

## 12 | Appendices



*American Three-toed Woodpecker. ABR, used with permission.*

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Appendix A. “Species of greatest conservation need” (SGCN) in Alaska by justification—terrestrial vertebrates and marine mammals. Please refer to Appendix B when subspecies, stock or Distinct Population Segment (DPS) qualifies as SGCN. Chapter 4 describes SGCN justification in detail.

Species of Conservation Need	See Appendix B for subspecies, stock, or DPS	ESA Listed, Proposed, or Under Review <sup>1</sup>	ASRS <sup>2</sup>	AK Shorebird Plan <sup>3</sup>	AK Landbird Plan <sup>4</sup>	ACAD Priority Species <sup>5</sup>	Birds of Conservation Concern <sup>6</sup>	Stewardship	Culturally Important
<b>Amphibians and Reptiles</b>									
<i>Rana luteiventris</i> , Columbia Spotted Frog			•						
<i>Ambystoma macrodactylum</i> , Long-toed Salamander			•						
<i>Ambystoma gracile</i> , Northwestern Salamander			•						
<i>Anaxyrus boreas</i> , Western Toad			•						•
<i>Lithobates sylvaticus</i> , Wood Frog			•						
<b>Waterfowl</b>									
<i>Anser canagicus</i> , Emperor Goose						•		•	•
<i>Anser albifrons</i> , Greater White-fronted Goose	•								
<i>Branta bernicla</i> , Brant	•		•						
<i>Branta hutchinsii</i> , Cackling Goose	•								
<i>Branta canadensis</i> , Canada Goose	•								
<i>Cygnus buccinator</i> , Trumpeter Swan								•	
<i>Anas acuta</i> , Northern Pintail						•			
<i>Aythya affinis</i> , Lesser Scaup									•
<i>Aythya valisineria</i> , Canvasback								•	
<i>Polysticta stelleri</i> , Steller’s Eider		TH	•			•		•	•
<i>Somateria fischeri</i> , Spectacled Eider		TH	•			•		•	•
<i>Somateria spectabilis</i> , King Eider						•			•
<i>Somateria mollissima</i> , Common Eider	•								•
<i>Melanitta perspicillata</i> , Surf Scoter			•						•
<i>Melanitta fusca</i> , White-winged Scoter									•
<i>Melanitta americana</i> , Black Scoter						•		•	•
<i>Clangula hyemalis</i> , Long-tailed Duck						•			•
<i>Histrionicus histrionicus</i> , Harlequin Duck								•	
<b>Grouse and Ptarmigan</b>									
<i>Canachites canadensis</i> , Spruce Grouse	•		•		•				
<i>Lagopus lagopus</i> , Willow Ptarmigan			•		•			•	
<i>Lagopus muta</i> , Rock Ptarmigan	•				•				
<i>Dendragapus fuliginosus</i> , Sooty Grouse					•			•	
<b>Loons and Grebes</b>									
<i>Podiceps auritus</i> , Horned Grebe			•			•			
<i>Podiceps grisegena</i> , Red-necked Grebe			•						
<i>Aechmophorus occidentalis</i> , Western Grebe			•				•		
<i>Gavia arctica</i> , Arctic Loon			•						
<i>Gavia stellata</i> , Red-throated Loon			•						
<i>Gavia adamsii</i> , Yellow-billed Loon			•			•	•		

Appendix A. Continued.

