The Story of Ketchikan Pulp Company - YouTube](#)

## The Alaska Marine Highway System (AMHS) & The M/V Malaspina



(M/V Malaspina docked in Ward Cove) photo credit Tim Hall

### History of AMHS

The story of the Alaska Marine Highway System starts with three men who had a dream to provide dependable marine transportation between Alaska's coastal communities. That dream expanded to become the only marine route recognized as a National Scenic Byway and All-American Road. The system currently extends across 3,500 miles of scenic coastline and provides service to over 30 communities, each with their own unique intrinsic qualities.

The mission of the Alaska Marine Highway System is to provide safe, reliable, and efficient transportation of people, goods and vehicles among Alaska communities, Canada and the 'Lower 48', while providing opportunities to develop and maintain a reasonable standard of living and high quality of life, including social, education and health needs.

## The Founding Years: 1948 - 1962

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### MV Chilkoot (+)



### MV Chilkoot (-)

In 1948, Haines residents Steve Homer, Ray and Gustav Gelotte set up a company named Chilkoot Motorship Lines and purchased the *MV Chilkoot*, an ex-US Navy landing craft. Their first year proved challenging, but they were able to haul the first bus north as one of the first charters over the highway to Anchorage. The Board of Road Commissioners supported Chilkoot Motorship Lines and provided funding for three wood ramps to be built at Tee Harbor, Haines, and Skagway. The ramps were in service at the beginning of 1949.

### Territory Purchases Business (+)



### Territory Purchases Business (-)

After a couple years of service, Chilkoot Motorship Lines faced bankruptcy. Due to snow levels closing the road to Haines between October and May 15 they were not able to operate year-round. They tried to secure contracts with mines in the winter months in order to be profitable; however, these contracts fell through. As news traveled that the service may be discontinued, the Territorial Government came forward and offered to purchase the business. After thoughtful consideration the owners decided to sell Chilkoot Motorship Lines to the territory of Alaska in June 1951.

### MV Chilkat (+)



## MV Chilkat (-)

The *MV Chilkoot* soon proved to be too small. On April 18, 1957 the *MV Chilkat* began daily service between Juneau, Haines and Skagway. On January 3, 1959 Alaska became the 49th state, making *MV Chilkat* the first state-owned ferry. The first Alaska Legislature meeting in 1959 approved the Alaska Ferry Transportation Act. That same year, voters approved bond issues totaling \$18 million to expand the ferry fleet. These bonds enabled the state to commission four new vessels and build docks throughout Southeast Alaska and the Kenai Peninsula.

## The Beginning of AMHS: 1963 - 1964

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### MV Malaspina, MV Taku & MV Matanuska



### MV Malaspina, MV Taku & MV Matanuska (-)

In 1963 the Division of Marine Transportation was formally established, founding the Alaska Marine Highway System, three ships were added to the fleet and five communities gained service. The *MV Chilkat* was joined by the *MV Malaspina*, *MV Taku* and *MV Matanuska* and service extended to Ketchikan, Petersburg, Sitka, Wrangell, and Prince Rupert, BC. In January, *MV Malaspina* was brought online with routes in Southeast, followed by *MV Taku* in April and *MV Matanuska* in June. This increase gave Alaskans access to neighboring communities and the Canadian connection provided a link to the railroad and highway.

### First Port Calls (+)





### First Port Calls (-)

On January 23, 1963, *MV Malaspina* arrived in Ketchikan causing a traffic jam as residents clamored to see their first ferry. Betty J. Marksheffel, a Ketchikan resident, wrote, "I was looking out the window and saw the *Malaspina* in Tongass Narrows. Something happened at that moment – THE FEELING OF ISOLATION WENT AWAY! – as I watched the ship coming up the channel. We could take our car, or walk onboard, and GO SOMEWHERE!!!! Our highway had arrived!" As the *Malaspina* headed north through Southeast Alaska the excitement swelled. In its first year the fleet successfully transported 16,000 vehicles and 83,000 passengers.

### MV Tustumena (+)



## MV Tustumena (-)

By 1964 the focus turned to providing service to Southwest Alaska. The fourth new ferry *MV Tustumena* "Trusty Tusty" came online with a home port of Kodiak. It was built with an elevator capable of loading and unloading vehicles without a ramp, regardless of tide levels, and is used in communities where a dedicated ramp loading directly into the car deck is not available. The *MV Tustumena* is the smallest AMHS vessel with cabins and is accredited as an ocean-going vessel, a classification it shares only with the *MV Kennicott*.

## Adding South Central & Southwest Alaska (+)



### Adding South Central & Southwest Alaska (-)

In 1964, Kodiak, Cordova, Homer, Seldovia, Valdez, and Seward were added to the system and serviced by the *MV Tustumena*. As service extended to additional communities, Alaskans gained access to not only their coastal neighbors, but to other parts of North America – and at a price that was often more reasonable than other forms of transportation. In 1964, the first year of service for both Southeast and Southwest Alaska, AMHS had a total of 5 ferries and 16 ports of call and provided service to more than 100,000 passengers and nearly 22,000 vehicles.

## Expansion: 1965 — 1973

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### Expanding South (+)



### Expanding South (-)

By 1967, the state of Alaska was looking to expand service down to the "Lower 48." The southern terminus of the original route was Prince Rupert and the state was not interested in expanding further south since the Canadian ferries served this purpose. However, problems with the Canadian ferry system and rockslides on the highway out of Prince Rupert finally convinced Alaska to create an alternate route and move the terminus south. Seattle and Bellingham held a spirited battle to be the terminus of the new service and Seattle won the bid.

### Expanding North (+)



### Expanding North (-)

In 1968 Port Lions, Tatitlek and Whittier were added to the system and on May 21, *MV Chilkat* began a Valdez to Whittier run. This created a ferry-rail link with the Alaska Railroad in order to shuttle vehicles between Portage and Whittier, allowing access to the highway system closer to Anchorage. It also provided a connection for Anchorage residents to the Richardson Highway via Valdez. By 1968, traffic levels exceeded 130,000 passengers and 39,000 vehicles.

### MV Wickersham (+)



### MV Wickersham (-)

In 1968, the state purchased a new ocean-going vessel for just under \$7 million to run between Seattle, Washington and Southeast Alaska. It was originally built by A/S Langesund Mekaniske Verksted in Norway and was called the *Stena Britannica*. Once purchased by the state of Alaska, the ship was rechristened the *MV Wickersham*, after Alaska judge and political leader James Wickersham. Due to complications of operating this foreign built vessel, she was put up for sale in 1973 and sold to Rederi AB Sally (Sally Line) in 1974 who renamed her Viking 6. *MV Wickersham* was scrapped in 2001.

### MV E.L. Bartlett



### MV E.L. Bartlett (-)

In 1969, the *MV E.L. Bartlett* was added to the fleet and reached Prince William Sound on July 1. During its years of service, its primary ports were Valdez, Whittier, Tatitlek, and Cordova. It was named after Senator Edward Lewis "Bob" Bartlett who served as Alaska's Territorial Delegate to Congress from 1945-1959. The *MV E.L. Bartlett* was 177'1" long and had a beam of 53'. Its service speed was 12 knots and could carry 236 passengers and 29 vehicles.

### Lengthening Vessels (+)



### Lengthening Vessels (-)

In 1969, *MV Tustumena* was expanded by 56 feet to make her overall length 296 feet. This enabled the vessel to better handle rough waters and to increase the number of staterooms and vehicle capacity. The expansion included bow thrusters, larger electrical generators, and an enclosed sundeck. Similarly, in 1972 the *MV Malaspina* and in 1978 the *MV Matanuska*, were lengthened by 56 feet to make their overall length 408 feet, increasing both passenger and vehicle capacity on these vessels.



## Increased Capacity & Additional Ports: 1974 - 1989

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### MV LeConte, MV Columbia & MV Aurora (+)



### MV LeConte, MV Columbia & MV Aurora (-)

Due to the passage of bonds in 1966 and 1970, the state expanded the fleet to include *MV LeConte* and *MV Columbia* in 1974, and *MV Aurora* in 1977. *MV LeConte* was commissioned with a homeport of Juneau and *MV Aurora* with a homeport of Hoonah. The small size of these vessels made them able to provide service to small ports such as Angoon, Pelican, and Tenakee Springs. On July 5, 1974 *MV Columbia* was acquired with a homeport of Ketchikan. *MV Columbia* is the largest vessel of the fleet, and until 2004 was also the fastest.

### New Southeast Ports & Aleutian Chain Run (+)



### New Southeast Ports & Aleutian Chain Run (-)

New ships and increased capacity meant new ports of call. Therefore, the communities of Hoonah, Kake, Metlakatla, Pelican, Angoon, and Tenakee Springs were added to the system in 1970 through 1979. In 1979, *MV Tustumena* initiated service along the Alaska Peninsula to False Pass, King Cove, and Sand Point. In 1983 and 1984, Chignik, Cold Bay and Dutch Harbor were added to the system. In 1993, Akutan was added, completing the Aleutian Chain run.

### MV Chilkat Sold (+)



### MV Chilkat Sold (-)

After a long history serving the communities of coastal Alaska, the original "Blue Canoe", the *MV Chilkat* was sold in 1988. The *MV Chilkat* was 99 feet long and could carry 59 passengers and 15 vehicles and served the coastal communities of Alaska for over 30 years. After being anchored in different harbors and sold several times over the years, sources indicate that the *MV Chilkat* is currently being used as a scallop boat.

### New Southern Terminus (+)



## New Southern Terminus (-)

On September 29, 1989, *MV Columbia* made its last sailing from Seattle's Pier 48. On October 4, the Washington port and southern terminus moved to Bellingham and the *MV Matanuska* made the first service call from that port. The ship carried the body of the founder of Chilkoot Motorship Lines, Steve Homer, to his final resting place in Haines. On October 6, 1989, *MV Columbia* made the first scheduled sailing out of Bellingham.

## National Acclaim: 1990 - 2012

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### MV Kennicott (+)



### MV Kennicott (-)

In 1998, *MV Kennicott* was commissioned with the homeport of Valdez. The *MV Kennicott* can be transformed into a command center for emergency teams responding to an oil spill, something that was essential following the 1989 Exxon Valdez disaster. The unique vessel design includes a helicopter landing pad, a floating dock that's stored below deck, decontamination showers, and additional communications. The *MV Kennicott* proved to be a very seaworthy and versatile vessel, and for the first time connected the "Lower 48" with South Central Alaska. Due to the addition of the Cross Gulf route, the community of Yakutat gained service in 1998.

National Scenic Byway & All-American Road



### National Scenic Byway & All-American Road (-)

The Alaska Marine Highway gained federal recognition in 2002, when it was named a National Scenic Byway for its scenic, cultural, and archaeological qualities. The Alaska communities served by the byway each have their own indigenous and modern culture, fascinating history and beautiful scenery. In 2005, the Alaska Marine Highway was named an All-American Road by the Federal Highway Administration, the highest designation awarded by the National Scenic Byway Program. It is the only marine route with the designation of National Scenic Byway and All-American Road.

### MV E.L. Bartlett Sold (+)



### MV E.L. Bartlett Sold (-)

In 2003, *MV E.L. Bartlett* was decommissioned and sold to All Alaskan Seafoods on eBay. It would have cost between \$5 million and \$6 million to outfit the ferry to satisfy new federal safety regulations that were to take effect on October 1 of that year. The regulations would have required the *MV E.L. Bartlett* to be outfitted with evacuation chutes and motorized rescue boats. In 2008, the vessel was donated by Lloyd Cannon to the Seattle Maritime Academy.

### MV Lituya, FVF Fairweather & FVF Chenega (+)



### MV Lituya, FVF Fairweather & FVF Chenega (-)

In 2004, *MV Lituya* was commissioned with a home port of Metlakatla making it the first shuttle ferry dedicated to a single route. In that same year, *FVF Fairweather* began service with a homeport of Juneau. Then in 2005, *FVF Chenega* was commissioned with a homeport of Cordova. *FVFs Fairweather* and *Chenega* were the first all-aluminum high-speed vehicle and passenger ferries built in the United States, as well as the first vehicle ferries built in the U.S. to comply with stringent International High Speed Craft code.

### Additional Ports (+)





### Additional Ports (-)

On November 23, 2010, Gustavus, the Gateway to Glacier Bay National Park & Preserve, was added. On April 27, 2012 Ouzinkie, located on Spruce Island just north of Kodiak, became part of the system. And, on June 18, 2012 Old Harbor, an area that is thought to have been inhabited for nearly 2,000 years, also gained service. The addition of these communities meant that the Alaska Marine Highway System provided service to 35 communities going into its 50th Anniversary.

## 50 Years & Counting: 2013 - 2018

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### Celebrating 50 Years (+)



### Celebrating 50 Years (-)

To commemorate the 50th Anniversary, the Alaska Marine Highway began a year-long celebration highlighting the history of the system including vessels and communities serviced. Overall, celebrations were held in 15 communities, including Cordova, Prince Rupert, Ketchikan, Wrangell, Petersburg, Juneau, Haines, Skagway, Pelican, Seldovia, Unalaska, Valdez, Whittier, Bellingham, and Sitka, as well as in Fairbanks and Anchorage. The Ketchikan Gateway Borough also kicked off the anniversary with a proclamation honoring 50 years of service, & Alaska's delegation also entered statements into the Congressional Record.

### In the Spotlight (+)



### In the Spotlight (-)

Throughout the Golden Anniversary, the Alaska Marine Highway received incredible press coverage. Providing public television programming throughout Alaska, 360 North and KTOO helped launch the 50th anniversary with a new documentary featuring the history of AMHS from its inception. From local Alaska outlets such as the *Juneau Empire*, *Alaska Journal of Commerce*, *Petersburg Pilot*, and *KTVA Channel 11* to farther reaching sources such as *The Oregonian*, *The Bellingham Herald*, *Los Angeles Times*, and *The New York Times* the coverage was overwhelmingly positive. Additionally, *Lands' End* featured the crew of the *MV Malaspina* in their business outfitters catalogue which launched in October.

### Alaska Class Ferries (+)



### Alaska Class Ferries (-)

The State of Alaska is well on its way to building two new Alaska Class Ferries. The keels were laid at the Vigor Shipyard in Ketchikan on December 13, 2014. The ferries are scheduled for delivery in the spring and fall of 2019. The Alaska Class Ferry will serve Juneau, Haines, and Skagway and operate as a day boat, with the second one based in Prince William Sound. The vessels will be 280 feet long and carry 300 passengers and 53 vehicles.

### MV Taku Sold (+)



### MV Taku Sold (-)

In 2018 the MV Taku was sold to Jabal Al Lawz Trading Est. The final sale price was \$171,000. The Taku was determined to be in excess of state needs for ferry vessels and outside the realm of what the state could afford to maintain and operate in passenger service with available funding. The vessel was constructed in 1963 and faithfully operated as a part of the Alaska Marine Highway System for over 50 years. The Taku was taken out of service on June 23, 2015.

### MV Tazlina Christened (+)



## MV Tazlina Christened (-)

On August 11, 2018 the first of two Alaska Class ferries, the MV Tazlina, was christened by then First Lady Donna Walker at Vigor's Ketchikan shipyard. The vessel is the first AMHS ferry to carry the Made In Alaska logo. The Tazlina entered service in Lynn Canal in May 2019 and is expected to improve ferry service through the area. The Alaska Class Ferries are longer, wider, deeper, and heavier and can handle much higher winds and seas than the 235 class ferries, MV's Aurora & LeConte.

## Resizing the Fleet 2019 - 2022

### FVF's Fairweather & Chenega Sold (+)



### FVF's Fairweather & Chenega Sold (-)

On March 10, 2021, the Alaska DOT&PF finalized the sale of the AMHS vessels Fairweather and Chenega to Servicios y Concesiones Maritimas Ibicencas S.A. of Ibiza, Spain. The sale price for Chenega was \$3,111,111, and the Fairweather sold for \$2,063,333, for a total of \$5,174,444. AMHS transferred the proceeds into its Vessel Construction Fund, an account used for future AMHS vessel maintenance and construction. The buyer enlisted a heavy-lift ship to pick up the two ferries in Ketchikan to transport both vessels via the Panama Canal to their new homeport in Spain.

Looking forward the Alaska Marine Highway System continues to stay committed to maintaining the infrastructure of the system and the condition of the ships. We are grateful for the support that Alaskans and visitors have shown us throughout the years.

### Tustumena Replacement Vessel Design Phase (+)



### Tustumena Replacement Vessel Design Phase (-)

The Tustumena Replacement Vessel design advances with release of Preliminary General Arrangements. Early work in progress shows the basic break down of decks and spaces. The design team has completed internal review with numerous items identified for revision. Visit the [TRV page](#) for more information and to view current design drawings.

### MV Hubbard Crew Quarters Progress (+)





### MV Hubbard Crew Quarters Progress (-)

AMHS is in the process of adding crew cabins and associated accommodations to the *M/V Hubbard*. Crew cabins will allow the vessel a longer operating day extending its range of operation. After the final installation of the crew cabin modules, the vessel will again be moved outside of the Assembly Building where future work, which includes installation of piping, insulation, mechanical and electrical systems, construction and installation of interior wall panels and floor coverings, installation of interior furniture, and kitchen and galley equipment installations will occur. Concurrently, the State is completing tasks on several of the ship's underwater portions for annual overhaul work. The vessel will also receive all needed USCG and ABS certifications before departing the shipyard ready for revenue service.

### MV Malaspina Officially Retiring to Ketchikan (+)



## MV Malaspina Officially Retiring to Ketchikan (-)

The *M/V Malaspina* will stay in Ward Cove, Ketchikan, Alaska under a sales agreement signed in June, 2022, between M/V Malaspina, LLC and the Alaska Department of Transportation & Public Facilities (DOT&PF). The vessel will be used in a historic restoration effort to showcase Ketchikan's logging and maritime history for the Ketchikan-based visitor's business. The vision of keeping the Malaspina as a historic centerpiece allows the beloved ship to stay in Alaska and serve a useful purpose as worker housing and a potential maritime museum, and hopefully a training platform for students working towards a career in the maritime industry.

Information credit: Alaska Department of Transportation

[History - Alaska Marine Highway System](#)

[SitNews: M/V Malaspina Officially Retiring to Ketchikan, Alaska By DAVE KIFFER](#)

## Connell Lake & Pipeline Trail



Connell Lake is located about three miles east of Ward Cove. A large dam at Connell Lake (man-made) and the four-foot diameter pipeline supplied water to the former mill and now serve as a water source for fire prevention for the North Tongass Fire and Emergency Medical Services (EMS) Area and a sewage treatment plant on the former mill property. The habitat along the pipeline is heavily forested and since the pipeline is gravity fed, the general gradient is downward towards Ward Cove. The wood stave pipeline built in 1954 still functions and runs from the Connell Lake Dam to Ward Cove. Water flows continuously through the pipeline at a rate of 49 million gallons per day, which helps to preserve its integrity. The water is currently used for wastewater treatment and fire hydrant water supply. The pipeline and adjacent service road are maintained yearly when the pipe is checked for integrity and the vegetation is cleared on both sides of the pipeline.

The trail begins at the North Tongass Highway and parallels Revilla Road following a wooden pipeline to Connell Lake. The trail is comprised of gravel and natural tread and follows an old road that is fairly level with few steep inclines. Young alder and salmonberry grow along the trail making some areas thick and brushy. This level, gravel trail offers hiking and mountain biking along a large wooden pipeline. The trail provides links to the Salvage and Ward Creek trails, and the Last Chance Campground. During the summer months, salmonberry, blueberry, and huckleberry bushes provide an easily accessed berry picking spot.

## Tongass National Forest

The Tongass National Forest in southeastern [Alaska](#) is the largest [national forest](#) in the [United States](#) at 17 million acres (69,000 km<sup>2</sup>). Most of its area is part of the [temperate rain forest WWF](#) ecoregion, itself part of the larger [Pacific temperate rain forest](#) WWF ecoregion, and is remote enough to be home to many species of endangered and rare flora and fauna. The Tongass, which is managed by the [United States Forest Service](#), encompasses islands of the [Alexander Archipelago](#), [fjords](#) and [glaciers](#), and peaks of the [Coast Mountains](#). An [international border](#) with [Canada \(British Columbia\)](#) runs along the crest of the [Boundary Ranges](#) of the Coast Mountains.<sup>[2]</sup> The forest is administered from Forest Service offices in [Ketchikan](#). There are local ranger district offices located in [Craig](#), [Hoonah](#), [Juneau](#), Ketchikan, [Petersburg](#), [Sitka](#), [Thorne Bay](#), [Wrangell](#), and [Yakutat](#).<sup>[3]</sup>

### History

The [Alexander Archipelago Forest Reserve](#) was established by [Theodore Roosevelt](#) in a presidential proclamation of 20 August 1902. Another presidential proclamation made by Roosevelt, on 10 September 1907, created the Tongass National Forest. On 1 July 1908, the two forests were joined, and the combined forest area encompassed most of [Southeast Alaska](#). Further presidential proclamations of 16 February 1909 (in the last months of the Roosevelt administration) and 10 June, and in 1925 (by [Calvin Coolidge](#)) expanded the Tongass. An early supervisor of the forest was William Alexander Langille.<sup>[4]</sup>

### Description

The Tongass National Forest is home to about 75,000 people who are dependent on the land for their livelihoods. Three [Alaska Native](#) nations live in Southeast Alaska: the [Tlingit](#), [Haida](#), and [Tsimshian](#). Thirty-one communities are located within the forest; the largest is [Juneau](#), the state capital, with a population of 31,000. The forest is named for the Tongass group of the Tlingit people, who inhabited the southernmost areas of Southeast Alaska, near what is now the city of [Ketchikan](#).

### Ecology

The Tongass includes parts of the [Northern Pacific coastal forests](#) and [Pacific Coastal Mountain icefields and tundra](#) ecoregions. Along with [the Central and North Coast regions of British Columbia](#) designated by environmental groups as the [Great Bear Rainforest](#), the Tongass is part of the "perhumid rainforest zone", and the forest is primarily made up of [western red cedar](#), [sitka spruce](#), and [western hemlock](#). The Tongass is Earth's largest remaining temperate rainforest.<sup>[5]</sup> The terrain underlying the forest is divided between [karst \(limestone](#) rock, well-drained soil, and many caves) and [granite](#) (poorly drained soil).

Unique and protected creatures seldom found anywhere else in [North America](#) inhabit the thousands of islands along the Alaska coast. Five species of [salmon](#), [brown](#) and [black bears](#), and [bald eagles](#) abound throughout the forest. Many migratory birds spend summer months nesting among the archipelago, notably the [Arctic tern](#).

Though its land area is huge, about 40% of the Tongass is composed of wetlands, snow, ice, rock, and non-forest vegetation, while the remaining 10 million acres (40,000 km<sup>2</sup>) are forested. About 5 million

acres (20,000 km<sup>2</sup>) are considered “productive old-growth”, and 4,500,000 acres (18,000 km<sup>2</sup>) of those are preserved as wilderness areas.<sup>[6]</sup>

Historically, logging operations tended to concentrate on lower-elevation, bigger-tree ecosystems for harvesting; at present, approximately 78% of the land remains intact, i.e. 383,000 acres (1,550 km<sup>2</sup>) out of 491,000 acres (1,990 km<sup>2</sup>) original big-tree, low-elevation forest area. Given the high value of these areas for wildlife species, close to 70% of this [old growth forest](#) is protected in reserves and will never be eligible for harvest.<sup>[7]</sup>

Major disturbances in the Tongass National Forest include windfall and landslides. Local winter windstorms referred to as the "Takus" can affect the structure of some stands and often cause single-tree blow-downs.

Of all the old growth in the forest, no more than 11% of the remaining area will ever be harvested. Of the 5,700,000 acres (23,000 km<sup>2</sup>) of "productive old-growth" in the forest, 676,000 acres (2,740 km<sup>2</sup>), or 12% of the total old-growth, are slated for harvest over the next 10 years.<sup>[7]</sup>

### **Wilderness areas**

There are 19 [designated wilderness areas](#) within the Tongass National Forest, more than in any other national forest. They contain over 5,750,000 acres (23,300 km<sup>2</sup>) of territory,<sup>[8]</sup> also more than any other. From largest to smallest, they are:

- Misty Fjords National Monument Wilderness
- [Kootznoowoo Wilderness](#)
- Tracy Arm-Fords Terror Wilderness
- [Stikine-LeConte Wilderness](#)
- Russell Fjord Wilderness
- [South Baranof Wilderness](#)
- [West Chichagof-Yakobi Wilderness](#)
- [Endicott River Wilderness](#)
- [South Prince of Wales Wilderness](#)
- South Etolin Wilderness
- [Chuck River Wilderness](#)
- Tebenkof Bay Wilderness
- Kuiu Wilderness
- Petersburg Creek-Duncan Salt Chuck Wilderness
- [Karta River Wilderness](#)
- Pleasant/Lemesurier/Inian Islands Wilderness
- [Coronation Island Wilderness](#)
- Warren Island Wilderness
- Maurille Islands Wilderness

There are three other wilderness areas within the Alaska Panhandle region that are not part of the Tongass National Forest, but are administered by the [United States Fish and Wildlife Service](#) as part of the [Alaska Maritime National Wildlife Refuge](#). From largest to smallest they are the [Forrester Island Wilderness](#), the [Saint Lázaria Wilderness](#), and the [Hazy Islands Wilderness](#). Also in Southeast Alaska, but

not in the Tongass National Forest, are the [Glacier Bay Wilderness](#) and a small part of the [Wrangell-Saint Elias Wilderness](#), which are both administered by the [National Park Service](#).

## Recreation

The Tongass National Forest offers outstanding recreation opportunities, many of which are only found in Alaska. The forest has close to one million visitors each year. Most come by cruise ships arriving through the Inside Passage of Southeast Alaska. The Forest Service provides visitor programs at the [Mendenhall Glacier Visitor Center](#) in Juneau and the [Southeast Alaska Discovery Center](#) in Ketchikan. The Mendenhall Glacier Visitor Center, built in 1962, was the first Forest Service visitor center in the nation. The forest interpretive program on the state ferries began in the summer of 1968, and was the longest-running naturalist program in the agency until ending in 2013.

There are approximately 150 rustic public recreation cabins for rent across the Tongass in remote locations, reachable by trail, boat, or floatplane. Many are fully accessible. There are 15 campgrounds across the forest, many in spectacular settings with views of glaciers and bald eagles. Six campgrounds offer advance reservations.

In addition, there are several spectacular bear-viewing areas in the forest. The southernmost site is in [Hyder, Alaska](#). One can drive to Hyder through [British Columbia](#). The Fish Creek site is open from mid-July through September for a small permit fee. Both black and brown bears can be seen safely from an elevated viewing platform and boardwalk. Forest staff are on site for safety and to answer questions. The Anan Bear Viewing area is only reachable by boat from Wrangell. Both black and brown bears are seen from early July through August. There is an extensive viewing platform and deck above the river for viewing in safety. A day pass is required before visiting the site. Pack Creek Bear Viewing area at [Admiralty Island National Monument](#) is a 30-minute floatplane trip from Juneau. Brown bear viewing occurs from June to September. The original bear viewing platform was built by the [Civilian Conservation Corps](#) in the 1930s. Today, Forest Service and Alaska Department of Fish and Game staff live on site in summer to provide orientation to the area and answer questions. A permit is required to visit the area. Both black and brown bears can also be seen along many of the over 100 hiking trails in the Tongass National Forest.

## Logging



Forest Service map of the Tongass

Timber harvest in Southeast Alaska consisted of individual hand logging operations up until the 1950s, focusing on low-lying areas and beach fringe areas. In the 1950s, in part to aid in Japanese recovery from [World War II](#), the Forest Service set up long-term contracts with two pulp mills: the [Ketchikan Pulp Company](#) (KPC) and the [Alaska Pulp Company](#). These contracts were scheduled to last 50 years, and originally intended to complement independent saw log operations in the region. However, the two companies conspired to drive log prices down, put smaller logging operations out of business, and were major and recalcitrant polluters in their local areas. Ultimately, virtually all timber sales in the Tongass were purchased by one of these two companies.

In 1974, the KPC contract for Northern Prince of Wales was challenged by the Point Baker Association led by Alan Stein, Chuck Zieske and Herb Zieske. Federal District Court Judge Von Der Hydt ruled in their favor in December 1975<sup>[9]</sup> and March 1976,<sup>[10]</sup> enjoining clearcutting of over 150 square miles (390 km<sup>2</sup>) of the north end of Prince of Wales Island. The suit threatened to halt clearcutting in the United States. In 1976, Congress removed the injunction in passing the [National Forest Management Act](#), a direct response to their lawsuit.<sup>[11]</sup> Over half the old growth timber was removed there by the mid-1990s.

Much of the power of these companies lay in the long-term contracts themselves. The contracts guaranteed low prices to the pulp companies — in some cases resulting in trees being given away for "less than the price of a hamburger."

The Tongass Timber Reform Act, enacted in 1990, significantly reshaped the logging industry's relationship with the Tongass National Forest. The law's provisions cancelled a \$40 million annual subsidy for timber harvest; established several new wilderness areas and closed others to logging; and required that future cutting under the 50-year pulp contracts be subject to environmental review and limitations on old-growth harvest. Alaska Pulp Corporation and Ketchikan Pulp Corporation claimed that the new restrictions made them uncompetitive and closed down their mills in 1993 and 1997, respectively, and the Forest Service then cancelled the remainder of the two 50-year timber contracts.

In 2003, an appropriations bill rider required that all timber sales in the Tongass must be positive sales, meaning no sales could be sold that undervalued the "stumpage" rate, or the value of the trees as established by the marketplace (2008 Appropriations Bill P.L. 110-161, H. Rept. 110-497, Sec. 411). However, the Forest Service also conducts NEPA analyses, layout, and administrative operations to support these sales, and as such, the government does not make a profit overall.<sup>[6]</sup> Given the guaranteed low prices during contract days and the continued high cost of logging in Southeast Alaska today, one analysis concludes that, since 1980, the Forest Service has lost over one billion dollars in Tongass [timber sales](#).<sup>[13]</sup> Logging operations are not the only deficit-run programs, however. The Forest Service likens the overall deficit of the timber harvest program to the many other programs the agency operates at a deficit, including trail, cabin, and campground maintenance and subsistence programs.

High-grading (preferentially targeting for logging the most profitable forest types) has been prevalent in the Tongass throughout the era of industrial-scale logging there.<sup>[14]</sup> For example, the forest type with the largest concentration of big trees—volume class 7—originally comprised only 4% of the forested portion of the Tongass, and over two-thirds of it has been logged.<sup>[15]</sup> Other high-grading has concentrated on stands of Alaska cedar and red cedar. The karst terrain often produces large trees and has fewer [muskeg](#) bogs, and has also been preferentially logged.<sup>[13]</sup>

As of 2008, the Forest Service has released a new [amendment](#) to the Forest Plan for the Tongass Forest.

### **Roadless controversy**

The most controversial logging in the Tongass has involved the [roadless areas](#). Southeast Alaska is an extensive landscape, with communities scattered across the archipelago on different islands, isolated from each other and the mainland road system. The road system that exists in the region is in place because of the resource extraction history in the region, primarily established by the Forest Service to enable timber harvest. Once in place, these roads serve to connect local communities and visitors to recreation, hunting, fishing, and subsistence opportunities long into the future. However, installing roads in the vast wilderness areas of the Tongass is also a point of controversy for many in the American public, as reflected in the [roadless area conservation](#) movement, which has opposed further road construction on the grounds that it would promote [habitat fragmentation](#), diminish wildlife populations and damage salmon spawning streams. Further, they argue that existing roads are sufficient.<sup>[16]</sup>

The Tongass National Forest was included in the Roadless Initiative passed on 5 January 2001, during the last days of the [Bill Clinton](#) Administration, and the initiative prevented the construction of new roads in currently roadless areas of United States national forests.

In September 2006, a landmark court decision overturned Bush's repeal of the Roadless Rule, reverting to the 2001 roadless area protections established under President Clinton. However, the Tongass remained exempt from that ruling. In June 2007, [U.S. House](#) members added an amendment to the appropriations bill to block federally funded road building in Tongass National Forest. Proponents of the amendment said that the federal timber program in Tongass is a dead loss for taxpayers, costing some \$30 million annually, and noted that the Forest Service faces an estimated \$900 million road maintenance backlog in the forest. Supporters of the bipartisan amendment included the [Republicans for Environmental Protection](#). Representative [Steve Chabot](#), an Ohio Republican who sponsored the amendment, said, "I am not opposed to logging when it's done on the timber company's dime... But in this case, they are using the American taxpayer to subsidize these 200 jobs at the tune of \$200,000 per job. That just makes no sense."<sup>[5]</sup>

In July 2009, the [Obama Administration](#) approved clear-cut logging on 381 acres (1.54 km<sup>2</sup>) in the remaining old growth forests of a Tongass National Forest roadless area.<sup>[17]</sup> The timber sale was permanently stopped by a lawsuit.<sup>[18][19]</sup>

In March 2011, Judge [John Sedwick](#) from the Anchorage federal district court, in his ruling,<sup>[20]</sup> reinstated the Roadless Rule on roadless areas in the Tongass, but with three of the Forest Service's recent timber projects excluded from that ruling "without prejudice." Those projects were Iyouktug Timber Sales ROD (record of decision), Scratchings Timber Sale ROD II, and Kuiu Timber Sale Area ROD.<sup>[20]</sup> The Order concluded in part:



Because the reasons proffered by the Forest Service in support of the Tongass Exemption were implausible, contrary to the evidence in the record, and contrary to Ninth Circuit precedent, the court concludes that promulgation of the Tongass Exemption was arbitrary and capricious.

“With the passage of the Roadless Rule, inventoried roadless areas, for better or worse, [were] more committed to pristine wilderness, and less amendable to road development for purposes permitted by the Forest Service.”<sup>[21]</sup>

While the Forest Service may reevaluate its approach to roadless area management in the Tongass, it must comply with the requirements of the APA [the federal Administrative Procedures Act] in doing so.”<sup>[20]</sup>

### **Native Corporation Lands**

Native Corporation Lands are those designated by the Alaska Native Claims Settlement Act of 1971 (ANCSA). This Act conveyed approximately 44,000,000 acres (180,000 km<sup>2</sup>) of Federal land in Alaska to private native corporations which were created under the ANCSA. 632,000 acres (2,560 km<sup>2</sup>) of those lands were hand-picked old growth areas of the Tongass National Forest and are still surrounded by public National Forest land. These lands are now private and under the management of Sealaska, one of the native regional corporations created under the ANCSA.

Transference of public National Forest land to a privately owned corporation removes it from protection by Federal law and allows the owners to use the land in whatever way they see fit without regard to the effects of the use on surrounding lands and ecosystems. This fact has caused much controversy involving the business interests of Native Regional Corporations and the personal interests of local Native and non-Native residents of Southeastern Alaska.

Currently Sealaska, a native regional corporation created under the ANCSA is asking for an amendment to the Act that would distribute additional land to Alaskan Natives. On 23 April 2009, Senator Murkowski and U.S. Rep. Don Young introduced a revised Sealaska bill (S. 881 and H.R. 2099) that requests public lands that are both economically valuable and environmentally delicate. Starting with the session of Congress in 2011, Senator Murkowski reintroduced a slightly modified version of the Sealaska Bill and Representative Don Young introduced a companion bill (S 730 and HR 1408). While HR 1408 was passed out of the Natural Resources Committee, S 730 remains in the Natural Resources Committee of the Senate. A measure attached to the National Defense Authorization Act passed Congress on December 12, 2014 completing land selections promised by the 1971 Alaska Native Claims Settlement Act.

A study released by Audubon Alaska on 22 February 2012 showed that the Sealaska selection of the largest trees in areas designated in S 730 and HR 1408 is 1200 percent greater than the occurrence of these trees in the Tongass as a whole.”<sup>[22]</sup>

There is strong opposition to passage of S 881 coming from seven communities in the Tongass, most on Prince of Wales Island. In addition, there are fears expressed by the Territorial Sportsmen that the [northern goshawk](#) will be listed as endangered if the bill is passed. Similar concerns were expressed by the Alaska Outdoor Council in letters to Senators Murkowski and Begich and Governor Parnell.

