

5 | Distribution and Abundance of Wildlife in Alaska



Savannah Sparrow. A. Underwood, ADF&G.

Distribution of Species of Greatest Conservation Need

To describe the distribution and abundance of “species of greatest conservation need” (SGCN) in Alaska, a spatial framework of biogeographic regions was adopted (Figure 5.1). This framework largely follows Kessel and Gibson (1978), which others have used to describe the distribution of birds (Armstrong 2015) and mammals (MacDonald and Cook 2009) in the state. It also has the benefit of aligning closely with boundaries that define Bird Conservation Regions (NABCI 2000) and multiple state management boundaries in Alaska (ADF&G 2024, ADF&G 2022, ADF&G 2023).

There are six biogeographic regions for terrestrial species: Northern Alaska, Western Alaska, Central Alaska, Southwest Alaska, Southcentral Alaska, and Southeast Alaska (Figure 5.1). For marine species, there are three regions: Beaufort/Chukchi Seas, Bering Sea, and Gulf of Alaska (Kessel and Gibson 1978). For the 2025 revision of the Alaska State Wildlife Action Plan (SWAP), we adjusted the northern boundary of the Southcentral region northward to align with state management areas of aquatic species (ADF&G 2022). This change better delimits the natural distributions of aquatic species in the Southcentral region that were altered by late Pleistocene glaciation (e.g., Oswood et al. 2000).

This chapter provides an overview of the nine biogeographic regions in Alaska and describes in broad terms the primary environmental features in each region. The nine regions serve as a foundation for Chapter 6 “Key Habitats of Wildlife in Alaska,” where available habitats and number of SGCN species in those habitats are described for each region.

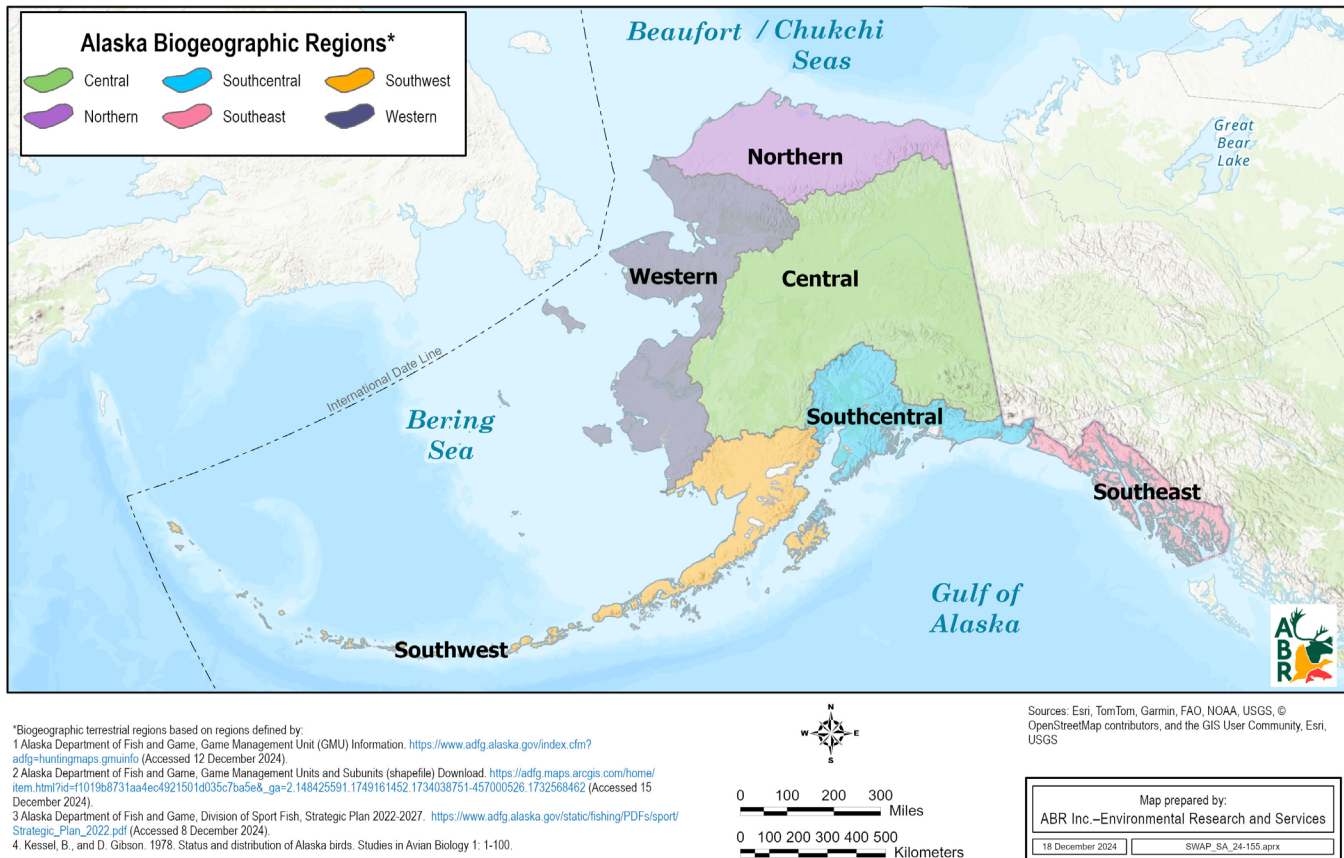


Figure 5.1. Map of the six terrestrial and three marine biogeographic regions in Alaska used in this wildlife action plan.

In this chapter, the following information is reported for each biogeographic region (Figure 5.1):

- Land or ocean area.
- Climate, including historical averages (1950–1999) compared to prevailing conditions (2000–2024).
- Physiography, including major mountain ranges and other significant landscape features.
- Typical vegetation and overview of important ecological attributes.
- Representative examples of vertebrate SGCN species present; distribution of each SGCN by biogeographic region is reported in Appendix D.

The presentation of climate data for each biogeographic region is a significant update, compared to previous versions of SWAP. Table 5.1 summarizes climate data for two time periods, 1950–1999 (historical) and 2000–2024 (recent), providing a comparison of recent change relative to historical averages. Further information on climate is provided in Chapter 7. Climate variables for each of the six terrestrial biogeographic regions and three marine regions were estimated using the ERA5 global reanalysis data set (Hersbach et al. 2020), with data downloaded from C3S (C3S 2017) to produce estimates of temperature, precipitation, snowfall, and sea surface temperature.

Northern Alaska

The Northern Alaska biogeographic region (Figure 5.1) is also referred to by some as the Arctic region. It encompasses 78,877 square miles and is bounded by the Beaufort Sea and Chukchi Sea to

Table 5.1. Average annual, winter, and summer air temperatures and average precipitation for historical (1950–1999) and more recent (2000–2024) time periods across Alaska’s biogeographic regions. Comparison illustrates general patterns of relative change. Data comes from the updated ERA5 Land global dataset (Muñoz-Sabater et al. 2021) with grid cells of about 5.6 miles resolution used in each biogeographic region for the indicated time period and season. Sea surface temperatures are provided in parentheses for the three marine regions.

Region	Historical (1950–1999)						Recent (2000–2024)					
	Temperature (F) ¹			Precip ⁴ (in) Annual	Snowfall ⁵ (in) Oct–May	Temperature (F)			Precip ⁴ (in) Annual	Snowfall ⁵ (in) Oct–May		
	Annual	DJF ²	JJA ³			Annual	DJF ²	JJA ³				
Northern	11.6	-16.5	45.7	14.7	5.4	15.4	-11.3	46.5	16.1	6.0		
Western	23.1	-1.1	50.1	23.9	9.6	25.9	3.0	51.5	24.8	9.7		
Central	22.7	-5.8	53.0	23.8	9.0	25.2	-1.4	54.1	24.5	9.0		
Southwest	33.8	19.4	49.7	49.8	18.1	36.1	23.1	51.3	51.7	17.7		
Southcentral	28.6	12.1	46.0	74.3	36.7	33.1	15.8	49.5	76.5	35.8		
Southeast	36.3	23.6	49.2	114.8	44.4	39.4	28.5	52.0	119.0	42.4		
Beaufort/Chukchi Sea	13.4 (30.5)	-8.8 (29.0)	35.3 (32.6)	12.0	6.2	18.3 (32.3)	-2.9 (29.0)	37.4 (36.3)	13.6	7.3		
Bering Sea	34.5 (38.7)	25.4 (34.5)	44.5 (44.3)	34.1	12.0	36.4 (39.9)	27.8 (35.4)	45.9 (45.8)	35.2	11.2		
Gulf of Alaska	44.3 (46.1)	38.4 (41.4)	51.2 (51.5)	48.9	3.7	45.2 (46.7)	39.6 (41.9)	52.4 (52.8)	50.3	3.1		

¹ Average air temperature (or average sea surface temperature) is calculated by averaging the coldest month’s average temperature and the warmest month’s average temperature of each year, over the course of many years.

² DJF refers to the average air temperature for December, January, and February (i.e., meteorological winter)

³ JJA refers to the average air temperature for June, July, and August (i.e., meteorological summer)

⁴ Average annual total precipitation is calculated from yearly totals of precipitation, reported as the depth of water falling on the Earth’s surface, averaged over many years.

⁵ Snowfall is expressed in inches of water equivalent (i.e., liquid water produced when snow melts), not snow depth.

the north and the crest of the Brooks Range to the south. It includes the Arctic Coastal Plain as well as the northern foothills of the Brooks Range.

The Arctic Coastal Plain is a treeless, windswept landscape stretching across the Alaska coast of the Beaufort and Chukchi seas and into Canada. This region is characterized by abundant lakes (especially to the west), wetlands, and permafrost-related features such as pingos, ice-wedge polygon networks, peat ridges, and frost boils. Permafrost is nearly continuous across the region, resulting in typically saturated soils with thick organic horizons. The plain gradually ascends from the coast southward to the foothills of the Brooks Range.