Species of Conservation Need	See Appendix B for subspecies, stock, or DPS	ESA Listed, Proposed, or Under Review <sup>1</sup>	ASRS <sup>2</sup>	AK Shorebird Plan <sup>3</sup>	AK Landbird Plan <sup>4</sup>	ACAD Priority Species <sup>5</sup>	Birds of Conservation Concern <sup>6</sup>	Stewardship	Culturally Important
<b>Swifts and Hummingbirds</b>									
<i>Cypseloides niger</i> , Black Swift			•		•		•		
<i>Chaetura vauxi</i> , Vaux's Swift			•			•	•		
<i>Selasphorus rufus</i> , Rufous Hummingbird			•		•	•	•		
<b>Cranes</b>									
<i>Antigone canadensis</i> , Sandhill Crane								•	•
<b>Shorebirds</b>									
<i>Haematopus bachmani</i> , Black Oystercatcher			•	•			•	•	
<i>Pluvialis squatarola</i> , Black-bellied Plover			•	•		•		•	
<i>Pluvialis dominica</i> , American Golden-Plover			•	•		•	•	•	
<i>Pluvialis fulva</i> , Pacific Golden-Plover			•	•				•	
<i>Charadrius vociferus</i> , Killdeer			•	•					
<i>Bartramia longicauda</i> , Upland Sandpiper			•	•					
<i>Numenius tahitiensis</i> , Bristle-thighed Curlew			•	•		•	•	•	
<i>Numenius phaeopus</i> , Whimbrel	•					•			
<i>Limosa lapponica</i> , Bar-tailed Godwit	•		•			•	•		
<i>Limosa haemastica</i> , Hudsonian Godwit				•		•	•	•	
<i>Limosa fedoa</i> , Marbled Godwit	•					•	•		
<i>Arenaria interpres</i> , Ruddy Turnstone			•	•		•		•	
<i>Arenaria melanocephala</i> , Black Turnstone				•		•	•	•	
<i>Calidris canutus</i> , Red Knot	•					•			
<i>Calidris virgata</i> , Surfbird			•	•		•		•	
<i>Calidris acuminata</i> , Sharp-tailed Sandpiper				•				•	
<i>Calidris himantopus</i> , Stilt Sandpiper			•	•		•			
<i>Calidris ruficollis</i> , Red-necked Stint			•						
<i>Calidris alba</i> , Sanderling			•	•		•			
<i>Calidris alpina</i> , Dunlin	•		•			•			
<i>Calidris ptilocnemis</i> , Rock Sandpiper	•								
<i>Calidris minutilla</i> , Least Sandpiper			•	•					
<i>Calidris subruficollis</i> , Buff-breasted Sandpiper			•	•		•	•		
<i>Calidris melanotos</i> , Pectoral Sandpiper			•	•		•	•	•	
<i>Calidris pusilla</i> , Semipalmated Sandpiper				•		•		•	
<i>Calidris mauri</i> , Western Sandpiper			•	•		•		•	
<i>Limnodromus griseus</i> , Short-billed Dowitcher	•					•	•		
<i>Limnodromus scolopaceus</i> , Long-billed Dowitcher			•	•		•		•	
<i>Gallinago delicata</i> , Wilson's Snipe			•	•					
<i>Actitis macularius</i> , Spotted Sandpiper				•		•			
<i>Tringa solitaria</i> , Solitary Sandpiper	•								
<i>Tringa brevipes</i> , Gray-tailed Tattler			•						



Appendix A. Continued.

Species of Conservation Need	See Appendix B for subspecies, stock, or DPS	ESA Listed, Proposed, or Under Review <sup>1</sup>	ASRS <sup>2</sup>	AK Shorebird Plan <sup>3</sup>	AK Landbird Plan <sup>4</sup>	ACAD Priority Species <sup>5</sup>	Birds of Conservation Concern <sup>6</sup>	Stewardship	Culturally Important
<i>Fulmarus glacialis</i> , Northern Fulmar			•					•	
<i>Pterodroma inexpectata</i> , Mottled Petrel			•			•	•		
<i>Ardenna bulleri</i> , Buller's Shearwater			•			•	•		
<i>Puffinus tenuirostris</i> , Short-tailed Shearwater			•						
<i>Puffinus griseus</i> , Sooty Shearwater			•						
<i>Puffinus creatopus</i> , Pink-footed Shearwater			•				•		
<b>Cormorants</b>									
<i>Urile urile</i> , Red-faced Cormorant			•			•	•	•	
<i>Urile pelagicus</i> , Pelagic Cormorant			•			•			
<b>Hawks and Eagles</b>									
<i>Aquila chrysaetos</i> , Golden Eagle			•		•				
<i>Astur atricapillus</i> , American Goshawk	•				•			•	
<i>Haliaeetus leucocephalus</i> , Bald Eagle					•			•	•
<i>Buteo jamaicensis</i> , Red-tailed Hawk	•		•		•				
<i>Buteo lagopus</i> , Rough-legged Hawk			•						
<i>Falco sparverius</i> , American Kestrel			•		•				
<i>Falco columbarius</i> , Merlin	•								
<i>Falco rusticolus</i> , Gyrfalcon			•		•				
<i>Falco peregrinus</i> , Peregrine Falcon	•				•				
<b>Owls</b>									
<i>Megascops kennicottii</i> , Western Screech-Owl			•				•		
<i>Bubo scandiacus</i> , Snowy Owl			•		•		•		•
<i>Surnia ulula</i> , Northern Hawk Owl			•		•			•	
<i>Strix nebulosa</i> , Great Gray Owl			•						
<i>Asio flammeus</i> , Short-eared Owl			•		•	•	•		
<i>Aegolius funereus</i> , Boreal Owl			•						
<i>Aegolius acadicus</i> , Northern Saw-whet Owl			•						
<b>Woodpeckers</b>									
<i>Sphyrapicus ruber</i> , Red-breasted Sapsucker					•			•	
<i>Picoides dorsalis</i> , American Three-toed Woodpecker			•						
<i>Picoides arcticus</i> , Black-backed Woodpecker			•						
<i>Dryobates villosus</i> , Hairy Woodpecker	•				•				
<b>Flycatchers</b>									
<i>Contopus cooperi</i> , Olive-sided Flycatcher			•		•	•	•		
<i>Contopus sordidulus</i> , Western Wood-Pewee			•		•				
<i>Empidonax alnorum</i> , Alder Flycatcher			•						
<b>Shrikes and Corvids</b>									
<i>Lanius borealis</i> , Northern Shrike			•						
<i>Perisoreus canadensis</i> , Canada Jay			•						