## Fun Facts

- Tongass National Forest is 17 million acres large and extends 500 miles along the Pacific coast. That's more than three times the size of any other national forest.
- The Tongass comprises 75% of the land mass of Southeast Alaska.
- Two thirds of the Tongass is scrub forest, ice, rock and muskeg. The remaining one third is considered commercial forestland, and half of that is low volume timberlands. There is only about 4% of old growth left.
- Often called "the forest of islands" the Tongass is in many locations only accessible by air or boat.
- Almost one third of the Tongass (5.7 million acres) is designated to be managed as wilderness.
- Only 4% of the Tongass contains the biggest, most productive old-growth forest, half of which has been clear-cut.
- In 1902 the Alexander Archipelago Reserve was created, which became the Tongass National Forest in 1907 by Presidential proclamation.
- The more than 55" of rain makes up the temperate rainforest, as well as the cool, overcast summers with an average temperature of 61 degrees.
- Trees throughout the Tongass can be anywhere from 200-700 years old; Sitka spruce up to 850 years old.

The Tongass' terrain varies from coastal rain forests to volcanic uplands, from glacial fjords to tundra meadows. Wide stream valleys carved by glaciers slice through dense forests, and the forest's tall snow-capped mountain ranges count some of the highest peaks in North America.

Often called "the forest of islands," the Tongass is in many locations only accessible by air or boat, via a route known as the Inside Passage. The Tongass is also characterized by its lush rainforest of gigantic western hemlock and Sitka spruce. A wet, maritime climate ensures that most areas of the Tongass are doused with anywhere from 8 to 13 or more feet of rainfall a year. Prime growing conditions for the world's largest temperate rainforest means that visitors to the forest should invest in good raingear before arriving.

- The three types of trees native to the Ketchikan area of the Tongass are: Sitka Spruce, Western Hemlock, and Yellow Cedar.
- What roads exist in Southeast Alaska have been developed from forest roads built to reach timber.
- The Tongass is an integral part of our subsistence way of life and an important part of our livelihood economically and recreationally.

# The Flora & Fauna of Southeast Alaska



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## What on Earth is Muskeg?

Like a soggy blanket draped over the landscape, muskeg, or peat bog, covers more than 10 percent of southeast Alaska. It provides a surprisingly fragile home for an abundance of plants that thrive in the wet, acid soil. During the summer, the flowers on many of them add a carpet of soft color to the muted greens and browns typical of muskeg.

Muskeg itself consists of dead plants in various stages of decomposition, ranging from intact sphagnum peat moss or sedge peat to highly decomposed muck. Pieces of wood, such as buried tree branches, roots, or whole trees, can make up 5 to 15 percent of the soil.

The water level in muskeg is usually at or near the surface. Stepping on muskeg is like stepping on a sponge, and walking across it involves avoiding the multitude of open ponds that range in size from potholes to small lakes. Despite their innocuous appearance, muskeg holes can be more than just messy - they can be dangerous. Some are quite deep and offer no footholds to help the unwary climb back out.

Sphagnum moss is the mainstay of muskeg. It soaks up and holds 15 to 30 times its own weight in water. In the process, it keeps water from draining through the soil. So muskegs can form even on relatively steep slopes, especially in Southeast Alaska's cold wet climate.

Muskeg is so wet, acid, and infertile that about the only trees that grow in it are a few stunted shore pine (*Pinus contorta*). These may grow only 5 to 15 feet high and less than 10 inches around in 300 to 400 years.

Muskegs need two conditions to develop: abundant rain and cool summers. A dead plant that falls on dry soil is attacked by bacteria and fungi and quickly rots. If that plant lands in water or on saturated soil, though, it faces a different fate. Air can't get to it, so the bacteria and fungi can't function well. The cool temperatures slow them down even more. All this slows decomposition, and the plant debris accumulates to form peat and eventually, a muskeg.

## MUSKEG: WETLANDS

### THE SCOOP

The colloquial term "muskeg" is used to refer to the complex mosaic of fens, bogs, pools, streams, exposed rock and scrubby forest that becomes increasingly common as one proceeds north. Muskegs do cover 10% of S.E. Alaska, and you won't find muskegs in drier climates. Sometimes the blanket muskeg is continuous from sea level to the alpine and has a very diverse flora with low elevation wetland species mixing with such typically subalpine species, such as subalpine daisy and the Indian hellebore. The top layer of moss is the mainstay of muskeg. The "sphagnum" moss holds 15 to 30 times its own weight in water. The trees are

stunted because of the amount of water, not a lot of nutrients make their way to the tree.

### FUN FACTS

- The "bonsai" looking tree is known as the mountain hemlock.
- The sink holes in the muskegs can reach levels of 20-40 feet deep.
- The blue oil sheen that you see floating on top of the water in muskegs are all natural from decomposing vegetation or decomposing trees that have fallen into the sink holes.
- Muskegs protect the forest from erosion and flooding due to heavy rainfall, however if it is a dry season the muskeg will release water to the forest to prevent loss.
- In the spring just about every other day it seems, there are new "bog" flowers popping up!

### IN THE TLINGIT WORLD

- Tlingit people have used the moss for many different things: fire starter, insulation of houses; also women have used it as the first form of diapers.
- Tlingit men and women use the muskegs to go hunting & hike around.
- The Hudson Bay tea that is gathered is also used as a medicinal purpose by elders for many generations. It is said to be used like the Theraflu; for cold and flu symptoms.

## SECOND GROWTH FOREST



**Second growth** is forest that grows up after a disturbance leads to trees being replaced. This disturbance can be human-caused like logging or a forest fire, or it can be a "natural" disturbance such as an insect infestation or a wildfire. Second growth is dominated by trees that are younger than what are typically found in old growth, and often, but not always, lacks characteristics such as a many-layered canopy, large snags, and large downed wood both on the ground and in the streambeds.

If allowed to grow, second growth will eventually turn into **old growth** as the trees mature and the forest begins to develop old growth characteristics.

<b>Key features of an old growth forest:</b>	<b>Comparative features of an even-aged</b>
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<ul style="list-style-type: none"> <li>• large trees</li> <li>• several vertical canopy layers (ie. understory, mid-story, overstory)</li> <li>• openings in canopy created by fallen trees</li> <li>• standing dead trees, called snags</li> <li>• lots of large, rotting wood on forest floor</li> </ul>	<p><b>second growth forest:</b></p> <ul style="list-style-type: none"> <li>• younger, smaller trees of similar ages</li> <li>• a single canopy layer (trees of similar heights)</li> <li>• solid canopy; generally few openings</li> <li>• few, if any, snags</li> <li>• fewer, smaller-sized rotting wood on forest floor</li> </ul>
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As the forest landowner or the forester charged with managing the forest, we can manage second growth stands to include old growth characteristics. We can leave and/or create snags for certain types of wildlife during harvest. We can leave and/or create large downed wood on the forest floor and in the streams for more structure and habitat. We can leave large trees, and thin smaller trees to encourage the growth of the remaining trees and the shrubs and trees in the "understory".

These management decisions are usually made for each harvest unit, depending on the many different characteristics that make each forest stand unique, and depending on the needs of the land manager. The decision reflects our need for the wood in the trees and our need for a healthy forest!

**WHAT ARE SECONDARY FORESTS?**

Secondary forests are forests regenerating largely through natural processes after significant removal or disturbance of the original forest vegetation by human or natural causes at a single point in time or over an extended period, and displaying a major difference in forest structure and/or canopy species composition with respect to pristine primary forests. Secondary vegetation is generally unstable and represents successional stages. If undisturbed by recurrent disturbances such as grazing, tree felling, and frequent fires, secondary vegetation may slowly be invaded by primary forest trees and can eventually revert to the original type. But the speed of change depends on the frequency and intensity of disturbance, and the availability of seed parents.

On the other hand, a repeated and extended disturbance may deflect the succession. For example, if a secondary forest community is subjected to fire or grazing, or if a second period of cultivation intervenes following an initial disturbance, the development may culminate in replacement of the forest by an open grassland, with or without scattered trees and bushes.

**Origin of secondary forests**

Before large areas of primary forests were destroyed by man (a very recent event), small patches in the pristine forest (mostly openings and bare spots on riverbanks) were the only habitats where secondary species could establish. When a primary forest is first logged it normally contains a high standing volume of timber, a variable proportion of which is marketable, depending upon species composition and market demand. This standing volume

has accumulated over a long period. The quality and volume of commercial timber of the first cut will probably not be matched in future cuts. A return to a pristine forest is unlikely, unless the logged forest is closed to further exploitation for a century or more.

In practice the disturbance of pristine forest vegetation has been gradual. Frequencies and intensities of disturbance have built up incrementally with rapid population growth, changes in forest ownership and land use practices, and forest management systems, in response to changing market and policy forces. By the time of forest reservation, many forests had been farmed, and most forests had permanent villages or hunting camps, and in some areas a significant covering of (swidden) farms studded the forests even in the 17<sup>th</sup> century (Hawthorne and Abu-Juam, 1995). Areas close to forts and coastal trading centers in the West, Central, eastern and southern Africa had been exploited for timber and other utility products over many centuries. In some cases, logs were taken from in-land areas by floatation down rivers.

Different silvicultural and management practices, including uniform, shelterwood selection systems and salvage logging, have been tried in the region (Parren, 1991; Logie and Dyson, 1962). From the 19<sup>th</sup> century to the Second World War, only occasional large trees (1 to 1.5 m diameter) of relatively few commercial species were logged. Heavy felling occurred during and in the post-war period with expanding demand for timber in Europe and an expansion of timber industry at home. Salvage felling and creaming allowed unlimited felling of tree species in demand. In some cases, this was combined with poisoning and removal of non-commercial species. Such actions posed the biggest threat to the management of secondary forests in the region.

### **Categories of secondary forest**

In practice the following categories of secondary forests can be identified (Terms of Reference for this Workshop):

- Post extraction secondary forests: forests regenerating largely through natural processes after significant reduction in the original forest canopy through tree extraction at a single point in time or over an extended period and displaying a major change in forest structure and/or canopy species composition from that of the primary/natural forests on similar site conditions in the area given a long time without significant disturbance.
- Swidden fallow secondary forests: forests regenerating largely through natural processes in woody fallows of swidden agriculture for the purpose of food production by farmers and/or communities.
- Rehabilitated secondary forests: forests regenerating largely through natural processes on degraded lands. Regeneration could be enhanced by protection from chronic disturbance, site stabilization, water management and enrichment planting to facilitate natural regeneration.
- Post-fire secondary forests: forests regenerating largely through natural processes after significant reduction in the original forest canopy caused by fires at a single point in time or over an extended period, and displaying a major change in forest structure and/or canopy species composition from that of potential primary/natural forests on similar site conditions in the area, given a long time without significant disturbance.

- Post-abandonment secondary forests: forests regenerating largely through a natural process after abandonment of alternative land uses such as agriculture or pasture development for cattle production.



## TREES OF SOUTHEAST ALASKA

The trees of Alaska span a vast array of ecosystems from open, wind-swept tundra bordering the Arctic Ocean, and Bering Sea through expansive boreal forests of the Interior to impressive temperate rain forests along the Pacific Coast. Tree composition changes with the prevailing climate across the state. In the Interior, principal species include white spruce, birch, and quaking aspen on uplands, black spruce and tamarack in forested wetlands, and balsam poplar within floodplains. Willows are abundant in the Interior as well, however most do not reach tree size. The coastal temperate rain forests of **southcentral** and **southeastern** Alaska are comprised mainly of western hemlock, and Sitka spruce. Mountain hemlock, Alaska yellow-cedar, western red cedar, and shore pine are most often encountered where soils are more poorly drained. Deciduous trees are uncommon in the temperate rain forests of Alaska, and are represented mainly by red alder and black cottonwood.



Western Hemlock Trees

The Western Hemlock (*Tsuga heterophylla*) is a large evergreen coniferous tree growing to 150-200 feet tall, with a trunk diameter of up to 8 feet. It is the largest species of hemlock, with the next largest (Mountain Hemlock *T. mertensiana*) reaching a maximum of 140 feet. It is native to the west coast of North America, with its northwestern limit on the Kenai Peninsula, Alaska, and its southeastern limit in northern Sonoma County, California. It is closely associated with temperate rain forests, and most of its range is less than 75 miles from the Pacific Ocean. There is however an inland population in the Rocky Mountains in southeast British Columbia, northern Idaho and western Montana. It mostly grows at low altitudes, from sea level to 2,000 feet, but up to 6,000 feet in the interior part of its range in Idaho.



Western Hemlock boughs are used to collect herring eggs during the spring spawn in southeast Alaska. The boughs provide an easily collectible surface for the eggs to attach to as well as provide a distinctive flavor. This practice originates from traditional gathering methods used by Native Alaskans from southeast Alaska.

Leaves — light green to medium green on top, with two whitish parallel lines beneath, 1/4 to 7/8 inch long, blunt-tipped, soft, shiny, and flat, growing from two sides of branch parallel to the ground

Cones — brown, oval-shaped, 5/8 to 1 inch long; thin, papery scales; hanging down at end of twig

Bark — reddish-brown when young, turning gray-brown; scaly when young, becoming thick and furrowed with age

Size at maturity and lifespan — 100 to 150 feet in height and 2 to 4 feet in diameter; 200 to 500 years

Distribution — sea level to subalpine areas; throughout the coastal forest of Southeast Alaska and north to Prince William Sound

### Shore Pine Trees

Depending on subspecies, Shore Pine (*Pinus contorta*) grows as an evergreen shrub or tree. The shrub form is krummholz and is approximately 3.3 to 9.8 ft high. The thin and narrow-crowned tree is 130 to 160 ft. high and can achieve up to 6.6 ft. diameter at chest height. The murrayana subspecies is the tallest. The crown is rounded and the top of the tree is flattened. In dense forests, the tree's a slim, conical crown. The formation of twin trees is common in some populations in British Columbia. The elastic branches stand upright or overhang and are difficult to break. The branches are covered with short shoots that are easy to remove.



Leaves — yellow-green to dark green; 1 to 2 1/4 inches long; two leaves, each a half-round, bundled together, making a circle when pressed together

Cones — light brown; egg-shaped; 1 1/4 to 2 inches long; pointed backwards on branches; woody, with stiff prickles on the end of each scale

Bark — resinous and scaly, becoming furrowed with age; dark brown to blackish

Size at maturity and lifespan — often a small, scrubby tree; 20 to 40 feet in height and 8 to 12 inches in diameter; sometimes 75 feet in height and 18 to 32 inches in diameter on well-drained, sunny sites; 200 to 600 years

Distribution — especially in coastal muskegs; sea level to alpine zone; throughout Southeast Alaska, north to Yakutat

## Red Alder Trees

Red Alder (*Alnus rubra*) is a deciduous tree native to western North America, from southeast Alaska south to central coastal California.

It is the largest species of alder in North America and one of the largest in the world, reaching heights of 66 to 98 ft. The name derives from the bright rusty red color that develops in bruised or scraped bark. The bark is mottled, ashy-gray and smooth, often draped with moss. The leaves are ovate, 2.8 to 5.9 inches long, with bluntly serrated edges and a distinct point at the end; the leaf margin is revolute, the very edge being curled under, a diagnostic character which distinguishes it from all other alders. The leaves turn yellow in the autumn before falling. The male flowers are dangling reddish catkins 3.9 to 5.9 inches long in early spring, and female flowers are erect catkins which develop into small, woody, superficially cone-like oval dry fruit 0.79 to 1.18 inches long. The seeds develop between the woody bracts of the 'cones' they are shed in the autumn and winter.



## Sitka Spruce (Alaska's State Tree)



The Sitka Spruce (*Picea sitchensis*) is a large evergreen tree growing to 120-180 feet tall, and with a trunk diameter of 3-5 feet. It is by far the largest species of spruce, and the third tallest tree species in the world (after Coast Redwood and Coast Douglas-fir).

Sitka Spruce is native to the west coast of North America, with its northwestern limit on Kodiak Island, Alaska, and its southeastern limit near Fort Bragg in northern California (Griffin & Critchfield 1972). It is closely associated with the temperate rain forests and is found within a few kilometers of the coast in the southern portion of its range.

Sitka Spruce is a long-lived tree, with individuals over 700 years old known. Because it grows rapidly under favorable conditions, large size may not indicate exceptional age. The Queets Spruce has been estimated to be only 350 to 450 years old, but adds more than a cubic meter of wood each year.

A unique specimen with golden foliage that used to grow on the Queen Charlotte Islands, known as Kiidk'yaas, is sacred to the Haida Native American people. It was illegally felled, although saplings grown from cuttings can now be found near its original site.

Sitka Spruce is of major importance in forestry for timber and paper production. It is used widely in piano, harp, violin, and guitar manufacture, as its high strength-to-weight ratio and regular, knot-free rings make it an excellent conductor of sound. The Steinway and Sons piano company is well known for using exclusively Sitka spruce soundboards in its pianos. The harp company, Lyon and Healy, is well known for its use of Sitka spruce for the soundboard of their harps as well. This wood is an important material for homebuilt aircraft for the same reasons.

Outside of its native range, it is particularly valued for its fast growth on poor soils and exposed sites where few other trees can be grown successfully; in ideal conditions young trees may grow 4 feet per year. It is naturalized in some parts of Britain where it was introduced in 1831 and New Zealand, though not so extensively as to be considered an invasive weed tree.

Newly grown tips of Sitka Spruce branches are used to flavor spruce beer and are boiled to make syrup.

The root bark of Sitka Spruce trees is used in Native Alaskan basket-weaving designs.

Leaves — dark green, 5/8 to 1 inch long, needle sharp, growing in all sides of branches from woody pegs (a trait common only to spruce)

Cones — light orange-brown, 2 to 3 1/2 inches long, usually found in the top quarter of tree, hanging down from branches, papery scales



Bark — thin and smooth, developing scaly plates with age, gray, becoming dark purplish brown with age

Size at maturity and lifespan — 150 to 225 feet in height and 5 to 8 feet in diameter, grows much larger in the southern part of its range, 500 to 700 years

Distribution — sea level to 3,000 feet elevation in Southeast Alaska, throughout Southeast Alaska, west to Kodiak Island and north to the coast of the Alaska Peninsula.

### Yellow Cedar Trees

This species goes by many common names including Nootka Cypress, Yellow Cypress, and Alaska Cypress. Even though it is not a cedar, it is also often confusingly called "Nootka Cedar", "Yellow Cedar", "Alaska Cedar", or even "Alaska Yellow Cedar". Its name derives from its discovery on the lands of a First Nation of Canada, the Nuuchahnulth of Vancouver Island, British Columbia, who were formerly referred to as the Nootka. Nootka Cypress is native to the west coast of North America, from the Kenai Peninsula in Alaska, south to northernmost California, typically occurring on wet sites in mountains, often close to the tree-line, but sometimes also at lower altitudes.

Leaves — dark green; 1/16 to 1/8 inch long

Cones — patchy green and black, nearly round; 1/2 inch in diameter; scattered among the needles; sharp central point on each cone scale

Bark — shreddy; generally ash gray

Size at maturity and lifespan — 40 to 80 feet in height and 1 to 2 feet in diameter; slow-growing trees; 15 to 20 inches in diameter at 200 to 300 years; up to 1,000 years

Distribution — muskegs, alpine meadows, and nearby forests of Southeast Alaska as far north as Prince William Sound; sea level to timberline in Southeast Alaska, though mainly at elevation of 500 to 1,200 feet; common in northern Southeast Alaska scattered in southern Southeast

## THE COMMON CONIFERS OF SOUTHEAST ALASKA

The temperate rain forest of the panhandle of Alaska is widely known for its lush vegetation. Conifers, cone-bearing trees such as hemlock, and spruce, seem to be everywhere. In reality, they cover a bit over half of southeast Alaska. Western hemlock (70 percent) and Sitka spruce (20 percent) are the most abundant. Western red cedar, yellow-cedar, mountain hemlock, and shore pine make up most of the rest.

### **Sitka spruce (Alaska's state tree)** ***Picea sitchensis***

Leaves -- dark green, 5/8 to 1 inch long, needle sharp, growing in all sides of branches from woody pegs (a trait common only to spruce)

Cones -- light orange-brown, 2 to 3 1/2 inches long, usually found in the top quarter of tree, hanging down from branches, papery scales

Bark -- thin and smooth, developing scaly plates with age, gray, becoming dark purplish brown with age

Size at maturity and lifespan -- 150 to 225 feet in height and 5 to 8 feet in diameter, grows much larger in the southern part of its range, 500 to 700 years

Distribution -- sea level to 3,000 feet elevation in Southeast Alaska, throughout Southeast Alaska, west to Kodiak Island and north to the coast of the Alaska Peninsula



Both species of hemlock have very thin branches and tops that curve downward and appear to be gracefully nodding. In the spring, new vegetation bursting from the buds is bright yellow-green. Here's how to tell them apart:

### **Western hemlock** ***Tsuga heterophylla***

Leaves -- light green to medium green on top, with two whitish parallel lines beneath, 1/4 to 7/8 inch long, blunt-tipped, soft, shiny, and flat, growing from two sides of branch parallel to the ground

Cones -- brown, oval-shaped, 5/8 to 1 inch long; thin, papery scales; hanging down at end of twig



Bark -- reddish-brown when young, turning gray-brown; scaly when young, becoming thick and furrowed with age

Size at maturity and lifespan -- 100 to 150 feet in height and 2 to 4 feet in diameter; 200 to 500 years

Distribution -- sea level to subalpine areas; throughout the coastal forest of Southeast Alaska and north to Prince William Sound

**Mountain hemlock**  
***Tsuga mertensiana***

Leaves -- dark blue-green; 1/4 to 1 inch long; soft but more pointed than western hemlock; growing from all sides of the branch in a tarlike pattern

Cones -- purplish when new, brown when mature; cylindrical; 1 to 2 1/2 inches long; thin, papery scales

Bark -- divided into narrow flattened ridges; becoming thick and deeply furrowed with age; gray when young, turning reddish brown with age

Size at maturity and lifespan -- 50 to 100 feet in height and 10 to 30 inches in diameter; prostrate near timberline; slow-growing trees; size 18 to 20 inches in diameter at 180 to 260 years; 400 to 500 years

Distribution -- sea level to 3,000 to 3,500 feet elevation; throughout Southeast Alaska



**Shore Pine**  
***Pinus contorta* Dougl. var *contorta***

Leaves -- yellow-green to dark green; 1 to 2 1/4 inches long; two leaves, each a half-round, bundled together, making a circle when pressed together

Cones -- light brown; egg-shaped; 1 1/4 to 2 inches long; pointed backwards on branches; woody, with stiff prickles on the end of each scale

Bark -- resinous and scaly, becoming furrowed with age; dark brown to blackish

Size at maturity and lifespan -- often a small, scrubby tree; 20 to 40 feet in height and 8 to 12 inches in diameter; sometimes 75 feet in height and 18 to 32 inches in diameter on well-drained, sunny sites; 200 to 600 years

Distribution -- especially in coastal muskegs; sea level to alpine zone; throughout Southeast Alaska, north to Yakutat



Both species of cedar have scale-like needles that look like braided hair. The needles are small, pointed, smooth, and flattened to the branch. Though commonly called cedars, they are members of the cypress family. Yellow-cedar, also known as Alaska cedar, is named for its bright yellow heartwood, and western red cedar, for its deep reddish brown heartwood. Both are aromatic and highly resistant to rot. Here's how to tell them apart:

**Yellow-cedar**  
***Chamaecyparis nootkatensis***



Leaves -- dark green; 1/16 to 1/8 inch long

Cones -- patchy green and black, nearly round; 1/2 inch in diameter; scattered among the needles; sharp central point on each cone scale

Bark -- shreddy; generally ash gray

Size at maturity and lifespan -- 40 to 80 feet in height and 1 to 2 feet in diameter; slow-growing trees; 15 to 20 inches in diameter at 200 to 300 years; up to 1,000 years

Distribution -- muskegs, alpine meadows, and nearby forests of Southeast Alaska as far north as Prince William Sound; sea level to timberline in Southeast Alaska, though mainly at elevation of 500 to 1,200 feet; common in northern Southeast Alaska scattered in southern Southeast

### **Western red cedar**

#### ***Thuja plicata***

Leaves -- shiny yellow-green; 1/16 to 1/8 inch long; springy, fan-shaped branches, turning up at the ends

Cones -- brown, oval-shaped, 1/2 inch long; clustered near end of branches; cone scales woody and curve outward at maturity

Bark -- fibrous and stringy; cinnamon-red when young, becoming gray with age

Size at maturity and lifespan -- 70 to 100 feet in height in Southeast Alaska (growing much taller in southern part of range); 2 to 4 feet in diameter (occasionally reaching 6 feet); 300 to 700 years (occasionally 1,000)

Distribution -- found in coastal forests in Southeast Alaska; sea level to 3,000 feet elevation; southern Southeast Alaska to just north of Sumner Strait

### **Other Conifers in Southeast Alaska**

Four other species of cone-bearing plants are found in Southeast Alaska. Common mountain juniper (*Juniperus communis*) is a low-spreading evergreen shrub that grows in muskegs, and on dry slopes and rock outcrops in alpine or subalpine areas. Two fir species -- Pacific silver fir (*Abies amabilis*) and subalpine fir (*Abies lasiocarpa*) -- are found in this region. The Pacific silver fir is mainly found east and south of Ketchikan on well-drained sites from sea level to 1,000 feet in elevation. The subalpine fir is most common in Misty Fjords National Monument, the head of Lynn Canal, and in areas of recent glaciation, such as valley bottoms, or on moist subalpine slopes near timberline. Pacific Yew (*Taxus brevifolia*) is rare in Southeast Alaska and found only in the most southern part of the panhandle.

## BERRIES OF SOUTHEAST ALASKA

### Red Baneberry & White Baneberry

*(Actaea rubra & Actaea pachypoda)*

The berries from these two plants are very poisonous. As few as 5 or 6 of them can make you seriously ill. More can cause death. However, it is unlikely that you will eat very many if you are cautious, as they don't taste very good -- they are very acrid-tasting. Most cases of poisoning are with children.

White Baneberry is also known as "Doll's Eyes".

The following information has been taken from my [Ontario Wildflowers](#) website.



### White Baneberry

*(Actaea pachypoda)*

The poisonous berries. This shows how the plants got its alternate common name: Doll's Eyes.

Personally, I don't think there's much danger of anyone eating these berries - they're almost creepy looking.





Berries just starting to form.



Mature berries. Note the conspicuous dot at the end of each one. This is unique. No other plant in Ontario has berries like this (except Red Baneberry).

The berries are **poisonous**.



A photo of the whole plant.

Note the compound leaves, with toothed leaflets.

Red Baneberry berries are sometimes white, making identification of these two plants difficult for novices.

White Baneberry berries are held on thick stalks, and have a large conspicuous dot at the end of each one.

Red Baneberry berries are held on thin stalks and have a tiny dot at the end of each one.



Flowers. Note that the raceme is taller than wide. This is, generally speaking, true for White Baneberry.

Red Baneberry flower racemes are generally as wide as they are tall.

**Red Baneberry**  
(*Actaea rubra*)



Red Baneberry leaf:  
compound, with toothed  
leaflets.

The leaves of Red and  
White Baneberry are  
virtually identical.



Berries just starting to grow.

Note the thin stalks.



Mature berries. Note the glossy bright red color.

The berries are **poisonous**.



Just to confuse identification of this plant, Red Baneberry berries are sometimes white!

The way to tell them apart from White Baneberry, is that Red Baneberry berries are on thin stalks and have a tiny dot at the end of each berry.

White Baneberry berries are held on thick stalks, and have a large conspicuous dot at the end of each berry.



Flowers. Note that the flower raceme is generally as wide as it is tall.

White Baneberry flower racemes are generally taller than they are wide.

## Alaska Berry Picking

### Berry picking brings out Alaskans in droves

Alaska berry picking is akin to beach combing. It is very addictive. If you've ever had a blueberry pie made with fresh blueberries than you know what I mean. Blueberries, Salmonberries, Raspberries and many other berries are all over Alaska. With nearly 50 types of berries in Alaska, most of which are edible, it is no wonder that the fruit has been a mainstay of the **Alaska Native** diet for centuries. Alaska berry picking brings out Alaskans in droves to their favorite spots. In Alaska there are plenty of berries to go around and you can go picking all you want. Remember, bears also love berries and they have the right-of-way. Sing, make noise or wear bear bells so they hear you coming!



### **Very Important!**

I would advise anyone who's never been berry picking in Alaska, to get a book with pictures of berries that include the leaves. Alaska has many similar berries that are poisonous. Leaf identification helps very much so. You'll also want to avoid **all** white berries as every white berry in Alaska is poisonous.

### **Many Types of Alaska Berries:**

The edibility of some depends upon the maturity of the plant. Highbush cranberries are tastier before maturity, while others, like northern red currant, are tastier afterward.

Crowberries and alpine bearberries are among the berries that look tasty all the time, but, in fact, never are — at least not off the plant. Keep in mind that doesn't necessarily mean they aren't good to eat.

Crowberries, for instance, are good for pies and jellies, and bearberries can be mixed with other berries as an 'extender' in pies. This is worth noting because crowberries, which grow on a low, green, shrub-like plant, are often plentiful and untouched in the Anchorage area. They are also said to be best when picked after a good frost.

### Blueberries:

The Alaska berry picking season is anywhere from late August to late September. Very sweet in taste they are far superior to their cultivated cousins. Wild blueberries are an excellent source of vitamin C, niacin, manganese, carbohydrates, and dietary fiber. They also contain little sodium or fat. Generally higher elevations produce sweeter berries. Blueberries get very dark (near black) when they are ripe and about to fall. That is the best time to pick due to taste and sweetness.



### Salmonberries:

Salmonberries ripen in early August. On moist, sunny slopes in Alaska, the Salmonberry plants can form impenetrable thickets. They are a close cousin of the raspberry. The juicy fruit, which looks like a yellow or orange blackberry, is a welcome trailside snack, though too bland for some tastes. Native Alaskans ate not only the berries but also the tender young shoots. Numerous birds and animals also feast on the fruits, which may be abundant in good years. The deep pink flowers are distinctive and may occur along with the fruits.



### Raspberries:

The Raspberry is a plant that produces a tart, sweet, red composite fruit in late summer or early autumn. The fruit is not a true berry but a cluster of drupelets around a central core. Very small, but very tasty. An Alaska Berry Picking favorite.



### Crowberries:



Crowberries are common in bogs and alpine meadows. Very bland raw, but sweetened in a pie, incredible! The crowberry is similar in appearance to a blueberry. It is a light green, mat forming shrub which grows in areas similar to that of the partridgeberry. The Inuit, of which these berries are a staple, call them, "Fruit of the North". Their flowers, male, female, or both sexes are purple-crimson, inconspicuous, and appear May to June. The season usually begins in July and lasts until the first snow. They are almost completely devoid of natural acid and their sweet flavor generally peaks after frost. Crowberries are extremely high in vitamin C, approximately twice that of blueberries.

## Highbush Cranberries:

Just follow your nose to find Highbush Cranberries. But besides being tasty, highbush cranberries can be gathered until after the snow flies. They have a very distinctive smell. It's the smell of fall, a musty fox smell.



Beware of Baneberries! Baneberries, similar in looks to highbush cranberries, can be found interspersed in a patch of waist-high, highbush cranberry foliage. But baneberries have some subtle but noticeable differences from the highbush cranberries. The baneberry's seed is different from the highbush cranberry. It has a little, black crescent-shaped seed inside and a tiny, poppy seed-like black spot on the outside.

## Lingonberries:

Lingonberries ripen in August and are red, tart and smaller than cranberries but with a finer flavor. The jewel-like, ruby-red lingonberries with small, shiny oval-shaped green leaves are much smaller than commercial cranberries. They are found on slender stalks, sometimes in clusters, low to the ground in woods, thickets, mountain slopes and tundra. Lingonberries are an extremely versatile and valuable food source and also have a high level of antioxidants.



## Red Huckleberry Plants: A Valuable Northwest Native

By Kristi Dranginis

Huckleberry plants can be found hiding in plain sight. Whether you are passing a backyard garden or walking in the forest, massive old growth tree stumps are an integral part of the Pacific Northwest's modern landscape. In many places these old giants act as nursery stumps (a stump that, as it decays, creates detritus which contributes to the formation of rich Humus, providing ideal conditions for plant life to flourish) to a host of other plant life. One of the most common inhabitants of these nursery stumps is the red huckleberry (*Vaccinium parvifolium*).



Its bright green and thin crooked branches hang laden with pink-red berries early in the spring. These delicate translucent berries have been a source of food for generations of Northwest natives, animals and people alike. They are rich in vitamin C, available sugars and minerals like manganese. Many native tribes of the Northwest collected the berries and either ate them fresh or dried them to make into cakes for use later in the year. Red huckleberries are easy to collect,



you simply shake one of the branches and make sure to have a basket or open bag ready underneath. The berries will fall easily from their stem.

As heavily used as they are, not everyone enjoys their tangy-tart flavor. It is for this reason that they are usually combined with other berries, like the blueberry (another *Vaccinium* of the Ericaceae family) to add sweetness.

### **Medicinal Uses for Red Huckleberry Plants**

The dried leaves and stems, collected late in the summer to early fall, are medicinally valuable resources as well. According to Thomas Elpel in his thorough book on plants, *Botany in a Day*, "the berries and plants alike are rich in flavonoids, which are consumed for their antioxidant effects". Further, the Red huckleberry plants are known to be, he says "mildly astringent, diuretic and sometimes act as vasoconstrictors". It is because of these properties that a tea of the leaf and stem are helpful in cases of diarrhea as well as a gargle for sore throats and inflamed gums.

Michael Moore, another leading expert on plants, states in his book, *Medicinal Plants of the Pacific West*, that "some folks with allergies and the tendency for skin hyperactivity may find that the tea decreases their inflammatory responses".

Whatever it is that first draws you to the red huckleberry plants, I recommend spending some time sitting next to one of them on their big old nursery stumps and taking in all the beauty and bounty they have to offer. See if you can discover who else relies on the huckleberry for sustenance, being sure to return throughout all times of the year.

### **Cloudberries**

*Rubus chamaemorus*

From Wikipedia, the free encyclopedia

*Rubus chamaemorus* is a [rhizomatous herb](#) native to [alpine](#) and [arctic tundra](#) and [boreal forest](#), producing amber-colored edible fruit similar to the [raspberry](#) or [blackberry](#). English common names include cloudberry,<sup>[1]</sup> bakeapple (in [Newfoundland and Labrador](#)), knotberry and knoutberry (in England), aqpiq or low-bush salmonberry (in [Alaska](#) - not to be confused with true salmonberry, [Rubus spectabilis](#)),<sup>[2]</sup> and averin or evron (in [Scotland](#)).

### **Description**

Unlike most *Rubus* species, the cloudberry is [dioecious](#), and fruit production by a female plant requires pollination from a male plant.

The cloudberry grows to 10–25 cm (4-10 inches) high. The [leaves](#) alternate between having 5 and 7 soft, hand like lobes on straight, branchless stalks. After pollination, the white (sometimes reddish-tipped) [flowers](#) form raspberry-sized [aggregate fruits](#). Encapsulating

between 5 and 25 [drupelets](#), each fruit is initially pale red, ripening into an amber color in early autumn.

### **Distribution and ecology**

Cloudberries occur naturally throughout the [Northern Hemisphere](#) from 78°N, south to about 55°N, and very scattered south to 44°N mainly in mountainous areas. In Europe they grow in the [Nordic countries](#) and the [Baltic states](#). In Asia across northern [Russia](#) east towards the [Pacific Ocean](#). Small populations are also found further south, as a botanical vestige of the [Ice Ages](#); it is found in Germany's [Weser](#) and [Elbe](#) valleys, where it is under legal protection, and rarely in the [moorlands](#) of [Britain](#) and [Ireland](#). In North America, cloudberries grow wild across most of northern [Canada](#), [Alaska](#), northern [Minnesota](#), [New Hampshire](#), and [Maine](#); there is a historical record of a small population formerly occurring on [Long Island](#) east of [New York City](#).<sup>[3][4]</sup>

The cloudberry can withstand cold temperatures down to well below  $-40\text{ }^{\circ}\text{C}$  ( $-40\text{ }^{\circ}\text{F}$ ), but is sensitive to [salt](#) and to dry conditions. It grows in [bogs](#), [marshes](#) and [wet meadows](#) and requires sunny exposures in acidic ground (between 3.5 and 5  $\text{pH}$ ).

Cloudberry leaves are food for [caterpillars](#) of several [Lepidoptera](#) species. The [moth Coleophora thulea](#) has no other known food plants. See also [List of Lepidoptera that feed on Rubus](#).





Male flower



Unripe cloudberry



Cloudberry jam

Wide distribution occurs due to the excretion of the indigestible seeds by birds and mammals. Further distribution arises through its [rhizomes](#) which can develop extensive berry patches.