Numerous large, braided rivers flow northward from the Brooks Range across the coastal plain. Thousands of shallow, rectangular thaw lakes that are aligned north-northwest due to prevailing summer winds cover up to 50% of the area, making it largely a wetland. In winter, small streams may run dry or freeze completely, while many larger rivers, often spring-fed, maintain flow year-round and create aufeis (layered ice deposits) that persist into summer. Just south of the coastal plain, the Brooks Range foothills feature long, linear ridges, gently rolling hills, glacial moraines, and mesas composed of tightly folded sedimentary rocks dividing narrow alluvial valleys. Unlike the coastal plain, the foothills have few lakes but are traversed by many swift streams and rivers, some freezing solid in winter while others braid across gravel flats, which results in large aufeis deposits.

A dry, polar climate dominates Northern Alaska, characterized by short, cool summers and long, cold, windy winters, with prevailing winds from the southwest. The coastal plain experiences cool and frequently foggy summers, given proximity to the abundant sea ice in the Beaufort and Chukchi seas. In contrast, the foothills experience somewhat warmer and wetter conditions.



Stream outflow from a lake on the Arctic Coastal Plain. S. Laske, USGS, used with permission.



Brooks Range near Anaktuvuk Pass. NPS, used with permission.

Annual average temperature (2000–2024) is 15°F with seasonal averages varying between -11°F and 47°F (Table 5.1). Average annual total precipitation is 16 inches, including an average of 6 inches of snowfall water equivalent. Recent conditions indicate an increase in both annual average temperature and total precipitation, relative to historical data (1950–1999; Table 5.1).

On the coastal plain, vegetation is dominated by wet sedge tundra in drained lake basins, swales, and floodplains; on gentle ridges, it is dominated by more well-drained tussock tundra and sedge-dryas tundra. Low willow thickets are common on well-drained riverbanks. The predominant vegetation in the foothills is mixed shrub-sedge tussock tundra with dryas tundra occurring on ridges. Vegetation along rivers is dominated by dwarf riparian willow near the coast and low and tall willow thickets in the foothills.

Northern Alaska provides globally important habitats for breeding waterfowl and shorebirds (e.g., American Golden-Plover, Dunlin, Pectoral Sandpiper), mesopredators (e.g., Snowy Owl, Arctic fox), raptors (e.g., Rough-legged Hawk, Gyrfalcon), and landbirds (e.g., Arctic Warbler, Lapland Longspur, Redpolls). Many species of waterbirds nest and breed on the Arctic Coastal Plain, including King Eider, Spectacled Eider, Steller’s Eider, Long-tailed Duck, Red-throated Loon, Arctic Loon, and Yellow-billed Loon. One bird of particular note is the Gray-headed Chickadee, which is believed to inhabit Northern Alaska year-round. It needs further study, given its apparent decline and rarity on the landscape, and because little is currently known about its habits (Booms et al. 2020).

In the summer, many seabirds, including fulmars, auklets, guillemots, puffins, and murre, can be found in the marine waters of Northern Alaska. For shorebirds, most of the United States breeding populations of Long-billed Dowitcher, Dunlin, Semipalmated Sandpiper, Pectoral Sandpiper, and Buff-breasted Sandpiper occur in this region. In total, more than two dozen shorebird species breed in Northern Alaska, with more than six million birds estimated to breed in the National



Arctic ground squirrel. ABR, used with permission.

Petroleum Reserve in Alaska (NPR-A) alone. Many shorebird species also use the region's coastal areas for migration staging, creating localized concentrations, prior to migrating to southern parts of the western hemisphere, Southeast Asia, Oceania, Australia, and New Zealand. Some of these species include Black-bellied Plover, Whimbrel, Bar-tailed Godwit, Red Knot, Dunlin, Semipalmated Sandpiper, Western Sandpiper, Long-billed Dowitcher, Lesser Yellowlegs, and Red-necked Phalarope (ASG 2019). Smith's Longspur, a passerine SGCN, breeds on broad riverine terraces in the foothills of the Brooks Range, and Snowy Owls are common in the region, where they track populations of small mammals (Handel et al. 2021).

Small mammals common in Northern Alaska include singing, root, and northern red-backed voles; tundra and barren ground shrews; snowshoe hares; Alaska marmots; Arctic ground

squirrels; and collared and brown lemmings. No land mammal species is restricted solely to the Northern bioregion of Alaska (MacDonald and Cook 2009). Offshore waters support the Pacific walrus, beluga, bearded seal, spotted seal, ringed seal, and polar bear. The Beaufort and Chukchi seas provide pack ice for polar bears in the winter and spring, whereas receding pack ice in summer and fall drives them to land to hunt for food. In the fall, the receding pack ice also provides open-water feeding grounds for bowhead whales.

Fish such as Dolly Varden, Arctic and Bering cisco, and Arctic grayling spawn and overwinter in the larger rivers. Additionally, small populations of pink, chum, and Chinook salmon spawn in small and large coastal rivers within the region.

Western Alaska

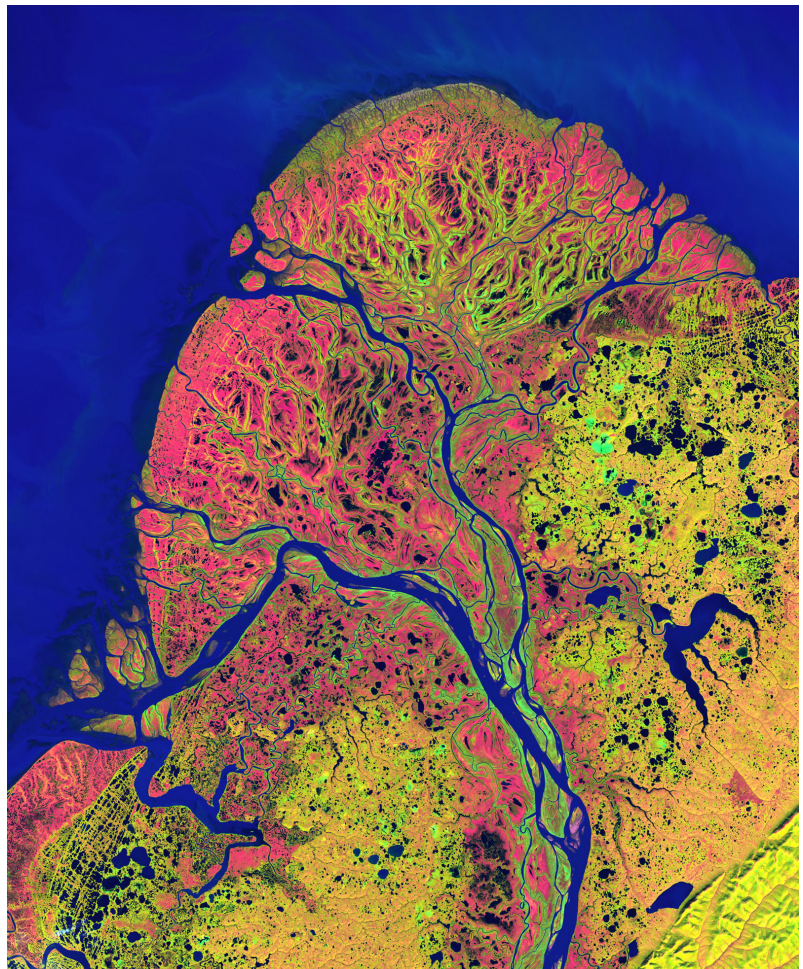
The Western Alaska biogeographic region (Figure 5.1) encompasses 109,183 square miles and is bounded by the Chukchi Sea to the north and the Bering Sea to the west. Various mountain ranges, such as the westernmost portion of the Brooks Range foothills, the Nulato Hills, and the Ahklun and Kilbuck mountains, define the eastern boundary of the region. The region's vast expanse encompasses 10 degrees of latitude and the region increases in elevation in the mountains that define the eastern boundary. It includes the Seward Peninsula in the north and the vast Yukon-Kuskokwim Delta in the south. Another feature of Western Alaska is the presence of the Bering Sea islands, including St. Lawrence, Nunivak, St. Matthew, Hall, and the two Pribilof Islands of St. George and St. Paul.

The coastal plains surrounding Kotzebue Sound are generally less than 330 feet in elevation and tend to be poorly drained. As in Northern Alaska, permafrost-related features dominate the landscape, with pingos around the Selawik River and many thaw lakes throughout the region. The low, rolling Nulato Hills occur between the Bering Sea and the Yukon River drainage in Central Alaska, while the

Ahklun and Kilbuck mountains separate the drainages into the Kuskokwim and Bristol bays; these mountains are steep and angular, with elevations reaching 4,950 feet. Past glaciers carved broad U-shaped valleys, and large finger lakes fill valleys on the south side of the mountains. Permafrost exists in most low-lying areas. The Yukon–Kuskokwim Delta is the result of deposition of heavy sediment loads from the glacial Yukon and Kuskokwim rivers. This flat coastal plain is characterized by abundant thermokarst lakes, meandering streams, highly productive brackish marshes, and wet meadows. Isolated basalt hills and volcanic cinder cones less than 400 feet high punctuate the landscape. Discontinuous permafrost impedes drainage and contributes to shallow organic soils. Large tidal fluctuations along the coast and occasional storm tide surges flood coastal areas with salt water, creating invertebrate-rich coastal marshes.

The region experiences cold, wind-swept winters, with prevailing winds blowing predominantly from the southwest. Precipitation varies geographically across the region and is influenced by elevation. Annual average temperature (2000–2024) is 30°F with seasonal averages varying between 15°F and 49°F (Table 5.1). Average annual total precipitation is 25 inches, with local averages ranging from 14 to 60 inches, including an average of 10 inches of snowfall water equivalent. Recent conditions indicate an increase in both annual average temperature and total precipitation, relative to historical data (1950–1999; Table 5.1).