## Appendix A. Continued.

Species of Conservation Need	See Appendix B for subspecies, stock, or DPS	ESA Listed, Proposed, or Under Review <sup>1</sup>	ASRS <sup>2</sup>	AK Shorebird Plan <sup>3</sup>	AK Landbird Plan <sup>4</sup>	ACAD Priority Species <sup>5</sup>	Birds of Conservation Concern <sup>6</sup>	Stewardship	Culturally Important
<i>Corvus corax</i> , Common Raven	•				•				
<b>Chickadees, Larks, Swallows, and Leaf Warblers</b>									
<i>Poecile rufescens</i> , Chestnut-backed Chickadee					•		•	•	
<i>Poecile hudsonicus</i> , Boreal Chickadee								•	
<i>Poecile cinctus</i> , Gray-headed Chickadee	•		•		•				
<i>Eremophila alpestris</i> , Horned Lark			•		•	•			
<i>Riparia riparia</i> , Bank Swallow			•		•	•			
<i>Tachycineta bicolor</i> , Tree Swallow			•						
<i>Tachycineta thalassina</i> , Violet-green Swallow			•						
<i>Hirundo rustica</i> , Barn Swallow			•						
<i>Phylloscopus borealis</i> , Arctic Warbler			•		•			•	
<b>Kinglets, Creepers, and Wrens</b>									
<i>Corthylio calendula</i> , Ruby-crowned Kinglet	•								
<i>Regulus satrapa</i> , Golden-crowned Kinglet			•			•			
<i>Certhia americana</i> , Brown Creeper	•		•						
<i>Troglodytes pacificus</i> , Pacific Wren	•		•		•			•	
<b>Waxwings and Thrushes</b>									
<i>Bombycilla garrulus</i> , Bohemian Waxwing			•		•	•			
<i>Bombycilla cedrorum</i> , Cedar Waxwing			•						
<i>Catharus minimus</i> , Gray-cheeked Thrush			•		•			•	
<i>Catharus guttatus</i> , Hermit Thrush	•								
<i>Ixoreus naevius</i> , Varied Thrush					•		•	•	
<i>Luscinia svecica</i> , Bluethroat			•					•	
<i>Oenanthe oenanthe</i> , Northern Wheatear			•		•			•	
<b>Pipits, Finches, Longspurs, and Buntings</b>									
<i>Anthus cervinus</i> , Red-throated Pipit			•					•	
<i>Anthus rubescens</i> , American Pipit			•			•			
<i>Fringilla montifringilla</i> , Brambling			•						
<i>Pinicola enucleator</i> , Pine Grosbeak						•			
<i>Leucosticte tephrocotis</i> , Gray-crowned Rosy-Finch	•		•		•	•		•	
<i>Acanthis flammea</i> , Redpoll			•		•	•		•	
<i>Spinus pinus</i> , Pine Siskin					•	•			
<i>Calcarius lapponicus</i> , Lapland Longspur	•		•		•	•			
<i>Calcarius pictus</i> , Smith's Longspur			•		•				
<i>Plectrophenax nivalis</i> , Snow Bunting	•		•		•	•			
<i>Plectrophenax hyperboreus</i> , McKay's Bunting			•		•	•	•	•	
<b>Sparrows, Blackbirds, and New World Warblers</b>									
<i>Passerella iliaca</i> , Fox Sparrow	•				•			•	
<i>Spizelloides arborea</i> , American Tree Sparrow			•		•	•		•	