Cuttings of these taken in May or August are successful in producing a genetic clone of the parent plant.<sup>[5]</sup>

## Cultivation

Despite great demand as a delicacy (particularly in Norway and Finland) the cloudberry is not widely cultivated and is primarily a wild plant. Wholesale prices vary widely based on the size of the yearly harvest, but cloudberries have gone for as much as €10/kg (in 2004).<sup>[6]</sup>

Since the middle of the 1990s, however, the species has formed part of a multinational research project. The Norwegian government, in cooperation with Finnish, Swedish and Scottish counterparts, has vigorously pursued the aim of enabling commercial production of various wild berries (Norway imports 200 - 300 [tonnes](#) of cloudberries per year from Finland). Beginning in 2002, selected [cultivars](#) have been available to farmers, notably "Apolto" (male), "Fjellgull" (female) and "Fjordgull" (female). The cloudberry can be cultivated in Arctic areas where few other crops are possible, for example along the northern coast of [Norway](#).

## Uses

The ripe fruits are golden-yellow, soft and juicy, and are rich in [vitamin C](#). When eaten fresh, cloudberries have a distinctive tart taste. When over-ripe, they have a creamy texture somewhat like yogurt and a sweetened flavour. They are often made into [jams](#), [juices](#), tarts, and liqueurs. In Finland, the berries are eaten with heated "[leipäjuusto](#)" (a local cheese; the name translates to "bread-cheese"), as well as [cream](#) and [sugar](#). In Sweden, cloudberries and cloudberry jam are used as a topping for ice cream, pancakes, and waffles. In Norway, they are often mixed with [whipped cream](#) and sugar to be served as a dessert called "[Multekrem](#)" (cloudberry cream), as a jam or as an ingredient in homemade ice cream. Cloudberry yoghurt—*molte-/multeyoghurt*—is a supermarket item in [Norway](#).<sup>[7]</sup>

In Newfoundland and Labrador, Canada, cloudberries are used to make "Bakeapple Pie" or jam. [Arctic Yup'ik](#) mix the berries with [seal](#) oil, [reindeer](#) or [caribou](#) fat (which is diced and made fluffy with seal oil) and sugar to make "Eskimo Ice Cream" or [Akutaq](#). The recipes vary by region. Along the [Yukon](#) and [Kuskokwim River](#) areas, white fish ([pike](#)) along with shortening and sugar are used. The berries are an important traditional food resource for the Yup'ik.

Due to its high vitamin C content, the berry is valued both by [Nordic](#) seafarers and Northern indigenous peoples. Its [polyphenol](#) content, including compounds, such as [benzoic acid](#), appears to naturally preserve food preparations of the berries.<sup>[8]</sup> Cloudberries can be preserved in their own juice without added sugar, if stored cool.<sup>[9]</sup>

## Alcoholic drinks

In Nordic countries, traditional [liqueurs](#) such as [Lakkalikööri](#) (Finland) are made of cloudberry, having a strong taste and high sugar content. Cloudberry is used as a spice for making [akvavit](#). In northeastern [Quebec](#), a cloudberry liqueur known as chicoutai ([aboriginal](#) name) is made.<sup>[10]</sup>

## Nutrients and phytochemicals

Cloudberrys contain [citric acid](#), [malic acid](#), [α-tocopherol](#), [anthocyanins](#) and the [provitamin A carotenoid](#), [β-carotene](#) in contents which differ across regions of Finland due to sunlight exposure, rainfall or temperature.<sup>[11]</sup> The [ellagitannins](#) [lambertianin C](#) and [sanguin H-6](#) are also present.<sup>[12]</sup> [Genotype](#) of cloudberry variants may also affect [polyphenol](#) composition, particularly for ellagitannins, sanguin H-6, anthocyanins and [quercetin](#).<sup>[13]</sup>

Polyphenol extracts from cloudberrys have improved storage properties when [microencapsulated](#) using [maltodextrin](#) DE5-8.<sup>[14]</sup> At least 14 [volatile](#) compounds, including [vanillin](#), account for the [aroma](#) of cloudberrys.<sup>[15]</sup>

## Cultural references

The cloudberry appears on the [Finnish](#) version of the [2 euro coin](#).<sup>[16]</sup> The name of the hill Beinn nan Oighreag in [Breadalbane](#) in the [Scottish Highlands](#) means "Hill of the Cloudberrys" in [Scots Gaelic](#).<sup>[17]</sup>

The berry is called Bakeapple in [Newfoundland](#). One explanation for the name suggests it is derived from the French term "Baie Qu'Appelle", meaning "What is this berry called?"<sup>[18]</sup>

## Thimbleberry

### **Rubus parviflorus (Thimbleberry)**

Kingdom : Plantae – Plants  
Subkingdom : Tracheobionta – Vascular plants  
Superdivision : Spermatophyta – Seed plants  
Division : Magnoliophyta – Flowering plants  
Class : Magnoliopsida – Dicotyledons  
Subclass : Rosidae  
Order : Rosales  
Family : Rosaceae – Rose family  
Genus : Rubus L. – blackberry  
Species : Rubus parviflorus Nutt. – thimbleberry



An excellent native bramble shrub with thornless stems - a treat for berry lovers, but not as much of a treat as the taste! Thimbleberry grows rapidly and forms dense thickets of upright 4-6' stems.

The large, downy maple-like leaves are 4-8" across and the blossoms are pure white and 2." The tart, red, edible fruits tumble into your hand when ripe. Birds love these berries and often it is a race to see who gets the first taste! Both the berries and the sprouts were prized by Native groups

Thimbleberries like moist soils but will tolerate drier sites. They are found between Alaska and California and east to the Great Lakes are hardy in USDA zones 3-9.

**The following article was written by Colleen Stuckey, who lives on Vancouver Island, British Columbia, Canada.**



Thimbleberry should be named the 'Queen of Berries,' with her ruby amulets and velvet green robes. And the taste of her berries is a regal treat!

Thimbleberry is an upright shrub with multiple, thornless stems or canes reaching heights of 7'. The bark is distinct in that it peels in tiny fragments.

The sizeable leaves are between 4" – 8" across with five points, reminiscent of a maple leaf. Fine hairs are on either side of the leaf, making it soft to the touch. No other member of the Rubus family has this characteristic leaf.

Between May and early July, clusters of 2 –7 showy 1 ½" flowers form. These flowers are pollinated by insects, after which berries develop. The berries turn from pink to scarlet when fully ripe and are soft, cup-shaped and full of tiny seeds.

It is easy to know when to harvest berries: when ripe they tumble effortlessly from the branches at the slightest touch. They ripen extremely fast—just a few hours on a sunny day can turn a hard, pink berry red, soft and delectable.

**Habitat and Range:** The Thimbleberry has an extensive range, from USDA zones 3 - 9. It is found from the southernmost stretches of Alaska, south to California and the mountain ranges in New Mexico, east all the way to the Great Lakes and north to the 55° N latitude.

Thimbleberries are generally found at lower elevations in damp sites at the forest edge on the coast. East of the Cascade Mountains, however, they grow in drier areas although they far prefer moist soils. Thimbleberries can tolerate partial to almost full shade, although the shrubs will grow more lush with more light.



**Photo from Walter Siegmund.**

**Ornamental Value:** Thimbleberry is a beautiful shrub, with prominent white blossoms and wide, velvety leaves that form a dense cover. The vibrant scarlet berries compliment the green foliage.

**Native Plant Gardening / Wildlife Habitat:** Thimbleberry bushes attract a myriad of wildlife. The flowers are a source of nectar for butterflies, the berries are relished by birds and mammals alike and the dense cover of the large leaves acts to protect animals and birds from predation.



Quail, grouse, partridge, thrushes, thrashers, towhees, cardinals and grosbeaks are just some of the birds that feed on the ripe berries. But competition for the berries is stiff! Bears, coyotes, raccoons, squirrels, foxes, opossums and skunks are also very fond of the juicy little treasures.

Factor in the lower level browsers—the voles, rabbits, porcupines and beavers--and then the taller mammals—the deer, moose and Bighorn sheep—all feeding on the twigs, buds and leaves and it's a wonder any of these shrubs can survive!

From a gardener's point of view, these bushes are attractive and pragmatic. Not only can they lure the robins and other winged villains from more prized berry plants (although you ought to taste Thimbleberries, maybe they are the prize—I certainly think so!) but also they can be planted outside of your deer-proof fencing, as the bushes will tolerate browsing.

Consider planting Thimbleberry bushes to hide an unsightly feature in your backyard, as the large leaves will quickly form a low canopy.



**Restoration and Mitigation Value:** Although not helpful in curbing erosion, Thimbleberry grows well on disturbed sites. In fact, Thimbleberry is one of the first plants to assert itself after a major disturbance such as a clear-cut, a fire or a site clearing. Although the top growth may be killed, the rhizomes remain alive and re-sprout. There is also evidence that disturbances serve to waken dormant seed that have lain buried. After such a disturbance, Thimbleberries compete with certain conifers—namely, [Western Hemlock \(\*Tsuga heterophylla\*\)](#), [Sitka Spruce \(\*Picea sitchensis\*\)](#) and [Douglas Fir \(\*Pseudotsuga menziesii\* var. \*menziesii\*\)](#). They often dominate and may slow the return of these trees.

On the other hand, the [Engelman Spruce \(Picea engelmannii\)](#), [Lodgepole Pine \(Pinus contorta var. latifolia\)](#), [Western Larch](#) and [Grand Fir](#) can all establish themselves under the shelter of this shrub.

**Historical / Cultural uses:** Many First Nations groups harvested Thimbleberries extensively. The leaves were mixed with those of wild strawberry and wild trailing blackberry to make tea. The sprouts were collected, peeled and eaten raw as a vegetable (an excellent source of Vitamin C, as are the berries).

Berries were eaten fresh and dried, sometimes with the addition of clams and pressed into cakes, for winter use.

While still pink, they were harvested by some tribes and placed in cedar bark bags. Water was sprinkled on top and they would ripen in the bag. I am sure this was most beneficial as the birds and mammals simply adore these fruit and they fall so quickly from the canes when ready.

The leaves were also used as padding to line baskets. The boiled bark was an ingredient in soap and the dried and crushed leaves were laid on burns to prevent scarring.



**Fruit: Not quite ready**

**Edible and Medicinal Uses:** Before consuming any wild plant be absolutely certain that you have properly identified the plant. It is best to observe a plant through several seasons and stages of growth to be certain you have the correct plant. Use extreme caution in preparation as many wild plants have toxic parts (for example, the roots may be poisonous but not the leaves of some species) and check with a health care professional before using any wild plant medicinally.

Lastly, do not over harvest: leave ample fruit for reseeding and wildlife food. Respect that native plants are already in extreme competition with both human development and such troublesome invasive species as Scotch Broom (*Cystisus scoparius*), Gorse (*Ulex europaeus*) and Purple Loosestrife (*Lysimachia salicaria*).

By depleting an area of a native species, you are essentially inviting an invasive species to establish itself. Pick fruit or leaves in areas where there are large enough numbers of the plant to support harvesting.

Thimbleberries are very edible. In fact, they are one of the tastiest fruit in the Pacific Northwest. Soft, juicy and with a rich flavor, they melt in your mouth. Some people use the leaves in the same way that they use red raspberry leaves therapeutically. However, more research is needed to determine whether the active chemical components are the same between rubus species.



**Propagation Techniques:** Being one of the more difficult of the Rubus species to propagate, it may be best to leave this one to the professional horticulturalist. Cutting the rhizomes into sections during the dormant winter months and then rooting these cuttings in a cold frame is the easiest means of multiplying this plant, although these cuttings may not root.

**Plant Associations:** In the moist sites it prefers, Thimbleberry is found in conjunction with other moisture-lovers: [Red Elderberry \(\*Sambucus racemosa\* var. \*arborescens\*\)](#), [Cow Parsnip \(\*Heracleum lanatum\*\)](#), and [Ninebark \(\*Physocarpus\*\)](#), [Vanilla Leaf \(\*Achlys triphylla\*\)](#), Foamflower (*Tiarella* spp.) and [Salal \(\*Gaultheria shallon\*\)](#).

In the drier sites it can be found among [Snowberry \(\*Symphoricarpos\* spp.\)](#), [Bigleaf Maple \(\*Acer macrophyllum\*\)](#), Lupines (*Lupinus* spp.) and [Oceanspray \(\*Holodiscus discolor\*\)](#).

Lastly, in disturbed sites it grows alongside other pioneer species: [Fireweed \(\*Chamerion angustifolium\* var. \*canescens\*\)](#) and [Salal \(\*Gaultheria shallon\*\)](#).



## **Soapberry**

A spreading to erect shrub, Soapberry is 1 to 4 meters tall, with smooth brownish-grey back and oval-shaped leaves. The buds, young twigs and backs of the leaves are conspicuously dotted with coppery scuff. Inconspicuous male and female flowers grow on separate bushes. The berries are small, soft, orange-red and translucent; they have a strong, sour-bitter taste. Soapberry grow in open woods, gravel soil, and dry slopes. Soapberry ranges from northern Alaska and the Yukon to east-central Oregon.

The berries are not eaten in the usual way, but made into a favorite confection, commonly known as “Indian ice-cream”.

Soapberries are harvested in mid-summer.

The berries should never come in contact with grease or oil – they simply will not whip if allowed to touch the smallest amount; now, even plastic pails are rejected as containers since they are “greasy” to touch.

In the past, Soapberries were preserved by drying, individually or in cakes. Today they are canned or frozen.



The taste of Soapberries is acquired; few people enjoy Indian ice-cream the first time they sample it. Even the sweetest froth has a sour-bitter taste, and an inexperienced eater is usually bothered by the air from the whip accumulating in the stomach.

Tlingits relish soapberries whipped with sugar and a little water, some also add a banana. The foaming action of the whipped berries is caused by the presence of substances called saponins; when beaten, the fruits act much like egg whites or whipping cream. But be prepared, as this gives the fruits a unique flavor.

## PLANTS OF SOUTHEAST ALASKA

### Shoreline Plants

**Species:** *Menyanthes trifoliata* L., buckbean, bogbean

**Family:** Menyanthaceae

The somewhat bean-like, three-lobed leaves held above the water by long, fleshy stalks make buckbean relatively easy to identify. During the summer, buckbean produces spikes of showy pink or white tubular flowers with distinctively fringed petals. The flowers’ rank smell attracts flies and beetles, as well as bees, for pollination. This medium-sized plant commonly sprawls with sphagnum moss in the shallow acidic waters of bogs or in freshwater lakes.



**Leaf:** Large, alternately arranged leaves have 3 oblong- to- oval, smooth-edged or slightly toothed leaflets (2-12 cm long and 1-5 cm wide). The leaves arise on long stalks (5-30 cm) from the plant base. Wing-like appendages (stipules) are found at the base of the leaf stalks.

**Stem:** The stems run horizontally as spongy thick rhizomes, either on boggy soil or sprawling near the water surface. Old leaf bases are often visible.

**Flower:** White or pink-tinged flowers are funnel-shaped with 5 fringed petals and 5 sepals. They are arranged in spikes of 10-20 flowers on leafless stalks 20-40 cm long.

**Fruit:** Capsule contains many shiny yellow-brown buoyant seeds.

**Root:** Thick and somewhat spongy roots arise from rhizomes and may be hanging in the water.

**Propagation:** Seeds and creeping rhizomes.

**Importance of plant:** Buckbean had many historical medicinal uses by Native Americans and Europeans and it is still used by modern herbalists. Some Native Americans used it as an emergency food supply. Occasionally sold as an ornamental pond plant. Leaves sometimes used as a hops substitute for brewing beer.

**Distribution:** Temperate Northern Hemisphere. In Washington mostly west of the Cascades.

**Habitat:** Ponds, bogs, wet meadows, seeps, and lake margins. Neutral to acidic water, often growing with Sphagnum moss.



**May be confused with:** When in bloom, buckbean is unlikely to be confused with other Northwest aquatic plants. The leaves could be confused with marsh cinquefoil ([Potentilla palustris](#)) which usually has more than 3 distinctly toothed leaflets per leaf. Deer cabbage (*Fauria crista-galli*), a related species with heart or kidney shaped leaves, is found in wet areas on the Olympic Peninsula.

## Heracleum maximum

From Wikipedia, the free encyclopedia

*Heracleum maximum*, cow parsnip (also known as Indian celery, Indian rhubarb or pushki) is the only member of the genus [Heracleum](#) native to [North America](#). Its classification has caused some difficulty, with recent authoritative sources referring to it variously as *Heracleum maximum* or *Heracleum lanatum*, or as either a subspecies, *H. sphondylium* subsp. *montanum*, or a variety, *H. sphondylium* var. *lanatum*, of the [common hogweed](#) (*H. sphondylium*). The classification given here follows [ITIS](#).

### Distribution

Cow parsnip is distributed throughout most of the continental [United States](#) except the [Gulf Coast](#) and a few neighboring states. It occurs from sea level to elevations of about 2,700 metres (9,000 ft),<sup>[1]</sup> and is especially prevalent in [Alaska](#). It is listed as "[Endangered](#)" in Kentucky and "Special Concern" in Tennessee. In [Canada](#), it is found in each province and territory, except [Nunavut](#). It may be [weedy](#) or [invasive](#) in portions of its range.<sup>[2]</sup>



The seeds are 8–12 mm (0.3–0.5 in) long and 5–8 mm (0.2–0.3 in) wide.

### Characteristics

Cow parsnip is a tall [herb](#), reaching to heights of over 2 metres (7 ft). The genus name *Heracleum* (from "Hercules") refers to the very large size of all parts of these plants.<sup>[3]</sup> Cow Parsnip has the characteristic flower [umbels](#) of the carrot family ([Apiaceae](#)), about 20 centimetres (8 in) across; these may be flat-topped or rounded, and are always white. Sometimes the outer flowers of the umbel are much larger than the inner ones. The leaves are very large, up to 40 cm (16 in) across, and divided into lobes. The stems are stout and [succulent](#). The seeds are 8–12 mm (0.3–0.5 in) long and 5–8 mm (0.2–0.3 in) wide.<sup>[1]</sup>

The stems and leaves contain [furocoumarins](#), chemicals responsible for the characteristic rash of erythematous vesicles (burn-like blisters) and subsequent hyperpigmentation that occurs after getting the clear sap onto one's skin. The chemical is photosensitive, with the rash occurring only after exposure to ultraviolet light. Because of this, [phytophotodermatitis](#) may occur after using a weed-eater to remove the plants on a sunny day.



The leaves are very large, up to 40 cm (16 in) across, and divided into lobes.

## Uses

[Native American](#) tribes had many different uses for this plant. A common use was to make [poultices](#) to be applied to bruises or sores. In addition, young stalks and leaf stems were used for food, where the outer skin was peeled off giving a sweet flavor. The dried stems were used as drinking straws for the old or infirm, and to make [flutes](#) for children.

A yellow [dye](#) can be made from the roots, and an infusion of the flowers can be rubbed on the body to repel flies and [mosquitoes](#).<sup>[4]</sup>

The [Kutenai](#) (the Kootenai or Kootenay nation, as they refer to themselves outside of Canada) in the Northern Rockies call cow parsnip in their native language *wumash* ([Ktunaxa](#): wumaʃ).<sup>[5]</sup> The [Concow](#) (Konkow or Koyom'kawi, as they refer to themselves) band of the Maidu culture in Northern California call it chou'-mē-ō ([Konkow language](#)).<sup>[6]</sup>

## Bullwhip Kelp

by Sonja Koukel and Roxie Rodgers Dinstel

Bullwhip kelp (*Nereocystis lutkeana*), also called bull kelp, is a large seaweed belonging to the brown algae family. Growing in shallow bays or channels in depths of 30 feet or more, this impressive kelp can grow up to 100 feet in length. Bullwhip kelp is easily recognized by the long, hollow stem that terminates in a floating bulb on which long blades, 9 to 12 feet long, trail in the water. The stem, or stipe, is attached to the ocean bottom with a stout, rootlike holdfast. The bulb, the stipe and the blades are all edible. Nutrition



and Health Seaweed harvesting is generally done in the spring and summer months, although some types of seaweed are available year-round. And, unlike many wild mushrooms, all common Alaska seaweeds are nontoxic. The greatest dangers to seaweed edibility are man-made. When seeking possible beaches for harvesting, assess the quality of the water. Look for any outfalls, old industrial sites, chemical spills or logging dumps in the immediate area that would contaminate the seaweed. You should also check with the Alaska Department of Environmental Conservation (DEC) for information about possible contaminated local water bodies. The DEC report, "Alaska's Impaired Waters," lists known contaminants by water body for many areas of Alaska. This report is available at <https://dec.alaska.gov/water/wqsar/Docs/2010impairedwaters.pdf>. Research on the nutritional value of bullwhip kelp has been conducted, although not extensively. Preliminary research indicates that bullwhip kelp is low in fat, relatively high in protein and very high in potassium, sodium, iodine and magnesium. Bullwhip kelp is also a good source of dietary fiber. Harvesting Bullwhip kelp is best when harvested from June through August. Because it grows in subtidal areas, it may be reached only at low tides. Generally, at high tide all that can be seen is the top portion — the bulb and blades. Use a tide book to prepare for harvesting and familiarize yourself with the timing of the low tides. Generally, the early morning hours in spring coincide with low tides that make



harvesting easier. For collecting bullwhip kelp, a small boat or skiff is required. It's unlikely you would be able to reach bullwhip kelp at low tide on foot. You'll also need:

A sharp knife.

A bucket or a grocery bag, mesh bag or old pillowcase for holding the kelp. Do not use garbage bags since some are treated with chemicals and may contaminate your harvest.

A large waterproof tote will protect your car from drippings when transporting your harvest back home. In your boat, it will protect your harvest from potential contamination from boat gas and oil. When you approach the kelp bed, sometimes referred to as a "cabbage patch," carefully position the boat so that you can grasp the long stem, or stipe. Using the knife, cut down into the water as far as you can, but don't fall in! If you don't want the entire stipe, you may harvest only the bulb and/ or blades from the top of the bulb. Overharvesting of most sea vegetables is not yet a problem. However, be a considerate forager. Do not remove more than you need. Keep in mind that bullwhip kelp is one of the giant kelps that make up the great kelp forests, places that are home to many species, including sea otters, crabs, fish and other ocean creatures. Removing too much will result in the destruction of important habitat. The bulb of bullwhip kelp contains its reproductive organs, so harvesting bulbs before they release their spores may also lead to a reduction in the ecologically-significant local kelp forests.

**Selection, Cleaning and Storage** Occasionally, fresh bullwhip kelp may be found washed up along the shore after a storm. You may harvest and use this kelp if it is still olive brown in color and appears moist. Do not use beached bullwhip kelp if it shows signs of aging such as a woody texture on the exterior, a white interior that displays "cottonlike" fibers and a strong taste of salt. While bullwhip kelp does have a high salt content, the fresh stipe should not have an overwhelming saltiness. The bullwhip kelp stipe and the blades are handled and prepared differently. However, the bulb and the stipe may be processed together in recipes. It's best to process the stipe and bulb within 24 hours of harvest as bullwhip kelp does not keep well under refrigeration or by freezing.

**Blades** Use fresh, rinsed blades in salads, stir-fries or soups. Use your imagination and creativity and add blades to your favorite dishes. To preserve for storage, the blades will need to be dried. To dry bullwhip kelp:

Rinse in fresh water.

Hang to dry outside.

If it is raining, dry blades indoors; however, your house will smell of the sea. When the blades are dry they will be darker brown in color and shriveled up. Store in airtight containers in a cool, dry place.

**Stipes (and bulbs)** The stipe and bulb can be used fresh. However, the most common preservation method used for the stipe is pickling. To prepare the stipe for processing: y Rinse in freshwater to remove the excess salt.

Peel away the brownish outer layer using a vegetable peeler or sharp knife. The outer brown skin will become slimy when it's out of the saltwater. Hold with a paper towel to keep a grasp on the stipe.

The inner "flesh" of the kelp should be a light green in color and firm to the touch. Cut the peeled stipe into rings or slices. When using slices, they should fit into the jars you are using.

Kelp pickles are preserved using the boiling water canning method. Keep jars in hot water until ready to use. For detailed steps on boiling water canning, refer to the Extension publication FHN-000562B, Canning Overview/Equipment, or Extension DVD FHN-01280, Canning Basics. Written publications are available for free download on the CES website; DVDs cost \$5. Recipes

**Bullwhip Kelp Dill Pickles** 4–6 pounds of bullwhip kelp cut into rings or strips 3 cups white vinegar (5 percent) 3 cups water 6 tablespoons canning and pickling salt ¼–⅓ cup fresh or dried dill ¼–⅓ cup mustard seed 4 cloves fresh garlic, chopped, or ¼–⅓ cup dried garlic Begin the pickling process by preparing the brine. In a large pot mix the vinegar, water and salt. Bring to a boil and keep hot. To pack the jars: In the bottom of the hot pint jar, sprinkle 1–2 teaspoons of the dill, garlic and mustard seed. The amount used depends on how spicy you like your pickles. Pack the kelp slices or rings into the hot jars.

When the jars are half filled with the kelp, add more dill, then finish filling the jar with kelp. Fill the jars tightly, leaving a ½-inch headspace. Pour hot brine over the kelp, leaving a ½-inch headspace. Remove air bubbles by sliding a rubber spatula or plastic knife down the sides of the jar, pushing the contents slightly to allow air bubbles to float to the top. Wipe the top rim of the jar with a clean cloth or paper towel. Place the lid and ring on the jar. Process the pickles in the boiling water canner for 11 minutes for pints. Yield: 6 pints

**Bullwhip Kelp Sweet Pickles** 6–8 pounds of bullwhip kelp cut into ½-inch chunks 3½ cups white vinegar (5 percent) 4½ cups white sugar 2 teaspoons celery seed 1 tablespoon whole allspice 2 tablespoons mustard seed. Begin the pickling process by preparing the brine. Combine all ingredients together in the large pot, except for kelp. Bring mixture to a boil. Keep hot. Pack the kelp chunks into the hot pint jars. Leave a ½-inch headspace. Pour hot brine over the kelp, keeping the ½-inch space at the top of the jar.

Remove air bubbles by sliding a rubber spatula or plastic knife down the sides of the jar, pushing the contents slightly to allow air bubbles to float to the top. Wipe the top rims of the filled jars with a clean cloth or paper towel. Place prepared lids and rings on the jars. Process pint jars of pickles in the boiling water canner for 16 minutes. Yield: 4 pints

NOTE: Most seaweeds can be harvested for personal use. However, some restrictions may apply. For more information, contact your local Cooperative Extension office, the Sea Grant Marine Advisory Program or the Alaska Department of Fish and Game.

## Devil's club

From Wikipedia, the free encyclopedia

Devil's club or devil's walking stick (*Oplopanax horridus*, [Araliaceae](#); *syn.* *Echinopanax horridus*, *Fatsia horrida*<sup>[2]</sup>) is a large understory [shrub](#) endemic to the arboreal rainforests of the Pacific Northwest, but also disjunct on islands in [Lake Superior](#). It is noted for its large palmate leaves and erect, woody stems covered in noxious and irritating spines. It is also known as Alaskan ginseng and similar names, however it is not a true [Ginseng](#).

## Description

Devil's club generally grows to 1 to 1.5 metres (3 ft 3 in to 4 ft 11 in) tall; however, instances exist of it reaching in excess of 5 metres (16 ft) in [rainforest](#) gullies. The spines are found along the upper and lower surfaces of veins of its leaves as well as the stems. The [leaves](#) are spirally arranged on the stems, simple, palmately lobed with 5-13 lobes, 20 to 40 centimetres (7.9 to 15.7 in) across. The [flowers](#) are produced in dense [umbels](#) 10 to 20 centimetres (3.9 to 7.9 in) diameter, each flower small, with five greenish-white petals. The [fruit](#) is a small red [drupe](#) 4 to 7 millimetres (0.16 to 0.28 in) diameter.<sup>[2]</sup>

The plant is covered with brittle yellow spines that break off easily if the plants are handled or disturbed, and the entire plant has been described as having a "primordial" appearance. Devil's club is very sensitive to human impact and does not reproduce quickly. The plants are slow growing and take many years to reach seed bearing maturity, and predominately exist in dense, moist, old growth conifer forests in the Pacific Northwest.<sup>[2]</sup>



Shiny red drupes in elongated clusters ([Mount Baker-Snoqualmie National Forest](#)).

## Habitat

This species usually grows in moist, dense forest habitats, and is most abundant in old growth conifer forests. It is found from [Southcentral Alaska](#) to western [Oregon](#) and eastward to western [Alberta](#) and [Montana](#). Disjunct native populations also occur over 1,500 kilometres (930 mi) away in [Lake Superior](#) on [Isle Royale](#) and [Passage Island](#), [Michigan](#) and [Porphyry Island](#) and [Slate Island](#), [Ontario](#).<sup>[1]</sup>

## Propagation

Devil's club reproduces by forming [clonal colonies](#) through a [layering](#) process. What can appear to be several different plants may actually have all been one plant originally, with the clones detaching themselves after becoming established by laying down roots.<sup>[3]</sup>

## Uses



Spines of *O. horridus*, [Squak Mountain State Park, Issaquah, Washington](#)

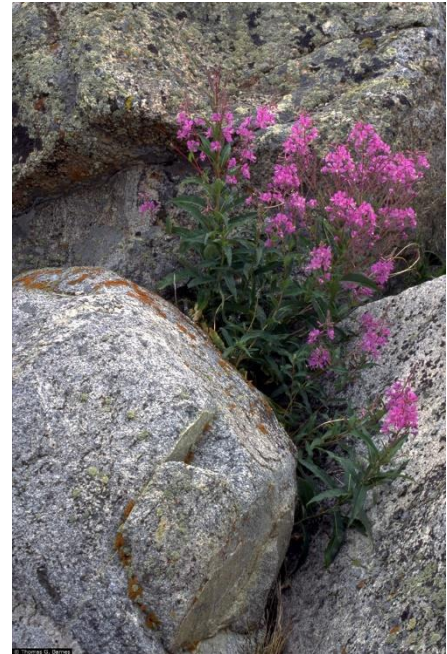


Large leaves extend from the top of spiny stems.

Native American peoples such as the Tlingit and Haida have used the plant as traditional medicine for ailments such as adult-onset diabetes, as well as [rheumatoid arthritis](#).<sup>[4]</sup> Traditionally, it was and is still used to make paints. [In vitro](#) studies showed that extracts of Devil's Club inhibit [tuberculosis microbes](#).<sup>[5]</sup> Additionally, Devil's club has been shown to extend life expectancy and reduce leukemia burden in mice engrafted with murine C1498 [acute myeloid leukemia](#) cells.<sup>[6]</sup>

The plant has also been used ceremonially by the [Tlingit](#) and [Haida](#) people of [Southeast Alaska](#). A piece of Devil's club hung over a doorway is said to ward off evil. The plant is harvested and used in a variety of ways, including [poultices](#) applied externally and ointments, however the consumption of an oral tea is most common in traditional settings. Some Tlingit disapprove of the commercialization of the plant as they see it as a violation of its sacred status.<sup>[7]</sup>

Because Devil's club is related to [American Ginseng](#), some think that the plant is an [adaptogen](#). The plant has been harvested for this purpose and marketed widely as "Alaskan ginseng",<sup>[8]</sup> which may damage populations of Devil's Club and its habitat. The genus [Panax](#) ('true' ginseng) is exceptional among [Araliaceae](#) both morphologically and chemically.<sup>[citation needed]</sup> Other, even closely related plants with proven adaptogen effects, such as [Eleutherococcus senticosus](#) the "Siberian ginseng", are chemically dissimilar to *Panax* ginseng.<sup>[9]</sup>



## Fireweed (*Chamerion angustifolium*)

By Edna Vizgirdas

Fireweed is a tall showy wildflower that grows from sea level to the subalpine zone. A colorful sight in many parts of the country, fireweed thrives in open meadows, along streams, roadsides, and forest edges. In some places, this species is so abundant that it can carpet entire meadows with brilliant pink flowers.

The name fireweed stems from its ability to colonize areas burned by fire rapidly. It was one of the first plants to appear after the eruption of Mt. St. Helens in 1980. Known as rosebay willowherb in Great Britain, fireweed quickly colonized burned ground after the bombing of London in World War II, bringing color to an otherwise grim landscape. Fireweed is the official floral emblem of the Yukon Territory in Canada.

A member of the Evening Primrose family (Onagraceae), taxonomists previously included fireweed in the *Epilobium* (willowherb) genus, but it is now placed in the *Chamerion* (fireweed) group. The Evening Primrose family contains about 200 species worldwide.

A hardy perennial, fireweed stems grow from 4 to 6 feet high but can reach a towering 9 feet. The numerous long narrow leaves scattered along the stems are the origin of the species name "angustifolium" (Latin for narrow leaved). The leaves are unique; leaf veins are circular and do not terminate at the leaf edges. A spike of up to 50 or more pink to rose-purple flowers adorns the top of the stems from June to September. The four petals alternate with four narrow sepals, and the four cleft stigma curls back with age. Each flower is perched at the end of a long cylindrical capsule bearing numerous seeds. Seeds have a tuft of silky hairs at the end. A single fireweed plant can produce 80,000 seeds! The delicate fluffy parachutes can transport seeds far from the parent plant. The fluff was used by native peoples as fiber for weaving and for padding.

Fireweed was important to native people around the world. Choice patches of fireweed were even owned by high-ranking families in British Columbia. Tea was made from the leaves. High in vitamins A and C, fireweed shoots provided a tasty spring vegetable. Flowers yield copious

nectar that yield a rich, spicy honey. Today, fireweed honey, jelly, and syrup are popular in Alaska where this species grows in abundance.

Fireweed can be a beautiful addition to the home garden. Since it reproduces readily from rhizomes as well as from seed, fireweed can quickly take over a garden if left unattended. You will be rewarded for your efforts however, since the colorful flowers are sure to attract lots of pollinators.

## **Boschniakia rossica; Northern Groundcone**

From Wikipedia, the free encyclopedia

*Boschniakia rossica*, commonly known as the northern groundcone, is a [holoparasitic](#) plant that lives in the northern latitudes of the northern hemisphere. In the Pacific Northwest Temperate Rainforest, it does not grow south of Prince of Wales Island, beyond that boundary is the Vancouver groundcone habitat. It does not contain chlorophyll, so it must be parasitic to obtain nutrients. It specializes on *Alnus* species, but can parasitize off of other trees and shrubs such as on *Betula* (birch), *Salix* (willow), *Vaccinium* (blueberry), *Picea* (spruce), and *Chamaedaphne* (leatherleaf shrub). This organism is likely to be found at mid elevations alongside rivers and streams, where moisture is abundant. This species propagates itself through water flow. In some places bears are known to have eaten the starchy roots, or tubers, of this plant.

### **Morphology**

*B. rossica* grows between 6–12 inches, with two or three stems per individual. It has tall slender stalks. The roots grow horizontally from a main bulbous mass. It can vary from very dark maroon to reddish brown in color. This is a perennial plant, and flowers every summer. It can produce up to 300,000 seeds. *B. rossica* very much looks like a pine cone growing up out of the ground.



### **Traditional and other names**

- Poque – other common name
- Cao-cong-rong (China)
- Oniku (Japan)
- Orinamudcobusali (Korea)
- Du'iiinahshèe (Gwichya Gwich'in)
- Doo'iiinahshih/Ts'eedichi (Teetå'it Gwich'in)
- Tulukkam nauligaafa (Inuit)
- Uktschutsch (Kamtschadalis)

### **In Chinese medicine**

In China, *B. rossica* is considered a [Traditional Chinese medicine](#). In the [Changbai Nature Reserve](#), it is considered a protected and endangered species. *B. rossica* has many traditional applications including: cleansing and nourishing the kidneys in tonic form, cures impotence in

men, strengthens the heart, used in invigorating tonics, eases constipation, is used on skin rashes, it has anti-aging effects, used in conjunction with other herbs to increase memory retention. In some First Nations and Native American cultures the whole plant is dried, ground, and used as a topical application, and sometimes smoked in a pipe.

### Modern science

Genetic analyses have been conducted on *B. rossica* to determine its phylogeny. There are many ways to phylogenetically classify *B. rossica*, but scientists from Ohio State University have determined that the family Orobanchaceae is estimated to have originated about 52.2 million years ago.<sup>[1]</sup> The strongest bootstrap support is for terminal clades. The most parsimonious tree of *Boschniakia* forms a grade with *Conopholis* and *Epifagus* as well as other species of *Orobanche*. In this tree, *Lindenbergia* and *Schwalbea* are sister taxa. These are still hypotheses, and further research is being conducted.