The southern portion of Western Alaska is home to the expansive Yukon–Kuskokwim Delta, which is roughly the size of Oregon and ranks among the world’s largest river deltas. This area is a crucial nursery for many of the nation’s shorebirds and waterfowl, especially for Arctic-breeding geese such as Brant, Cackling, and Emperor Geese. In the region’s mountainous areas, vegetation varies with elevation and terrain. At higher elevations, the landscape is either barren or covered by alpine tundra, featuring dryas-lichen or sedge-ericaceous shrub vegetation. At lower elevations, vegetation transitions to dwarf shrubs, tall shrubs (willow–birch–alder), or spruce and birch forests. Valleys often contain a mix of shrublands and wetlands interspersed with forests of white spruce, balsam poplar, or a combination of white spruce and paper birch. Upland areas, characterized by peat mounds,



An image from space of the low-lying Yukon River Delta, showing its many water features. Goddard Space Flight Center, used with permission.

sand dunes, and volcanic soils, support dwarf shrub communities of birch and ericaceous (heath) shrubs. Inland bogs contain tussock-forming sedges and sedge-moss communities. Willow thickets thrive along rivers and well-drained slopes, while alders and stunted spruce and birch grow along the major streams.

The Yukon–Kuskokwim Delta is classified as wet maritime tundra and features flat, treeless, and extremely wet coastal areas dominated by sedges and sedge tussocks. In better-drained areas upriver and to the east, vegetation transitions to white spruce, willows, alder, paper birch, and spruce-hardwood forests in drier microsites. The delta’s diverse tundra plant life, influenced by its historical connection to Asia and varied geology, supports abundant wildlife. Over 20 species of waterfowl and 10 species of shorebirds, including Spectacled Eider, Bristle-thighed Curlew, and Bar-tailed Godwit, breed here.

Just as the climate of Western Alaska varies due to its expansive reach along the coast and elevation gradients, so do its fish and wildlife resources. In the northern part of this region, polar bears, spotted seals, bearded seals, ringed seals, beluga whales, bowhead whales, and Pacific walrus can be seen near the coast and on adjacent ice floes. The northern part of this region is also an important breeding area for two relatively rare Alaska bird species, Arctic Loon and Bristle-thighed Curlew. Common terrestrial mammals include singing voles and tundra shrews. All five species of Pacific salmon ascend area rivers to spawn. Dolly Varden spawn and overwinter in most rivers, and Arctic grayling are resident in larger streams. Bering cisco, Alaska blackfish, burbot, and sheefish are common residents of the freshwaters.

The Bering Sea islands are treeless, rocky, volcanic islands characterized by moist tundra meadows of sedges, grasses, low shrubs, and lichens. The shorelines are a mix of rocky sea cliffs and sand dunes. These islands provide important habitat for numerous marine mammals and seabirds. The



Iliamna Bay, Cook Inlet. ABR, used with permission.



Spectacled Eider. A. Bankert, ABR, used with permission.

Walrus Islands group in Bristol Bay gets its name from the large number of male walrus that haul out on the beaches each summer. The largest concentration occurs on Round Island, where Steller sea lions also haul out. Beluga whales feed along the coast. The Pribilof Islands provide habitat for approximately three million seabirds, including nearly the entire world population of Red-legged Kittiwakes. Other large breeding colonies of Crested Auklet and Red-faced Cormorants also exist on the islands. In many winters, polynyas (ice-free areas surrounded by ice) south of St. Lawrence Island attract virtually the entire global population

of Spectacled Eiders. They forage on mollusks and other crustaceans found on the sea floor. The Pribilof Rock Sandpiper breeds only on the Bering Sea islands. McKay's Bunting, the only passerine species endemic to Alaska, breeds only on St. Matthew and Hall islands.

One of the richest pockets of invertebrate life in the Bering Sea is found near St. Lawrence Island, where extremely productive benthic communities, including mollusks and amphipods, support marine mammals and waterfowl. A diverse mix of marine fish, including pollock, halibut, salmon, and forage fish (e.g., herring and capelin), also contribute to the abundance of birds and mammals. Along with wintering bowhead whales, breeding and wintering walrus inhabit the area near St. Lawrence Island. The ice-associated seals—ringed, ribbon, bearded, and spotted—can be found on the northern islands. The Pribilof Islands provide critical breeding grounds for Steller sea lions and northern fur seals. Bowhead, beluga, sei, North Pacific right, gray, and humpback whales swim through the waters of the Bering Sea shelf. Dolly Varden and coho salmon spawn in rivers on St. Lawrence and Nunivak islands.

The Alaska hare, an unusually large lagomorph endemic to Western Alaska, is an important focal species because little is known about its vital rates, distribution, and population size or trends. Two species of shrew (the Pribilof Island shrew and the St. Lawrence Island shrew) and one vole (insular vole) occur only in this region, on islands in the Bering Sea. Other important land mammals include taiga and root voles, as well as Arctic ground squirrels.

Central Alaska

The Central Alaska biogeographic region (Figure 5.1), covering an area also known as Interior Alaska, encompasses 245,214 square miles and stretches from the crest of the Brooks Range in the north to the Yukon River in the west, to Canada in the east, and to the coastal mountain ranges in the south.

The Brooks Range occurs in the northernmost portion of Central Alaska and spans the entire state, east to west. It represents the northern extension of the Rocky Mountains. The range is characterized by steep mountains of uplifted sedimentary and metamorphic rock, with scattered glaciers above 5,940 feet. Within the Brooks Range, elevations range from 1,640 to 8,530 feet. Near the southern boundary of the Central Alaska region is the Alaska Range. The mountains of the Alaska Range are high, very steep, and covered with glaciers, rocky slopes, and ice fields. Elevations vary from broad



Koyukuk River in autumn. B. Raften, USFWS, used with permission.

valleys at 2,000 feet to peaks greater than 12,000 feet, with the tallest mountain in North America rising to 20,310 feet. Glaciers have shaped these mountains; therefore, cirques and U-shaped valleys are common features. Streams and rivers, heavy with sediment, run swiftly down mountain ravines and braid across valley bottoms. The Wrangell and Kuskokwim mountains are found in the southern portion of Central Alaska. While the Wrangell Mountains are steep and covered with ice fields and glaciers, the Kuskokwim Mountains are rolling mountains with elevations generally below 4,000 feet.

Lowlands in Central Alaska are shaped by large rivers, including the Yukon, Tanana, Kuskokwim, Copper, Porcupine, and Old Crow rivers. Permafrost tends to be discontinuous and is retreating in extent due to climate change. Thawing results in thaw lakes, collapse-scar bogs, and fens. Glacial moraines and kettle lakes across the lowlands are evidence of past glaciation, and oxbow lakes exist where river routes have changed.

The prevailing climate in Central Alaska is continental and is characterized by long, cold winters and short, warm summers. Some upland areas experience dry, warm summers, contributing to a higher frequency of wildfires. Annual average temperature (2000–2024) is 25°F with seasonal averages varying between -1°F and 54°F (Table 5.1). Average annual total precipitation is 25 inches, including an average of 9 inches of snowfall water equivalent. Recent conditions indicate an increase in both annual average temperature and total precipitation, relative to historical data, but no change in snowfall water equivalent (1950–1999; Table 5.1).

Vegetation in Central Alaska is diverse. In the north, it includes shrub-sedge tussock tundra with willow thickets along rivers and streams and sparse spruce-birch forests at lower elevations. Steep slopes and slopes at higher elevations are largely barren, while upper and intermediate slopes support alpine heath communities. When vegetation is present, it features shrub birch, dwarf shrub communities, or dryas-lichen tundra. In the southern part of the region, boreal forest is extensive, and it features stands of black and white spruce. Floodplains are dominated by black spruce and tamarack. On more well-drained slopes and uplands, white spruce, paper birch, and quaking aspen occur.

Areas affected by forest fires typically regenerate to tall willow, birch, and alder shrubs. In lowland areas, vegetation varies with soil drainage. Highly productive stands of white spruce and balsam poplar dominate on riverine terraces along the major rivers. Where meandering streams have left oxbows or cut-off sloughs, wet sedge meadows, grass marshes, shrub swamps, and aquatic vegetation occur. Tall alders, birch, and willows dominate active floodplains and river bars.

Small mammals in Central Alaska include snowshoe hares; brown and northern bog lemmings; meadow, tundra, and taiga voles; and little brown bats. Common, dusky, and tundra shrews can be found in the wide valley floors of this region. The woodchuck is restricted to this region in Alaska.

Rivers and lakes throughout Central Alaska support northern pike, burbot, whitefish, and grayling. Headwater streams in the mountains support resident populations of Dolly Varden. All five species of Pacific salmon migrate up the Yukon and Kuskokwim rivers to spawn in tributary streams and commonly occur throughout the region.



Rusty Blackbird. A. Underwood, ADF&G.



Wonder Lake and the Alaska Range. © M. Emery, used with permission.

This boreal forest-dominated region supports a large variety of birds, including Surfbirds that breed in rocky areas above tree line. Open, mixed deciduous-conifer forests support a large variety of birds, including Boreal Chickadees, Northern Flickers, and Boreal Owls. Landbirds inhabiting this area across a diversity of habitats include Golden Eagles, Olive-sided Flycatchers, Blackpoll Warblers, Great Gray Owls, and Rusty Blackbirds. The rich aquatic habitats attract millions of waterbirds, including breeding species such as Lesser Scaup, Northern Pintail, Surf and Black Scoters, and Red-throated Loon.