## Appendix A. Continued.

Species of Conservation Need	See Appendix B for subspecies, stock, or DPS	ESA Listed, Proposed, or Under Review <sup>1</sup>	ASRS <sup>2</sup>	AK Shorebird Plan <sup>3</sup>	AK Landbird Plan <sup>4</sup>	ACAD Priority Species <sup>5</sup>	Birds of Conservation Concern <sup>6</sup>	Stewardship	Culturally Important
<i>Junco hyemalis</i> , Dark-eyed Junco					•			•	
<i>Zonotrichia leucophrys</i> , White-crowned Sparrow			•		•			•	
<i>Zonotrichia atricapilla</i> , Golden-crowned Sparrow			•		•			•	
<i>Passerculus sandwichensis</i> , Savannah Sparrow			•			•			
<i>Melospiza melodia</i> , Song Sparrow	•				•				
<i>Melospiza lincolni</i> , Lincoln's Sparrow	•				•				
<i>Agelaius phoeniceus</i> , Red-winged Blackbird			•						
<i>Euphagus carolinus</i> , Rusty Blackbird					•	•			
<i>Leiothlypis celata</i> , Orange-crowned Warbler			•		•			•	
<i>Geothlypis tolmiei</i> , MacGillivray's Warbler			•						
<i>Setophaga ruticilla</i> , American Redstart			•						
<i>Setophaga striata</i> , Blackpoll Warbler			•		•	•			
<i>Setophaga coronata</i> , Yellow-rumped Warbler			•						
<i>Setophaga townsendi</i> , Townsend's Warbler					•			•	
<i>Cardellina pusilla</i> , Wilson's Warbler			•		•			•	
<b>Mice and Lemmings</b>									
<i>Zapus hudsonius</i> , Meadow Jumping Mouse			•						
<i>Dicrostonyx groenlandicus</i> , Nearctic Collared Lemming			•						
<i>Lemmus trimucronatus</i> , Nearctic Brown Lemming	•		•						
<i>Synaptomys borealis</i> , Northern Bog Lemming		U	•						
<b>Voles and Deermice</b>									
<i>Microtus abbreviatus</i> , Insular Vole								•	
<i>Microtus longicaudus</i> , Long-tailed Vole	•		•						
<i>Microtus miurus</i> , Singing Vole			•					•	
<i>Microtus oeconomus</i> , Root or Tundra Vole	•		•					•	
<i>Microtus pennsylvanicus</i> , Meadow Vole	•		•						
<i>Microtus xanthognathus</i> , Taiga or Yellow-cheeked Vole			•					•	
<i>Clethrionomys gapperi</i> , Southern Red-backed Vole	•		•						
<i>Peromyscus keeni</i> , Northwestern Deermouse			•					•	
<b>Muskrats and Woodrats</b>									
<i>Ondatra zibethicus</i> , Common Muskrat			•						
<i>Neotoma cinerea</i> , Bushy-tailed Woodrat			•						
<b>Squirrels and Marmots</b>									
<i>Glaucomys sabrinus</i> , Northern Flying Squirrel	•		•						
<i>Marmota broweri</i> , Alaska Marmot			•					•	
<i>Marmota caligata</i> , Hoary Marmot	•		•						
<i>Urocyon parryi</i> , Arctic Ground Squirrel	•		•						
<b>Pikas and Hares</b>									
<i>Ochotona collaris</i> , Collared Pika			•					•	