## Lysichiton americanus: Skunk Cabbage

From Wikipedia, the free encyclopedia

*Lysichiton americanus*, also called western skunk cabbage (USA), yellow skunk cabbage (UK),<sup>[1]</sup> American skunk-cabbage (Britain and Ireland)<sup>[2]</sup> or swamp lantern, is a plant found in swamps and wet woods, along streams and in other wet areas of the [Pacific Northwest](#), where it is one of the few native species in the [arum family](#). The plant is called skunk cabbage because of the distinctive "skunky" odor that it emits when it blooms. This odor will permeate the area where the plant grows, and can be detected even in old, dried specimens. The distinctive odor attracts its pollinators, scavenging [flies](#) and [beetles](#). Although similarly named and with a similar smell, the plant is easy to distinguish from the eastern skunk cabbage ([Symplocarpus foetidus](#)), another species in the arum family found in eastern North America.

### Description

The plant grows from [rhizomes](#) that measure 30 cm or longer, and 2.5 to 5 cm in diameter. The short-stalked [leaves](#) are the largest of any native plant in the region, 30–150 cm long and 10–70 cm wide when mature. Its [flowers](#) are produced in a [spadix](#) contained within a 7–12 cm, large, bright yellow or yellowish green [spathe](#) atop a 30–50 cm stalk. The flowers are numerous and densely packed. It is among the first flowers to bloom in late winter or early spring.<sup>[3][4][5]</sup> Unlike the genus [Symplocarpus](#) (which includes [S. foetidus](#), the eastern skunk cabbage), the flowers of *Lysichiton* species do not produce heat,<sup>[6]</sup> although this is widely and incorrectly said to be the case.<sup>[7]</sup>



## Distribution

*L. americanus* is found from [Kodiak Island](#) and [Cook Inlet, Alaska](#) south through [British Columbia](#), [Washington](#), [Oregon](#), and [Northern California](#) as far south as [Santa Cruz County](#). Isolated populations are also found in northeastern Washington, northern [Idaho](#), [Montana](#), and [Wyoming](#).<sup>[8][9]</sup>

The plant was introduced into cultivation in the [United Kingdom](#) in 1901 and has escaped to become naturalized in marshy areas in [Britain](#) and [Ireland](#), for example in [Hampshire](#) and [Surrey](#), including [Wisley Gardens](#), and in the north and west of the UK.<sup>[10]</sup>

## Cultivation

It has been used as an ornamental garden plant in [Britain](#) and [Ireland](#), where it grows well in marshy conditions. It has gained the [Royal Horticultural Society's Award of Garden Merit](#).<sup>[11]</sup>

[Hybrids](#) with [Lysichiton camtschaticense](#), called [Lysichiton × hortensis](#), are also cultivated. These have larger spathes than either of the parents.<sup>[10]</sup>

## Other uses

While some consider the plant to be a [weed](#), its roots are food for [bears](#), who eat it after hibernating as a [laxative](#) or [cathartic](#). The plant was used by indigenous people as medicine for burns and injuries, and for food in times of famine, when almost all parts were eaten. The leaves have a somewhat spicy or peppery taste. Caution should be used in attempts to prepare western skunk cabbage for consumption, as it contains [calcium oxalate](#) crystals, which result in a gruesome prickling sensation on the tongue and throat and can result in intestinal irritation and even death if consumed in large quantities. Although the plant was not typically part of the diet under normal conditions, its large, waxy leaves were important to food preparation and storage. They were commonly used to line berry baskets and to wrap around whole salmon and other foods when baked under a fire. It is also used to cure sores and swelling.

## Usnea



Usnea has only one attachment to a tree  
USNEA is not an international committee created by the United Nations. It's a likable lichen. In fact, all but two of the 20,000 or so lichen are forager friendly, if you prepare them correctly. Of the bunch, Usnea gets the Miss Congeniality Award, or the Most Likely to Succeed. First, Usnea (OOS-nay-ah) is relatively low in acid (7% tops) and in small amounts can be eaten as is without soaking, and I have a tender tummy so it is quite compatible. Next, it is mostly carbohydrates, often 96%. It's nearly all food and high in Vitamin C.



Everyone from Native Americans to Europeans to the Chinese used it to dress wounds. What more could you ask for? Here in central Florida it is seen most often on oak trees, but in other areas it can be found on conifers as well as hickory, walnut, apple, mulberry, and golden rain trees. Recently I found some on sumac. Here it is one or two inches long, farther north it can be four or five inches long or more.



Usnea is round, hairy looking, not flat  
All lichen, including Usnea, should be soaked in several changes of water if one is going to eat more than a small amount of it. The leaching reduces the acid level and bitterness. Still, for legal purposes, everything comes with a warning these days. This lichen has been promoted for weight loss via an increase in the metabolism rate. There is no research on the safety or efficacy of eating Usnea for weight loss. I know I like it right off the tree in amounts about one-third to one half the size of a cotton ball, eating it as an occasional trail-side nibble. Larger amounts should be leached of the acid or it will irritate your lower digestive track.

Individual results can vary, try cautiously. Some times it is sweet off the tree, some times bitter. Of the weight loss claims I know nothing

Usnea is not hard to identify if one makes sure to look for specific markers. First it resembles hair, round, and is known as "Old Man's Beard" and "Beard Lichen." Technically it is a fruticose lichen, or a hanging hair lichen. It also resembles Spanish Moss, which was named after Usnea because Spanish Moss looks like it. Here is the big difference between the two:

Usnea has a white, elastic core going through its main trunk. If you gently pull it apart you will see a white core, it might even stretch. Spanish Moss has a black core. In fact, to my knowledge Usnea is the only lichen with a white core. Also most Usnea is gray green and does not change color through the season (there are exceptions. There is a red Usnea but also usable.) The point is, always pull apart the largest piece you can find and check for a very clear, very definite, white core.

### **Witch's Hair (*Alectoria sarmentosa*)**



**KINGDOM** Fungi  
**PHYLUM** Ascomycota  
**CLASS** Ascomycetes  
**ORDER** Lecanorales  
**FAMILY** Alectoriaceae

Witch's Hair hangs from conifer branches in moist forests, especially in the more open old-growth forests where much sunlight penetrates. It is more desiccation-resistant than many other lichens and mosses, so it grows well in the upper canopy where the humidity is lower and winds are higher. It does equally well on lower branches where enough sunlight is present. *Alectoria* looks much like Old Man's Beard, *Usnea*, but lacks the central stemlike cords that characterize that genus.

Where *Alectoria* are common, the lichen loads on trees may reach over a ton per acre dry weight. Many other lichens are present in these wet forests that receive so much moisture from winds that blow from the ocean to the coast. The wet air rises and holds less moisture as it does, so rain and fog are prevalent, furnishing both water and windborne nutrients for these plants.

Although classified here as a fungus, Witch's Hair is actually a lichen, a symbiotic association of a fungus and a green alga. The alga gives it its greenish color and also provides carbohydrates through photosynthesis, just as in a higher plant. The body or thallus of the plant is essentially a home for the alga and transmits nutrients and water to it. As the thallus is provided by the fungus, the combined organism is classified as a fungus.

Reproduction in lichens is by saucer-like fruiting bodies called apothecia. These bodies are relatively seldom seen in Witch's Hair (*Alectoria* means 'unmarried,' perhaps referring to this lack), which propagates vegetatively when bits of it are blown off a branch and land on another one.

Some lichens provide reasonably good nutrition, and both deer and caribou browse on this species during winter, either on low branches or when storms blow it down onto the snow. In some areas, caribou depend on it to make it through the winter, and their access to it is facilitated by a snow crust hard enough for them to walk on. Flying squirrels are also known to make heavy use of this and other lichens in their diet at times.

Witch's Hair has long been used by Northwest Natives as a source of fiber, for example for diapers and bandages. It was used on dance masks as false hair, and ponchos and footwear were woven from it, although considered inferior to hides for this purpose.

## FAUNA

### Brown Bear

**Brown bears** (*Ursus arctos*), also known as grizzlies, occur throughout Alaska except on islands south of Frederick Sound in southeast Alaska, west of Unimak in the Aleutian Chain, and Bering Sea islands. They also occur in Russia, northern China, northern Japan, Europe, western Canada, and in limited portions of the northwestern United States. Brown bears symbolize Alaska as depicted on the back of the state quarter and on the state flag (*Ursa Major* – The Big Dipper). They are also important to Native Alaskans, local residents, hunters, fishers, photographers, and hikers.



**General description:** Brown and grizzly bears are classified as the same species *even* though there are notable differences between them. Kodiak bears (brown bears from the Kodiak Archipelago) are classified as a distinct subspecies (*U. a. middendorffi*) from those on the mainland (*U. a. horribilis*) because they have been isolated from other bears since the last ice age about 12,000 years ago. "Brown bears" typically live along the southern coast of the state where they have access to seasonally abundant spawning salmon. The coastal areas also provide a rich array of vegetation they can use as food as well as a milder climate. This allows them to grow larger and live in higher densities than their "grizzly" cousins in the northern and interior parts of the state. To minimize confusion, this report uses the term "brown bear" to refer to all members of *Ursus arctos*.

The brown bear resembles its close relatives the black bear (*U. americanus*) and the polar bear (*U. maritimus*). Brown bears are usually larger than black bears, have a more prominent shoulder hump, less prominent ears, and longer, straighter claws. Polar bears are similar in size to coastal brown bears, but are more streamlined, lacking the hump. The varying shapes of these bears are adaptations to their particular life styles. Long claws are useful in digging roots or excavating small mammals, but are not efficient for climbing trees. The musculature and bone structure of the hump are adaptations for digging and for attaining bursts of speed necessary for capture of moose or caribou. Color is not a reliable key in differentiating these bears because black and brown bears have many color phases and polar bears may have stained fur. For example, black bear fur may be black, brown, reddish or even shades of grey and white, while brown bear colors range from dark brown through very light blond.

Brown bear weights vary by age, gender, location, and time of year. Bears weigh about one pound (0.5 kg) at birth and attain adult size by age 6. Adult males tend to be 30-50% larger than females. A large male may weigh up to 1,500 lbs. (680 kg) in coastal areas or up to 500 lbs. (227 kg) in interior areas. Bears weigh the least when they emerge from their dens in the spring, and can increase their weight by over 50% during late summer and fall. The largest brown bear ever killed had a skull that was 17.9" (46 cm) and 12.8" wide (33 cm). Such a bear, when standing on its hind feet, would be over 10' (3.0 m) tall.

Brown bears have an exceptionally acute sense of smell, exceeding that of dogs. Contrary to popular belief, bears are not nearsighted. Their eyesight and hearing are comparable to humans. They can run in short bursts up to 40 mph (64 kph) and are excellent swimmers. By all indications, bears are extremely intelligent and most have individual personalities.

**Life history:** Cubs are born in the den during January and February. Twins are most common, but litter sizes can range from 1 to 4. When the cubs emerge in June, they may weigh up to 15 lbs. (7 kg) and they actively explore their world under the constant supervision of their mothers. Mothers can be furiously protective of cubs, however less than half of the cubs survive. Families typically stay together for 2 or 3 years and after separation female cubs tend to stay near where they were raised while males go farther afield. Most brown bears are sexually mature at 5 years old; however, females often do not successfully produce a litter until later. The mating season is in the spring (May to July) and they are serial monogamous (have one mate at a time, but several each year). The oldest brown bear in Alaska was a 39- year old female, while the oldest male was 38.

Bear populations in Alaska are healthy and productive. Densities vary depending on the quality of the environment. In areas of low productivity, such as on Alaska's North Slope, studies have revealed bear densities as low as one bear per 300 mi<sup>2</sup> (777 km<sup>2</sup>). In areas abundant food, such as the Alaska Peninsula, Kodiak and Admiralty Island, densities as high as one bear per square mile (2.6 km<sup>2</sup>) have been found. In central Alaska, both north and south of the Alaska Range, bear densities tend to be intermediate, about one bear per 15-25 mi<sup>2</sup> (39-65 km<sup>2</sup>). These figures do not mean that each bear has this much territory for its exclusive use. The area occupied by any individual bear overlaps those used by many other bears.

**Foods:** Brown bears are very adaptable and like humans, they consume a wide variety of foods. Common foods include salmon, berries, grasses, sedges, cow parsnip, ground squirrels, carrion, and roots. In many parts of Alaska, brown bears are capable predators of moose and caribou, especially newborns. Bears may also be attracted to human camps and homes by improperly stored food and garbage as well as domestic animals.

Although generally solitary in nature, brown bears often occur in large groups in concentrated feeding areas such as salmon spawning streams, sedge flats, open garbage dumps or on whale carcasses. Because of this, they have developed a complex language and social structure to express their feelings and minimize serious fights. These feeding concentration areas also provide opportunities for people to watch bears.

**Winter dormancy:** In the winter when food is unavailable or scarce, most brown bears enter dens and sleep through the winter. Although this is not true hibernation, their body temperatures, heart rate, and other metabolic rates are drastically reduced. While in the den they do not eat, drink, urinate or defecate. Pregnant females are usually the first to enter dens in the fall. These females, with their newborn cubs, are the last to exit dens. Adult males, on the other hand, enter dens later and emerge earlier than most other bears. In northern areas, bears may spend up to 8 months in dens, while in areas with relatively mild winters, such as Kodiak, some male bears stay active all winter.

**Safety:** Brown bears and people can co-exist as long as we treat bears with respect and learn as much as possible about their needs and behavior. Basic bear safety rules include: never approach a bear; only observe them from a safe distance; avoid surprising bears; do not run from bears; and, stay away from animal carcasses that have been claimed by bears. In bear

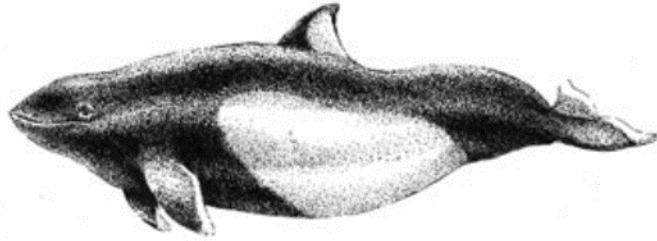
country, campers can minimize conflicts with bears if they reduce food odors, secure food and garbage so bears cannot get it, use electric fences, and avoid camping on bear travel routes.

**Management:** Bear hunting is an important traditional and economic aspect of life in Alaska and with proper management can occur without jeopardizing populations. In most coastal areas brown bear hunting regulations are designed to maintain high bear densities and provide hunters with opportunities to pursue large bears. In many other parts of the state, bear hunting regulations are less stringent as managers strive to balance the numbers of bears with number of moose and caribou available for human hunters. Bear viewing is another popular activity in Alaska and although it is often considered “non-consumptive”, it can have serious impacts on bear populations if it is not conducted properly. Most viewing occurs at places where bears congregate at concentrated food sources that are critical to their survival. If some bears avoid these areas because people are there, those bears may not get the fat and protein they need to make it through the upcoming winter. Managing human behavior around such areas is as important to the continued health of the bear population as is managing bear hunting.

**Research and conservation:** Alaska has over 98 percent of the United States population of brown bears, and more than 70 percent of the North American population, so it has a special responsibility to this magnificent animal. The Alaska Department of Fish and Game is responsible for managing bears in the state and for ensuring that management is based on the best scientific knowledge possible. Important aspects of this effort include maintaining healthy populations of bears throughout Alaska, conserving bear habitat, preventing overharvest, and conducting studies necessary to understand population requirements and how bears and people can co-exist. As Alaska continues to develop, it is critical that everyone recognize their role as stewards of this important resource and strive to safely share our great state with them.

Text: Sterling Eide and Sterling Miller Illustration: R.T. Wallen Revised by Larry Van Daele and reprinted 2008

## Dall's Porpoise



*Phocoenoides dalli*, commonly known as the **Dall's porpoise**, is most easily recognized by its unique black and white markings similar to those of a killer whale/orca. It was named by the American naturalist William Healey Dall who was the first to collect a specimen. The Dall's porpoise is capable of swimming in excess of 30 knots and is often seen riding alongside the bows of boats.

**General description:** The Dall's porpoise is black with white markings. Most commonly the animal will be mostly black with large white sections on the sides, belly, on the edges of the flukes, and around the dorsal fin, though there are exceptions to this pattern. The Dall's porpoise is born at an approximate size of 3ft. The average size of an adult is 6.4 ft and weighs approximately 300 lbs. The body is stocky and more powerful than other members of phocoenidae (porpoises). The head is small and lacks a distinct beak. The flippers are small, pointed, and located near the head. The dorsal fin is triangular in shape with a hooked tip. The mouth of the Dall's porpoise is small and has a slight underbite.

**Food habits:** Dall's porpoises eat a wide variety of prey species. In some areas they eat squid, but in other areas they may feed on small schooling fishes such as capelin, lantern fish (Myctophids), and herring. They generally forage at night.

**Life history:** Female Dall's porpoises reach sexual maturity at between 3 and 6 years of age and males around 5 to 8 years, though there is little known about their mating habits. After a 12 month gestation period, a single calf is born, usually during mid-summer. Calves and their mothers live separate from main porpoise herds for a period of time. Lactation lasts 2-4 months and Dall's porpoise usually have calves every 3 years. The average life span is 16-17 years.

**Habitat and seasonal movements:** Dall's porpoises live solely in the North Pacific Ocean. They range from Japan to southern California and up to Alaska and the Bering Sea. Throughout most of the eastern North Pacific they are present during all months of the year, although there may be seasonal onshore-offshore movements along the west coast of the continental United States, and winter movements of populations out of Prince William Sound and areas in the Gulf of Alaska and the Bering Sea.

**Behavior:** These are perhaps the fastest of the small cetaceans. They are easily recognizable from a distance by the "rooster tail" splash that they make as they surface. This "rooster tail" splash creates a hollow cone, which allows the porpoise to breathe while still under the surface of the water. They generally travel in groups of 10-20, but at times their numbers can reach ten times that. They have an affinity for boats and will often come to ride alongside them.

**Population size:** Estimates of total population size for the whole Northern Pacific in 1983 ranged from 790,000 to 2,300,000 animals. There are an estimated 83,400 Dall's porpoise in

the Alaskan stock, though due to difficulties in gathering reliable population counts and lack of direct effort, these are not exact numbers.

**Predators, hunting, and other mortality:** Killer whales and sharks are the natural predators of the Dall's porpoise; though because of their large body size, speed and agility, its believed they generally escape predation. There is no Dall's porpoise fishery in the United States, but it is estimated that about 30 animals per year are killed as a result of being caught in fishing nets in Alaska. There is still an active Dall's porpoise fishery in Japan. Estimates suggested 40,367 Dall's porpoises were killed in 1989 from the Japanese hand-harpoon fishery alone. In recent years these numbers have declined because of the Japanese government's effort to regulate the hand-harpooning of these animals. In 1992 11,403 were killed. This species is often killed accidentally in the Japanese seas and off of North America by drift nets set for salmon. Although the numbers of Dall's porpoise taken have been drastically reduced in the past decade, at one point it is estimated that over 20,000 were caught in Japan and over 4,000 in the US in a single year. The reduction in incidental catch is a result of better fishing equipment and practices.

Text: John Wells Printed in 2008

## Harbor Seal

The **harbor seal** (*Phoca vitulina*), a widespread species in both the north Atlantic and Pacific oceans, is found in Alaska along the coast extending from Dixon Entrance north to Kuskokwim Bay and west throughout the Aleutian Islands. Harbor seals, and other phocid (true) seals, also are called "hair" seals, which helps distinguish true seals from fur seals. In the Tlingit language, harbor seals are called *tsaa*, the Alutiiq name for seals is *isuwig* and the Inupiaq name is *qasigiaq*.



**General description:** Harbor seals are mammals; that is they have hair and are warm-blooded, air breathing animals which suckle their young. They weigh about 24 pounds (11 kg) at birth and gain weight rapidly during a month-long suckling period, perhaps doubling their weight. They can reach five to six feet (1.7-1.9) in length. Average weight for adults is about 180 pounds (82 kg); males are somewhat larger than females and can weigh up to 285 pounds (129 kg). They are covered with short, stiff, bristle-like hair. Coloration varies, but two basic patterns occur: a dark background with light rings, or light colored sides and belly with dark blotches or spots. Harbor seals molt annually, usually in summer; timing of molt depends upon sex and age class.

Harbor seals are well adapted to life in the sea. They are able to dive to depths up to 1640 feet (500m) and can remain submerged for over 20 minutes, although most dives are less than 65ft

(20m) and less than 4 minutes long. Oxygen-conserving adaptations that allow such dives include high blood volume, reduced peripheral circulation, reduced heart rate, and high levels of myoglobin (oxygen-binding protein in muscle). Harbor seals are graceful and efficient swimmers as they use their hind flippers for propulsion and foreflippers as rudders. Movement on land is accomplished by laborious, caterpillar-like undulations on their bellies.

**Food habits:** Harbor seals are opportunistic feeders and likely take advantage of seasonally available prey resources. In Alaska, commonly eaten prey includes walleye pollock, Pacific cod, capelin, eulachon, Pacific herring, sandlance, Pacific salmon, sculpin, flatfish (e.g., flounder and sole), octopus, and squid.

**Life history:** In Alaska, single pups are born between May and mid-July. Young pups are able to swim almost immediately after birth. They normally remain with their mothers about one month, after which they are weaned and separate from their mother. At that time over half their body weight may consist of fat, providing them a head start on self-sufficiency. Sexual maturity occurs at between 3 and 7 years. Mature females mate shortly after weaning their pups. Development of the embryo is suspended for about 11 weeks; a trait called embryonic diapause (i.e., delayed implantation). Active fetal development is about 8½ months. The sex ratio of harbor seals at birth is approximately equal and remains so until about 5 years of age. Thereafter mortality rates for males are higher, and females become relatively more abundant. Maximum ages estimated from annual rings in their teeth are 26 years for a male and 35 years for a female.

**Seasonal movements:** Harbor seals show variable movement patterns depending on their sex and age class, with some exhibiting considerable localized travel but no seasonal patterns, while others show more extended movements, particularly during the winter. Seasonal use of glacial fjords, where many females aggregate to give birth on icebergs in the summer, is common. Satellite tagging studies have shown that pups may range up to 232 miles (374 km) from their birth site, although most movements are less than 62 miles (100km) away. Juvenile seals can make more extensive movements of up to 186-310 miles (300-500 km) away from their tagging location; however, most remain within 100km. Adult seals typically make shorter movements and on average are within 37 miles (60km) of their tagging site. More recent tagging of seals that occupy glacial fjords has revealed movements of seals from one glacial fiord to another as well as one extensive movement of a juvenile female seal from Glacier Bay in southeastern Alaska to Prince William Sound, an estimated straight-line distance of ~ 520 miles (830 km). As more seals are being satellite-tagged, much more information is becoming available about winter and summer movements.

**Behavior:** Harbor seals haul out of the water periodically to rest, give birth, and nurse their pups. In winter seals spend up to 80% of their time in the water. In spring and summer they spend more time hauled out during pupping and molt season. Reefs, sand and gravel beaches, sand and mud bars, and glacial, pan ice, and sea ice are commonly used for haul-out sites. Harbor seals are sometimes found in rivers and lakes, usually on a seasonal basis (present in summer, absent in winter). At Iliamna Lake, seals are present year-round and are probably resident. Births of harbor seal pups are not restricted to a few major rookeries (as is the case for many species of pinnipeds) but occur at many haul-out sites. Most harbor seals are closely associated with nearshore coastal waters (<25 km from land); however, there have been a few cases of seals making trips to the continental shelf margin (50-100km offshore). While harbor seals will often voluntarily swim close to humans on beaches or in small boats, seals resting on



land or ice are wary of people and will rush into the water if approached too closely. If disturbed too often, seals have been known to abandon favorite haul-out sites or their pups.

**Population size:** Harbor seals are difficult to census because they can be accurately counted only when they are hauled out. They haul out at different times of the day at thousands of locations in Alaska; both at terrestrial sites and on glacial ice calved from tidewater glaciers. The proportion of the total population hauled out at any given time is unknown as some seals are in the water and not available to be counted during a given survey. The total Alaska harbor seal population is estimated at approximately 141,000 in non-glacial sites and approximately 15,000 in glacial fjords.

The number of harbor seals has declined in several areas of the Gulf of Alaska, Prince William Sound, and the Aleutian Islands since the mid-1970s. At Tugidak Island near Kodiak, numbers declined 90 percent from approximately 11,000 seals to 1,000. Seal numbers began increasing in the Kodiak area in the mid-1990s and in Prince William Sound around 2002. A greater than 65% decline in seal numbers has been documented in Glacier Bay since the early 1990s; seals there continue to decline at a precipitous rate. The reasons are unknown but multiple factors are likely involved.

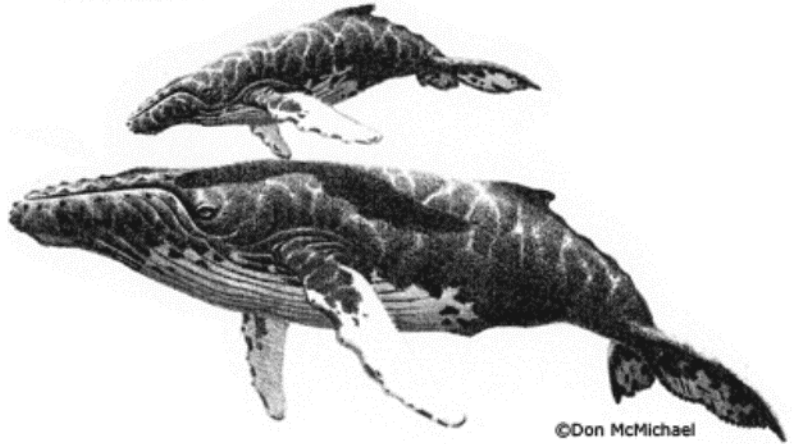
**Predators, hunting, and other mortality:** The most common predator of harbor seals is the killer whale. Other predators include sharks, sea lions, and land predators such as wolves, bears and coyotes. Since implementation of the Marine Mammal Protection Act in 1972, hunting has been restricted to Alaska Natives. Harbor seals play a crucial role in the culture and diet of Alaska Natives; the annual subsistence harvest of harbor seals in Alaska is about 1,800 to 2,900 animals, with fewer seals harvested in recent years. The harbor seal's ability to damage or remove salmon from gillnets has caused conflicts between seals and commercial fishers in Alaska. This behavior creates economic losses for fishers and often fosters an antagonistic attitude toward seals. The Copper River Delta, the mouths of the Stikine and Taku rivers, and portions of Bristol Bay are areas with notable harbor seal-fishery conflicts. Sometimes seals are caught and killed or injured in fishing gear, primarily in gillnets and occasionally in crab pots.

Text: Edward Kinkhart, Ken Pitcher, and Gail Blundell Illustration: R.T. Wallen Revised and reprinted 2008

## Humpback Whale

### The humpback whale

(*Megaptera novaeangliae*) is a found worldwide in tropical, temperate and subpolar waters, and can commonly be seen feeding in shallow waters along the southern coast of Alaska. In the North Pacific, humpback whales migrate from winter breeding grounds near Japan, Hawaii or Mexico to summer feeding grounds from Washington to as far north as the Chukchi Sea.



### General description:

The humpback whale is a baleen whale, and one of the largest members of the rorqual family. Adult females average 49 ft (15m) in length and weigh approximately 35 tons, with adult males being slightly smaller. Rorquals can be distinguished by having both a dorsal fin and ventral pleats running from the tip of the lower jaw back to the belly area. The humpback whale has a distinctive robust body shape that narrows to a slender peduncle. The head is broad and rounded when viewed from above, but slender in profile. The top of the head and the lower jaw contain a series of rounded fleshy knobs. Humpbacks are predominantly black, but have varying degrees of white on the throat, belly, flippers and flukes. Humpbacks can be distinguished from other whales by the extremely long flippers with large knobs on the leading edge. The flippers can reach 25 to 30 percent of the total length of the animal. The flukes are broad with sharp points and serrated edges. The shape and pattern of each whale's dorsal fin and flukes are distinct and have been used by biologists to identify and monitor individual animals.

**Food Habits:** Baleen whales take their name from the fringed plates called baleen which hang downward on either side of the upper jaw. Humpback whales have a series of 270-400 baleen plates that are dark in color and measure about 30 in (76cm) long. During feeding, large volumes of water and food can be taken into the mouth because the pleated grooves in their throat allow for a substantial amount of expansion. As the mouth closes, water is forced through the baleen plates, which act as a sieve, trapping the food inside the mouth. They are also known for utilization of bubble nets, created by releasing air bubbles while swimming in circles beneath their prey, then lunging, open mouthed, to the surface through the center of the concentrated prey. Humpback whales rarely feed while migrating or during the winters in the tropical waters. Feeding occurs almost exclusively during the summer months and animals live off of fat reserves while breeding. During feeding, each humpback whale eats up to 1.5 tons of food per day that consists mainly of euphausiids (krill), and various small schooling fishes.

**Life History:** Females reach sexual maturity at 5 years and males at 7 years. Humpbacks are believed to live to be 40-50 years old. Aging of adult whales has proven to be difficult and studies on aging techniques are ongoing. Females have an 11.5 month gestation period and give birth to a single calf every 1-3 years. Calves nurse for 6-10 months on milk that is

45-60% fat (human milk is 2% fat). At birth, calves average 10-15 ft (3-5m) in length and weigh about 1.5 tons.

**Seasonal movements:** The humpback whale is a migratory species, spending its summers in temperate and subpolar waters, but mating and calving in tropical and sub-tropical waters closer to the equator. Humpbacks may be seen at any time of year in Alaska, but most animals winter in temperate or tropical waters near Mexico, Hawaii, and in the western Pacific near Japan. An exception to this rule is a population that remains year-round in the Arabian Sea. Migrations of up to 3,000 miles (4,800 km) each way are typical. In the spring, the animals migrate back to Alaska where food is abundant and tend to concentrate in several areas including Southeast Alaska, Prince William Sound, Kodiak, the Barren Islands at the mouth of Cook Inlet, and along the Aleutian Islands. The Chukchi Sea is the northernmost area for humpbacks during their summer feeding, although, in 2007, humpbacks were seen in the Beaufort Sea east of Barrow, which would suggest a northward expansion of their feeding grounds.

**Behavior:** Humpbacks are usually observed alone or in small groups that persist for only a few hours. Groups may stay together a little longer in summer in order to forage and feed cooperatively. Long-term relationships lasting months or even years, have been observed, but are rare. Humpbacks are renowned for their various acrobatic displays. One of the more spectacular behaviors is breaching, which researchers believe may be related to courtship or play. During mate selection, groups of 2-20 males can gather around a single female and exhibit a variety of behaviors in order to establish dominance. Breaching, spy-hopping, lob-tailing, tailslapping, flipper-slapping, charging and parrying can be observed, and these displays can last for hours. Song is also assumed to have an important role in mate selection; however, scientists remain unsure whether the song is used between males in order to establish identity and dominance, between a male and a female as a mating call, or a mixture of the two. Humpback whale songs are long, complex, and only sung by males. Whales within a distinct population sing the same song; while the songs of whales from other populations are different. A typical song lasts from 10-20 minutes, is repeated for hours at a time, and changes gradually over the years.

**Population size:** Throughout its range, the humpback whale has been listed as endangered under the Endangered Species Conservation Act of 1970, and as depleted under the Marine Mammal Protection Act of 1972. Worldwide, humpback numbers were severely reduced during commercial whaling; some evidence suggests 90-95% of the population was removed. There are 3 separate populations of humpbacks, those living in the North Pacific Ocean, those in the North Atlantic Ocean, and those roving the oceans of the Southern Hemisphere. In the North Pacific, more than 23,000 animals were taken in the before this species was granted protection from whaling in 1966. Before whaling began, approximately 15,000 humpbacks are estimated to have existed in the north Pacific. Current population estimates for the North Pacific stock range from 6,000-8,000 individual animals, and an increase in numbers on the Hawaiian wintering grounds suggests that at least this portion of the North Pacific stock is growing by approximately 7 percent per year.

**Predators, hunting, and other mortality:** The primary source of mortality for humpback whales is most likely humans. Historically, most whales were killed through commercial whaling. Currently, whaling is strictly regulated by the International Whaling Commission, with only small numbers being allowed to be taken for aboriginal subsistence purposes. Two animals per year are allowed to be harvested from the North Pacific stock. Since commercial whaling was

banned, most human caused humpback deaths are through entanglement in fishing gear, boat strikes, or acute exposure to pollutants. Secondary effects of humans on humpback whales such as pollutants, contaminants, decrease in prey species, and decrease or alteration in habitat are difficult to estimate. Killer whales, false killer whales, and large sharks predate upon humpback whale calves, although it is believed to be relatively infrequent.

Text: Steven T. Zimmerman and Shawna A. Karpovich  
Illustration: Don McMichael Revised and reprinted 2008



## Orca

The **killer whale** (*Orcinus orca*) was first known as the “whale killer” or “killer of whales” because they were observed to kill and eat whales. The term “whale” was previously used as a common name for the larger marine mammals in the order Cetacea, which includes whales, dolphins, and porpoises. The killer whale is the largest member of the dolphin family (Delphinidae).

**General description:** Adult male killer whales in the North Pacific may grow to a length of approximately 27 feet (8.2 m), whereas females grow to an average length of about 23 feet (7 m). Adult males may weigh almost twice as much as females, up to 13,300 pounds (6,000 kilograms). Killer whales are predominantly black in color with large white patches under the jaw and above and behind each eye. Much of the ventral surface of killer whales is also white and there are large white patches which extend from the ventral area onto the flanks. A gray or white saddle area is often found behind the dorsal fin. This area is highly variable and is one of the characteristics used to identify individual whales. The very tall dorsal fin is characteristic of this species. The dorsal fin may reach 6 feet in height in males but usually does not exceed 3 feet in height in females.

**Distribution and migration:** Killer whales occur in all of the earth's oceans and seas, yet most concentrations are found in cold temperate waters. They are found throughout the marine waters of Alaska but occur most commonly over the waters of the continental shelf from Southeast Alaska through the Aleutian Islands and northward into the Chukchi and Beaufort seas. Killer whales migrate northward throughout the Bering Strait in the spring as the pack ice retreats. They leave the Beaufort and Chukchi areas in the fall when the ice advances. Killer whales in the Pacific Northwest and Alaska occur in groups of animals called pods. Most pods in Alaska number fewer than 40 animals. The individuals that comprise each pod change very little. Killer whale pods are matrilineal and consist of a female and her offspring of both sexes. In the North Pacific Ocean three ecotypes of killer whales have been recognized by their genetics, morphology, acoustics, association patterns, and feeding ecology, including their prey. Differences in the movement patterns among killer whale ecotypes have led, in part, to their names; i.e., “resident,” “transient,” and “offshore.” Specifically, residents have the smallest home range and typically return each year to predictable locations, transients have larger home ranges and have less predictable movements as they transit through local areas quickly, and

offshores have the largest home ranges that include areas farther offshore. Killer whale pods appear to have their own unique, recognizable type of calls which do not change over periods as long as 25 years.

**Abundance:** During the 1980s, photo-identification techniques were used for the first time in Southeast Alaska and in Prince William Sound to estimate the number of individuals and pods of killer whales occurring in those two areas. Following the Exxon Valdez oil spill, these studies were expanded and carried out on a more systematic basis. Population assessment studies expanded further into the Gulf of Alaska and the Aleutian Islands in the late 1990s and early 2000s when predation by killer whales was considered by some a significant threat to the recovery of the endangered Steller sea lion. Based on results from this research, three population 'stocks' of transient killer whales have been recognized in Alaskan waters: (1) the AT1 stock, which occurs from Prince William Sound west through the Kenai Fjords; (2) the Gulf of Alaska, Aleutian Islands, and Bering Sea (GOA/AI/BS) stock; and (3) the West Coast transients stock, which occurs between Southeast Alaska and California. The abundance of the isolated AT1 stock declined from 22 whales in 1989 to only 8 whales in 2004 when it was designated as depleted under the Marine Mammal Protection Act. In contrast, relatively less data exist for the GOA/AI/BS transient stock, particularly for waters west of Kodiak Island, and preliminary estimates indicate their abundance may be about 500 individuals. Based on photo-identification studies, an estimated 323 whales comprise the community of West Coast transients, of which 105 whales are known to occur in California waters and the remaining 218 whales occur in the waters of Washington State, British Columbia, and Southeast Alaska. The Alaska Resident stock, which occurs from Southeast Alaska to the Aleutian Islands and Bering Sea, has a minimum abundance of 1,123 whales, the large majority outside of Southeast Alaska. The Northern Resident stock, which occurs from approximately mid-Vancouver Island (British Columbia) throughout most of Southeast Alaska, has a minimum abundance of 216 whales. An estimate of the abundance of offshore killer whales, which occur from California through Alaska, is not available. Systematic population assessment studies have not been conducted in the Bering, Chukchi, or Beaufort seas, and thus substantial numbers of killer whales, of each of the three ecotypes, may remain to be identified and counted.