Southwest Alaska

The Southwest Alaska biogeographic region (Figure 5.1) encompasses 61,799 square miles and includes the Alaska Peninsula, the Aleutian Islands, and the lowlands around Bristol Bay. The lowlands are dominated by moraines and other glacially influenced landforms, and elevations range from sea level to 500 feet. The Alaska Peninsula separates the Gulf of Alaska from the Bering Sea, and its dominant feature is the Aleutian Range, the peninsula's volcanic spine that reaches elevations of 8,580 feet above sea level. Extensive glaciers historically covered this area, and because glaciers remain on some high peaks, many lakes and rivers contain suspended glacial flour comprised of sediment from glacial erosion of rock and gravel. Many lakes and large river basins occur in the lowlands of the peninsula, which terminate in broad estuarine areas on the Bering Sea. Much of the shoreline of Bristol Bay and the Bering Sea is characterized by mixed sand and gravel beaches and exposed mudflats. The protected bays and lagoons often have eelgrass beds, which provide food for waterfowl and are the base of the food chain for many fish species. Izembek Lagoon contains one of the largest eelgrass beds in the world, a critical food source for Pacific Black Brant. The rugged Gulf Coast has intertidal habitats and subtidal kelp forests on rocky substrates.

Arcing 1,200 miles westward from the Alaska Peninsula to the island of Attu, the Aleutian Islands are a chain of volcanic islands formed by the Pacific tectonic plate being forced beneath the Bering Sea plate. Fog often shrouds the steep, rubble-covered peaks, which rise to 6,000 feet above sea level. Icecaps or small glaciers occur on many of the volcanoes, and past glaciation is evident. The archipelago's location over an active seismic fault results in frequent volcanic and seismic activity. Out of the 76 volcanoes in the chain, 40 have been active in the past 250 years.

A maritime climate dominates the Alaska Peninsula and the Aleutian Islands, whereas the climate transitions from maritime to continental in the lowlands around Bristol Bay. Rain, fog, and persistent winds are common throughout Southwest Alaska. Annual average temperature (2000–2024) is 36°F with seasonal averages varying between 23°F and 51°F (Table 5.1). Average annual total precipitation is 52 inches, including an average of 18 inches of snowfall water equivalent. Recent conditions indicate increases in annual average temperature and total precipitation, relative to historical data (1950–1999; Table 5.1).

In the lowlands around Bristol Bay and the Alaska Peninsula, moist and wet tundra dominates the landscape. Low and dwarf shrub communities of willow, birch, and alder, as well as mosses and tussock-forming sedges, characterize these wetlands. Spruce and birch forests occur along major rivers and streams, and sand dunes are present along bluffs on the coast and riverbanks. Most of the Alaska Peninsula and the Aleutian Islands are treeless. Tundra vegetation predominates below the barren ice-covered peaks. The alpine tundra is a semiarid habitat that supports low shrubs, lichens, mosses, and grasses. Moist tussock tundra of mosses, lichens, and tufted hair grass occurs in mountain valleys and along plateaus. Tall shrub communities of alder and willow dominate floodplains. The flora of the Aleutian Islands is a blend of species from the North American and Asian continents. Alpine tundra is characterized by species not found to the north or in Central Alaska, including Alaska arnica, Siberian spring beauty, caltha-leaved avens, western buttercup, and Kamchatka rhododendron. Low shrub communities of willow, birch, and alder dominate mountain flanks and coastlines, interspersed with ericaceous-heath, dryas-lichen, and grass communities. Uplands are characterized by peat and mats of heath tundra with sedges. Shallow, nearshore marine waters support eelgrass beds.

All five species of Pacific salmon spawn in this region, as do other anadromous species (e.g., Dolly Varden). The Kvichak River may be one of the world's most productive sockeye salmon systems, and the Nushagak River supports the third-largest Chinook salmon run in the world. Over



Alaska Peninsula, National Wildlife Refuge. © M. Emery, used with permission.



Vulcan Dome and volcanic springs near the headwaters of Surprise Lake below Aniakchak Caldera. NPS, used with permission.

the last 30 years, the annual harvest of salmon in Bristol Bay has exceeded 25 million fish, of which over 95% were sockeye salmon, making this the most valuable commercial fishery in Alaska. The streams and rivers of Bristol Bay also support healthy populations of resident rainbow trout and Arctic grayling. The Aleutian Islands unit of the Alaska Maritime National Wildlife Refuge is thought to have more salmon spawning streams than any other refuge in the country, providing a rich food resource for birds as well as terrestrial and marine mammals.

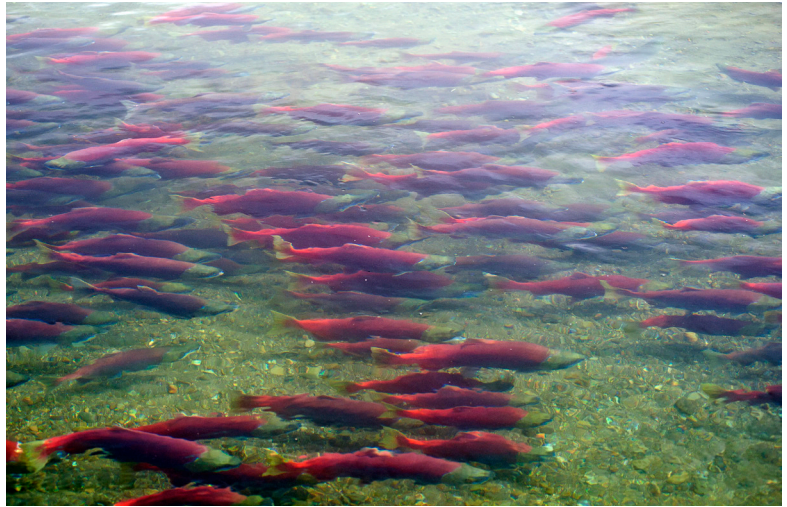
Common small mammals include Arctic, red, and ground squirrels; collared and brown lemmings; singing, root, and meadow voles; collared pikas; Alaska and snowshoe hares; dusky and tundra shrews; and little brown bats.

Nushagak and Egegik bays host large concentrations of migrant shorebirds annually, including Dunlin, Rock Sandpipers, and Western Sandpipers. Up to one-third of the global population of Bar-tailed Godwits (*baueri* subspecies only) uses Egegik Lagoon in the fall. Lowlands around Bristol Bay host roughly 10% of the breeding population of Red-throated Loons. The productive estuaries of Nushagak and Kvichak bays are used during spring migration by thousands of sea ducks, including King Eiders, Black Scoters, Long-tailed Ducks, and Steller's Eiders. Other coastal wetlands, lagoons, and bays in Southwest Alaska provide staging areas for large seasonal aggregations of waterfowl and shorebirds. Izembek and Moffet lagoons support concentrations of more than 500,000 shorebirds each spring, including Marbled Godwits, Rock Sandpipers, and nearly 100% of the global populations of Pacific Black Brant and Emperor Geese. Aleutian Terns, Red-faced Cormorants, Cassin's Auklets, and Kittlitz's Murrelets also breed here. Nelson Lagoon is the primary molting area for the Steller's Eider, which is currently listed as threatened under the ESA (62 FR 31748). The Alaska Peninsula and the Aleutian Islands support endemic species of both birds and mammals. Landbirds,

including Blackpoll Warblers and Rusty Blackbirds, breed in the forests and wetlands. McKay's Buntings and Sanderlings overwinter in terrestrial and intertidal habitats, respectively, in Southwest Alaska.

Southwest Alaska supports a diverse assemblage of marine species, including the beluga whale, northern sea otter, and Pacific walrus. Rookeries and haulouts for Steller sea lions are distributed primarily along the Gulf Coast and the Aleutian Islands. Northern sea otters inhabiting

this region belong to the Southwest Distinct Population Segment (DPS) and have been listed as threatened under the ESA since 2005 (74 FR 52010). Fin and humpback whales feed in the nearshore and offshore waters in the summer.



School of sockeye salmon. ADF&G.

Southcentral Alaska

The Southcentral Alaska biogeographic region (Figure 5.1) encompasses 51,116 square miles from Kamishak Bay and the southern tip of the Kenai Peninsula in the south to the Alaska Range in the north. This region includes Cook Inlet, Prince William Sound, and the Chugach and St. Elias mountain ranges. Approximately 500 miles of this region is coastline.



McKay's Bunting. J. Dau, ADF&G.

Elevation in Southcentral Alaska ranges from sea level to 14,750 feet. Gently sloping lowlands were extensively glaciated during the Pleistocene epoch. Hundreds of small lakes, swamps, fens, and bogs occur on glacial moraine deposits. Several large rivers, including the Susitna, Kenai, and Copper rivers, originate in the surrounding mountains and produce extensive floodplains in the lowlands. The Copper River Delta is the largest contiguous wetland on the Pacific Coast of North America at 700,000 acres. The rugged, ice-covered Chugach and St. Elias mountains serve as the backdrop for these lowlands, forming a crescent behind the Gulf of Alaska coastline and reaching from the southern tip of the Kenai Peninsula eastward around to the Fairweather Range in Southeast Alaska. These rugged mountains have the largest area of ice fields and glaciers outside the polar region. Fjords and archipelagos are common, and small lakes occur high in glacier-carved valleys. Glacial outburst floods, land subsidence, isostatic rebound, and localized high-wind events continue to dominate and influence landscape patterns.

The marine environments in Southcentral Alaska vary from exposed coastlines to sandy barrier islands and deep fjords. In Prince William Sound, water depths reach greater than 2,500 feet, and icebergs calve directly into marine waters at the base of tidewater glaciers. Tides here are large, and numerous freshwater rivers and streams flow into the ocean creating high-value estuarine habitats. During early summer, meltwater from snow and ice flows from the terminus of glaciers



Glacier in College Fjord, Prince William Sound. NOAA, used with permission.

and forms swift, short streams in valleys that can temporarily inundate coastal flats. Nutrient and mineral contributions from ice-melt into glacial fjords make them some of the most productive marine habitats in the world.