## Appendix A. Continued.

Species of Conservation Need	See Appendix B for subspecies, stock, or DPS	ESA Listed, Proposed, or Under Review <sup>1</sup>	ASRS <sup>2</sup>	AK Shorebird Plan <sup>3</sup>	AK Landbird Plan <sup>4</sup>	ACAD Priority Species <sup>5</sup>	Birds of Conservation Concern <sup>6</sup>	Stewardship	Culturally Important
<i>Lepus americanus</i> , Snowshoe Hare									•
<i>Lepus othus</i> , Alaska Hare			•					•	•
<b>Shrews</b>									
<i>Sorex alaskanus</i> , Glacier Bay Water Shrew								•	
<i>Sorex cinereus</i> , Cinereus or Masked Shrew	•		•						
<i>Sorex hoyi</i> , Pygmy Shrew			•						
<i>Sorex jacksoni</i> , Saint Lawrence Island Shrew			•					•	
<i>Sorex monticolus</i> , Southern Montane Shrew			•						
<i>Sorex obscurus</i> , Northern Montane Shrew			•						
<i>Sorex pacificus</i> , Pacific Shrew			•						
<i>Sorex navigator</i> , Western Water Shrew			•						
<i>Sorex pribilofensis</i> , Pribilof Island Shrew			•					•	•
<i>Sorex tundrensis</i> , Tundra Shrew			•						
<i>Sorex ugyunak</i> , Barrren Ground Shrew			•					•	
<i>Sorex minutissimus</i> , Holarctic Least Shrew			•						
<b>Bats</b>									
<i>Lasionycter noctivagans</i> , Silver-haired Bat			•						
<i>Myotis californicus</i> , California Myotis			•						
<i>Myotis lucifugus</i> , Little Brown Bat			•						
<i>Myotis evotis</i> , Long-eared Myotis			•					•	
<i>Myotis volans</i> , Long-legged Myotis			•						
<b>Canids</b>									
<i>Vulpes lagopus</i> , Arctic Fox								•	
<b>Mustelids</b>									
<i>Enhydra lutris</i> , Sea Otter	•	TH <sup>7</sup>							•
<i>Lontra canadensis</i> , North American River Otter	•								
<i>Martes americana</i> , American Marten	•								
<i>Martes caurina</i> , Pacific Marten			•						
<b>Pinnipeds</b>									
<i>Callorhinus ursinus</i> , Northern Fur Seal	•								
<i>Erignathus barbatus</i> , Bearded Seal	•	TH <sup>7</sup>							
<i>Histiophoca fasciata</i> , Ribbon Seal			•					•	
<i>Phoca largha</i> , Spotted Seal	•								
<i>Phoca vitulina</i> , Harbor Seal	•								
<i>Pusa hispida</i> , Ringed Seal	•	TH <sup>7</sup>							
<i>Eumetopias jubatus</i> , Steller Sea Lion	•	EN <sup>7</sup>							
<i>Odobenus rosmarus</i> , Pacific Walrus	•	U	•						
<b>Polar Bears</b>									
<i>Ursus maritimus</i> , Polar Bear	•	TH	•						•

Appendix A. Continued.

Species of Conservation Need	See Appendix B for subspecies, stock, or DPS	ESA Listed, Proposed, or Under Review <sup>1</sup>	ASRS <sup>2</sup>	AK Shorebird Plan <sup>3</sup>	AK Landbird Plan <sup>4</sup>	ACAD Priority Species <sup>5</sup>	Birds of Conservation Concern <sup>6</sup>	Stewardship	Culturally Important
<b>Baleen Whales</b>									
<i>Balaena mysticetus</i> , Bowhead Whale	•	EN	•						
<i>Eubalaena japonica</i> , North Pacific Right Whale	•	EN	•						
<i>Balaenoptera acutorostrata</i> , Common Minke Whale	•								
<i>Balaenoptera borealis</i> , Sei Whale		EN	•						
<i>Balaenoptera physalus</i> , Fin Whale	•	EN	•						
<i>Megaptera novaeangliae</i> , Humpback Whale	•	EN/TH <sup>7</sup>	•						
<b>Toothed Whales</b>									
<i>Delphinapterus leucas</i> , Beluga	•	EN <sup>7</sup>	•						
<i>Physeter macrocephalus</i> , Sperm Whale	•	EN	•						
<i>Berardius bairdii</i> , Baird’s Beaked Whale	•								
<i>Mesoplodon stejnegeri</i> , Stejneger’s Beaked Whale	•								
<i>Ziphius cavirostris</i> , Cuvier’s Beaked Whale	•								
<b>Dolphins and Porpoises</b>									
<i>Sagmatias obliquidens</i> , Pacific White-sided Dolphin	•								
<i>Phocoena phocoena</i> , Harbor Porpoise	•		•						
<i>Phocoenoides dalli</i> , Dall’s Porpoise	•								