**Food habits:** Killer whales are opportunistic feeders and have been observed to prey on virtually any large marine animal available. Resident killer whales are known to be fish-eaters, in contrast to transients that feed on marine mammals. For offshores, relatively few feeding observations are available, and the limited data indicate these whales appear to prey primarily on fishes, including sharks. However, until the diet of offshores is better understood, the possibility exists that offshores may kill other marine mammals. Resident pods appear to feed primarily on a wide variety of fish such as salmon, herring, halibut, and cod. Transient pods may feed on any available species of marine mammal. The stomach of a killer whale found stranded near Prince William Sound contained a harbor seal, a harbor porpoise, and a Steller sea lion. Killer whales also have been observed to prey on river otters, sea otters, squid, and several species of birds. Killer whales may briefly leave the water to grab seals and sea lions from the shore. Animals within a pod often feed cooperatively. When preying on large animals such as gray or humpback whales, the killer whales may attack as a pack, tearing away at the prey animal from several angles. When preying on schooling fish, smaller killer whales may swim close to the beach to drive the fish from shallow waters out to the rest of the pod. Large groups of killer whales are often involved in hunting schools of fish. Smaller groups (two to eight animals) are more often used when preying on marine mammals such as seals or porpoises. Little is known about the diving behavior of killer whales. Typical dive times last

three to five minutes although this is highly variable, depending on the type of activity in which the animal is engaged. The diet of AT1 transients is relatively well understood. Based on more than 20 years of field observations these whales are thought to feed primarily on harbor seals and Dall's porpoise. The feeding habits of GOA/AI/BS transients are less well known in general and essentially unknown during the period from fall to spring. Observations of feeding by GOA/AI/BS transients have been limited to date, but observed prey include fur seals, gray whales, minke whales, and Steller sea lions. In addition to killer whale diet being relatively distinct among the three ecotypes, prey preferences may also be region-specific. Thus, some groups of GOA/ AI/BS transients may specialize on certain prey species, as AT1 transients specialize on harbor seals and Dall's porpoise.

**Reproduction:** Killer whales are long-lived animals and reproduce slowly. The maximum age which these animals can attain has not been determined but may be at least 50 years for males and 80 years for females. The annual birth rate has been estimated at 4 to 5 percent but may be higher following the deaths of several animals in a pod. In stable pods, some females may not breed at all. Much remains to be learned about the reproductive behavior of killer whales. Females are believed to become sexually active at 15 years of age, on average, yet that age can vary between 11-18 years. Young are born at intervals of three to eight years, although animals born in captivity have borne young 19 months apart. The gestation period has been estimated at 16 to 18 months. In the north Pacific, most births appear to occur between fall and spring.

**Sources of mortality:** Humans are the only predators of killer whales. Killer whales have been taken throughout the world for meat and oil. Many killer whales have also been removed from the wild for public display. In recent years, resident killer whales have begun removing black cod (sablefish) from longlines set by Alaska fishers. This has resulted in several of the animals being shot. Such shooting is no longer legal.

Text: Steve Zimmerman Illustration: Don McMichael Revised by Bob Small and reprinted in 2008



## Red Squirrel

The **red squirrel** (*Tamiasciurus hudsonicus*) makes itself quite conspicuous with its lively habits and noisy chatter. Cone cuttings on stumps or rocks are common and tracks in snow are numerous where this squirrel occurs. It can be found in spruce forests over most of Alaska and has a wide range in North America. It occupies a wide variety of forest habitat, occurring in the hardwood forests of eastern North America and the coniferous forests of the west and north.

**General description:** The active rodent averages 11 to 13 inches in length (28-33 cm), including tail, and is a rusty-olive color on the upper parts of its body with a whitish belly and

underparts. In summer, a dark stripe on the side separates the upper rusty color from the white of the belly. The bushy tail is often a lighter orange or red with light tipped hairs.

**Life history:** Red squirrels are solitary but pair for mating in February and March. Females usually breed when they are 1 year old. Three to seven young are born after a gestation period of 36 to 40 days. The young are born blind and hairless, weighing about ¼ ounce at birth. They are weaned at about 5 weeks but remain with the female until almost adult size.

The young leave the female and are independent during their first winter. This means that they have to be successful at gathering and storing a winter's supply of food.

**Behavior:** Much of the red squirrel's time in the summer is spent cutting and storing green spruce cones. There may be several bushels of cones stored in a cache. Caches may attain a diameter of 15 to 18 feet and a depth of 3 feet. Red squirrels also cache mushrooms on tree branches. They eat seeds, berries, buds, fungi, and occasionally insects and birds' eggs. They are busy collecting and storing food from early morning until dusk and also on moonlit nights.

Nests may be a hole in a tree trunk or a tightly constructed mass of twigs, leaves, mosses, and lichens in the densest foliage of a tree (making the nest almost completely weatherproof). A loose mass of twigs and leafy debris in a high tree is used as a "fair weather" nest. Their ground burrows, also known as middens, are used mostly for food storage. There is usually one large active midden in each territory with perhaps an inactive or auxiliary midden.

The home range of red squirrels is about ½ to 1 acre, and each squirrel knows its territory well. Each squirrel has several nests in its territory and always seems to know which retreat is nearest. Territorial behavior seems to be most rigid during caching of food and relaxes somewhat in the spring.

The red squirrel is active all year but may remain in its nest during severe cold spells and inclement weather. They are agile climbers and, being extremely curious, will often attempt to enter buildings, upsetting anything they can move and gnawing on woodwork. Once in a house or cabin, they can be very destructive, tearing out insulation and mattress stuffing for use as nesting material and caching food stores in any available niche.

**Predators:** The main predators of red squirrels are hawks, owls, and marten. Other predators may occasionally take a squirrel but are not serious threats. Around populated areas, one of the predators is the domestic housecat.

**Human use:** The red squirrel is used to a limited extent by man for food and fur. Squirrels may be small but the meat is good eating. In parts of Canada and Alaska the pelts are sold for their fur. Red squirrels may damage trees, cutting off twigs by the bushel, but they are also helpful because they distribute and plant seeds of spruce and other trees.

Text: Jeannette R. Earnest Illustration: K. Hocker Revised and reprinted 2008

## River Otter

The North American **river otter** (*Lutra canadensis*) ranges over most of North America north of Mexico. The river (or land) otter is found throughout Alaska with the exception of the Aleutian Islands, the offshore islands of the Bering Sea, and the area adjacent to the arctic coast east of Point Lay.

River otters, or other otter species, inhabit most of the rest of the world. All are amphibious members of the family Mustelidae along with mink and sea otter. Animals in this family produce a strong, sometimes disagreeable scent, which is discharged from a pair of anal glands.

**General description:** The North American river otter is a thickset mammal with short legs, a neck no smaller than its head, inconspicuous ears, and a muscular body that is broadest at the hips. Its tail is powerful and a little more than a third as long as its head and body. Only the hind feet are webbed. Adults weigh 15 to 35 pounds (6.8-15 kg) and are 40 to 60 inches (102-152 cm) in length. On the average, females are about 25 percent smaller than males.

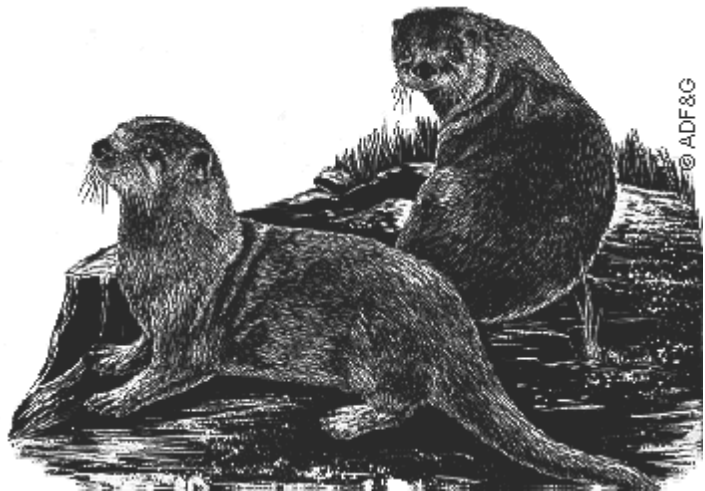
When prime, river otter fur appears black-brown, with the belly slightly lighter in color than its back. The chin and throat are grayish. Otter fur consists of a very dense undercoat overlaid with longer guard

hairs, which are usually removed by furriers. River otters appear to have well-developed senses of smell and hearing. Their vision is not especially good but may be better underwater than above. Several sets of strong whiskers are used by the animal in hunting and avoiding obstructions.

**Life history:** River otters in Alaska breed in spring, usually in May. Mating can take place in or out of the water. One to six pups (usually two or three) are born the next year any time from late January to June following a gestation period of 9 to 13 months. Delayed implantation (a period of arrested embryonic growth) accounts for this variation in the length of gestation.

The pups are born toothless and blind in a den that is usually a subterranean burrow. Their eyes open 7 weeks later. When about 2 months old, they begin to leave the den and shortly thereafter start to swim and eat solid food. They are taught to swim by the female who must coax or drag them into the water. Pups are weaned when about 5 months old. They will stay with their mother until shortly before her next litter is born.

River otters are sexually mature when 2 years old. A female will then mate with the male of her choice and produce one litter each year. Otters can live and breed for more than 20 years.





**Behavior:** Otters are graceful swimmers and propel themselves in the water by paddling or vertically flexing their hindquarters and thick tails. They can swim at about 6 miles per hour and can go faster for short distances by "porpoising" along the surface. River otters dive to depths of at least 60 feet (18 m) and can stay submerged for more than 4 minutes. They can run as fast as a man and on hard snow or ice reach speeds of more than 15 miles per hour (24 km/hr.) by alternately running and sliding.

About half of a river otter's time is spent sleeping. Both young and adults are fond of play. They manipulate rocks or sticks, play tag and hide-and-seek, dunk each other, wrestle, and slide on mud or snow.

Signs of river otter activity are seen more often than the animals themselves. They travel several miles overland between bodies of water and develop well-defined trails that are used year after year. They may flatten and dig up the vegetation or snow over an area of several square yards. Scats, twisted tufts of grass, and small piles of dirt and vegetation are commonly found in such areas. Urine and scent deposited on these piles serve as "scent posts" that are used for communication and territorial marking.

During the winter, otters dig elaborate tunnels and feeding dens within the snow over a frozen lake or bay where fluctuations in water levels leave cracks for them to come and go.

**Food habits:** River otters in Alaska hunt on land and in fresh and salt water. They eat snails, mussels, clams, sea urchins, insects, crabs, shrimp, octopi, frogs, a variety of fish, and occasionally birds, mammals, and vegetable matter. Aquatic organisms no bigger than a man's finger are usually eaten at the surface of the water; larger food is taken ashore.

If a fish or other animal is too big to be eaten at one meal, the remains are abandoned and become available to other flesh-eating mammals and birds. Scraps left out of the water may be a significant source of food available to some scavengers when snow and ice are present.

**Social habits:** River otters are often found in groups. A family unit is made up of a female and her pups, with or without an adult male. The family usually travels over an area of only a few square miles. The female appears to dominate the rest and may drive other animals away from a small area around the den where her pups are living.

Other groups may consist of an adult male and female, a litter of pups that remain together after the family separates, or a group of bachelor males. Male groups usually consist of fewer than 10 individuals. Larger numbers that are occasionally seen together may represent a temporary association of neighboring groups. The groups have no apparent leader. Otters travel together and operate as a social unit but do not cooperate in hunting or share what is caught. They travel over a wide area, and apparently there are no exclusive territories. Fighting among otters is extremely rare, although they are wary of strange individuals.

**Vocalizations:** River otters produce a variety of noises. They growl, caterwaul, and whine. When alarmed, individuals emit an explosive "hah!" When two or more are together, they often produce a mumbling noise that seems to be a form of conversation. A good imitation of this is made by closing the lips and rapidly uttering "hm" several times in a deep voice. A bird-like chirp apparently expresses anxiety and is most often heard when members of a group become separated.

**Human uses:** River otters have no significant predators except man. They are occasionally killed unintentionally when they become entangled in fish nets or trapped in crab pots. For the last 10 years, between about 1,200 and 2,400 otters have been harvested annually in Alaska for

their pelts. They are usually taken in steep traps. Natives in Prince William Sound once hunted otters with the aid of dogs of a nondescript type that were small enough to enter an otter den. The dogs could usually drive out the otter without a fight.

Text: J.D. Solf and Howard Golden Illustration: Sue Arthur

## Mink

The **American mink** (*Neovison vison*) and other fur bearing animals attracted trappers, traders, and settlers to Alaska from around the world. Some of the most valuable furbearers belong to the Mustelidae or weasel family, which includes the American mink. Other members of this family in Alaska include weasels, martens, wolverines, river otters, and sea otters. Mink are found in every part of the state with the exceptions of Kodiak Island, Aleutian Islands, the offshore islands of the Bering Sea, and most of the Arctic Slope.

**General description:** A mink's fur is in prime condition when guard hairs are thickest. Mink are then a chocolate brown with some irregular white patches on the chin, throat, and belly. White patches are usually larger on females and often occur on the abdomen in the area of the mammary glands. Several albino mink have been reported from Alaska. Underfur is usually thick and wavy, not longer than an inch. It is dark gray to light brown in color with some suggestion of light and dark bands. The tail is one third to one fourth of the body length with slightly longer guard hairs than the body. As an adaptation to their aquatic lifestyle, their feet have semi webbed toes and oily guard hairs tend to waterproof the animal. Adult males range in total length from 19 to 29 inches (48-74 cm). They may weigh from three to almost five pounds (1.4-2.3 kg). Females are somewhat smaller than males. Their movements are rapid and erratic as if they are always ready to either flee or pounce on an unwary victim. Like skunks, mink discharge a fetid liquid from their scent glands when they are afraid or excited. The odor is very strong and unpleasant to most people.



**Life history:** In Alaska, northern mink breed about two weeks later than those further south, because onset of breeding is determined by the beginning of long days. The breeding season extends from March through April, depending on the latitude. Males and females may breed with more than one other mink. The young within a single litter can be the result of fertilization by different males and/or two different ovulations more than a week apart. The total gestation period varies from 40 to 75 days. In mink and other weasels, the fertilized egg does not attach to the uterus to develop right away as in most mammals. This delayed implantation accounts for the great variation in length of the gestation period. Once the egg implants, fetal development takes about 30 days to complete. In Interior and western Alaska most births occur during June. Differences in the abundance of food available to the mother affect the number of young born and the number that are weaned. Litter size varies from 4 to 10 kits. The den is generally a burrow or hollow log near a pond or a stream. In most cases the den used has been constructed and deserted by other animals. At birth, newborn mink are about 0.35 ounces (10 g) and slightly haired. Young mink remain in the den about a month. They grow rapidly and attain their adult size by September. In the following spring they may breed and raise their own young.

**Food habits:** Mink will eat virtually anything they can catch and kill, including fish, birds, bird eggs, insects, crabs, clams, and small mammals. There are both seasonal and annual differences in the diet depending on what is available. Mink prefer streams, ponds, beaches, or marshes. An abundance of hares or mice may cause them to move inland. Adult mink have been known to kill and eat young mink.

**Predators:** Little is known about the overall effects of other predators on mink populations. Occasional predators of mink include wolves, foxes, hawks, owls, eagles, lynx, and river otters. The relationship between otters and mink is unclear. If there are otters along a stream, usually they will not tolerate the presence of mink within their territory.

**Trapping:** Mink trapping provides both recreation and income for some Alaskans. Trapping mink as a livelihood requires an unusual amount of stamina, perseverance, and knowledge of the animals' habits. The value of mink furs, or pelts, changes dramatically depending on the current demand in the fur clothing business, and the trapper's income may go up and down accordingly. Mink are farmed extensively for their pelts.

Text; John Burns Illustration: R.T. Wallen Revised by Rod Flynn and reprinted 2008

## Sea Otter

The **sea otter** (*Enhydra lutris*) lives in shallow water areas along the shores of the North Pacific. Its range once extended from Baja California north then west through the Aleutian Islands, to the Kamchatka Peninsula, and south to the northern islands of Japan. In 1742, Vitus Bering's men returned with sea otter pelts from the historic voyage of discovery of Alaska. Interest in these rich furs initiated an era of exploitation which almost wiped out the sea otter. The Tlingit name for sea otters is *Yáxwch*.

The early Russian settling of Alaska was largely a result of the sea otter fur industry. In 1867, when Russian exploitation had greatly reduced the numbers of sea otters, Alaska was sold to the United States. The few conservation measures that had been instituted by

the Russians in their final years of occupation were dropped by the Americans, and hunting intensified. Sea otters became alarmingly scarce. Finally, in 1911, when so few animals were left that it was no longer profitable to hunt them (in many areas they were completely



exterminated), sea otters were given full protection under the Fur Seal Treaty. The treaty was signed by the United States, Great Britain, Russia, and Japan.

In 1960, the state of Alaska assumed management authority for sea otters. The management program conducted by the state included the successful reintroduction of sea otters to unoccupied habitat in Southeast Alaska, British Columbia, and Washington. The Marine Mammal Protection Act transferred management authority to the U.S. Fish and Wildlife Service in 1972.

Recovery of the Alaska sea otter population in the 1900's was dramatic. Perhaps as few as 2,000 total animals existed in 1911, but by the mid-1970s the Alaska population numbered between 110,000 and 160,000. However, in the last two decades, the south-west Alaska stock of sea otters has declined sharply (over 80% in many locales), most likely due to predation by killer whales. In other parts of Alaska (south-central and southeast), populations generally appear to be stable or increasing. Most of the sea otter habitat in Alaska has now been repopulated. Sea otter populations also exist in the Commander and Kurile islands, British Columbia, Washington, and California.

**General Description:** Sea otters are members of the weasel family (Mustelidae) and are related to mink and river otters. Adult males weigh 70 to 90 pounds (32-41 kg) with some individuals weighing 100 pounds. Females average 40 to 60 pounds (18-27 kg). Adults may reach a length of 4.5 feet (1.4 m). The hind feet are webbed and are adapted for swimming. The toes on the forefeet are short and stiff, enabling the animal to deftly handle food. Although they will at times haul out to rest on shorelines, they can spend their entire life in the water and have no need to go ashore. On land their gait is clumsy. Probably because of this vulnerability, they rarely are found more than a few yards from water.

The fur, which is possibly the finest in the world, consists of a very dense underfur of inch-long fibers and sparse guard hairs. The underfur ranges from brown to almost black. Guard hairs may be black, pale brown, or silver, often giving a veiled effect of silvery hairs on a dark background. Older animals often develop a silvery head. This, combined with the prominent whiskers, leads to the nickname of "Old Man of the Sea."

Unlike seals, which rely on a heavy layer of blubber for protection against the cold North Pacific waters, sea otters depend on air trapped in their fur for maintaining body temperature. If the fur becomes soiled or matted by material such as oil, the insulation qualities are lost. This results in loss of body heat and eventual death. For this reason, otters spend much time grooming their fur to keep it clean.

**Food Habits:** Sea urchins, crabs, clams, mussels, octopus, other marine invertebrates, and fishes make up the normal diet of sea otters. They usually dive to the bottom in 5 to 250 feet of water and return with several items of food, roll on their backs, place the food on their chests and eat it piece by piece using their forepaws, with sometimes a rock to crack shells. In the wild, sea otters never eat on land. The search for food is one of the most important daily activities of sea otters, as large amounts are required to sustain the animal in healthy condition. Feeding dives generally last about 1 -1½ minutes although some otters are capable of staying underwater for five minutes or more. Captive animals require a daily food intake equal to one-quarter of their body weight. In order to obtain the 8 to 15 pounds (4-7 kg) of solid food needed, an otter may have to bring up 40 to 50 pounds (18-23 kg) of whole shellfish. Their feeding habits may result in conflicts with subsistence, recreational, and commercial fishers when otters move into areas that support important shellfish resources.

**Life History:** Sea otters mate at all times of the year, and young may be born in any season. However, in Alaska most pups are born in late spring. Like other marine mammals, they have only one pup during each breeding cycle. A pup weighs 3 to 5 pounds (1.4-2.3 kg) at birth and is light brown in color. The female's maternal instinct is very strong and she seldom leaves her pup except when diving for food. When the female travels or sleeps, the pup usually rides its mother's chest as she floats on her back. The pup may weigh 30 pounds (14 kg) or more when weaned and looks almost as big as its mother. Females can produce one pup a year, but in areas where food is limited, they may produce pups less frequently. Many sea otters live for 15 to 20 years.

**Seasonal movements:** Sea otters usually do not migrate. They seldom travel far unless an area has become overpopulated and food is scarce. The home range of individual sea otters can vary from only a few km<sup>2</sup> to over 40 km<sup>2</sup>.

**Behavior:** Sea otters are gregarious and may become concentrated in an area, sometimes resting in groups of fewer than 10 to more than 1,000 animals. Breeding males are territorial, and will drive nonbreeding males out of areas where females are concentrated. In some areas, the nonbreeding males will concentrate in "male areas" which are usually at the edge of occupied areas, and often off exposed points of land where shallow water extends offshore.

**Population size:** Currently, the number of sea otters in Alaska is thought to be around 70,000.

**Predators, hunting, and other mortality:** In much of their range, predation on sea otters is of little significance. However, predation by killer whales has been observed, and in the last two decades appears to be the primary cause of precipitous population declines in south-west Alaska. Bald eagles also can prey on newborn pups, and sea otters are sometimes caught and drowned in fishing nets. Sea otters are hunted by Alaska Natives for subsistence and products used in handicrafts. The 1989 *Exxon Valdez* oil spill dramatically demonstrated the effects of oil contamination on sea otters, as about 1,000 carcasses were found after the

spill, and it is likely that the total number that died was considerably greater. Thus, while sea otters will thrive in Alaska's waters under good conditions, it is clear that they can be susceptible to both human activities and shifts in predation behavior by other species.

Text: Karl Schneider and Brenda Ballachey Illustration: R.T. Wallen Revised and reprinted 2008

## Sitka Black-tailed Deer

The **Sitka black-tailed deer** (*Odocoileus hemionus sitkensis*) is native to the wet coastal rain forests of Southeast Alaska and north-coastal British Columbia. Its range has been expanded by transplants, and established populations now also exist near Yakutat, in Prince William Sound, and on Kodiak and Afognak islands.

**General description:** The Sitka black-tailed deer is smaller, stockier, and has a shorter face than other members of the black-tailed group. Fawns are born in early June and weigh 6 to 8 pounds (2.7-3.6 kg) at birth. The average October live weight of adults is about 80 pounds (36 kg) for does and 120 pounds (54.5 kg) for bucks, although dressed-weight bucks of over 200 pounds (90.1 kg) have been reported. The summer coat of reddish-brown is replaced by dark brownish gray in winter. Antlers are dark brown with typical black-tailed branching. Normal adult antler development is three points (including the eyeguard) on each side. Antlers are relatively small, with very few scoring more than 110 points by the Boone and Crockett system.

Their average life span is about 10 years, but a few are known to have attained an age of at least 15.



**Life history:** Fawns are born in late spring. After the winter snow pack recedes, deer disperse; migratory deer move to high elevation alpine/subalpine habitats while resident deer remain at lower elevations throughout the forest. Summer and early fall are periods of active foraging as deer accumulate fat reserves which will help them through the winter and early spring. With the first heavy frost, deer in the higher alpine and subalpine descend to the upper forest.

The breeding season (or rut) peaks during late November. Breeding bucks spend little time foraging and by late November have used up much of their fat reserve. Does, however, generally enter December in prime condition. Does breed during their second year of life and continue producing fawns annually until they are 10 or 12 years of age. Reproductive success decreases rapidly beyond 10 to 12 years and by age 15, which is probably the maximum life expectancy, reproduction has essentially ceased. Prime age does (5 to 10 years) typically produce two fawns annually.

Throughout the rest of the winter and early spring, deer are generally restricted to uneven-aged old-growth forest below 1,500 feet in elevation. The old-growth forest provides optimal winter habitat because the high broken canopy intercepts much snow but still provides enough light for the growth of forage plants used by deer. During winter, the distribution of deer at various elevations is influenced by changing snow depth. During extreme snow accumulation, many deer congregate in heavily timbered stands at lower elevations, and some may even move onto the beach. Spring is a critical period for deer, and if winter snows are deep and persistent many deer die of starvation. As snow melts in mid-to late spring deer begin to disperse, and by late spring and early summer they start rebuilding some of the fat reserves lost during winter.

**Home range:** Summer and winter home range areas vary from 30 to 1,200 acres and average about 200 acres for radio-collared deer on Admiralty Island. Migratory deer have larger annual home ranges than resident deer. The average distance between summer and winter home ranges is five miles for migratory deer and half a mile for resident deer. Movement of deer between watersheds appears to be minimal during winter.

**Food habits:** During summer, deer generally feed on herbaceous vegetation and the green leaves of shrubs. During winter, they are restricted to evergreen forbs and woody browse. When snow is not a problem, evergreen forbs such as bunchberry and trailing bramble are preferred. During periods of deep snow, woody browse such as blueberry, yellow cedar and hemlock, and arboreal lichens are used. Woody browse alone, however, is not an adequate diet and deer rapidly deplete their energy reserves when restricted to such forage.

**Populations:** Deer populations in Alaska are dynamic and fluctuate considerably with the severity of the winters. When winters are mild, deer numbers generally increase. Periodically, however, a severe winter will cause a major decline in the population. Deer have a high reproductive potential, and depressed populations normally recover rapidly. In some cases, however, predation may speed deer decline, as well as slow recovery to higher levels. The wolf, which occurs on the mainland and islands south of Frederick Sound, is considered the major predator of deer in Southeast Alaska. Both black and brown bears also prey on deer to some degree.

Maintaining large tracts of old-growth forest is vital for sustaining healthy populations of deer in Southeast Alaska. Deer are highly dependent on uneven-aged old-growth spruce/hemlock forests especially for winter survival. Areas cleared of trees produce forage during summer. However, during winter, these areas are often inaccessible due to deep snow. As cleared areas age, conifer growth becomes dense, shading out understory forage plants leaving very poor habitat for deer. In the long term, cleared areas will experience a significant decline in deer numbers.

The presence of a number of parasites and disease has been noted in Alaska deer, with the lungworm being the most significant. Winter-killed deer often show signs of this parasite, particularly in northern Southeast Alaska. A high incidence of lungworm is frequently an indicator of high deer density, and lungworm infections probably contribute to deer mortality during hard winters. Lungworm is primarily a disease of animals of less than 2 years of age.



**Hunting:** Throughout much of the range of Sitka black-tailed deer, normal dispersed hunting pressure has little influence on deer numbers. Bag limits vary from complete closures to six deer of either sex, depending on populations. Early season hunting is concentrated in the alpine and subalpine areas. The largest portion of the harvest is taken in November during the rut when both sexes respond to a call resembling the bleat of a fawn. During late November and December, heavy snow sometimes concentrates deer at low elevations allowing high harvest levels when local weather conditions are favorable.

Text: Harry Merriam, John Schoen & Dave Hardy Illustrations: R.T. Wallen Revised and reprinted 2008

## Steller Sea Lion

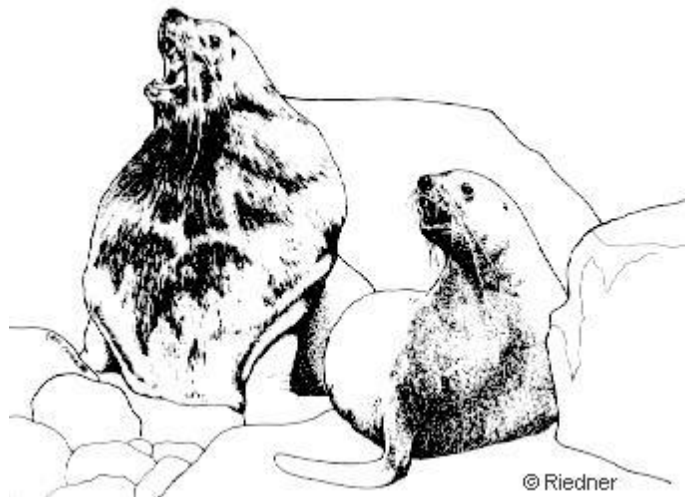
The Steller (or northern) sea lion (*Eumetopias jubatus*) is the largest member of the family Otariidae, the "eared seals," which includes all sea lions and fur seals. It is the only member of genus *Eumetopias*. Otariids differ from phocids, the "true seals," in having external ear flaps, long forearms resembling flippers used for propulsion, and rotatable hind flippers that allow quadrupedal locomotion on land.

Steller sea lions are known to several languages: in Aleut, *qawax*; in Alutiiq, *wiinaq*; in Central Yup'ik, *uginaq* (sometimes *apakcuk*) and in Siberian Yup'ik, *ulgaq*. The Russian common name translates to "sea wolf." *Eumetopias*, from the Greek, means "having a broad forehead", and *jubatus*, from Latin, means "having a mane."

Steller sea lions inhabit over 300 haul outs and rookeries along the North Pacific rim from Hokkaido, Japan, north along the Kuril Islands into Kamchatka and the Sea of Okhotsk, east along the Aleutian chain and into the central Bering Sea, through the Gulf of Alaska, south through southeastern Alaska, the Canadian Pacific coast and to the Channel Islands off California.

**General Description:** At birth, pups have dense, coarse, nearly black fur with a frosty appearance because the tips of the hair are colorless. Color lightens after their first molt in late summer. Most adult females are buff colored on the back. Nearly all males stay darker on the front of the neck and chest; some are even a reddish color. Adult males have prominent, broad foreheads and muscular necks.

Males and females have a marked size difference. Weight at birth is 51 pounds (23 kg), and body length is 45 inches (112 cm). Females grow rapidly during the first four years but slow by



the fifth year, with little growth after age 6. Males continue to grow until the eleventh year. Although there are variations, most females reach maximum size by the seventh year, and males reach adult size by the twelfth year. The average weight of an adult male is 1,245 pounds (566 kg), and the body length averages 10 2/3 feet (282 cm). Adult females average 579 pounds (263 kg) in weight and 8 2/3 feet (228 cm) in length. Although only 20 percent longer, the average adult male weighs over twice as much as the average adult female.

**Food Habits:** Scientists use kitchen spoons to scrape sea lion scat off rocky haul outs throughout Alaska and Canada. This scat is examined for the presence of "hard parts," such as fish bones or squid beaks, that can be keyed to prey species eaten by sea lions. Recently, scientists are also attempting to identify the chemical signatures of prey items in the blood and blubber of sea lions.

From this work we know that Steller sea lions are generalist marine predators with a diet of fishes and cephalopods that tends to be predictable by season and region, with the occasional meal of bird or true seal for variety. Some prey are generally available year-round, such as walleye Pollock, Atka mackerel, arrowtooth flounder and cephalopods, while others are targeted by sea lions when they become seasonally abundant, such as Pacific herring, Pacific salmon, Pacific cod, eulachon and capelin. Western Alaska diets are dominated by Atka mackerel and walleye pollock and eastern diets feature walleye pollock, Pacific cod, flatfish, rockfish and forage fish. Sea lions can consume prey whole while underwater.

**Life History:** Males may live up to 20 years and females to 30 years. Males reach sexual maturity at 3-7 years but do not hold territories on breeding rookeries until 9-13 years. Females start breeding at 3-7 years and spend the next two decades either pregnant or lactating. Females are bred in June, but the fertilized egg does not implant until October. Single pups are born the following June, with birthdates at southern rookeries earlier than births at northern rookeries. Twins are rare. Pups suckle from 1 to 3 years, with most apparently weaning after their first winter.

**Seasonal movements:** Sea lions do not migrate, but do move their "central-place haul out," the center of their foraging activity, to track seasonal concentrations of their many types of prey. They breed on exposed, offshore rookeries during summer and generally move to more protected haul outs in winter, especially in southeastern Alaska. Very young sea lions can swim 75 miles (120 km) non-stop between haul outs. Some sea lions make long-distance movements over long periods of time. The longest recorded movements are Forrester Island to Cape Newenham (1,600 miles / 2,500 km), Kozlof Cape, Russia to Round Island (1,400 miles / 2,300 km) and Medny Island, Russia to Round Island (1,200 miles / 2,000 km).

**Behavior:** Steller sea lions use rookeries and haul outs on land to rest and suckle their young. Adult females must continue foraging while nursing their pups, and the pups' bodies are well-adapted to fast while females are hunting prey during 1-2 day trips. By their first spring, pups are able to reach similar diving depths as adults but do not do so as frequently. As pups grow older, their swimming and diving patterns grow to resemble that of older sea lions. The behavior of older juveniles and adults appears to track the behavior of their prey; for example, deep diving as prey move deeper during daylight, a focus on night-time behavior while prey are shallow and the gathering of many sea lions at places with seasonal runs of forage fish. Foraging trips are usually within a few tens of miles off haul outs, but the longest recorded continuous foraging trip was 550 miles (900 km) into the Bering Sea. Older juvenile sea lions can dive to at least 1500 feet (500 meters) and stay underwater for over 16 minutes.

**Population size:** During the late 20th century, the western Alaska Steller sea lion population (the Gulf of Alaska and Aleutian Islands) suffered a substantial decline, but there are signs of stabilization in recent years. The first population trend counts made in 1956-1960 estimated at least 140,000 sea lions in this area. A major population decrease was first detected in the eastern Aleutians during the mid-1970s and the estimated population dropped to 110,000 by the late 1970s. The decline spread eastward into the Kodiak Archipelago during the late 1970s and early 1980s, then spread westward through the Aleutian Islands during the early to mid-1980s, with the steepest declines of 15% per year occurring during the late 1980s. By 1990 the population was 30,525, and decline continued through the 1990s at 5.4% per year. Between 2000 and 2004, surveys found increasing or stable numbers throughout the Western Stock. Meanwhile, the Eastern Stock has increased by over 3% per year since the 1970s, and likely exceeded 50,000 animals in 2007. Indeed, new breeding rookeries have become established in southeastern Alaska in the early 21st century.

In 1990, Steller sea lions were listed as "threatened" range-wide under the Endangered Species Act of 1973 due to the dramatic population decline in the western portion of their range. Meanwhile, scientists identified substantial genetic differences, regional differences in population trend and a low exchange rate of breeding animals between rookeries, indicating that Steller sea lions existed in "distinct population segments." Thus, in 1997, the population was split immediately east of Cape Suckling on the Gulf of Alaska coast (near 144° W longitude) into an "endangered" Western Stock and "threatened" Eastern Stock. Recent work suggests a third subdivision between Asian and North American populations within the Western Stock may be appropriate.

**Predators, hunting, and other mortality:** At the turn of the 21st century, there is substantial effort being made to identify causes for and remedies to the Western stock population decline, and these are the subject of considerable debate. The possible sources of the decline being examined are grouped into "top-down" processes, such as predation, disturbance, intentional killing and entanglements, and "bottom-up" processes, such as reduced prey quality or abundance and long-term shifts in their environment. Assessment of these threats and planning for the recovery of Steller sea lions is a long-term collaborative process involving numerous stakeholder groups. One-fifth of one percent of Steller sea lions sighted during surveys in southeastern Alaska are entangled by marine debris including packing straps and fishing gear, but the extent of mortality due to this is unknown.

Historically, Steller sea lions were used as a food source, clothing, boat coverings, meat for fox farms and craftwork. The commercial pup harvest in 1964-1972 provided fur for clothing manufacture. Contemporary use includes food, some clothing and craftwork. While the Steller sea lion population is listed as "depleted" under the Marine Mammal Protection Act of 1972, and thus subsistence takes are subject to Federal management, subsistence harvest continues because it has not been shown to contribute to the decline. Between 2000-2004, 191 were taken per year in the Western stock, and 6 per year in the East.

Revised by Michael J. Rehberg (2008) Original text by Stephen T. Zimmerman (1994)

## Beaver

The beaver (*Castor canadensis*) is North America's largest rodent. The beaver's scientific name is descriptive of the castor glands which are located near the base of the tail. Castor is a strong-smelling, oily substance that is used for communication by beavers through scent marking. It also is attractive to many animals and has been used in trapping lures and as a base for perfume. The beaver is found throughout most of the forested portions of the state, including Kodiak Island where it was introduced in 1925.



**General description:** Beavers in the wild live about 10 to 12 years. They have been known to live as long as 19 years in captivity. They continue to grow throughout their lives and may reach 3 to 4 feet (0.9-1.2 m) long, including tail. Although most adult beavers weigh 40 to 70 pounds (17-32 kg), very old, fat beavers can weigh as much as 100 pounds (45 kg).