The climate in Southcentral Alaska is a mix of continental and maritime. Annual average temperature (2000–2024) is 31°F, with seasonal averages varying between about 16°F to 50°F (Table 5.1). Annual average total precipitation is 77 inches, with wetter areas

averaging 187 inches annually. Annual average snowfall water equivalent is approximately 36 inches, but varies widely, from five to 107 inches. Recent conditions indicate increases in temperature and precipitation but a decrease in snowfall water equivalent, relative to historical data, (1950–1999; Table 5.1).

In the westernmost part of Southcentral Alaska in the Gulf of Alaska, Sitka spruce and black cottonwood have only recently become established on islands; the dominant vegetation consists of willow and alder thickets or wet and moist sedge meadows. Barrens or alpine tundra occurs at higher elevations. From Afognak Island moving eastward, spruce and hardwood forests dominate the landscape, but the varying climatic conditions, discontinuous permafrost, and rolling



Dunlins and Ruddy Turnstones. B. Richard, ADF&G.

topography support a diverse set of vegetation types. Lowlands with wet, organic soils support black spruce stands, and ericaceous shrubs are dominant in open bogs. Plant communities of tall shrubs, wet graminoids (grasses and sedges), and wet forbs (broad-leaved herbs) also occur. Uplands have mixed forests of white and Sitka spruce, aspen, and birch. Tall shrub communities, dominated by willow and alder, occur in floodplains. Farther east, a lush temperate rain forest dominated by western hemlock and Sitka spruce grows along the shoreline and on mountain slopes. Cottonwood and alder stands occur in river valleys. At the highest elevations, thin, rocky soils support alpine tundra composed of sedges, grasses, and low shrubs.

The diverse habitats and relatively mild climate in Southcentral Alaska result in a great diversity of vertebrate fish and wildlife species, ranging from amphibians to marine mammals. For instance, this region is the northernmost range of the western toad. Small mammals include the northern flying squirrel; Arctic ground and red squirrels; singing, root, and meadow voles; collared pika; snowshoe hare; and dusky and tundra shrews. The endangered Cook Inlet beluga whale population occurs only within the region and is isolated from other beluga whale populations. Northern sea otters, Steller sea lions, and humpback whales occur in high numbers.

Numerous lakes, ponds, and wetlands in Southcentral Alaska attract large numbers of shorebirds and waterfowl. The Copper River Delta is one of North America's most important shorebird stopover sites. Along with nearby Controller Bay (Bering River Delta), the area supports the largest spring concentration of shorebirds in the Western Hemisphere (Bishop et al. 2016). Thirty-six species of migrating shorebirds have been recorded in the Copper River Delta alone, with the two most

abundant species being Dunlin and Western Sandpiper. Recent work has documented that Red Knots (*roselarii* subspecies) also stage in Controller Bay during their spring migration (Bishop et al. 2016). Significant numbers of Western Sandpipers, Dunlin, Rock Sandpipers, Short-billed Dowitchers, and Hudsonian Godwits also use Cook Inlet during migration, breeding, or wintering.

Other waterfowl and shorebird species of importance in the region include the entire breeding population of Dusky Canada Geese and sizable populations of Aleutian Terns, Red-throated Loons, and Black Oystercatchers. Prince William Sound supports a large concentration of migrating surfbirds each spring, and high nesting concentrations of Bald Eagles and Marbled Murrelets also occur in the region. Cassin's Auklets and other seabirds nest in cliff colonies along the rocky shorelines, and Kittlitz's Murrelets breed in rocky areas in the mountains. Yellow-billed Loons and many species of sea ducks winter along the coast in Prince William Sound. Sensitive landbirds in the region include Olive-sided Flycatchers and Blackpoll Warblers.

The Matanuska and Susitna River drainages are home to all five species of Pacific salmon, rainbow trout, Dolly Varden, Arctic grayling, and whitefish. Northern pike and Alaska blackfish are not native to this region, but numerous populations occur now due to illegal human introductions and subsequent dispersal of each species. The Kenai River has a unique run of the world's largest Chinook salmon. Dolly Varden, rockfish, halibut, and lingcod occur throughout Prince William Sound.

Southeast Alaska

The Southeast Alaska biogeographic region (Figure 5.1) encompasses 33,513 square miles and includes the entire Alaska Panhandle. It spans from Yakutat Bay in the north to the southern tip of Prince of Wales Island in the south and encompasses the Alexander Archipelago and the North Coast Mountain range. Other major islands besides Prince of Wales Island include Admiralty, Baranof, Chichagof, Kuiu, and Kupreanof. The region's islands are interlaced with coastal inland waters, including Icy Strait, Lynn Canal, Stephens Passage, Chatham and Clarence straits, and Frederick Sound.



Alexander Archipelago. NOAA, used with permission.



Southeast Alaska rain forest. ADF&G.

The Coast Mountains straddle the border between Alaska and British Columbia, with elevations ranging from sea level to 9,840 feet. During the Pleistocene, massive ice sheets covered these mountains. Winter snows feed ice fields and glaciers in this ecoregion, but steep, rugged peaks are exposed and retreating glaciers have left U-shaped valleys. During the summer, melting ice feeds swift streams and rivers to the coast. Several interior rivers pass through these mountains, including the Taku, Stikine, Unuk, and Whiting rivers. This area includes the southernmost extent of tidewater glaciers on the North American continent (LeConte Glacier, near Wrangell).

The Alexander Archipelago consists of thousands of islands, including Prince of Wales, the third largest island in the United States. Past glaciers carved deep U-shaped valleys that filled with seawater when the glaciers retreated. Elevation in the archipelago ranges from sea level to over 3,280 feet. Rolling moraine landforms dominate the hills and valley bottoms. Tectonic movement and the forces of isostatic rebound after glacier retreat have raised and lowered marine terraces, forming rich coastal lowlands and estuaries. Glacial inputs of nutrients and minerals strongly influence the nearshore marine environment, particularly where glaciers flow into bays and fjords. Limestone underlies parts of the ecoregion, and karst topography of sinkholes, caves, underground streams, and fractured bedrock fosters high levels of endemism in plants. With many narrow passages for tidewaters to transit, tidal range and currents can be extreme.

The primarily maritime climate in the region results in significant precipitation and relatively warm temperatures compared to the rest of Alaska (Table 5.1). Annual average temperature (2000–2024) is about 39°F, with seasonal averages varying between about 28°F to 52°F. Annual average total precipitation is 199 inches and ranges from 96 to 134 inches per year, with wetter areas receiving nearly 215 inches in some years. Annual average snowfall water equivalent is about 42 inches, but varies widely, with some areas averaging as little as 1.5 inches annually, while others receive up to 108 inches annually. Recent conditions indicate an increase in annual temperature and precipitation relative to historical data, including a decrease in the average snowfall water equivalent (1950–1999; Table 5.1).

The temperate rain forest, consisting primarily of western hemlock and Sitka spruce, reaches from the shoreline to 1,200 feet elevation on mountain slopes. Salal and western red cedar are also found in the southern parts of the archipelago. Mixed conifer, black cottonwood, and lodgepole pine occur on drier sites. Where bedrock is not exposed, the forest gradually transitions with elevation gain into shrublands, followed by alpine tundra. Water-tolerant plants such as sphagnum moss, sedges, and shore pine occur in peatlands. Poorly drained soils support open muskeg and forested wetlands.

The natural fragmentation of the archipelago has influenced species distribution and promoted a high level of endemism in Southeast Alaska. As a result of the region's unique island biogeography



Northern sea otter. M. L. Baird, ADF&G.

and variable glaciation through time, populations of many endemic birds, invertebrates, and mammals occur here. This biogeographic region is also rich in species compared to more northerly regions of the state. For example, it is home to amphibians, including northwestern salamanders, long-toed salamanders, wood frogs, spotted frogs, and western toads. The region supports multiple taxa found in no other region of the state, many of which are SGCN, but six resident species of bats, southern red-backed vole, root and meadow voles, meadow jumping mouse, and northwestern deer mouse.

Marine mammal life is abundant in Southeast Alaska and includes many species, such as northern sea otter, humpback whale, and Steller sea lion. The Forrester Island complex supports the largest Steller sea lion rookery in Alaska.

The coastal streams, headwater lakes, and rivers support large runs of all five Pacific salmon species. These species transport important, marine-derived nutrients back to freshwater and terrestrial ecosystems and draw Bald Eagles and other scavengers. Other resident and anadromous fish species in these watersheds include Dolly Varden, steelhead, and cutthroat trout. Large spawning concentrations of eulachon occur during spring near the mouths of some rivers, attracting large numbers of Bald Eagles and Steller sea lions. In fact, Southeast Alaska holds the highest nest density of Bald Eagles in the world.

Marine and estuarine waters of the Southeast biogeographic region support large seasonal concentrations of sea ducks, particularly during winter and spring migration and staging. For example, during the spring staging period, thousands of Surf Scoters congregate in Lynn Canal to take advantage of Pacific herring spawning sites. Sheltered waters around the islands of the Alexander Archipelago support many sea duck species during migration, molting, staging, and wintering periods. These include Harlequin Ducks, Surf and White-winged scoters, and Long-tailed Ducks.

Other birds of interest in this region include Red-breasted Sapsuckers, Varied Thrush, Rufous Hummingbirds, Black Oystercatchers, Marbled Murrelets, Kittlitz's Murrelets, Western Screech-Owls, and American Goshawks (inclusive of its subspecies, the Queen Charlotte Goshawk).

Southeast Alaska supports the largest breeding Marbled Murrelet population in the world. Additionally, Glacier Bay, in northern Southeast Alaska, holds the largest known breeding population of Kittlitz's Murrelets.