<sup>1</sup> Endangered Species Act (ESA). EN = Endangered, TH = Threatened, P = Proposed for listing under the ESA, U = Undergoing status review currently for possible ESA listing by U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS).

<sup>2</sup> ACCS (Alaska Center for Conservation Science). 2025. Alaska Species Ranking System. <https://accs.uaa.alaska.edu/wildlife/alaska-species-ranking-system/> (Accessed June 23, 2025).

<sup>3</sup> Alaska Shorebird Group 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK. 139 pp. [https://ak.audubon.org/sites/default/files/alaska\\_shorebird\\_conservation\\_plan\\_2019.pdf](https://ak.audubon.org/sites/default/files/alaska_shorebird_conservation_plan_2019.pdf) (Accessed July 23, 2025).

<sup>4</sup> Handel, C. M., I. J. Stenhouse, and S. M. Matsuoka (Eds.). 2021. Alaska Landbird Conservation Plan, version 2.0. Boreal Partners in Flight, Anchorage, AK. 146 pp. <https://www.usgs.gov/media/files/alaska-landbird-conservation-plan-version-2> (Accessed July 23, 2025).

<sup>5</sup> Partners in Flight. 2024. Avian Conservation Assessment Database, version 2024. <https://pif.birdconservancy.org/avian-conservation-assessment-database/> (Accessed July 24, 2025).

<sup>6</sup> USFWS (U.S. Fish and Wildlife Service). 2021. Birds of Conservation Concern, 2021. U.S. Fish and Wildlife Service, Migratory Birds, Falls Church, VA. <https://www.fws.gov/media/usfws-bird-species-concern> (Accessed July 24, 2025).

<sup>7</sup> Subspecies, stock, or DPS have different ESA listings and some may not be listed. See Appendix B.

Appendix B. Subspecies, stocks, and distinct population segments (DPS) of “species of greatest conservation need” (SGCN) in Alaska by justification—terrestrial vertebrates and marine mammals. Chapter 4 describes SGCN justification in detail.

Species of Conservation Need	Justification							
	ESA Listed, Proposed, or Under Review <sup>1</sup>	ASRS <sup>2</sup>	AK Shorebird Plan <sup>3</sup>	AK Landbird Plan <sup>4</sup>	AACAD Priority Species <sup>5</sup>	Birds of Conservation Concern <sup>6</sup>	Stewardship	Culturally Important
<b>Waterfowl</b>								
<i>Anser albifrons frontalis</i> , Greater White-fronted Goose (midcontinent population)								•
<i>Anser albifrons elgasi</i> , Tule Greater White-fronted Goose		•					•	•
<i>Branta bernicla nigricans</i> , Pacific Black Brant		•					•	•
<i>Branta hutchinsii minima</i> , Minima Cackling Goose							•	•
<i>Branta hutchinsii taverneri</i> , Taverner’s Cackling Goose							•	•
<i>Branta canadensis occidentalis</i> , Dusky Canada Goose		•					•	•
<i>Somateria mollissima v-nigrum</i> , Pacific Common Eider							•	•
<b>Grouse and Ptarmigan</b>								
<i>Canachites canadensis isleibi</i> , Spruce Grouse							•	
<i>Lagopus muta evermanni</i> , Evermann’s Rock Ptarmigan		•		•			•	
<i>Lagopus muta townsendi</i> , Townsend’s Rock Ptarmigan		•		•			•	
<i>Lagopus muta dixonii</i> , Dixon’s Rock Ptarmigan				•			•	
<i>Lagopus muta atkensis</i> , Turner’s Rock Ptarmigan		•		•			•	
<b>Shorebirds</b>								
<i>Numenius phaeopus hudsonicus</i> , Whimbrel		•	•				•	
<i>Limosa lapponica baueri</i> , Bar-tailed Godwit		•	•				•	
<i>Limosa fedoa beringiae</i> , Marbled Godwit		•	•		•	•	•	
<i>Calidris canutus roselaari</i> , Pacific Red Knot		•	•		•	•	•	
<i>Calidris alpina pacifica</i> , Pacific Dunlin			•				•	
<i>Calidris alpina arctica</i> , Arctic Dunlin		•	•			•	•	
<i>Calidris ptilocnemis ptilocnemis</i> , Pribilof Rock Sandpiper		•	•		•	•	•	
<i>Calidris ptilocnemis couesi</i> , Aleutian Rock Sandpiper		•	•				•	
<i>Calidris ptilocnemis tschuktschorum</i> , Bering Sea Rock Sandpiper		•	•				•	
<i>Limnodromus griseus caurinus</i> , Short-billed Dowitcher		•	•		•	•	•	
<i>Tringa solitaria cinnamomea</i> , Solitary Sandpiper			•			•	•	
<b>Seabirds</b>								
<i>Hydrobates furcatus furcatus</i> , Fork-tailed Storm-Petrel							•	
<i>Hydrobates furcatus plumbeus</i> , Fork-tailed Storm-Petrel		•						
<i>Hydrobates leucorhous leucorhous</i> , Leach’s Storm-Petrel		•						