The beaver's heavy chestnut brown coat over a warm soft underfur keeps the animal comfortable in all temperatures. It has large, webbed feet and a broad, black tail (about 10 inches long and 6 inches wide or 25 cm long and 15 cm wide) that can be used as a rudder when swimming. When slapped against the water, it serves as a sign of warning, but it can

signal other emotions as well. When the beaver stands up on its hind legs to cut down a tree, the tail is like a fifth leg used for balance.

The beaver is designed to swim and work under water. When submerged, nictitating membranes protect its eyes and its nose and ear valves close. A beaver also can cut and carry submerged wood without getting water in its mouth by drawing its loose lips tightly behind the protruding front teeth.

**Life history:** To survive, beavers must be assured of 2 or 3 feet (0.6-0.9 m) of water year-round. Water provides a refuge from enemies and a way to float and transport heavy objects such as branches and logs for food and construction. Food for winter use must be stored in underwater food caches during autumn.

If the habitat does not have the necessary water level, beavers construct dams. Each dam is a little different. A beaver may work alone or with family members to build a dam, using piled logs and trees secured with mud, masses of plants, rocks, and sticks. Although the average tree used for construction of a dam is 4 to 12 inches (10-30 cm) across the stump, use of trees up to 150 feet (45 m) tall and 5 feet (115 cm) across have been recorded. As the tree snaps, the beaver runs! Very large trees are not moved but the bark is stripped off and eaten. Smaller trees are cut into moveable pieces, dragged into the water for repairing dams and lodges. This work is done mainly in spring and autumn.

The den is used as a food cache, rearing area, and general home. Dens are of two types depending on water level fluctuations. Bank dens are simply dug into the stream or river bank with a mass of sticks, mud, and rocks constructed over the top of the den. Lodges are constructed of the same materials as bank dens, but are located where the water level is more stable and slower moving, like in a pond or lake.

Where streams are too large or swift to dam but do provide ample water throughout the year, the beavers may use bank dens. These may have several tunnel exits with at least one above the high water mark and another below the low water mark. The den itself is a large chamber averaging 2 feet wide by 3 feet long by 3 feet high (60 x 90 x 90 cm).

Bank dens and lodges have two things in common: they have one chamber-like room and at least one tunnel exit to deep water so it will be free of winter ice. The exit provides quick and easy access for food gathering and emergency escape from predators. Each year beavers will add materials to the lodge whether or not repairs are necessary. The same lodge is used by a beaver family year after year, so some can be quite large. It is the family's home year-round.

After mating (which takes place in January or February), the female prepares for a new litter. Two to four kits on average are born anytime from late April to June. Their eyes are open at birth, and the kits are covered with soft fur. They can swim at 4 days and dive at 2 months of age. The young beavers live with their parents until they are 2 years old. Then they leave to find their own homes.

**Food habits and predators:** The life of a beaver colony is governed largely by food supply. Beavers eat not only bark, but also aquatic plants of all kinds, roots, and grasses. As they exhaust the food supply in the area, the beavers must forage farther from their homes. This increases the danger from predators. When an area is cleared of food, the family migrates to a new home. In Alaska wolves, lynx, bears, and humans are important predators of beavers.

**Ecology and economic importance:** As beavers cut down small trees and clear away brush, they create new habitats that are ideal food patches for other animals. Waterfowl use these areas as feeding and nesting grounds. Ponds created by beavers often serve as fish habitat. Occasionally beaver dams may block streams to migrating anadromous fish, like salmon, and at times road culverts may be blocked or other human developments flooded by this industrious animal.

In the past, pelts were so important they were used as a trade medium in place of money. Between 1853 and 1877, the Hudson Bay Company sold almost three million beaver pelts to England. In Alaska today, trappers still harvest these furs. They are highly prized for cold weather coats and hats.

Text: Peter Shepherd, revised by Howard Golden, 2008 Illustration: Kathy Hocker

## BIRDS

### Eagles

The **bald eagle** (*Haliaeetus leucocephalus*) of Alaska's waterways and the soaring **golden eagle** (*Aquila chrysaetos*) of the Interior are two of this state's most magnificent birds of prey. Long valued for their aesthetic beauty, eagles are now recognized for their biological importance as scavengers and predators in the natural environment. These raptors deserve our protection and respect.

### Bald Eagles

**General description:** The bald eagle is so named for its conspicuous white head and tail. The distinctive white adult plumage is not attained until 5 or more years of age. Immature birds lack this easily identifiable characteristic and can be confused with the golden eagle. The immature bald eagle's unfeathered tarsi (lower legs) and whitish wing linings on the forward part of the wings can be helpful distinctions where the two species coexist. The bald eagle is Alaska's largest resident bird of prey with a wing span up to 7 1/2 feet (2.3 m) long and weights of 8 to 14 pounds (3.6-6.4 kg). Like many raptors, females are larger than males.



**Life history:** Found only in North America, bald eagles are more abundant in Alaska than anywhere else in the United States. The Alaska population has been estimated to include 30,000 birds at the time of fledging. Bald eagles are often found along Alaska's coast, offshore islands, and Interior lakes and rivers. The highest nesting densities occur on the islands of Southeast Alaska. Most bald eagles winter in southern Alaska, but some leave the state during cold months. In the Chilkat Valley, over 3,000 birds may congregate in late fall and early winter to feed on spawned-out salmon.

**Reproduction and nesting:** Bald eagles often use and rebuild the same nest each year. Nest trees are usually close to water, afford a clear view of the surrounding area, and often provide sparse cover above the nest. In Southeast Alaska, bald eagles usually nest in old-growth timber along saltwater shorelines and mainland rivers. Eagles in Southcentral Alaska nest in old cottonwood trees near water. Nest building begins in April, and both the male and female gather nest material. In late April, two (sometimes three) dull white or creamy yellow eggs are laid several days apart. Incubation lasts about 35 days. When the young hatch, sibling rivalry is common and the weaker, usually the younger, chick is killed or starved. The surviving young leave the nest after approximately 75 days. They do not attain adult plumage and breed until 4 or 5 years of age. After the breeding season, bald eagles congregate where food is plentiful, and they may continue to roost near the nest tree.

Reproductive success can be affected by pesticides in the eagles' prey. Alaska bald eagles seem to be reproductively healthy, but contaminants have been recorded in Alaska fish populations and in bald eagles. A greater threat to Alaska's bald eagle population is destruction of their nesting habitat and nest disturbances. Nest trees tend to be the largest in the stand and are usually 400 years old. In treeless areas on the Aleutians, nests are located on rock pinnacles, or they may be on the ground.

**Food habits:** Fish are the main diet of the bald eagle. Herring, flounder, pollock, and salmon are taken along the coast, while the Interior populations prey heavily upon salmon. Eagles also prey upon waterfowl, small mammals, sea urchins, clams, crabs, and carrion. Bald eagles are sometimes seen swimming, laboriously "rowing" with their wings. Eagles have thick down and float pretty well. There is a misconception that eagles cannot let go of prey. The talons grasp, but it's purely voluntary. An eagle will sometimes grab a fish that's too heavy to lift and will choose to swim, towing the meal to shore, rather than lose it.

**Management protection:** Claims by fox farmers and fishers of eagle depredations caused the Alaska Territorial Legislature in 1917 to impose a bounty system on eagles. These claims were later found to be mainly false, but over 100,000 eagles were killed before the bounty was removed in 1953. With statehood in 1959, the bald eagle in Alaska received federal protection under the Bald Eagle Protection Act of 1940. This act made it illegal to kill or possess an eagle, alive or dead, or to possess any part of an eagle, including feathers. Bald eagles were endangered or eliminated throughout most of the Lower 48 states as a result of habitat destruction, illegal shooting, pesticides, and poisoning. Bald eagle populations are recovering in many states because of strong support for endangered species wildlife habitat, and in 2007, the bald eagle was removed from the list of threatened and endangered species. Alaska's populations remain healthy, but careful stewardship and conservation of nesting habitat and salmon spawning streams as well as minimizing human disturbance near nest sites is necessary in order to protect Alaska's bald eagles from the potential harm caused by increasing human development.

In 1972, the Alaska State Legislature established a stretch of the Chilkat River as critical bald eagle habitat to ensure protection of the large numbers found there in winter. In 1982, a portion of the surrounding area was established as the Alaska Chilkat Bald Eagle Preserve.

## Golden Eagle

**General description:** The golden eagle is named for the golden buff-colored feathers on the crown and nape of the neck. The adult body color is usually dark brown, and the dark-tipped tail is either darkly barred or spotted. Adult plumage is acquired over a three to four year period and involves a gradual reduction in the amount of white coloration. Immature golden eagles have white wing patches and white at the base of the tail. This bird has a wing span from 6 to 7 feet (1.8-2.1 m) and weighs 8 to 12 pounds (3.6-5.4 kg).

Golden eagles are found in northern regions of the entire northern hemisphere. In Alaska, the range extends as far north as the Brooks Range with a limited and scattered distribution in Southeast and rare occurrences in the Aleutians or Alaska Peninsula. Not all eagles migrate but most go south when food supplies decline.

**Reproduction and nesting:** Time of courtship varies with elevation and latitude. Golden eagles arrive at Denali National Park in March and as late as May in the Brooks Range. Egg laying takes place from late April through May. Usually a clutch of two eggs is laid with 35 to 45 days needed for incubation. It takes 90 to 100 days for the hatchlings to become independent of their parents. Nests (eyries) as large as 10 feet across (3 m) and 4 feet (1.2 m) thick are usually located on cliffs, but trees may be used. Overall fledging success is approximately one eaglet per pair. Since mortality in juveniles can be as high as 75 percent, it could take one mating pair up to 10 years to produce two breeding birds.

**Food habits:** The golden eagle feeds mainly on ground squirrels, hares, and birds such as cranes, owls, and ptarmigans. While golden eagles are capable of killing large game animals (i.e., Dall sheep lambs, etc.), few killings have been observed. Eagles also feed on carrion. Like bald eagles, golden eagles can lift about three or four pounds, a bit more if they swoop down with some airspeed and grab something.

**Management and protection:** Federal and state laws protecting the bald eagle also apply to the golden eagle, making possession illegal. However, it is possible to get a permit from the U.S. Fish and Wildlife Service to possess eagle feathers and parts for specific purposes (including scientific and cultural). Chemical contaminants are not presently affecting the golden eagle. Loss of undisturbed habitat seems the most serious threat to maintaining healthy populations of golden eagles. Increasing human disturbance of eagles and remote area development pose similar problems for golden eagles as they do for Alaska's bald eagles.

Text: David W. Daum Illustration: Katherine Hocker Revised by Matt Kirchhoff and reprinted 2008



## Common Raven

The **common raven** (*Corvus corax*) is a member of a family of birds known as the Corvidae, which includes jays, crows, and magpies. The raven is found throughout most of the Northern Hemisphere in many types of habitats. The raven is a year-round resident in Alaska, nesting from the Seward Peninsula and the Brooks Range throughout the mainland, south to Kodiak Island, throughout the Aleutian Chain and along the coast and mountains of Southeast Alaska.

**General description:** The raven is the largest species of songbird and largest all-black bird in the world. In Alaska, the raven can only be confused with a hawk or the much smaller crow. Ravens have large, stout bills, shaggy throat feathers, and wedge-shaped tails, visible best when in flight.



Ravens are excellent fliers, engaging in aerial acrobatics and sometimes soaring to great heights. Flight is often an alternation of wing flapping and gliding and is deceptively fast, as ravens move quickly with seemingly slow wing beats. In courtship flights ravens fly with wingtips touching, and repeatedly dive and tumble together

There is no mistaking the raucous call of the raven; the deep, resonant “kaw” is its trademark. However, the raven can produce an amazing assortment of sounds; mews, whistles, high-pitched cries, “glooks,” and dripping water sounds. One study in Alaska showed ravens have more than 30 distinct vocalizations.

Ravens are among the most intelligent of all birds and can learn by watching, solve problems using logic, and recognize different individuals, human and raven. They are playful and carry sticks and feathers aloft, trade them back and forth in flight and drop and retrieve them in air; they will repeatedly slide single file down snow fields. They also interact in a playful fashion with other animals, including wolves and bears. This likely helps them when their scavenging puts them in close proximity to these predators.

**Life history:** Ravens probably first breed at 3 or 4 years of age and mate for life. Ravens are probably very long-lived in the wild; one captive bird died of old age at 29 years of age.

Ravens in the Interior begin displaying courtship behavior in mid-January, and by mid-March adult pairs are roosting near their nesting locations. The female lays from 3 to 7 eggs. Only the female incubates the eggs; she is fed by the male while on the nest. The chicks hatch after about three weeks and grow quickly, leaving the nest about four weeks after hatching. Both parents feed the young by regurgitating food and water which is stored in a throat pouch. In the Interior, young ravens leave the nest by the first week of June.

Ravens often form loose flocks during the day and congregate for roosting at night. As many as 800 ravens have been seen in one roost near Fairbanks.

Ravens do not undertake long migrations like many birds, but breeding birds usually relocate for nesting each year.

When not breeding they may travel 30 to 40 miles each day from roost to daytime feeding areas.

**Food habits:** Ravens consume a wide variety of both plant and animal matter. They are notorious scavengers and are at times predatory on small animals. They are common visitors to garbage dumps. Ravens will hide or cache food supplies, and will raid other ravens' caches. They also have the habit, like most hawks and owls, of regurgitating undigestible food in the form of a pellet. An analysis of hundreds of raven pellets from Umiat, Alaska, indicated that 50 percent of the raven's winter diet consisted of live prey (mostly small mammals) captured by ravens.

**Relationships and importance to man:** Long evoking strong emotion from man, the raven has often played important roles in cultures, mythologies, and writings. Ravens disobeyed Noah during the great flood by failing to return to the ark after being sent to search for land. The raven was used as an emblem by raiding Viking warriors in Europe, and has been written-up in countless disparaging ways in western literature. Conversely, in Norse mythology, the god Odin used two ravens named Thought and Memory, to fly the world each day in order to inform him of what was happening.

The spiritual importance of the raven to Alaska's Native people is still recognized. The Tlingit, Haida, Tsimshian, BellaBella, and Kwakiutl all viewed the raven as the creator of the world and bringer of daylight. The raven is also important in the creation of myths by the Eskimo. The myths of the raven remain a significant social and religious component of Alaska culture.

Various species of Corvids have been persecuted for damage done to man's crops or favored species of game birds. Ravens have been known to kill sickly young farm animals. More often, however they are probably scavenging on animals killed by other predators. Additionally, ravens have reportedly killed reindeer calves kept by Eskimos.

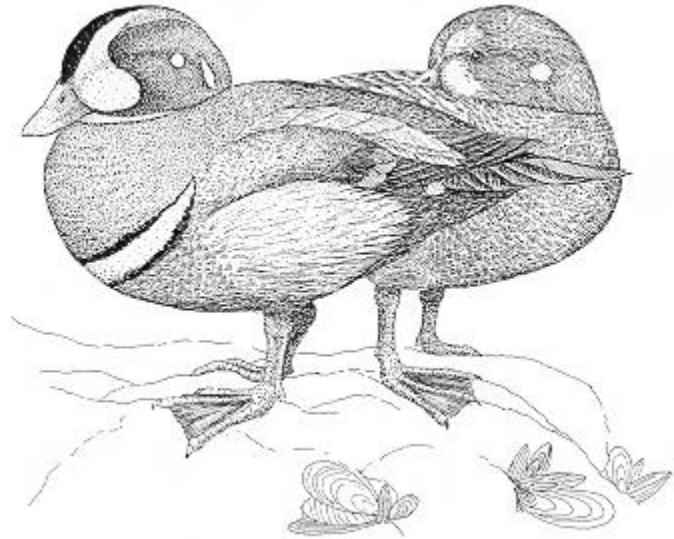
Ravens are common in Alaska and often congregate near human settlements during non-breeding times. They can be minor nuisances by scattering unattended garbage and stealing food set out for dogs. They will come to baited traps, which is unfortunate for trapper and bird alike.

**Management:** The Migratory Bird Treaty between the United States, Canada and Mexico was amended in 1972 to include the Corvids, thus giving federal protection to these species.

Text: Mark Schwan Illustration: Sue Arthur Revised by Riley Woodford and reprinted 2008

## Harlequin Duck

**Harlequin ducks** are undoubtedly one of North America's most beautiful yet least noticed waterfowl. Members of the family Anatidae, harlequins are more specifically classified as seaducks. As with the other seaducks, such as eiders, scoters, mergansers, and long-tailed ducks, harlequins spend most of the year on the ocean and only travel inland to breed. During winter they live very close to shore diving in rocky intertidal and shallow subtidal waters to feed on invertebrates. Harlequins are unique among North American waterfowl as they are the only ducks to nest along swiftly flowing rivers and streams. This combination, of nesting along remote mountain streams and wintering along rugged and exposed rocky coastlines is why these birds so often go unnoticed in spite of the males' colorful and striking appearance.



The colorful appearance of the male harlequin is reflected in both its common and its scientific name (*histrionicus histrionicus*) that refers to the brightly colored feathers. The slate blue-gray feathers with distinct black, white, and rufous markings on the head, neck, back, and sides is reminiscent of the gaily colored dress of medieval court jesters or "harlequins." The Latin, *Histrion*, means "stage player." With their color, males blend well into their multicolored and textured backdrop of various algae, mussels, rocks, and frothy waves. Females are less conspicuous. White facial patches on an otherwise chestnut brown body identify the more cryptic females. Males are larger than females, averaging about 650g (1.5 lbs.) to females 575g (1.3 lbs.). This is about half the size of the more familiar mallard.

Females most closely resemble female surf scoters or buffleheads. The much larger female scoters are easily differentiated from harlequins by the much larger bill. Bufflehead females have a singular white face patch and a white wing patch. As with most sea ducks, harlequins do not mature or attain full adult plumage until they are two years old. Young males may be confused for females in their first winter if the subtle differences in plumage are not closely observed.

Harlequin ducks are quite vocal and have been called "squeakers" in reference to their mouse-like call. They are also known as "rock ducks" because they are generally found roosting on or swimming near emergent rocks or rocky outcrops in the intertidal zone where they are generally found in small scattered flocks of five to 25 birds.

**Range and distribution:** Worldwide, harlequin ducks are divided into two distinct populations – a larger western or Pacific population and a much smaller eastern or Atlantic population. Genetic markers identify these as two distinct, geographically isolated populations. Alaska's birds are part of the Pacific population which includes birds wintering in nearshore waters of western North America and eastern Asia. The wintering range in western North America extends from the Pribilof Islands (southern Bering Sea) and Aleutian Islands of western Alaska as far south as northern California. The Pacific population is most numerous in Alaska and

British Columbia where it may exceed 250,000 birds but no comprehensive population estimates have been conducted to confirm this number. Large concentrations occur in the northern Gulf of Alaska including the Aleutian Islands and Alaska Peninsula, Kodiak Archipelago, Kachemak Bay, Prince William Sound, the Alexander Archipelago in southeast Alaska and British Columbia. Asian birds winter in Russia, Japan, and Korea in scattered locations from the east coast of Siberia south to the Sea of Japan.

Harlequin ducks breed in fast-flowing streams scattered throughout coastal and interior mountains. The Pacific harlequin duck breeds from northeast Siberia across to arctic Canada, throughout most of Alaska and British Columbia, and in the coastal and inland mountains of Oregon and Washington and the northern Rocky Mountain regions of the U.S. and Canada as far south as Wyoming. Historically, birds bred as far south as central California. In Alaska we have breeding records throughout much of the state including the eastern North Slope, northwest Alaska, St. Lawrence Island, Yukon-Kuskokwim region, Alaska Peninsula, Denali National Park, northern coast of the Gulf of Alaska, and southeast Alaska.

**Life history:** Harlequin ducks live in some of the wildest and most remote habitat in the northern hemisphere. Its choice of rugged often isolated coastal habitats and mountain streams rarely bring it to major waterfowl gathering sites where ducks are most often observed and hunted. Relatively few birds are harvested for sport or subsistence hunting.

The year in the life of a harlequin duck can be divided into 3 primary events: wintering, breeding, and molting. Like most waterfowl, harlequins migrate to a separate breeding area. After spending at least eight months at a coastal wintering area, the advent of spring triggers nesting behavior and this requires a new environment. Paired birds usually depart for breeding streams in late-April or May, but timing varies considerably according to diverse ecological conditions across their broad wintering and breeding range. The migration can be a short "lateral" one, simply flying up a nearby coastal breeding stream, or the trip may be lengthy and protracted. The widespread harlequin is known to also breed along glacial lakes, in tundra ponds, and perhaps rarely on offshore islets in marine waters. Many nonbreeding birds remain on the coast year-round.

Birds wintering along the British Columbia coast migrate east or northeast and nest in the coast range and Rocky Mountains of the U.S. and Canada. We have little information on the links between wintering and breeding areas for most of Alaska's harlequin ducks. A male from Prince William Sound, marked by ADF&G, migrated over 2,000 km to a breeding stream in the Anadyr River drainage of Russia while others migrated to breeding areas in the Brooks Range and Kenai Mountains. Meanwhile other birds from Prince William Sound nest on coastal streams a short distance from their wintering areas. Birds wintering in the western Aleutian Islands may nest in Russia or Alaska while many of those in southeast Alaska may nest in Canada. Birds wintering in Asia nest in the mountains of eastern Siberia

Prior to nesting, pairs will make flights up and down streams to prospect for nest sites. Most nests are built close to water, on the ground in dense vegetation, among tree roots, or in rock crevices. Nesting females take full advantage of their unobtrusive coloration and habitat to avoid detection, and their presence is not often discovered. She must find a spot where she will hopefully be well concealed from mink, bears, eagles, land otters and any other predator while safely above the flood stage of the river.

Nests are generally initiated between mid-May and mid-June. Eggs are laid every one to three days. After five to seven pale buff colored eggs are laid incubation begins. The female

incubates her eggs for about 28 days. Upon hatching, the female will lead the precocial young to the nearby stream within 24 hours. It will be another 42 to 56 days before the young can fly. Fledging generally begins around mid-August and may continue into September.

Like many other ducks, male harlequins have no role in incubating eggs or rearing young. Soon after females begin incubating, males return to the coast to join nonbreeding birds and molt their feathers. Molt sites are often close to their wintering sites. Studies in Iceland have indicated that food availability on the mountain streams may limit the density of nesting birds, so departure of males may improve survival of females and their young. In general, males return to the coast in mid to late June and are molting by early July. Each year waterfowl lose all their flight feathers and until new ones emerge they cannot fly for three to four weeks. During molt, males lose most of their striking colors, and males and females can only be distinguished by subtle differences in coloration and plumage patterns.

Most females, depending upon their success in hatching and rearing young, will not return to the ocean for another one to three months. Nesting females with their young are the last to return, arriving at coastal molting sites in August and September. Females rejoin males at molting sites and pair bonds are usually rejuvenated in fall or early winter. Marking and recapture of molting birds in successive years indicates that these sites are used by many of the same ducks, year after year. Following the molt and throughout winter many birds remain along the same few-kilometer stretch of shoreline. Birds remain along the coast until the following spring.

**Food habits:** As with other sea ducks, harlequins are skilled divers that feed primarily on a variety of intertidal benthic invertebrates. Snails, periwinkles, small clams, limpets, chitons, blue mussels, hermit crabs and amphipods are some of the more sought after species. In late summer and early fall, once salmon spawn, harlequins commonly feed at creek mouths where their diet includes alevins and salmon eggs. In March and April harlequins may find a rich food source in herring spawn when it becomes seasonally available.

On nesting streams, harlequins feed either by skimming organisms from the surface or by diving. Harlequins are better able than other ducks to contend with strong currents, spending a greater proportion of their foraging time under water among current-swept rocks and boulders. Larvae of aquatic insects are the main prey species in summer; especially those associated with the highly oxygenated waters of rushing mountain streams, such as midges, blackflies, caddisflies, and stoneflies.

Much of their habitat remains pristine and they are numerous in Alaska throughout the year. Harlequins are affected by degradation of water quantity and quality, human development near breeding streams, and intense recreational activity. They are particularly vulnerable to oil spills because spilled oil is often deposited in their intertidal habitats. The *Exxon Valdez* oil spill (EVOS) occurred in March before harlequins migrated to breeding areas. An estimated 1,298 to 2,650 harlequin ducks were killed within the area affected by the spill. The effects of the oil spill went beyond the immediate and direct mortality as intertidal habitat remained oiled and birds likely ingested sub-lethal doses while preening oil from feathers or from eating oil-contaminated prey. This was aggravated by clean-up activities which continued for several years and in some instances killed benthic invertebrates and the influx of boats, machines, and workers likely displaced birds from some of their preferred habitats. Seventeen years after the spill, birds are still being exposed to lingering oil.

Harlequins are one of a few unrelated duck species throughout the world that have become "river specialists." During the breeding season, the South American torrent duck, New Zealand blue duck, African black duck, and harlequin seek rapidly flowing streams and rivers for nesting and rearing young.

Text by Dan Rosenberg and Tom Rothe Illustration: Richard Carstensen and Michael R. Keeney  
Revised and Reprinted 2007

## Woodpeckers

**Woodpeckers** are a unique and interesting group of birds that occupy much of the forested regions of Alaska. Seven species occur in the state: the **northern flicker**, **red-breasted sapsucker**, **yellow-bellied sapsucker**, and **hairy, downy, three-toed**, and **black-backed woodpeckers**. Very little is known about the ecology of woodpeckers in Alaska. Most of the following information comes from studies conducted in other parts of North America.

**General description:** Woodpeckers are well-adapted for a life on tree trunks and limbs. Woodpeckers have stiff tail feathers which act as a brace for moving along vertical tree trunks. Their feet are also adapted for climbing and hanging. All woodpeckers have two toes pointing forward and either one or two toes pointing to the side or slightly backward. Thus, woodpeckers are able to grip a tree trunk surface with opposable toes.

Woodpeckers have evolved chisel-like bills coupled with strong neck and head muscles. These adaptations give them the ability to chip away bark and wood to uncover insects for food, as well as to create nesting cavities. The extremely long, barbed tongue (some species are able to extend their tongue two inches beyond the bill tip) enables the bird to spear insects hidden deep in small holes.

Even a novice bird-watcher can easily identify a woodpecker by its behavior. Only two other birds in Alaska, the much smaller brown creeper and red-breasted nuthatch, spend so much time moving vertically on tree trunks. All woodpeckers can be recognized by their undulating flight—wings flapping as the bird goes up and wings folded on the way down.

**Life history:** Reproductive habits of Alaska's woodpeckers are similar in many aspects. Four species (hairy, downy, three-toed, and black-backed) remain throughout the year and begin breeding activities during late winter. Northern flickers, red-breasted sapsuckers, and yellow-bellied sapsuckers migrate south in winter, returning in early spring. The male sets up a territory by "drumming." This loud repetitive noise is made by hammering the bill against a resonating surface such as the trunk of a dead tree. Woodpeckers use various displays, including head-weaving and body-bobbing, during courtship and as signs of aggression toward intruders.



After pairing, nest construction begins. All species in Alaska usually excavate new nest holes and chambers each year. Woodpeckers do not bring in nest material; eggs are laid on the wood chips that dropped down during cavity construction. Both sexes play a large role in nesting; both construct the nest site and share the duties of incubation, which takes about two weeks. Young are altricial, meaning they are blind and naked at hatching. The adults are then kept busy, one obtaining food while the other broods the young. Once the young have grown feathers and can maintain their own body heat, both adults bring in food. Adults regurgitate partially digested insects to feed the young. Later, whole insects may be brought to the growing chicks. Young leave the nest after 25-30 days. They may then remain with the parents for only a few days before becoming full independent.

**Management:** Woodpeckers play an important part in Alaska's forest ecosystems. Wood-boring and other insects which are inaccessible to other birds are consumed by woodpeckers. Studies in other parts of North America have estimated very large numbers of insects consumed; one black-backed woodpecker may eat 13,500 beetle larvae annually. In some areas, woodpeckers are thought to be able to eat enough larvae to prevent outbreaks of insects that damage and kill trees. Since wood and saw logs are very valuable in much of Alaska, woodpeckers could play an important economic role. Aesthetically, their value is incalculable. The sound of a drumming woodpecker is a sign of the approach of spring. The sight of a three-toed or black-backed woodpecker is eagerly sought by bird-watchers.

Because they are dependent on certain forest characteristics, including snags and trees with heart rot for drumming, nesting, roosting, and feeding sites, woodpeckers are vulnerable to alterations of forest habitats. Short rotation logging or selective cutting of trees with insect damage or heart rot have caused population declines of some species of woodpeckers in other parts of the world. Intensive cutting of dead trees for firewood is also potentially harmful to woodpecker populations. The role of woodpeckers as forest insect predators should not be overlooked by those seeking to improve timber production.

The **northern flicker** (*Colaptes auratus*) is probably the most easily identified woodpecker in Alaska. Two races are found here—the red-shafted (shaft is the stiff part of a feather), found primarily in Southeast Alaska, and the yellow-shafted, which predominates throughout the rest of the state. Both have a conspicuous white rump patch, seen especially in flight, and on the male, a black or red "mustache" extending back of the bill. Flickers can also be identified by their loud call that sounds like "wake-up, wake-up, wake-up."

Flickers have a less chisel-like bill than other woodpeckers, thus they cannot get to wood boring insects. Instead, they often feed on the ground and pick insects off tree trunks and branches. Ants are a favorite food.

Two species of sapsuckers occur in Alaska. **Yellow-bellied** (*Sphyrapicus varius*) and **red-breasted sapsuckers** (*S. ruber*) were formerly considered two races of the same species but are now classified separately. Yellow-bellied sapsuckers have black and white heads and chests with red only on the forehead and under the chin. They have been seen only a few times in Alaska. Sapsuckers with red heads, necks, and chests are red-breasted sapsuckers. They occur only in Southeast Alaska and are uncommon even there. Male and female sapsuckers are similar and difficult to distinguish in the field.

Sapsuckers are appropriately named as they obtain a large part of their food by "tapping" trees for sap. Small, square holes are drilled in rows around a tree trunk; these act as

miniature wells. Sapsuckers use their long tongues with their special brush-like tips to lap up the fluid that fills the holes. These birds also eat the insects which the flowing sap attracts.

The **hairy woodpecker** (*Picoides villosus*) and **downy woodpecker** (*P. pubescens*) frequent bird feeders filled with animal fat or suet during the winter. Hairy and downy woodpeckers look similar, being a vivid black and white with a white stripe down the back. Downy woodpeckers essentially look like miniature hairy woodpeckers but have much shorter bills in proportion to head size. Both males have bright red neck patches.

The **three-toed woodpecker** (*P. tridactylus*) is the most abundant and widespread woodpecker in Alaska, primarily inhabiting mature spruce forests. This woodpecker is predominantly black and white, although males have bright yellow foreheads. It is most easily distinguished from other woodpeckers by the black and white barred stripe on its back and sides.

**Black-backed woodpeckers** (*P. arcticus*) occur in forested parts of Alaska but are uncommon and difficult to observe. This bird is very similar in appearance to the three-toed except for its larger size and all black back. They often feed on the lower trunks of dead trees and prefer to nest in old snags near openings in the forests, such as bogs. Both black-backed and three-toed woodpeckers have only three toes rather than the four of other woodpeckers. This in no way impairs their ability to climb. They probably spend more time on tree trunks than any other woodpeckers in Alaska.

Text: William A. Lehnhausen Illustration: Lyon Revised and reprinted 2008

## **Sandhill Crane**

The **Sandhill crane** (*Grus canadensis*) is Alaska's largest game bird. Residents of the Yukon-Kuskokwim Delta have affectionately nicknamed it the "Sunday turkey." In some ways, cranes are birds of great contrasts. They are one of the most stately, and dignified birds in flight, but they can also be one of the most comical when doing their famous "mating dance." They come together in great flocks during migrations but are wary and scatter widely in their breeding and nesting areas.



**General description:** Sandhill cranes are wading birds that have long black legs, long necks, and black chisel-shaped bills. Adults stand almost 3 feet (0.9 m) tall and have a wing span of 6 feet (1.8 m) or more. Mature birds are an ash-gray color with a bright red forehead. Immature birds are quite mottled with coppery or rusty feathers and lack the red forehead of adults. Adult plumage is attained at 2½ years. In the past, the Sandhill cranes in Alaska were called “little brown” cranes and were thought to be a separate species based on their color. It is now known that the brownish-rust coloration of these northern birds is iron stain picked up in the peat bogs and muskegs of their breeding grounds.

Cranes breeding and migrating in Alaska are part of a complex of lesser Sandhill cranes found from Siberia across northern Canada. They are considered a separate subspecies from greater Sandhill cranes found in southern Canada and the lower 48 states. There is considerable variation in size among cranes, and their taxonomy has not been studied in detail.

Cranes have very powerful, unmistakable voices. The windpipe of cranes (and also trumpeter swans) forms a loop within the breastbone, producing the great resonance of their voices. Their cry has been described as a loud, rolling, musical rattle.

**Range and distribution:** There are two distinct groups of Sandhill cranes in Alaska. The more populous northern group breeds on the Yukon-Kuskokwim Delta, in the Interior, and along coastal areas throughout western and northern Alaska. These birds, along with others from Siberia and Canada, form the Mid-continent Population of lesser Sandhill cranes that winters in Texas, the southwestern United States, and Mexico. A smaller group, the Pacific Flyway Population, breeds in the Bristol Bay lowlands, on the Alaska Peninsula, and in the Cook Inlet-Susitna Valley region. A few nests have also been found in Southeast Alaska. This group winters in the Central Valley of California.

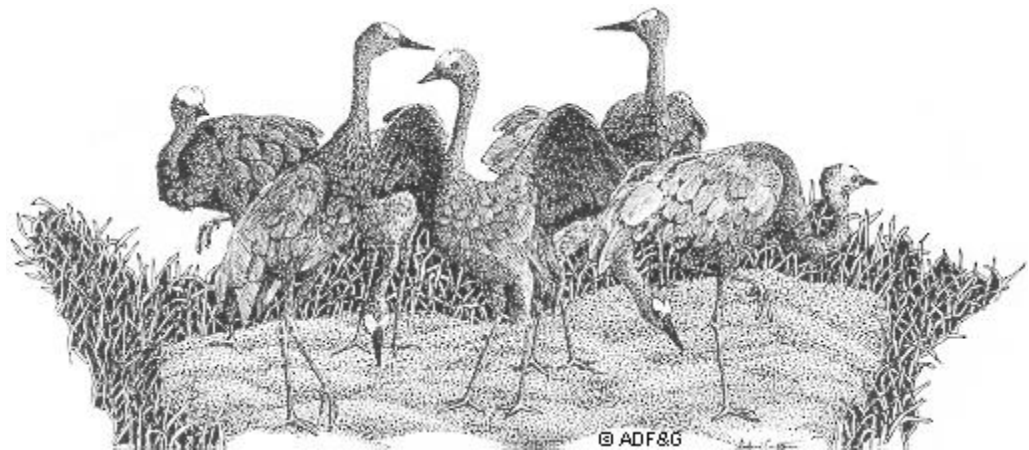
**Life history:**

Cranes arrive at their nesting grounds in early to mid-May. They nest on wet tundra, marshes, and muskegs.

Their nests are often simple affairs— shallow

depressions in the soil lined with dry grass and feathers. Normally, two eggs are laid. Eggs are spotted and gray to brown in color. Both sexes incubate them, and the young hatch in about 30 days. Nestlings are able to walk immediately after hatching. The young are frequently fed food items caught by the adults but can also capture insects on their own from an early age. In two to two-and-a-half months, the young have fledged and are ready to undertake the southward migration with their parents.

**Feeding and behavior:** Omnivorous ground feeders, cranes eat frogs, rodents, insects, bulbs, seeds, and berries as well as occasional seashore delicacies. They have adapted well to



agriculture and during the winter and on migration, feed largely on waste grain and small animals associated with farm fields.

The dance of the Sandhill's may be one of the strangest breeding displays on the tundra. Often called a mating dance, display activity reaches a peak in late winter and early spring, but it has also been seen at other times of the year when two cranes meet. The ritual starts with a deep bow followed by great leaps, hops, skips, turns, and more bows. This dance can go on for many minutes.

Cranes are extremely wary birds and hard to approach. Their long legs enable them to easily outdistance a person walking on the uneven tundra, but they will take flight if closely approached. Except for the nesting season, cranes are social birds that feed together and occupy safe communal roosts at night.