Beaufort and Chukchi Seas

The Beaufort and Chukchi seas biogeographic region (Figure 5.1) encompasses about 415,000 square miles. It includes all marine waters, coastline, and ocean floor between Cape Prince of Wales and Demarcation Point, including the Chukchi Sea, Kotzebue Sound, and the western portion of the Beaufort Sea that occurs in Alaska. The Alaska tidal coastline of the region is approximately 4,500 miles long and consists primarily of low topographic features and shallow coastal waters. Much of the northern coastline is characterized by shallow barrier islands which form productive lagoons and estuaries. In the Beaufort Sea, the continental shelf is relatively narrow, extending between 30 and 60 miles offshore, whereas the Chukchi Sea is shallow throughout, with depths less than 200 feet.

The Beaufort and Chukchi seas are ice-covered for much of the year, resulting in relatively low overall productivity. Annual average air temperature (2000–2024) is 18°F, with seasonal averages ranging from -3°F in winter to 37°F in summer (Table 5.1). Annual average sea surface temperature is 32°F and rises to 36°F in summer. Annual average total precipitation is about 14 inches, including seven inches of snow water equivalent (Table 5.1). Average annual wind speed for the region is about six mph to the southeast (northwesterly winds), but average winter wind speeds within the region exceed 23 mph.

Recent conditions (2000–2024) indicate increases in temperature and precipitation relative to historical data (1950–1999; Table 5.1). These changes are associated with a marked decline in sea ice extent in the region. During September, the month of minimum sea ice coverage, sea ice extent



Ice floes in the Chukchi Sea. J. Rose, ABR, used with permission.

has declined by approximately 30,800 square miles per decade in the Beaufort Sea, and 27,000 square miles per decade in the Chukchi Sea between 1957 and 2021 (Ballinger et al. 2023). The decrease in sea ice extent and the shortening of the ice-covered period are related to rising sea surface temperatures, which, in turn, amplify air temperatures and increase precipitation.

The Chukchi Sea is more productive than the Beaufort Sea because it mixes with nutrient-rich North Pacific waters that flow through the Bering Strait. It receives warmer, low-salinity water that flows from the Yukon River up through the Bering Strait; water circulation is primarily wind-driven from south to north during the ice-free season. In comparison, water circulation in the Beaufort Sea is generally westerly, with a subsurface undercurrent flowing to the east. Spring sea ice melt creates a productive nearshore corridor used by marine and anadromous fish and migrating shorebirds and waterfowl. Most marine mammals in the Beaufort Sea generally remain with the sea ice as it retreats northward. Kotzebue Sound is a large, shallow, productive bay fed by nutrient-rich waters of the Kobuk and Noatak rivers. It serves as an overwintering area for a large population of sheefish.

The Beaufort and Chukchi seas region supports populations of several marine mammals, including Pacific walrus; bowhead and beluga whales; bearded, ringed, ribbon, and spotted seals; and polar bears. This region is a summer home to many marine birds, including Red-throated and Yellow-billed Loons, auklets, Northern Fulmars, Black Guillemots, Thick-billed and Common Murres, Tufted and Horned Puffins, Black-legged Kittiwakes, Ross's and Glaucous Gulls, jaegers, Arctic Terns, and Red-necked and Red Phalaropes, and a large portion of sea ducks that breed in northern Alaska use the Beaufort and Chukchi seas for migration, molting, and staging. The barrier islands of the Beaufort Sea in particular provide important molting and staging areas for sea ducks, especially Long-tailed Ducks and Pacific Common Eiders. In the Chukchi Sea, Ledyard Bay is used during the molting period by likely all female Spectacled Eiders that breed on Alaska's Arctic Coastal Plain, as well as a significant number of males from both the Alaska and Russia breeding populations. Characteristic marine invertebrate species include snow crab, Pacific blue mussel, squid, sea cucumber, and sea stars. Characteristic fish species include salmon (Chinook, chum, and pink), pond and rainbow smelt, capelin, Pacific sand lance, Pacific herring, Arctic and saffron cod, stickleback (ninespine and threespine), cisco (broad, Arctic, and Bering), Dolly Varden, and Arctic lamprey.

Bering Sea

The Bering Sea biogeographic region (Figure 5.1) encompasses approximately 770,000 square miles. It includes all marine waters and ocean floor (i.e., United States territorial waters) from Cape Prince of Wales south to the Alaska Peninsula and encompasses both sides of the Aleutian Islands west of Unimak Pass. Approximately 44% of the region is a continental shelf, 13% is a continental slope, and 43% is in a deep-water basin. Offshore of the Aleutian Islands, the continental shelf is very narrow, and most of it is a deep-water



Female and male Steller sea lions with pup. ADF&G.

basin. The Aleutian Basin contains several deep-water marine canyons, ocean-floor ridges, and seamounts. The broad continental shelf of the Bering Sea is highly productive, and there are also extremely productive regions near the slopes of some major ridges, oceanic canyons, and seamounts. Productivity is strongly related to the Alaska Stream and Alaska Coastal Current, fed partly by the Kuskokwim and Yukon rivers and upwelling from the Bering Sea Gyre.

The region includes Norton Sound, Kuskokwim and Bristol bays, St. Lawrence and St. Matthew islands, and waters north of the Aleutian Islands. The Alaska coastline of the Bering Sea and the Aleutian Islands biogeographic region is approximately 7,000 miles long, most of which is within National Conservation Units, including the Yukon Delta National Wildlife Refuge, Togiak National Wildlife Refuge, and Izembek National Wildlife Refuge.

Weather and climate in the Bering Sea are highly variable and influenced in part by the region's wide latitudinal span. Annual average air temperatures (2000–2024) are approximately 28°F in winter and 46°F in summer (Table 5.1). Annual average sea surface temperatures range from about 35°F in winter to 46°F in summer. In colder areas, sea surface temperatures are 42°F in summer, and warmer areas can reach 50°F. Annual average total precipitation is 35 inches, including 11 inches of snow water equivalent during colder months. Average annual wind speed for the region is about three mph to the southeast (northwesterly winds), but average winter wind speeds within the region exceed 24 mph.

Recent conditions (2000–2024) indicate increases in winter and summer air temperature, sea surface temperature, and average annual precipitation, compared to historical data (1950–1999; Table 5.1), along with reduced sea ice extent. Much of the northern Bering Sea was historically ice-covered for most of the year, with the annual formation and subsequent melting of sea ice strongly influencing salinity and water temperature. However, in recent decades, the March sea-ice extent (i.e., maximum ice coverage) has declined by approximately 19,300 square miles per decade from 1957–2021, with record lows in 2018 and 2019 (Ballinger et al. 2023).

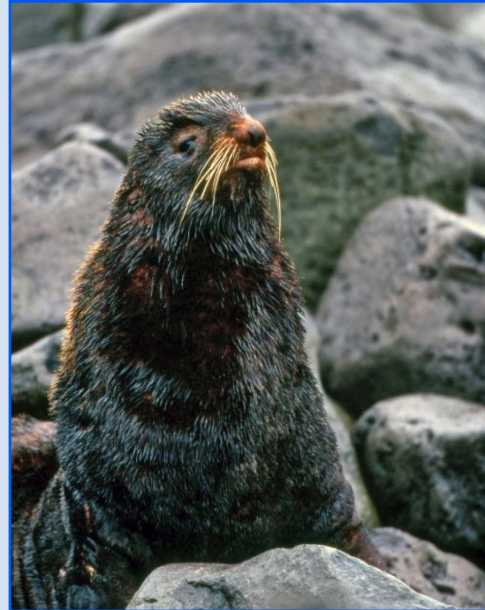
The region is home to about 300 species of fishes, many of which are commercially and ecologically important, along with hundreds of species of crustaceans and mollusks, some 50 species of seabirds,



Horned Puffins. ADF&G.

Species of Conservation Need: Northern Fur Seal (*Callorhinus ursinus*)

Northern fur seals have dense fur, stocky bodies, and long flippers. Adult females can weigh up to 140 pounds, reach lengths of five feet, and have dark gray or brown dorsal coloration with light gray or cream ventral coloration; males can weigh up to 600 pounds, reach lengths of seven feet, and have dark brown or black coloration. Northern fur seals spend approximately 80% of their time in the open ocean, ranging across areas of the North Pacific Ocean, Bering Sea, and Okhotsk Sea. The remainder of their time (summer and fall) is spent at breeding colonies on rocky beaches of Alaska's islands, such as St. Paul, Bogoslof, St. George, and Sea Lion Rock. The eastern Pacific stock is estimated at 626,618 fur seals as of 2019, while the estimated population in the 1950s was approximately 2.1 million fur seals. Threats to this species include changes in marine ecosystems, entanglement in marine debris, and contaminants.



Northern fur seal. J. Hyde, ADF&G.

and 26 species of marine mammals. Marine mammals found in the region include the Pacific walrus; Steller sea lion; bowhead, sei, fin, sperm, North Pacific right, humpback, and beluga whales; six species of seals; harbor porpoise; northern sea otter; and polar bear. Many seabirds feed in these waters during the breeding season, including Red-throated and Yellow-billed Loons; Laysan, Black-footed, and Short-tailed Albatrosses; Fork-tailed Storm-Petrel; cormorants; auklets; murrelets; guillemots; murrelets; puffins; kittiwakes; gulls; jaegers; and Arctic and Aleutian Terns. The world's population of Spectacled Eiders winters in the sea ice south of St. Lawrence Island in most winters. Aquatic species in the region include crab, scallop, abalone, mussel, clam, shrimp, five species of Pacific salmon, steelhead, salmon shark, sablefish, halibut, flounder, smelt, capelin, eulachon, cod, stickleback, rockfish, whitefish, sheefish, and Dolly Varden.