**Migration:** Almost all lesser Sandhill cranes in Alaska pass through two migration "funnels." One is the Copper River Delta through which about 20,000 cranes fly on their way along the Pacific Flyway to and from central California. The other is in the Tanana Valley near Delta Junction-George Lake. In early May and mid-September, 200,000 Mid-continent cranes pass through this northern funnel, with as many as 50,000 passing through per day during the peak. At least 50,000 cranes nesting in northeast Siberia travel this route and cross the Bering Strait during these migrations. Another 8,000 birds pass through the Yukon Flats area near Eagle. Both northern groups travel the Central Flyway through Canada and the plains states to and from their southwest wintering grounds. When taking off, flocks of cranes ascend in great circling columns, riding thermal currents of rising air, then form into "V"-formations. They fly very high and appear to be primarily daylight and fair-weather migrants, traveling as far as 350 miles a day.

**Management:** There is a fall hunting season for lesser Sandhill cranes in Alaska, which corresponds with the regular waterfowl season. Cranes are harvested conservatively because these long-lived birds have a naturally low reproductive rate. There is some potential for depredations on agricultural crops, particularly on grain and vegetable crops on the wintering grounds. Occasionally cranes damage rice field levees while burrowing for invertebrates, and local destruction of lettuce and other leaf crops can occur. Habitat conservation measures are becoming more critical to protect the migration stopovers and local roosting areas of cranes. These long-distance migrants need their traditional resting sites in certain kinds of wetlands and on the sandbars of major rivers, but habitat alteration and human disturbance is encroaching on these special sites. Beyond economic considerations, cranes are highly valued birds whose spectacular migrations and ancient manners provide a rare treat to people across North America.

Text: Tom Paul, Dan Rosenberg and Tom Rothe Illustration: Richard Carstensen

## Gulls

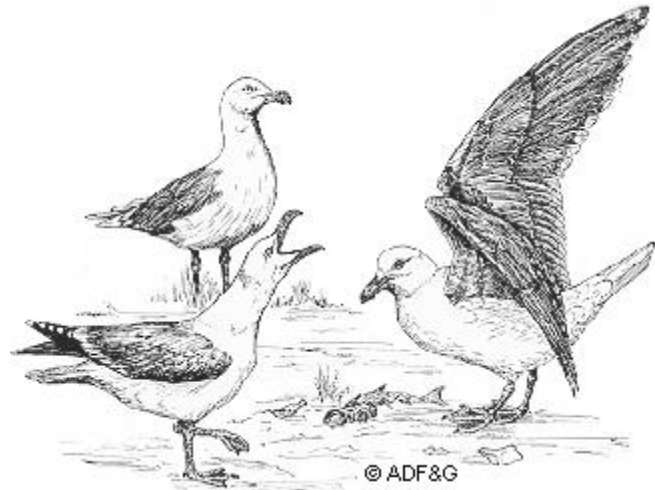
Three large gulls are commonly found in Alaska. These are the **glaucous-winged gull** (*Larus glaucescens*), **glaucous gull** (*L. hyperboreus*), and **herring gull** (*L. argentatus*), in order of decreasing abundance. These gulls are closely related, and hybrids are not uncommon.

## Glaucous-winged Gulls

Glaucous-winged gulls are the common “seagulls” familiar to many on the south coast of Alaska. Glaucous winged gulls breed in Alaska from the British Columbia border to the end of the Aleutian chain and northward to Bristol Bay, western Nunivak Island, and the Pribilofs.

**General description:** Adults have white heads and bodies, pink legs, brown eyes, gray backs, and wing tips typically the same shade of gray as the back. Their heads are heavily flecked with gray in winter. Recently fledged juveniles are dark-brownish gray. The plumage becomes lighter each year to age 4, when adult coloration is acquired and they first begin breeding. Adults typically live about 10 years and average 23 to 26 inches (58-66 cm) in length.

**Life history:** Glaucous-winged gulls are found principally in intertidal coastal habitats, although they follow major rivers and salmon streams inland. They also range hundreds of kilometers seaward, especially in winter. These birds are adaptable to a wide variety of natural and artificial settings, including highly urbanized environments. Efficient garbage collectors, they congregate at natural food sources such as salmon streams where they perform a useful function—they scavenge intertidal areas, riverbanks, and open sea for dead fish, invertebrates, birds, and mammals. These gulls also take small live fish at sea and in intertidal pools and prey upon eggs and chicks of other birds. They feed in circling flocks over fish schools and floating waste. Unfortunately, gulls tend to flock around onshore fish processing plants, garbage dumps, sewage outfalls, offshore factory ships, and trawlers. Thus their populations increase rapidly when new sources of food become available, and artificially high populations cause many problems. Glaucous-winged gulls were demonstrated to be vectors of *Salmonella* in an epidemic associated with contaminated water supplies at Ketchikan. In some places, glaucous-winged gulls also pose a hazard to aircraft, especially where garbage dumps are close to airports. Unless care is taken to reduce the availability of artificial food supplies, industrial and economic development of Alaska will cause gull population explosions with the resulting problems for public health, safety, and conservation of other Alaska seabirds.



Gulls tend to colonize and are very aggressive, often exhibiting much antagonism toward members of their own and other species. In late winter and early spring, glaucous-winged gulls appear at their colony sites, often before the snow melts. They prefer open, grassy hillsides of islands but will nest in a variety of locations. Colony size may range from less than 10 to as many as 10,000 pairs. A clutch of one to three eggs is laid in mid-to late May. Chicks hatch in mid-to late June and are raised within the nesting territory.

Glaucous-winged gulls are partially migratory; some populations shift to British Columbia, Washington, Oregon, and California in fall and winter. The Southeast Alaska, Vancouver, B.C. — Puget Sound area is a major wintering area for glaucous-winged gulls. Others remain in Alaska throughout the year.

Glaucous-winged gulls have few natural enemies; ravens, crows, and jaegers take eggs; bald eagles take chicks, juveniles, and adults. However, most loss is because of cannibalism and territorial defense killings by other gulls.

## Glaucous Gulls

Glaucous gulls breed along the coast of western and northern Alaska from the Yukon-Kuskokwim Delta to Demarcation Point on the Canada border and on several islands in the Bering Sea. The center of abundance of glaucous gulls in Alaska is the Yukon-Kuskokwim Delta and the east side of the Bering Strait. The largest breeding concentration of glaucous gulls is on St. Matthew/Hall Island. Glaucous gulls are common in the Aleutians in winter.

**General description:** Glaucous gulls are somewhat larger than glaucous-winged gulls, have white bodies and heads, yellow eyes, gray backs, and white wing tips. Adults average 25 to 31 inches (58-79 cm) in length. Glaucous gulls first breed at age 4. Immature glaucous gulls are light grayish-brown in their first year and nearly all-white (except for black-tipped bills) in their second year.

**Life history:** Glaucous gulls are occasionally seen in spring and summer along the south coast of Alaska as far as Cordova, Yakutat, and Glacier Bay. They occur on river deltas, coastal tundra, lagoons, sea cliffs, barrier islands, and pack ice. They are scavengers as well as important predators on waterfowl and other seabirds. However, coastal glaucous gulls away from marine bird colonies feed mainly on fish. Glaucous gulls nest in colonies on sea cliffs as well as in isolated pairs on tundra ponds. Colony size is usually far smaller than that of glaucous-winged gulls. Glaucous gulls appear on nesting territories before snow melts. They begin breeding in May. Clutch size is usually three eggs. Newly fledged juveniles remain with their parents close to nesting territories for several weeks after learning to fly, gradually moving to the sea in September and October.

Surveys of 1,500 miles (2,400 km) of northwestern Alaskan coast suggest that glaucous gulls may be entering a period of rapid population growth. Domestic and industrial development activities on the North Slope are generating large volumes of solid waste in unnatural settings, precisely the sort of environment that facilitates explosive increases in juvenile gull survival. Artificially high glaucous gull populations will pose problems in northern and western Alaska similar to the problems abnormally high glaucous-winged gull populations present in southcoastal areas.

## Herring Gulls

Herring gulls have white heads and bodies, gray backs, typically yellow eyes, and black wing tips with small white spots. Total length is 22 to 25 inches (56-64 cm). Juvenile herring gulls are difficult to tell from juvenile glaucous-winged gulls. Herring gulls are usually found breeding in low numbers on boreal lakes and rivers in interior Alaska. Some herring gulls, however, breed on the south coast of Alaska, notably in Upper Cook Inlet near the mouth of the Susitna River; at Dry Bay, mouth of the Alsek River, near Yakutat; and in Glacier Bay in recently deglaciated fjords. Hybridization with glaucous-winged gulls occurs in these locations. Hybrid gulls display characteristics of both these parental forms and are found at river mouths and near tidewater glaciers. They nest on flat gravel bars, sloping grassy hillsides, and on nearly vertical cliff faces. A Siberian form of the herring gull (*Larus argentatus vegae*) breeds on sea

cliffs on St. Lawrence Island and occasionally appears in western Alaska, where it hybridizes with glaucous gulls. In addition, many glaucous gulls on the Yukon-Kuskokwim Delta show signs of interbreeding with glaucous-winged gulls.

Almost all features of reproductive biology of Interior herring gulls resemble those of glaucous-winged gulls. However, the food of Interior herring gulls is limited and consists mainly of fish. This may account for their lower numbers. Alaska herring gulls are completely migratory, leaving lakes and rivers for the coast in September. Herring gulls banded on Alaska lakes have been re-sighted during winter in southern California and Mexico. Herring gulls return to Alaska lakes in May.

Alaska's herring gull populations are not likely to expand in the foreseeable future because of restricted nesting space and lack of substantial sources of artificial food. Indeed, as recreational boating traffic on lakes increases, disturbance of their relatively small colonies may result in population declines.

Text: Sam Patten Illustration: Sue Arthur Revised 1994 and reprinted 1998

## Great Blue Heron

*Ardea herodias*



<b>Conservation status</b>	Formerly often shot, simply because it made a conspicuous and easy target, but this rarely occurs today. Colonies may be disrupted by human disturbance, especially early in season. Still common and widespread, numbers probably stable.
<b>Family</b>	Hérons, Egrets, Bitterns
<b>Habitat</b>	Marshes, swamps, shores, tideflats. Very adaptable. Forages in any kind of calm fresh waters or slow-moving rivers, also in shallow coastal bays. Nests in trees or shrubs near water, sometimes on ground in areas free of predators. "Great White" form is mostly in salt water habitats.

Widespread and familiar (though often called "crane"), the largest heron in North America. Often seen standing silently along inland rivers or lakeshores, or flying high overhead, with slow wingbeats, its head hunched back onto its shoulders. Highly adaptable, it thrives around all kinds of waters from subtropical mangrove swamps to desert rivers to the coastline of southern

Alaska. With its variable diet it is able to spend the winter farther north than most herons, even in areas where most waters freeze. A form in southern Florida (called "Great White Heron") is slightly larger and entirely white.

### **Photo Gallery**



### **Feeding Behavior**

Forages mostly by standing still or walking very slowly in shallow water, waiting for fish to swim near, then striking with rapid thrust of bill. Also forages on shore, from floating objects, and in grassland. May hunt by day or night.

## **Eggs**

3-5, sometimes 2-7. Pale blue. Incubation is by both sexes, 25-30 days. Young: Both parents feed young, by regurgitation. Young capable of flight at about 60 days, depart nest at about 65-90 days. 1 brood per year in north, sometimes 2 in south.

## **Young**

Both parents feed young, by regurgitation. Young capable of flight at about 60 days, depart nest at about 65-90 days. 1 brood per year in north, sometimes 2 in south.

## **Diet**

Highly variable and adaptable. Eats mostly fish, but also frogs, salamanders, turtles, snakes, insects, rodents, birds. Has been seen stalking voles and gophers in fields, capturing rails at edge of marsh, eating many species of small waterbirds.

## **Nesting**

Breeds in colonies, often of this species alone, sometimes mixed with other wading birds; rarely in isolated pairs. Male chooses nest site and displays there to attract mate. Displays include stretching neck up with bill pointing skyward, flying in circles above colony with neck extended, stretching neck forward with head and neck feathers erected and then snapping bill shut. Nest: Site highly variable, usually in trees 20-60' above ground or water; sometimes in low shrubs, sometimes on ground (on predator-free islands), sometimes well above 100' in tree. Nest (built mostly by female, with material gathered mostly by male) is a platform of sticks, sometimes quite large.

## **Migration**

Northern populations east of Rockies are migratory, some going to Caribbean, Central America, or northern South America. Migrates by day or night, alone or in flocks. Some wander well to the north in late summer. Populations along Pacific Coast may be permanent residents, even as far north as southeastern Alaska.

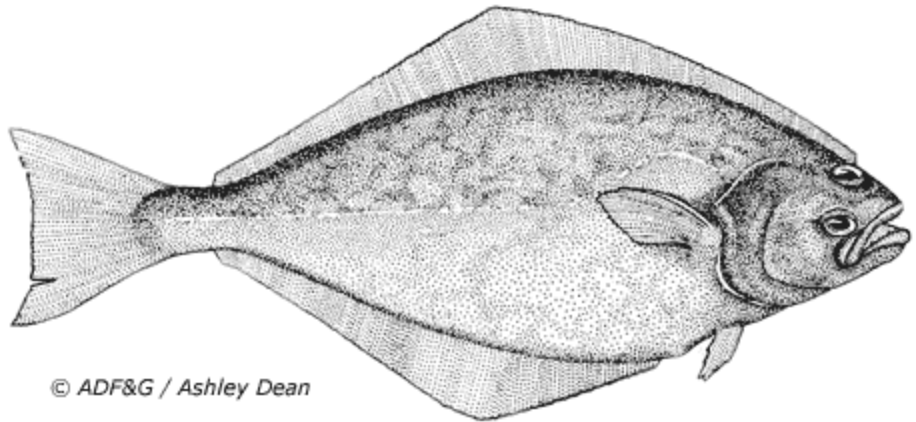
# FISH

## Pacific Halibut

The **Pacific halibut** (*Hippoglossus stenolepis*) was called "haly-butte" in Middle English, meaning the flatfish to be eaten on holy days.

### General description:

Halibut are more elongated than most flatfishes, the width being about one-third the length. Small scales are imbedded in the skin. Halibut have both eyes on their dark or upper side. The color on the dark side varies but tends to assume the coloration of the ocean bottom. The underside is lighter, appearing more like the sky from below. This color adaptation allows halibut to avoid detection by both prey and predator.



**Life history:** Spawning takes place during the winter months with the peak of activity occurring from December through February. Most spawning takes place off the edge of the continental shelf in deep waters of 200 to 300 fathoms. Male halibut become sexually mature at 7 or 8 years of age while females attain sexual maturity at 8 to 12 years. Females lay two to three million eggs annually, depending on the size of the fish.

Fertilized eggs hatch after about fifteen days. Free-floating eggs and larvae float for up to six months and can be transported several hundred miles by North Pacific currents. During the free-floating stage, many changes take place in the young halibut, including the migration of the left eye to the right side of the fish. During this time the young halibut rise to the surface and are carried to shallower water by prevailing currents. In the shallower water, young halibut then begin life as bottom dwellers. Most young halibut ultimately spend from five to seven years in rich, shallow nursery grounds like the Bering Sea.

Young halibut, up to 10 years of age, are highly migratory and generally migrate in a clockwise direction east and south throughout the Gulf of Alaska. Halibut in the older age classes tend to be much less migratory. Older fish often use both shallow and deep waters over their annual cycle.



Research indicates that there may be small, localized spawning populations in deep waters such as in Chatham Strait in northern Southeast Alaska. However, because of the free-floating nature of eggs and larvae and subsequent mixing of juvenile halibut from throughout the Gulf of Alaska, there is only one known genetic stock of halibut in the northern Pacific.

Halibut growth rates vary depending on locations and habitat conditions, but females grow faster and live longer than males. The oldest recorded female was 42 years old whereas the oldest male was 27 years old. Halibut are the largest of all flatfish. The largest recorded sport caught halibut was 459 pounds near Unalaska in 1996.

**Food habits:** Being strong swimmers, halibut are able to eat a large variety of fishes including cod, turbot, pollock, and some invertebrates such as crab and shrimp. Sometimes halibut leave the ocean bottom to feed on pelagic fish such as sand lance and herring.

**Commercial fishing:** Commercial halibut fishing probably began in 1888 when three sailing ships from New England fished off the coast of Washington state. As the industry grew, company-owned steamers carrying several smaller dories, from which the fishing was actually conducted, dominated the halibut fishery. Subsequently, smaller boats of schooner design in the 60- to 100-foot class were used in the fishery. These boats carried crews of five to eight and were specifically designed for halibut fishing. Today, many types of boats are used in the halibut fishery. Most of the old-style halibut schooners have been replaced by more versatile craft that may also be used in commercial salmon seine, troll, gillnet, and crab fisheries. Halibut gear consists of units of leaded ground line in 100 fathoms lengths referred to as "skates." Each skate has approximately 100 hooks attached to it. "Gangens," or the lines to which the hooks are attached are either tied to or snapped onto the ground line. A "set" consists of one or more baited skates tied together and laid on the ocean bottom with anchors at each end. Each end has a float line with a buoy attached. Hooks are typically baited with frozen herring, octopus, or other fresh fish. Depending on the fishing ground, depth, time of year, and bait used, a set is fished 2 to 20 hours before being pulled. Longlines are normally pulled off the ocean floor by a hydraulic puller of some type. The halibut are cleaned soon after being boated and are kept on ice to retain freshness.

**Sport fishing:** Sport fishing for halibut in Alaska is a very popular activity, with over 65 percent of the effort and harvest occurring in Kachemak Bay, Southeast Alaska, the Kodiak area, and near the mouth of Deep Creek in Lower Cook Inlet. Halibut taken by sport anglers are generally 15 to 20 pounds in weight; however, fish over 150 pounds are frequently caught. The current Alaska state record for a sport-caught halibut is 459 pounds, and a fish must weigh at least 250 pounds to qualify for the state's trophy fish program. Anglers use stout saltwater fishing gear to harvest halibut. The effort and interest in catching these delicious fish is increasing each year. In Southeast Alaska, halibut are second only to king salmon in sport angler preference.

Halibut, along with salmon, provided subsistence for several Pacific Coast native groups. Much folklore is found concerning halibut. Each fish hook used by Alaska natives were carved with special designs to bring good luck and large fish. The halibut were smoked and dried for winter use.

Fishing for Pacific halibut is regulated by the International Pacific Halibut Commission. Members from the United States and Canada meet yearly to review research, check the progress of the commercial fishery, and make regulations for the next fishing season. The management of halibut fishing by this commission is intended to allow a maximum sustainable yield of halibut.

Text: Mike Bethers

Illustration: Ashley Dean

Revised and reprinted 2007

## Pacific Herring

The **Pacific herring** (*Clupea pallasii*) is one of more than 180 species in the herring family, Clupeidae. This family contains some of the world's most abundant and commercially important fishes. Herring are important food sources for a wide variety of fishes, mammals, and birds.

Pacific herring migrate in schools and are found along both shores of the ocean, ranging from San Diego Bay to the Bering Sea and Japan.

### General

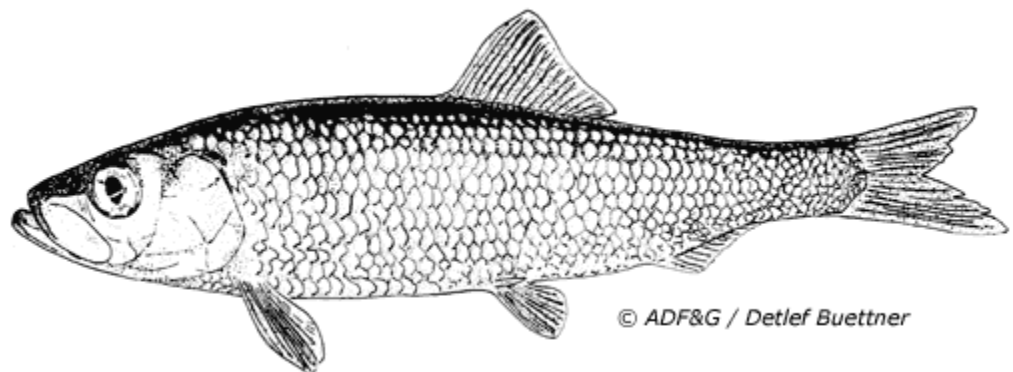
#### description:

Herring have a blue-green upper body with silvery sides and are devoid of markings. The body is laterally compressed and

the scales along the underside project in a slightly serrated arrangement. Scales are large and easily removed. These fish may grow to 18 inches in length, but a 9-inch specimen is considered large.

**Life history:** Pacific herring generally spawn during the spring. In Alaska, spawning is first observed in the southeastern archipelago during mid-March, in Prince William Sound in April and May, and in the Bering Sea during May and June. Spawning is confined to shallow, vegetated areas in the intertidal and subtidal zones.

The eggs are adhesive, and survival is better for those eggs which stick to intertidal vegetation than for those which fall to the bottom. Milt released by the males drifts among



the eggs and fertilizes them. The eggs hatch in about two weeks, depending on the temperature of the water.

Herring spawn every year after reaching sexual maturity at 3 or 4 years of age. The number of eggs varies with the age of the fish and averages 20,000 annually. Average life span for these fish is about 8 years in Southeast Alaska and up to 16 years in the Bering Sea.

Mortality of the eggs is high. Young larvae drift and swim with the ocean currents and are preyed upon extensively by other vertebrate and invertebrate predators. Following metamorphosis of the larvae to the juvenile form, they rear in sheltered bays and inlets and appear to remain segregated from adult populations until they are mature.

**Migratory and feeding behavior:** Herring are located in distinctly different environments during different periods of the year. After spawning, most adults leave inshore waters and move offshore to feed primarily on zooplankton such as copepods and other crustaceans. They are seasonal feeders and accumulate fat reserves for periods of relative inactivity. Herring schools often follow a diel vertical migration pattern, spending daylight hours near the bottom and moving upward during the evening to feed.

**Commercial fisheries:** Alaska's herring industry began in 1878 when 30,000 pounds were marketed for human consumption. The total value was \$900. By 1882, a reduction plant at Killisnoo in Chatham Strait was producing 30,000 gallons of herring oil. The industry was slow to expand, but a 1929 record 78,745 tons of these fish was harvested for all uses, including bait.

By 1967, no herring were harvested for reduction products. The total production of 3,025 tons was sold for bait. The decline of the Alaska reduction industry is attributed primarily to the development of Peruvian reduction industries.

Presently, herring are harvested primarily for sac roe to foreign markets. Substantial harvest for sac roe began in Southeast Alaska in 1971 and has expanded up the Alaska coast to Norton Sound. Herring are managed with individual quotas for identified stocks of herring on a spawning area basis and are harvested commercially by gillnetters and purse seiners. Sac roe fisheries in most areas are regulated under the state's limited entry program.

Herring are also commercially harvested for use as bait for the halibut, groundfish, crab, and salmon troll fisheries. Bait harvest has extended to Dutch Harbor in the Aleutian Chain in recent years.

Herring eggs on kelp are also harvested commercially. Wild kelp is harvested by divers and by hand picking in intertidal areas.

Pound kelp harvests, where herring are captured with purse seines and confined until they spawn in pound enclosures containing harvested kelp, produce a very high value product.

Statewide herring harvests have averaged approximately 34,000 metric tons in recent years, with a value of approximately \$10 million. About 10 percent of the commercial harvest is taken in food and bait fisheries, and the rest is taken in sac roe fisheries. In addition, fisheries for herring eggs on kelp harvest about 275 metric tons of product annually with a value of approximately \$3.5 million.

**Subsistence fisheries:** Herring are used for personal bait by area residents. Herring eggs on kelp are also used for subsistence by Alaska Natives.

## Chinook Salmon

The **Chinook salmon** (*Oncorhynchus tshawytscha*) is Alaska's state fish and is one of the most important sport and commercial fish native to the Pacific coast of North America. It is the largest of all Pacific salmon, with weights of individual fish commonly exceeding 30 pounds. A 126-pound Chinook salmon taken in a fish trap near Petersburg, Alaska in 1949 is the largest on record. The largest sport-caught Chinook salmon was a 97-pound fish taken in the Kenai River in 1986.

The Chinook salmon has numerous local names such as quinnat, tyee, tule, blackmouth, and king. In Washington and Oregon, they are called chinook, while in British Columbia they are called spring salmon.



**Range:** In North America, Chinook salmon range from the Monterey Bay area of California to the Chukchi Sea area of Alaska. On the Asian coast, Chinook salmon occur from the Anadyr River area of Siberia southward to Hokkaido, Japan.

In Alaska, they are abundant from the southeastern panhandle to the Yukon River. Major populations return to the Yukon, Kuskokwim, Nushagak, Susitna, Kenai, Copper, Alsek, Taku, and Stikine rivers. Important runs also occur in many smaller streams.

**General description:** Adults are distinguished by the black irregular spotting on the back and dorsal fins and on both lobes of the caudal or tail fin. Chinook salmon also have a black pigment along the gum line, thus the name "blackmouth" in some areas.

In the ocean, the chinook salmon is a robust, deep-bodied fish with bluish-green coloration on the back which fades to a silvery color on the sides and white on the belly. Colors of spawning chinook salmon in fresh water range from red to copper to deep gray, depending on location and degree of maturation. Males typically have more red coloration than females, which are typically gray. Older adult males (4-7 years) are distinguished by their "ridgeback" condition and by their hooked nose or upper jaw. Females are distinguished by a torpedo-shaped body, robust mid-section, and blunt noses. Juveniles in fresh water (fry) are recognized by well-developed parr marks which are bisected by the lateral line. Chinook salmon heading to the ocean (smolt) have bright, silver sides, and parr marks recede to mostly above the lateral line.

**Life history:** Like all species of Pacific salmon, chinook salmon are anadromous. They hatch in fresh water and rear in main-channel river areas for one year. The following spring, chinook

salmon turn into smolt and migrate to the salt water estuary. They then spend anywhere from 1-5 years feeding in the ocean, and return to spawn in fresh water. All chinook salmon die after spawning. Chinook salmon may become sexually mature from their second through seventh year, and as a result, fish in any spawning run may vary greatly in size. For example, a mature 3-year-old will probably weigh less than 4 pounds, while a mature 7-year-old may exceed 50 pounds. Females tend to be older than males at maturity. In many spawning runs, males outnumber females in all but the 6-and 7-year age groups. Small chinook salmon that mature after spending only one winter in the ocean are commonly referred to as "jacks," and are typically male. Alaska streams normally receive a single run of chinook salmon in the period from May through July.

Chinook salmon often make extensive freshwater spawning migrations to reach their home streams on some of the larger river systems. Yukon River spawners bound for the extreme headwaters in Yukon Territory, Canada, will travel more than 2,000 river miles during a 60-day period. Chinook salmon do not feed during the freshwater spawning migration, so their condition deteriorates gradually during the spawning run as they use stored body materials for energy and gonad development.

Each female deposits between 3,000 and 14,000 eggs in several gravel nests, or redds, which she excavates in relatively deep, fast moving water. In Alaska, the eggs usually hatch in late winter or early spring, depending on time of spawning and water temperature. The newly hatched fish, called alevins, live in the gravel for several weeks until they gradually absorb the food in the attached yolk sac. These juveniles, called fry, wiggle up through the gravel by early spring. In Alaska, most juvenile chinook salmon remain in fresh water until the following spring when they migrate to the ocean as smolt in their second year of life.

Juvenile chinook salmon in fresh water initially feed on plankton and later feed on insects. In the ocean, they eat a variety of organisms including herring, pilchard, sandlance, squid, and crustaceans. Salmon grow rapidly in the ocean and often double their weight during a single summer season.

**Commercial fishery and subsistence:** North Pacific chinook salmon catches during the late 1970s and early 1980s averaged more than 4 million fish per year. The United States harvested the majority of the catch followed by Canada, Japan, and the USSR. The annual Alaska harvest of chinook salmon averaged 630,000 fish from 1970 to 2006. The majority of the Alaska catch is made in Southeast Alaska, Bristol Bay, and the Arctic-Yukon-Kuskokwim areas. Commercially-harvested chinook salmon averaged approximately 18 pounds. The majority of the catch is made with troll gear and gillnets. There is an excellent market for chinook salmon because of their large size and excellent table qualities. Recent catches in Alaska have brought fishers nearly \$19 million per year. Annual chinook salmon harvests by subsistence and personal use fishers in Alaska averaged 167,000 fish from 1994 to 2005. The majority of the subsistence harvest is taken in the Yukon and Kuskokwim rivers.

**Sport fishery:** The chinook salmon is perhaps the most highly prized sport fish in Alaska and is extensively fished by anglers in Southeast Alaska and in Cook Inlet (Southcentral Alaska). Trolling with rigged herring is the favored method of angling in salt water, while lures and salmon eggs are used by freshwater anglers. The annual Alaska sport fishing harvest of chinook salmon from 1989 to 2006 averaged 170,000 fish. During that period, 60% of the sport fish harvest of Chinook salmon was taken in Southcentral Alaska, 26% in Southeast Alaska, and 4% in the Arctic-Yukon-Kuskokwim area.

**Management:** Unlike other salmon species, chinook salmon rear in inshore marine waters and are therefore available to commercial and sport fishers all year. Catches of chinook salmon in Southeast Alaska are regulated by quotas set under the Pacific Salmon Treaty. In other regions of Alaska, chinook salmon fisheries are also closely managed to ensure stocks are not over harvested.

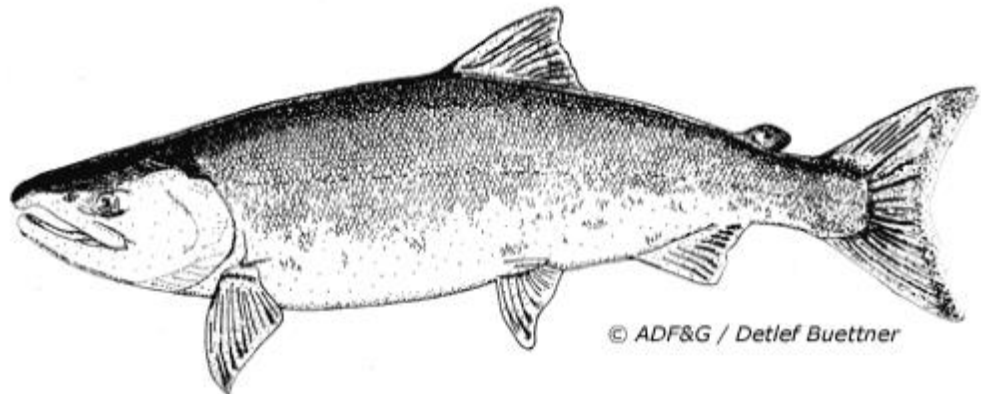
Text: Kevin Delaney Illustration: Ashley Dean Revised and reprinted 2008

## Chum Salmon

**Chum salmon** (*Oncorhynchus keta*) have the widest distribution of any of the Pacific salmon. They range south to the Sacramento River in California and the island of Kyushu in the Sea of Japan. In the north they range east in the Arctic Ocean to the Mackenzie River in Canada and west to the Lena River in Siberia. Chum salmon are the most abundant commercially harvested salmon species in arctic, northwestern, and Interior Alaska, but are of relatively less importance in other areas of the state. There they are known locally as "dog salmon" and are a traditional source of dried fish for winter use.

### General description:

Ocean fresh chum salmon are metallic greenish-blue on the dorsal surface (top) with fine black speckles. They are difficult to distinguish from sockeye and coho salmon without examining their



gills or caudal fin scale patterns. Chum have fewer but larger gillrakers than other salmon. After nearing fresh water, however, the chum salmon changes color—particularly noticeable are vertical bars of green and purple, which give them the common name, calico salmon. The males develop the typical hooked snout of Pacific salmon and very large teeth which partially account for their other name of dog salmon. The females have a dark horizontal band along the lateral line; their green and purple vertical bars are not so obvious.

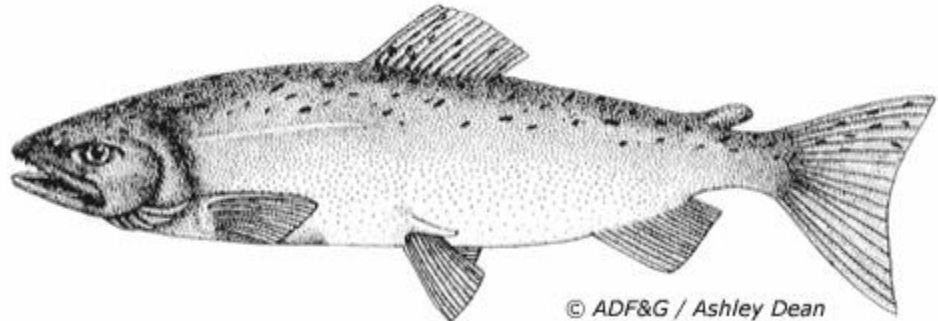
**Life history:** Chum salmon often spawn in small side channels and other areas of large rivers where upwelling springs provide excellent conditions for egg survival. They also spawn in many of the same places as do pink salmon, i.e., small streams and intertidal zones. Some chum in the Yukon River travel over 2,000 miles to spawn in the Yukon Territory. These have the brightest color and possess the highest oil content of any chum salmon when they begin their upstream journey. Chum salmon spawning is typical of Pacific salmon with the eggs deposited in redds located primarily in upwelling spring areas of streams. Female chum may lay as many as 4,000 eggs, but fecundity typically ranges between 2,400 and 3,100 eggs.

Chum do not have a period of freshwater residence after emergence of the fry, as do chinook, coho, and sockeye salmon. Chums are similar to pink salmon in this respect, except that chum fry do not move out into the ocean in the spring as quickly as pink salmon fry. Chum fry feed on small insects in the stream and estuary before forming into schools in salt water where their diet usually consists of zooplankton. By fall they move out into the Bering Sea and Gulf of Alaska where they spend one or more of the winters of their 3-to 6-year lives. In southeastern Alaska most chum salmon mature at 4 years of age, although there is considerable variation in age at maturity between streams. There is a higher percentage of chums in the northern areas of the state. Chum vary in size from 4 to over 30 pounds, but usually range from 7 to 18 pounds, with females generally smaller than males.

### **Noncommercial**

**fishery:** In arctic, northwestern and Interior Alaska, chum salmon remain an important year-round source of fresh and

dried fish for subsistence and personal use purposes. Sport fishers generally capture chum salmon incidental to fishing for other Pacific salmon in either fresh or salt water. Statewide sport harvest usually totals fewer than 25,000 chums. After entering fresh water, chums are most often prepared as a smoked product.



**Commercial fishery:** In the last decade over 18 million chum salmon, estimated at \$71 million, have been caught in Alaska. Most chum salmon are caught by purse seines and drift gillnets, with smaller amounts harvested by fish wheels and set gillnets. In many areas chum salmon are targeted due to large returns to hatchery terminal areas. The development of markets for fresh and frozen chum in Japan and northern Europe has increased their demand, especially in the last decade. Private non-profit hatcheries along with the Alaska Department of Fish and Game have built or modified several hatcheries for chum salmon production.

Text: Lawrence S. Buklis Illustration: Detlef Buettner/ADF&G

## **Coho Salmon**

**Coho Salmon** (*Oncorhynchus kisutch* (Walbaum)) also called silver salmon, are found in coastal waters of Alaska from Southeast to Point Hope on the Chukchi Sea and in the Yukon River to the Alaska-Yukon border. Coho are extremely adaptable and occur in nearly all accessible bodies of fresh water, from large trans-boundary watersheds to small tributaries.

**General description:** Adults usually weigh 8 to 12 pounds and are 24 to 30 inches long, but individuals weighing over 30 pounds have been landed. Adults in salt water or newly returning to fresh water are bright silver with small black spots on the back and on the upper lobe of the caudal fin (tail). They can be distinguished from Chinook salmon (*Oncorhynchus tshawytscha*)

by the lack of black spots on the lower lobe of the tail and by their white gums; Chinook have small black spots on both caudal lobes and they have black gums. Spawning adults of both sexes have dark backs and heads with maroon to reddish sides. The males develop a prominent hooked snout with large teeth called a kype. Juvenile coho salmon have 8 to 12 parr marks evenly distributed above and below the lateral line with the parr marks narrower than the interspaces. The adipose fin is uniformly pigmented and the anal fin has a long leading edge, usually tipped with white. The fins of juvenile coho are frequently tinted with orange.

**Life history:** Coho salmon enter spawning streams from July to November, usually during periods of high runoff. Adult coho return timing reflects requirements of specific stocks. For example, in some streams with barrier falls, adults arrive in July when the water is low and the falls are passable, however in some streams, coho may wait until August or September when higher flows from fall rains allow passage into small streams not normally passable at low flows. In large rivers, adults must arrive early, as they need several weeks or months to reach headwater spawning grounds. Run timing is also regulated by water temperature at spawning grounds: where temperatures are low and eggs develop slowly, spawners return early to compensate. Conversely, where temperatures are warm, adults are late spawners. Adults hold in pools until they ripen, then move onto spawning grounds; spawning generally occurs at night. The female digs a nest, called a redd, and deposits 2,400 to 4,500 eggs. As the eggs are deposited, they are fertilized with sperm, known as milt, from the male. The eggs develop during the winter, hatch in early spring, and the embryos remain in the gravel utilizing their egg yolk until they emerge in May or June. The emergent fry occupy shallow stream margins, and, as they grow, establish territories which they defend from other salmonids. They live in ponds, lakes, and pools within streams and rivers, usually among submerged, woody debris-in quiet areas free of current-from which they dart out to seize drifting insects.

During the fall, juvenile coho may travel miles before locating off-channel habitat where they pass the winter free of floods. Some fish leave fresh water in the spring and rear in brackish estuarine ponds and then migrate back into fresh water in the fall. They spend one to three winters in streams and may spend up to five winters in lakes before migrating to the sea as smolt. Time spent at sea varies. Some males (called jacks) mature and return after only 6 months at sea at a length of about 12 inches, while most fish stay 18 months before returning as full size adults.

Little is known about the ocean migrations of coho salmon. High seas tagging shows that maturing Southeast Alaska coho move northward throughout the spring and appear to concentrate in the central Gulf of Alaska in June. They later disperse towards shore and migrate along the shoreline until they reach their stream of origin.

**Commercial fishing:** The commercial catch of coho salmon has increased significantly from low catches in the 1960s, reaching 9.5 million fish in 1994. About half the commercially harvested coho were taken in Southeast Alaska, primarily by the troll fishery.

**Sport fishing:** The coho salmon is a premier sport fish and is taken in fresh and salt water from July to September. In 2005, anglers throughout Alaska caught 1.4 million coho salmon. In salt water they are taken primarily by trolling or mooching (drifting) with herring or with flies or lures along shore. In fresh water they hit salmon eggs, flies, spoons, or spinners. Coho are spectacular fighters and the most acrobatic of the Pacific salmon. On light tackle, coho provide a thrilling and memorable fishing experience.

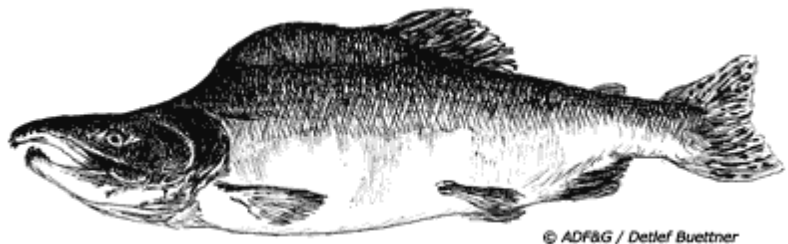


## Pink Salmon

The **pink salmon** (*Oncorhynchus gorbuscha*) is also known as the “humpy” because of its very pronounced, laterally flattened hump which develops on the backs of adult males before spawning. It is called the “bread and butter” fish in many Alaskan coastal fishing communities because of its importance to commercial fisheries and local economies. Pink salmon also contribute substantially to the catch of sport anglers and subsistence users in Alaska. It is native to Pacific and Arctic coastal waters from northern California to the Mackenzie River, Canada, and to the west from the Lena River in Siberia to Korea.

**General description:** The pink salmon is the smallest of the Pacific salmon found in North America with an average weight of about 3.5 to 4 pounds and average length of 20-25 inches. An adult sea run fish in coastal waters is bright greenish-blue on top and silvery on its sides. Close to fresh water it develops many large black spots on its back and over its entire tail fin. Its scales are very small and the flesh is pink. As fish approach spawning streams the bright appearance of males is replaced by brown to black above with a white belly; females become olive green with dusky bars or patches above and a light-colored belly. By the time males enter the spawning stream it has developed the characteristic hump and hooked jaws. Juvenile pink salmon are entirely silvery, without the dark vertical bars, or parr marks, displayed on the young of other salmon species.

**Life history:** Adult pink salmon enter Alaska spawning streams between late June and mid-October. Various runs (or races) of pink salmon, having a range of spawning times, may share the same river or spawn in adjacent rivers. Most pink salmon spawn within a few miles of the coast and spawning within the intertidal zone or the mouth of streams is very common. Shallow riffles where flowing water breaks over coarse gravel or cobble-size rock and the downstream ends of pools are favored spawning areas. The female pink salmon carries 1,500 to 2,000 eggs depending on her size. She digs a nest, or redd, with her tail and releases the eggs into the nest. They are immediately fertilized by one or more males and then covered by further digging action of the female. The process is commonly repeated several times until all the female’s eggs have been released. After spawning, both males and females soon die, usually within two weeks.



Sometime during early to mid-winter, eggs hatch. The alevins, or young fry, feed on the attached yolk sac material in order to continue to grow and develop. In late winter or spring, the fry swim up out of the gravel and migrate downstream into salt water. The emergence and outmigration of fry is heaviest during hours of darkness and usually lasts for several weeks before all the fry have emerged.

Following entry into salt water, the juvenile pink salmon move along the beaches in dense schools near the surface, feeding on plankton, larval fishes, and occasional insects. Predation is heavy on the very small, newly emerged fry, but growth is rapid. By fall, at an age of about 1 year, the juvenile pink salmon are 4 to 6 inches long and are moving into the ocean feeding grounds in the Gulf of Alaska and Aleutian Islands areas. High seas tag-and-recapture experiments have revealed that pink salmon originating from specific coastal areas have characteristic distributions at sea which are overlapping, nonrandom, and nearly identical from year to year. The Alaska pink salmon's range at sea overlaps with pink salmon from Asia, British Columbia, and Washington.

Pink salmon mature in two years which means that odd-year and even-year populations are essentially unrelated. Frequently in a particular stream the other odd year or even-year cycle will predominate, although in some streams both odd-and even-year pink salmon are about equally abundant. Occasionally cycle dominance will shift, and the previously weak cycle will become most abundant.

**History:** Pink salmon fisheries, both commercial and sport, are important in all coastal regions of Alaska south of Kotzebue Sound. Commercial canning and salting of pink salmon began in the late 1800s and expanded steadily until about 1920. During territorial days, commercial fishermen used fixed and floating fish traps extensively to catch pink salmon; but such traps were prohibited following statehood in 1959. Now most pink salmon are taken with purse seines and drift or set gillnets. Lesser numbers are taken with troll gear or beach seines. Runs declined markedly during the 1940s and 1950s; however, intensive efforts were successful in rebuilding and enhancing those runs through hatcheries, fish ladders, and improved fisheries management.

**Hatcheries:** Now a very important component of pink salmon management in Alaska, hatcheries throughout coastal Alaska releases millions of pink salmon fry annually to supplement wild pink stocks. These releases allow fishery managers to target pink salmon runs returning to terminal hatchery areas, while lowering fishing pressure on wild pink salmon stocks.

**Sport Fishing:** One of the easiest salmon to catch on rod and reel, pink salmon are often the first salmon species caught by children. Pink salmon are frequently targeted in saltwater off the mouth of streams, or in the inner tidal areas of fresh water streams. Favorite pink salmon lures are Pixies, Vibrax, Mepps\*\*, and a variety of flies. When these fish are ocean bright they make great table fare. From 1996 – 2006 sport fishermen in Alaska caught an average of 731,000 pink salmon each year, harvesting an annual average of 154,600 of these fish.

**Commercial Fishing:** Pink salmon continue to be one of the most important of the Pacific salmon in Alaska for commercial fishermen. Commercially caught pink salmon today are canned, filleted and flash frozen, made into nuggets, and prepared into complete pre-packaged meals. The average annual Alaska harvest between 1959 and 1992 was 45.1 million pink salmon. The current ten-year average harvest (1997-2006) is more than 107 million pink salmon.

Text: Alan Kingsbury Illustration: Ashley Dean, Detlef Buettner Revised 1994

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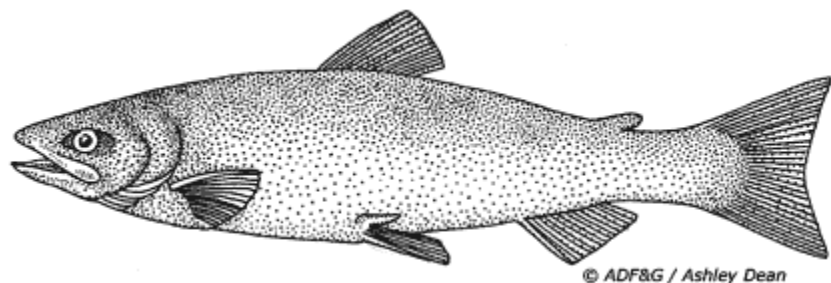
## Sockeye Salmon

The **sockeye salmon** (*Oncorhynchus nerka*), often referred to as "red" or "blueback" salmon, occurs in the North Pacific and Arctic oceans and associated freshwater systems. This species ranges south as far as the Klamath River in California and northern Hokkaido in Japan, to as far north as Bathurst Inlet in the Canadian Arctic and the Anadyr River in Siberia. Aboriginal people considered sockeye salmon to be an important food source and either ate them fresh or dried them for winter use. Today sockeye salmon support one of the most important commercial fisheries on the Pacific coast of North America, are increasingly sought after in recreational fisheries, and remain an important mainstay of many subsistence users.

**General description:** Sockeye salmon can be distinguished from Chinook, coho, and pink salmon by the lack of large, black spots and from chum salmon by the number and shape of gill rakers on the first gill arch. Sockeye salmon have 28 to 40 long, slender, rough or serrated closely set rakers on the first arch. Chum salmon have 19 to 26 short, stout, smooth rakers.

Immature and pre-spawning sockeye salmon are elongate, fusiform, and somewhat laterally compressed. They are metallic green blue on the back and top of the head, iridescent silver on the sides, and white or silvery on the belly. Some fine black speckling may occur on the back, but large spots are absent. Juveniles, while in fresh water, have the same general coloration as immature sockeye salmon in the ocean, but are less iridescent. Juveniles also have dark, oval parr marks on their sides. These parr marks are short-less than the diameter of the eye-and rarely extend below the lateral line. Breeding males develop a humped back and elongated, hooked jaws filled with sharp caniniform teeth. Both sexes turn brilliant to dark red on the back and sides, pale to olive-green on the head and upper jaw, and white on the lower jaw.

**Life history:** Sockeye salmon are anadromous: they live in the sea and enter freshwater systems to spawn. After hatching, juvenile sockeye salmon may spend up to four years in fresh water before migrating to sea as silvery smolt



weighing only a few ounces. They grow quickly in the sea, usually reaching a size of 4 to 8 pounds after one to four years. Mature sockeye salmon travel thousands of miles from ocean feeding areas to spawn in the same freshwater system where they were born. Little is known about the navigation mechanisms or cues they use on the high seas, although some evidence suggests that they may be able to use cues from the earth's magnetic field. Once near their natal freshwater system, sockeye salmon use olfactory cues to guide them home. Like all Pacific salmon, sockeye salmon die within a few weeks after spawning.

Maturing sockeye salmon return to freshwater systems from the ocean during the summer months, and most populations show little variation in their arrival time on the spawning

grounds from year to year. Freshwater systems with lakes produce the greatest number of sockeye salmon. Spawning usually occurs in rivers, streams, and upwelling areas along lake beaches. The female selects the spawning site, digs a nest (redd) with her tail, and deposits eggs in the downstream portion of the redd as one or more males swim beside her and fertilize the eggs as they are extruded. After each spawning act, the female covers the eggs by dislodging gravel at the upstream end of the redd with her tail. A female usually deposits about five batches of eggs in a redd. Depending upon her size, a female produces from 2,000 to 4,500 eggs.

Eggs hatch during the winter, and the young sac-fry, or alevins, remain in the gravel, living off the material stored in their yolk sacs, until early spring. At this time they emerge from the gravel as fry and move into rearing areas. In systems with lakes, juveniles usually spend one to three years in fresh water before migrating to the ocean in the spring as smolts. However, in systems without lakes, many juveniles migrate to the ocean soon after emerging from the gravel.

Sockeye salmon return to their natal stream to spawn after spending one to four years in the ocean. Mature sockeye salmon that have spent only one year in the ocean are called jacks and are, almost without exception, males. Once in the ocean, sockeye salmon grow quickly. While returning adults usually weigh between 4 and 8 pounds, weights in excess of 15 pounds have been reported.

In some areas, populations of sockeye salmon remain in fresh water all their lives. This landlocked form of sockeye salmon, called "kokanee," reaches a much smaller maximum size than the anadromous form and rarely grows to be over 14 inches long.

**Food habits:** While in fresh water, juvenile sockeye salmon feed mainly upon zooplankton (such as ostracods, cladocerans, and copepods), benthic amphipods, and insects. In the ocean, sockeye salmon continue to feed upon zooplankton (such as copepods, euphausiids, ostracods, and crustacean larvae), but also prey upon larval and small adult fishes (such as sand lance), and occasionally squid.

**Fisheries:** The largest harvest of sockeye salmon in the world occurs in the Bristol Bay area of southwestern Alaska where 10 million to more than 30 million sockeye salmon may be caught each year during a short, intensive fishery lasting only a few weeks. Relatively large harvests of one million to six million sockeye salmon are also taken in Cook Inlet, Prince William Sound, and Chignik Lagoon. All commercial Pacific salmon fisheries in Alaska are under a limited entry system which restricts the number of vessels allowed to participate. Most sockeye salmon are harvested with gillnets either drifted from a vessel or set with one end on the shore, some are captured with purse seines, and a relatively small number are caught with troll gear in the southeastern portion of the state.

Sockeye salmon are the preferred species for canning due to the rich orange-red color of their flesh. Today, however, more than half of the sockeye salmon catch is sold frozen rather than canned. Canned sockeye salmon is marketed primarily in the United Kingdom and the United States while most frozen sockeye salmon is purchased by Japan. Sockeye salmon roe is also valuable. It is salted and marketed in Japan.

There is also a growing sport fishery for sockeye salmon throughout the state. Probably the best known sport fisheries with the greatest participation occur during the return of sockeye salmon to the Kenai River and one of its tributaries the Russian River on the Kenai Peninsula.

Other popular areas include the Kasilof River on the Kenai Peninsula as well as the various river systems within Bristol Bay and Kodiak Island. Sockeye are highly prized by sport anglers for their tenacious fighting ability as well as food quality.

Subsistence users harvest sockeye salmon in many areas of the state. The greatest subsistence harvest of sockeye salmon probably occurs in the Bristol Bay area where participants use set gillnets. In other areas of the state, sockeye salmon may be taken for subsistence use in fish wheels. Most of the subsistence harvest consists of pre-spawning sockeye salmon, but a relatively small number

of post-spawning sockeye salmon are also taken. Personal use fisheries have also been established to make use of any sockeye salmon surplus to spawning needs, subsistence uses, and commercial and sport harvests. Personal use fisheries have occurred in Bristol Bay, where participants use set gillnets, as well as in Cook Inlet and Prince William Sound, where participants also use dip nets.



While most sockeye salmon production in Alaska results from the spawning of wild populations, some runs have been developed or enhanced through human effort. Although artificial propagation of sockeye salmon has proven difficult, notable success has been achieved at state-maintained hatcheries located on the upper Copper River in Prince William Sound and the Kasilof River on the Kenai Peninsula. A fish ladder installed on the Fraser River on Kodiak Island has also served to enhance sockeye salmon returns.

Text: Commercial Fisheries Management and Development Staff Illustration: Ashley Dean Revised and reprinted 1994

## **Cutthroat Trout**

### **General Description**

Coastal cutthroat trout occur as sea-run or freshwater-resident forms in streams and lakes along the coastal range from lower Southeast Alaska to Prince William Sound and are the most common trout species in the region. The freshwater-resident form lives in a wide variety of habitats, from small headwater tributaries and bog ponds to large lakes and rivers. Sea-run cutthroat trout are usually found in river or stream systems with accessible lakes, mostly south of Fredrick Sound. In some watersheds, like the Taku River, the two forms are found together.

The extent of breeding between the two forms is unknown, and the reason that some fish migrate to sea while others stay in fresh water remains an interesting question.

### Juveniles

Juveniles are 1–6 inches long and silver or yellowish to olive in color, with about 10 oval parr marks overlain with small black spots. Some juveniles will have a faint red or pink coloration along the lateral line and on the gill covers. The characteristic red or yellow slashes under the jaw begin to develop when a juvenile reaches approximately 3–5 inches in length.

### Adults

Adult coloration varies widely with habitat and life history: freshwater-resident fish living in small ponds or streams are typically 6–16 inches long, golden yellow with profuse black spotting on the body, head, and fins, and have vivid red slash marks under each jaw bone (hence the name cutthroat). Coastal cutthroat trout living in large landlocked lakes can exceed 24 inches in length, are uniformly silver with black spots, rosy gill covers, and faint slash marks under the jaw. Sea-run cutthroat trout are smaller, seldom more than 18 inches long. They are bluish-silver with dark or olive backs and less conspicuous black spotting; the characteristic slashes are faint yellow. With prolonged residence in fresh water and progression toward spawning condition, sea-run coastal cutthroat trout will darken up and closely resemble freshwater-resident pond- and stream-type fish.

### Similar Species

Lack of distinct slash marks in sea-run and lake-resident forms has led anglers to confuse these fish with rainbow trout. Cutthroat trout can most often be positively distinguished from rainbow trout (though with difficulty) by the presence of minute teeth between the gills behind the base of the tongue.

The fact that cutthroat trout and rainbow trout often occupy the same habitats leads to their occasional hybridization. This hybridization can make identifying cutthroat trout confusing, as hybrid fish are intermediate in appearance.

### Life History

#### Growth and Reproduction

Coastal cutthroat trout grow quite slowly, often taking 12 or more years to reach trophy size (3 pounds). Maturity is reached at age 3–7, with males typically maturing earlier than females.

Spawning occurs from April to early June and typically takes place over gravel beds in small isolated headwater streams, although they have been observed spawning in deeper rivers and in gravely upwelling areas of lakes. The selection of these small isolated streams likely results in less interaction with the more aggressive offspring of steelhead trout and coho salmon.

Fecundity (number of eggs per female) varies with size and locality, but is typically less than 1000 eggs per female. Once the eggs are deposited and fertilized, they remain in the gravel for 6–7 weeks before hatching. Newly-hatched cutthroat trout remain in the gravel living on the contents of their yolk sac for an additional 1–2 weeks prior to emerging as free-swimming

juveniles. Once emerged from the gravel, juvenile cutthroat trout will disperse to more ideal rearing habitats such as ponds, lakes, and backwater areas.

Unlike Pacific salmon, cutthroat trout are capable of spawning multiple times during their lives, but they rarely survive to spawn 3 or more times. Depending on food availability, adults may skip a year or two between spawning events.

### Feeding Ecology

Coastal cutthroat trout are carnivorous, feeding opportunistically on a variety of prey. Prey species and feeding techniques vary greatly depending on age, locality and season. Sea-run cutthroat feed on various insects and young salmon during out-migration. While at sea, they stay near shore feeding on amphipods and young salmon prior to returning to fresh water in the fall. During the winter, coastal cutthroat trout feed on sticklebacks, gastropods and salmon eggs in addition to insects and young salmon.

In lake-resident forms of the coastal cutthroat trout, juveniles typically employ a sit-and-wait feeding strategy. These fish will find shelter such as lily pads or logs and wait for passing prey such as insects or small fish. Once the lake-resident forms reach a larger size (14 inches or more) they often take on a more active, cruising strategy and will chase down small fish along drop-offs and vegetation lines. Lake residents usually grow to the largest size among the various forms of this species in Alaska.

### Migration

Sea-run cutthroat trout rear for 3–4 years in fresh water prior to their first seaward migration beginning in April. These first-time out-migrants are generally about 8 inches long. Time at sea varies from a few days to over 100 days before they return to their home stream. During their migration, they follow the shoreline, rarely crossing open bodies of water and seldom straying further than 50 miles from their home stream. In the late summer and fall they return to their home stream where they feed and mature during the winter months.

Homing appears to be very precise. Cutthroat trout can return to spawn in the same tributary stream where they emerged and reared years before.

Survival through the winter and first spawning season is about 40 percent, decreasing rapidly after the first spawning event. Less than 1 percent of the upstream migrants in a given year will survive to their third spawning migration. The fact that only about 60 percent of the migrants are sexually mature indicates the presence of feeding and over-wintering migrations in addition to spawning migrations.

### Range and Habitat

The coastal cutthroat trout ranges from northern California to Southcentral Alaska and makes use of a great variety of habitats within that range. Freshwater habitats range from the smallest

headwater stream (often less 3 feet wide) to large deep lakes. Saltwater habitats range from brackish estuaries to fully marine shoreline environments.

Over-wintering migrants, as well as lake residents, often select lakes and ponds to feed and wait out the winter, while stream-type residents frequently spend the entire year within relatively-small sections of a given stream. While in fresh water these fish prefer deeper pool habitat and cover, such as that formed by woody debris and undercut banks.

Cold, clear, gravely headwater streams are selected for spawning, but typically vacated rather quickly in favor of larger water bodies with more cover and relatively-abundant food resources.

For sea-run coastal cutthroat trout, time spent in salt water is typically just a few months but can extend for over a year in some cases. While in the marine environment, cutthroat trout prefer estuary and near-shore environments for feeding and cover.

## Status, Trends, and Threats

### Status

Throughout its range the coastal cutthroat trout is experiencing population declines, though the threats, and therefore the declines, are more severe in the southern portion of its range. Due to lack of widespread, long-term stock assessment throughout Alaska, it is difficult to assess population status and trends.

### Trends

In the Alaskan sea-run populations where long-term trend information is available, the population trends are declining, though for some monitored lake-resident populations, the status appears to be stable.

The lack of long-term information on population trends makes it difficult to determine the true status of the species within Alaska, however with increasing harvest rates and urbanization and its associated environmental impacts, we can expect that these populations will show signs of downward trending.

### Threats

Many threats to the stability of coastal cutthroat trout populations exist including the recent loosening of federal subsistence fishery regulations, and habitat degradation due to mining,



road construction, hydroelectric projects, oil spills, timber harvests, urbanization, and improper handling by sport fishermen.

## Rainbow Trout

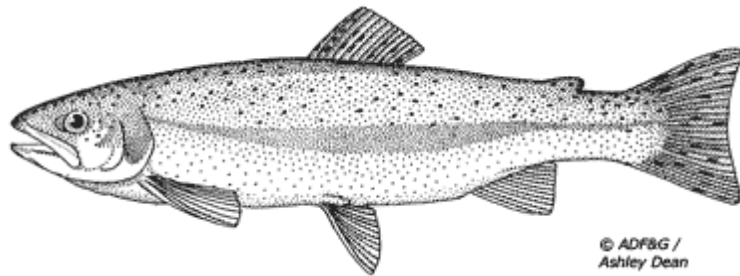
The **rainbow trout** (*Oncorhynchus mykiss*), is one of the most respected and sought after of Alaska's native game fishes. Serious anglers from the world over are drawn to Alaska to experience the thrill of challenging this hard fighting salmonid in the state's wilderness waters.

Rainbow trout occur as both freshwater resident and sea-run races. Sea-going rainbows, known as steelhead trout, are discussed in a separate *Wildlife Notebook Series* account.

Rainbow trout are native to waters throughout Southeast Alaska west to Kuskokwim Bay, and as far up the Kuskokwim River as Sleetmute. The clearwater lakes and streams draining into Bristol Bay provide outstanding habitat. Rainbow trout occur naturally on the Kenai Peninsula, throughout the fresh waters of Upper Cook Inlet, on Kodiak Island, and in the Copper River drainage. Release of hatchery-reared Alaska rainbow trout has extended the range of resident rainbows to specific lakes and streams in the Tanana River drainage near Fairbanks.

**General description:** Rainbow trout possess the well-known streamlined salmonid form, though body shape and coloration vary widely and reflect habitat, age, sex, and degree of maturity. The body shape may range from slender to thick. The back may shade from blue-green to olive. There is a reddish-pink band along each side about the midline that may range from faint to radiant. The lower sides are usually silver, fading to pure white beneath. Small black spots are present over the back above the lateral line, as well as on the upper fins and tail. In some locations, the black spots of adults may extend well below the lateral line and even cover the entire lower side. Rainbow trout are positively identified by the 8 to 12 rays in the anal fin, a mouth that does not extend past the back of the eye, and the lack of teeth at the base of the tongue. River or stream residents normally display the most intense pink stripe coloration and heaviest spotting followed by rainbows from lake and lake-stream systems. Spawning trout are characterized by generally darker coloration.

**Life history:** During late winter or early spring, when water temperatures are on the rise, the maturing adult rainbows usually seek out the shallow gravel riffles or a suitable clearwater stream. Spawning takes place from late March through early July, depending upon the specific location and the severity of the winter. The female uses her tail to prepare a redd, or nest, 4 to 12 inches deep and 10 to 15 inches in diameter. From 200 to 8,000 eggs are deposited in the redd, fertilized by a male, and covered with gravel.



Hatching normally takes place from a few weeks to as much as four months after spawning, depending upon the water temperature. A few more weeks may be required for the tiny fry to emerge from the gravel. Upon emergence, the small trout assemble in groups and seek shelter along the stream margins or protected lake shore, feeding on crustaceans, plant material, and

aquatic insects and their larvae. Rainbow trout rear in similar habitat for the first two or three years then move into the larger water of lakes and streams and turn more to a diet of fish, salmon carcasses, eggs, and even small mammals.

Age of onset of sexual maturity varies markedly between individuals due primarily to such factors as population density, productivity of the aquatic environment, and genetic makeup. In the wild, male and female spawners as young as ages 3 and 5, respectively, have been found, but a majority of both sexes mature at age 6 to 7. Spawning frequency ranges from annually to once each three years. Rainbow up to age 11 have been observed spawning.

Among resident rainbow, those living in or migrating to large lakes with sockeye salmon runs generally grow faster and larger than fish which remain year round in streams.

**Fishing:** Fishing success is typically greatest in late spring after spawning and fall. Rainbow trout are voracious feeders and strong swimmers willing to hit a wide variety of lures, baits, and flies. Weighted spinners, wobbling spoons and bait (where regulations allowed) such as salmon roe or shrimp are preferred by anglers using conventional gear. In some of the larger rivers plug fishing has become popular because it can be an effective method to fish deep fast water that is not easily fished by other methods. Fly fishers find that streamers, muddlers, and egg patterns fished near the bottom can be depended on to do the trick, and numerous patterns in a variety of colors will work. In some of Alaska's clear water rivers during mid-summer traditional dry flies such as various stone and caddis fly imitations often produce good catches. While salmon are spawning fly fishing enthusiasts employ egg patterns to enjoy what many consider to provide the best rainbow trout fishing of the year.

Alaska manages rainbow trout fisheries for the health of the species and for a diversity of recreational angling experiences. Wild trout are abundant over most of their range, but daily bag and size limits are intentionally conservative. Artificial lure-only regulations are commonly used to reduce angling mortality. Many of the heavily fished waters are closed to trout fishing during the spawning period to further protect these valuable fish. Specific trout waters have been designated catch-and-release or trophy fisheries or have maximum size limits to help enhance the quality of the fishing experience or preserve an abundance of large fish. Anglers who wish to take rainbow primarily for the pan are encouraged to visit one of the hundred or more lakes stocked annually with Alaska rainbow trout.

**Catch-and-release:** Because of conservative regulations on many Alaska waters anglers should become familiar with and practice proper catch and release methods. This means that they will live to spawn or bite again if gently released helping to maintain healthy fishable populations of rainbow trout.

Land fish quickly when possible.

Handle fish gently supporting the head and tail.

Keep fish in the water whenever possible.

Keep hands and fingers away from gills.

Carefully remove hook or cut line.

Revive fish by moving it gently back and forth in the water before releasing it.

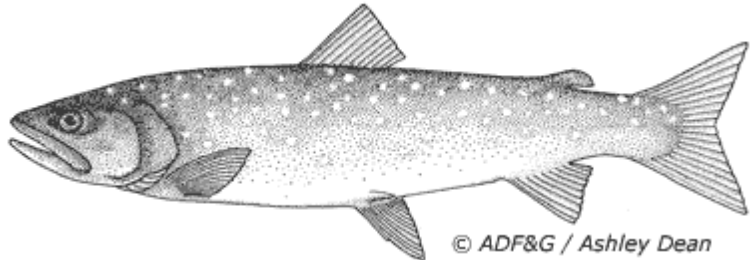
Text: Kevin Delaney

**Illustration: Ashley Dean**

Revised and reprinted 2008

## Dolly Varden

Two forms or sub-species of **Dolly Varden** (*Salvelinus mama Walbaum*) occupy most of the coastal waters of Alaska. The distribution and range of each form has changed in recent years with knowledge gained from genetic analysis, but there is no absolute distinction in life histories between the two forms. The northern form is primarily anadromous, occupying both sides of the Alaska Peninsula and north and eastward around the Alaska coast to the Canadian border as well as in the Susitna River Basin in Southcentral Alaska. The southern form is found from the Aleutians to the southern tip of Southeast Alaska including Kodiak Island, and on the south side of the Alaska Peninsula. The southern form primarily resides in perennial mainland and island streams, and exhibits a variety of life history forms including, stream resident, lacustrine (lake dwelling) and anadromous.



The origin of this odd name for a fish comes from the common name given to brightly-colored char in California during the 1870's. The name Dolly Varden actually refers to a colorful cloth of "pink pattern of good looks" that was milled for dressmaking in the late 19th century. The cloth itself was named after Dolly Varden, the character who wore brightly colored dresses in the Charles Dicken's 1841 novel, *Barnaby Rudge*.

Dolly Varden have a dark history in Alaska that lasted from 1921 through 1939. During this time, it was believed that Dolly Varden preyed heavily on commercially important and valuable young salmon. A bounty ranging from 2 to 5 cents was paid for each Dolly Varden tail turned into officials. It was thought that by eliminating Dolly Varden as a species the survival of juvenile salmon populations would greatly increase. It is now known this idea was totally erroneous as Dolly Varden are not highly predatory and were never responsible for any decline in salmon populations. However, 6 million tails were turned in for payment before the program ended in 1939, when 20,000 of the tails submitted for payment turned out to be mostly from Coho salmon.

**General description:** Young Dolly Varden have eight to ten, wide, oval blotches or parr marks contrasting with the mottled olive-brown color of their body. The sea run fish are silvery with an olive-green to brown color on the dorsal surface and numerous red to orange spots on their sides. As spawning season approaches, the mature males become brilliant red on the lower body surface, and the lower fins become reddish-black with a white leading edge. Mature females are similar, but are less brightly colored. Males develop an extended lower jaw called a kype, which hooks upward and fits into a groove in the upper jaw. A kype also forms in the females, but is considerably less developed.

Dolly Varden belong to a group of trout-like fish called char (*Salvelinus sp*). The primary visual distinction between char and trout and salmon are that char have light spots on their dark body sides while trout and salmon usually have black spots on their light colored sides.

**Life history:** Dolly Varden are fall spawners and usually spawn between September and November in small headwater streams. The female, depending on her size, may deposit from 600 to 6,000 eggs (2,500 to 10,000 in the northern form) in depressions, or redds, which she

constructs in the streambed gravel by digging with her tail fin. The male usually takes no part in nest building and spends most of his time defending the redd by chasing, biting or threatening intruders. When the female is ready to deposit her eggs, the male moves to her side and spawning begins. Sperm and eggs are released simultaneously into the redd where fertilization occurs. After spawning the female then forces the exposed eggs into the crevices by undulating her body and tail before covering the eggs with gravel.

The eggs develop slowly in the cold water temperatures and hatch in March approximately four to five months after fertilization. After hatching, the young Dolly Varden absorb the food from their yolk sac and usually do not emerge from the gravel until this food source is used. Emergence from the gravel usually occurs in April or May for the southern form and in June for the northern form.

The young Dolly Varden rear in streams for 2 to 4 years before beginning their first migration to sea, but some may rear as long as six years. During this rearing period, their growth is slow, a fact which may be attributed to their somewhat inactive habits. Young Dolly Varden often remain on the bottom, hidden from view under stones and logs, or in undercut areas along the stream bank, and appear to select most of their food from the stream bottom.

Prior to their seaward migration Dolly Varden go through a series of physical changes called smoltification which allows them to survive in saltwater and during this process the fish lose their parr marks and become silvery in color. The fish are now about 5 inches long and are called smolt. This seaward migration usually occurs in May or June, although significant but smaller numbers have been recorded migrating to sea in September and October. After their first seaward migration, Dolly Varden usually spend the rest of their lives migrating to and from fresh water in an interesting and often complicated pattern of migration.

The southern form migrates into lakes during the fall where they spend the winter while most northern Dolly Varden migrate into rivers to spend the winter. Dolly Varden hatched and reared in a lake system typically carry on annual spring migrations to saltwater seeking food before returning to a lake or river each fall to spend the winter. However, southern Dolly Varden originating from nonlake systems must seek a lake in which to winter and research suggests that they may find lakes by random searching, migrating from one stream system to another until they find one with a lake. Once a lake is found, these fish typically conduct annual seaward migrations in the spring, sometimes entering other freshwater systems in their search for food. Dolly Varden are known to follow salmon during upstream spawning migrations where there are lots of nutritious salmon eggs for the Dolly Varden to feed on.

Dolly Varden return to spawn in their stream of origin or "natal stream" upon reaching sexual maturity. Most southern forms of Dolly Varden reach maturity at age 5 or 6. At this age they may be 12-16 inches long and may weigh from 1/2 to 1 pound. Northern Dolly Varden reach maturity at age 5 to 9 after having spent three or four summers at sea, and may be 16 to 24 inches long. Dolly Varden possess the ability to find their natal stream without randomly searching, as was the case in their original search for a wintering area. Those of the southern form that survive the rigors of spawning return to a lake to spend the winter, while northern form Dolly Varden usually overwinter in the river system in which they have spawned.

Mortality after spawning varies depending on the sex and age of the fish. Males suffer a much higher mortality rate after spawning, partly due to fighting and the subsequent damage inflicted on each other. It is doubtful that much more than 50 percent of the Dolly Varden live to spawn a second time but a small number may live to spawn more than twice. Few southern

Dolly Varden appear to live longer than 8 years while northern Dolly Varden may live as long as 16 years, but individuals over age 10 are uncommon. Maximum size for southern Dolly Varden is between 15 and 22 inches and up to 4 pounds but an occasional 9-to 12-pound fish have been reported, especially in northern populations.

**Sport fishing:** Both forms of Dolly Varden are highly sought after by anglers throughout Alaska. The fish is unique as it has readily adapted to the numerous small to medium-sized non-lake streams that enter Alaskan saltwater areas. Because Dolly Varden migrate into freshwater and into marine near-shore areas at times when salmon may not be available to anglers it's status and popularity as a sport fish will continue to increase as angling pressure rises.

To be a successful Dolly Varden angler in Alaska, it helps to understand their migratory habits. Since sea-run Dolly Varden migrate to the marine environment from lakes in the spring, a lake outlet stream, stream mouth, or nearby beach should prove successful from April through June. Good Dolly Varden fishing can be found in salt water during the summer months (May – July) as Dolly Varden mingle with, and eventually, follow salmon migrations upstream. As mature Dolly Varden begin to return to their natal stream to spawn and feed in August and September, most coastal streams in Southeast Alaska and up through the Aleutian Chain provide good fishing opportunities. Try fishing near spawning salmon, in deep holes, and at the creek mouth on an incoming tide. Fishing for sea-run Dolly Varden in lakes can also be good as they migrate into lakes from late August through October, and are in prime condition after their spring and summer growing season. Ice fishing in lakes during the winter can also provide excellent angling opportunities. A sea-run Dolly Varden caught on light tackle can be an experience not easily forgotten and like other char, the Dolly Varden's pink, firm flesh is full of flavor.

Applying knowledge of any fish's life history can not only help in choosing where to fish, but can help in choosing an angling technique. Knowing that Dolly Varden hang out at the stream mouths and in the near-shore environment during the spring, and that they are feeding on emigrating pink salmon fry will lead anglers to try small spinners and or fly patterns imitate small fish. As the salmon fry grow and migrate along the saltwater beaches and shoreline during late spring and summer months try using slightly larger streamer flies and lures which imitate small silver colored fish. Coastal streams in August and September can produce excellent fishing for those using spinning lures or fly patterns which imitate salmon eggs drifting downstream.

Text: Dennis Hubartt Illustrations: Ashley Dean Revised by Roger Harding and reprinted 2008