Gulf of Alaska

The Gulf of Alaska biogeographic region (Figure 5.1) is a relatively open marine system encompassing approximately 592,000 square miles (within United States territorial waters). It includes all shorelines, marine waters, and ocean floor areas off the coast of southern Alaska between the southernmost point in Alaska at Cape Muzon on Dall Island in the east and Unimak Pass in the west. The area includes the marine waters of the Alexander Archipelago, Prince William Sound, Cook Inlet, Kodiak Island, and the southern shoreline of the Alaska Peninsula.

The region's coastline is approximately 24,700 miles long and includes many glacially carved fjords and estuaries. Much of the adjoining lands lie within National Conservation Units, including the Alaska Peninsula National Wildlife Refuge, Kodiak National Wildlife Refuge, Katmai National Park and Preserve, Lake Clark National Park and Preserve, Kenai National Wildlife Refuge, Kenai Fjords National Park, the Chugach National Forest, Wrangell-St. Elias National Park and Preserve, Glacier Bay National Park and Preserve, and the Tongass National Forest.

The Gulf of Alaska region consists primarily of deep ocean basins, with a narrow continental shelf comprising only 10% of the total area (approximately 62,000 square miles). The region is strongly influenced by the Alaska Current, which is part of a huge counterclockwise gyre in the Gulf of Alaska. Almost the entire Gulf of Alaska remains ice-free year-round. The region's weather is dominated by winds and the gulf is well known for generating significant storm events, which drive precipitation patterns across much of Alaska, the west coast of Canada, and the contiguous United States.

Annual average sea surface temperature is about 47°F, ranging from 42°F to 53°F (2000–2024; Table 5.1). Annual average air temperature is 45°F; with winter averaging 40°F and summer 52°F. Recent conditions indicate increases in average sea surface temperatures, annual average air temperatures, and total precipitation, relative to historical data (1950–1999; Table 5.1). Annual average total precipitation across the region is about 50 inches, while the wettest areas average between 103 and 133 inches per year. The region's annual average snow water equivalent is three inches, ranging from less than one to seven inches. In areas with predominantly northeasterly winds, sustained wind speeds range from seven to 16 mph, with autumn being the windiest season. In areas with predominantly southwesterly winds, sustained speeds range from four to 17 mph and winter is the windiest season, with average wind speeds exceeding 20 mph in some areas.

The region supports populations of hundreds of fish species, marine invertebrates, marine mammals, and many species of seabirds. Mammals on the SGCN list that are commonly found in the region include the Steller sea lion; sei, fin, North Pacific right, humpback, sperm, and beluga whales; northern fur and Pacific harbor seals; harbor porpoise; and northern sea otter. Seabirds in the region include loons, albatrosses, Fork-tailed Storm-Petrel, cormorants, auklets, murrelets, Pigeon Guillemot, Thick-billed and Common Murres, Tufted and Horned Puffins, kittiwakes, gulls, jaegers, and terns. The Kodiak Archipelago is of particular importance to wintering sea ducks, including Black Scoters, White-winged Scoters, Harlequin Ducks, and Barrow's Goldeneye, and its nearshore waters provide ample foraging areas and shelter from high winds and rough seas. More than 5% of the continental populations of Black Scoters, White-winged Scoters, and Harlequin Ducks inhabit these waters during winter months. The region is also used as a fall migratory corridor for passerines. The Gulf waters are home to many invertebrate and fish species, including crab, scallops, abalone, mussels, clams, shrimp, all five species of Pacific salmon, salmon shark, sablefish, halibut, flounder, smelt, capelin, eulachon, cod, stickleback, and many species of rockfish.

Species Richness of Terrestrial Vertebrate SGCN

The 2015 SWAP lacked a comprehensive, spatially explicit treatment of SGCN distributions at the landscape scale. ADF&G partnered with the University of Alaska Fairbanks in 2022 to create statewide, multispecies "heatmaps" depicting hotspots of species richness for 211 vertebrate SGCN in the terrestrial environment (Figure 5.2); this work was funded by a Competitive State Wildlife Grant (SWG) SWAP Improvement Grant. This mapping work provides the first overview of areas of species richness of wildlife SGCN across Alaska's terrestrial landscape.

Distributional hotspots are areas where multiple SGCN taxa co-occur. Identifying species-rich areas can help managers understand and predict landscape patterns of biodiversity, prioritize where to focus limited funds for future research and management efforts, and help inform future decisions about state wildlife resources (e.g., Underwood et al. 2011, Gary et al. 2019). Research and monitoring within SGCN hotspots also provide a cost-effective means to collect data on multiple SGCN taxa

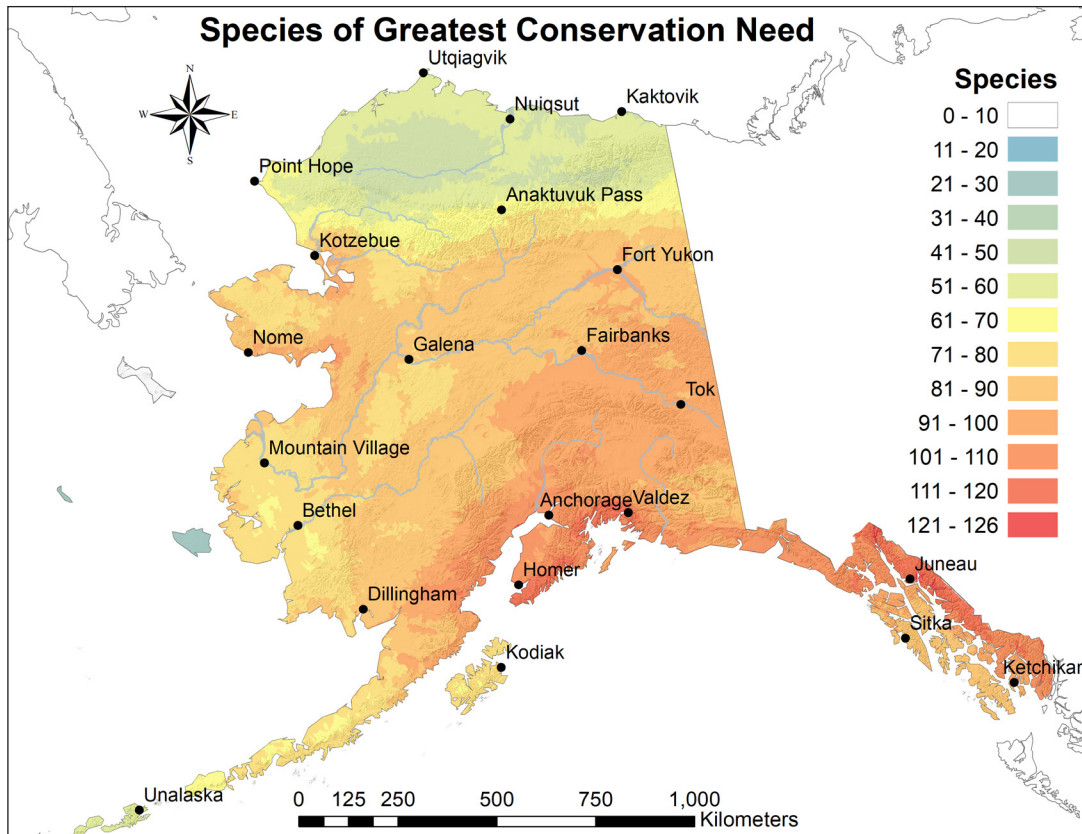


Figure 5.2. Statewide heatmap of “species of greatest conservation need” (SGCN) in Alaska, including the predicted distribution of 211 vertebrates (amphibians, birds, and mammals) across terrestrial environments. The color scale indicates the predicted number of overlapping SGCN taxa. Species range and distribution maps used to generate this figure were created by the U.S. Geological Survey Alaska Gap Analysis Project (ACCS 2024).

at once and provides opportunities to collaborate with partners. Finally, scientific work in SGCN-rich areas can help identify common drivers of decline, determine applied solutions, and pinpoint environmental factors that produce high levels of wildlife diversity, such as unique ecological features that support productive habitats for a variety of taxa.

Data used to create heatmaps came from 211 species range maps of vertebrate SGCN listed in the 2015 SWAP (7 amphibians, 159 birds, and 45 mammals). Range maps for Alaska were based on spatially explicit models (12-digit hydrologic unit code watershed scale) used to predict each species’ distribution on land, developed as part of the U.S. Geological Survey Gap Analysis Project (GAP; Gotthardt et al. 2014, Aycrigg et al. 2015, ACCS 2024). Individual species range maps were overlaid to determine areas with the highest numbers of SGCN. Over 90% of the 211 species used in the heatmap exercise in 2022 are retained on the 2025 SGCN list; therefore, the output and patterns described below remain broadly applicable until further updates become available. Results and predicted species-specific distribution layers are available at the University of Alaska Fairbanks’ Scenarios Network for Alaska + Arctic Planning (SNAP) GeoNetwork portal (SNAP 2024).

It is important to note that the maps are intended to provide a broad, landscape-level overview only. Species ranges in the Alaska GAP were modeled and extrapolated from the best available, but sometimes limited data, making the maps unsuitable for use or interpretation at finer, local scales.

General Patterns of Vertebrate Richness

A statewide heatmap of all vertebrate SGCN indicated that species richness is greatest in the Southcentral Alaska and Southeast Alaska biogeographic regions (Figure 5.2). The highest overall SGCN richness occurred along some coastal areas of Prince William Sound (126 species). Over 80% of the 126 species were also present near Juneau, Haines, and in the coastal region of Norton Sound (Figure 5.2).

Species Richness by Taxonomic Group

Spatial patterns of species richness also vary by taxonomic group. We created separate heatmaps for amphibian, bird, and mammalian groups. The greatest SGCN amphibian richness occurs in the Southeast Alaska region (Figure 5.3a), including the northern end of Sitka Island and the area surrounding Ketchikan. Only a single amphibian (the wood frog) is predicted to occur across much of the rest of the state.

SGCN bird richness is greatest in the Southcentral Alaska region (104 of 159 species), including the eastern Kenai Peninsula and Prince William Sound area (Figure 5.3b). Over 80% of the 104 avian SGCN are also predicted to co-occur in northern portions of the Southeast Alaska region, along the Gulf of Alaska coastline, and in coastal areas of northeastern Norton Sound (Figure 5.3b). The greatest mammalian SGCN richness is expected to occur across portions of the Seward Peninsula and Northwest Arctic coast. Other diverse areas for mammals included the eastern Central Alaska region, especially in the Upper Koyukuk River Valley, Yukon-Tanana Uplands, and the central Alaska Range (Figure 5.3c).

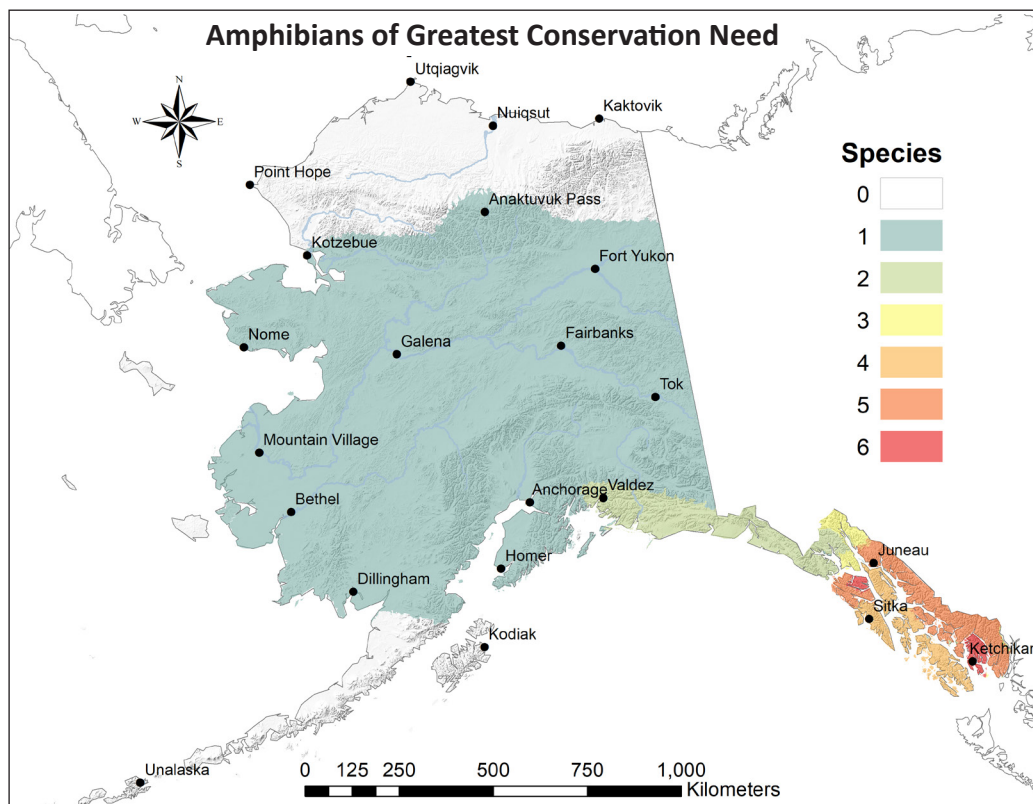


Figure 5.3a. Vertebrate species richness heatmaps by taxonomic group across Alaska (amphibian “species of greatest conservation need”).

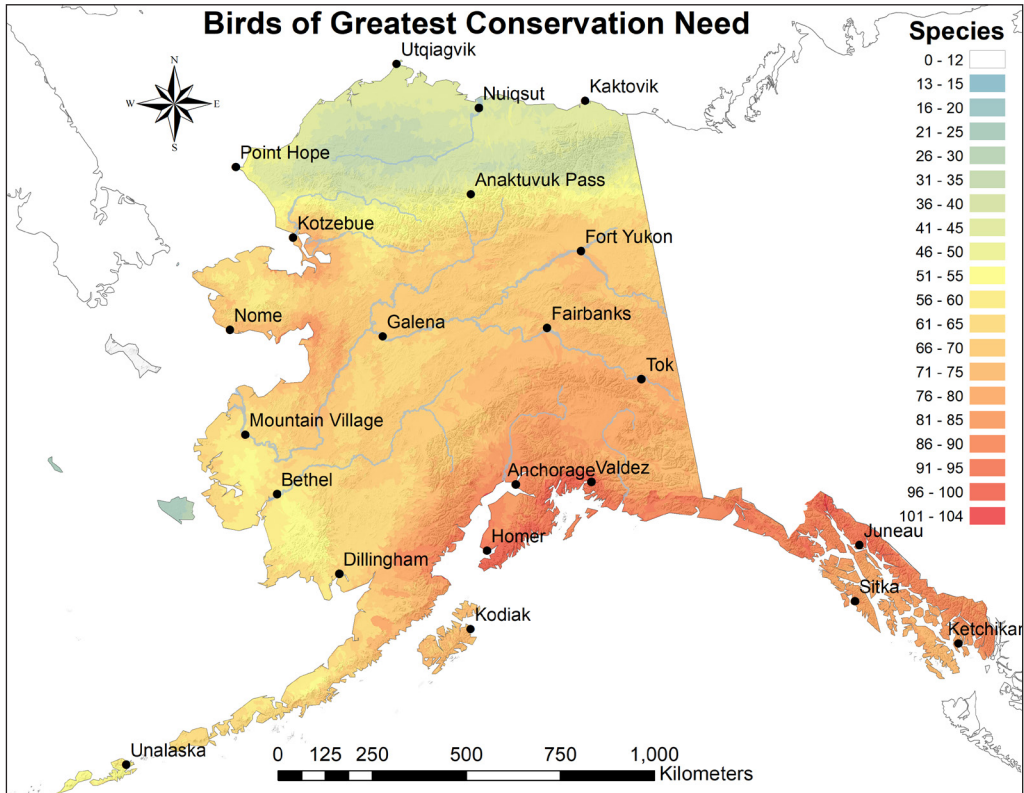


Figure 5.3b. Vertebrate species richness heatmaps by taxonomic group across Alaska (bird “species of greatest conservation need”).

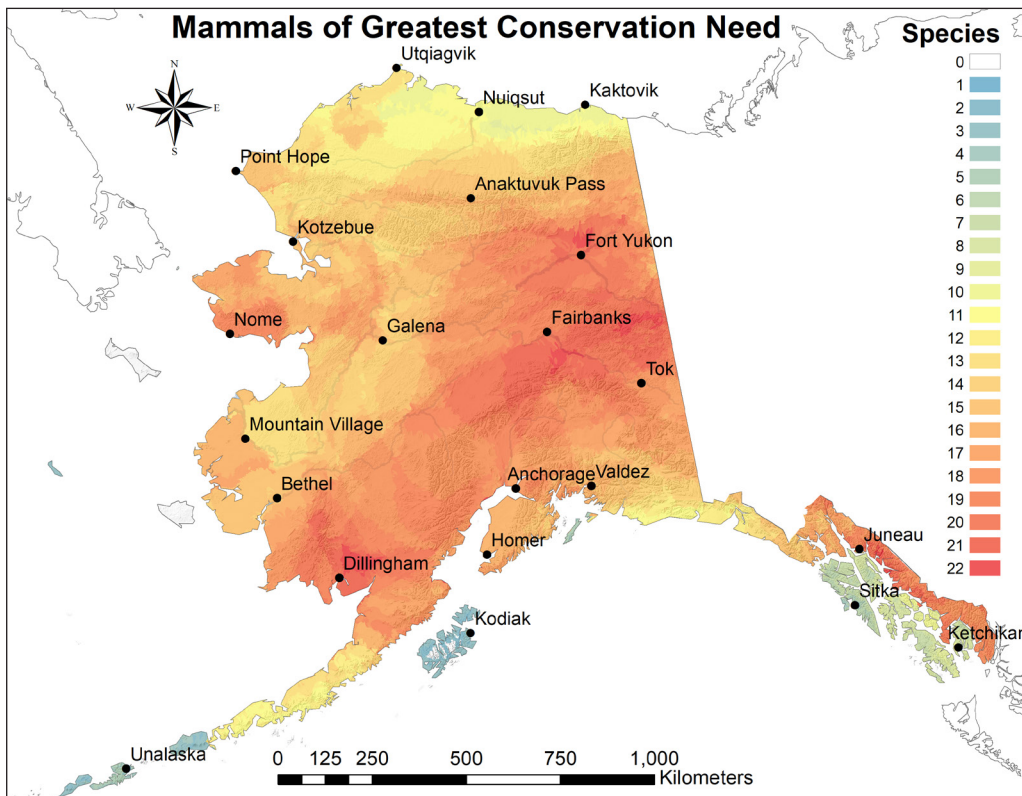


Figure 5.3c. Vertebrate species richness heatmaps by taxonomic group across Alaska (mammal “species of greatest conservation need”).

Abundance of SGCN

Given the large size and remoteness of Alaska, abundance estimates for most nonexploited species are unknown. All available Alaska population estimates for SGCN are given in Appendix E.

In cases where populations are suspected of being small or declining, more work has been conducted to arrive at credible population estimates. Where species have been proposed for Endangered Species Act (ESA) listing, or are already listed, relatively good population estimates are also available. It is safe to assume that some less-studied species, such as forage fish and many marine and freshwater invertebrates, are very abundant, numbering in the tens of millions to hundreds of billions. Many small mammals are also abundant, numbering in the millions to tens of millions.

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