Appendix B. Continued.

Species of Conservation Need	Justification						
	ESA Listed, Proposed, or Under Review <sup>1</sup>	ASRS <sup>2</sup>	AK Shorebird Plan <sup>3</sup>	AK Landbird Plan <sup>4</sup>	AACAD Priority Species <sup>5</sup>	Birds of Conservation Concern <sup>6</sup>	Culturally Important
<b>Hawks and Eagles</b>							
<i>Astur atricapillus laingi</i> , Queen Charlotte Goshawk		•					•
<i>Falco columbarius suckleyi</i> , Black Merlin		•					
<i>Buteo jamaicensis alascensis</i> , Red-tailed Hawk							•
<i>Falco peregrinus pealei</i> , Peale’s Peregrine Falcon		•					•
<b>Woodpeckers</b>							
<i>Dryobates villosus sitkensis</i> , Hairy Woodpecker							•
<b>Shrikes and Corvids</b>							
<i>Corvus corax kamtschaticus</i> , Common Raven		•					•
<b>Chickadees</b>							
<i>Poecile cinctus lathamii</i> , Gray-headed Chickadee		•				•	•
<b>Kinglets, Creepers, and Wrens</b>							
<i>Corthylio calendula calendula</i> , Ruby-crowned Kinglet		•					
<i>Corthylio calendula grinnelli</i> , Ruby-crowned kinglet							•
<i>Certhia americana alascensis</i> , Brown Creeper		•					
<i>Troglodytes pacificus kiskensis</i> , Kiska Pacific Wren		•		•			•
<i>Troglodytes pacificus helleri</i> , Kodiak Pacific Wren		•		•			•
<i>Troglodytes pacificus meligerus</i> , Attu Pacific Wren		•		•			•
<i>Troglodytes pacificus semidiensis</i> , Semidi Pacific Wren		•		•			•
<i>Troglodytes pacificus alascensis</i> , Pribilof Pacific Wren		•		•			•
<b>Thrushes</b>							
<i>Catharus guttatus nanus</i> , Hermit Thrush							•
<b>Finches, Longspurs and Buntings</b>							
<i>Calcarius lapponicus alascensis</i> , Lapland Longspur		•					•
<i>Plectrophenax nivalis townsendi</i> , Snow Bunting		•					
<i>Plectrophenax nivalis nivalis</i> , Snow Bunting		•					
<i>Leucosticte tephrocotis griseonucha</i> , Gray-crowned Rosy-Finch				•			•
<i>Leucosticte tephrocotis umbrina</i> , Gray-crowned Rosy-Finch				•			•
<b>Sparrows, Blackbirds, and New World Warblers</b>							
<i>Passerella iliaca insularis</i> , Kodiak Fox Sparrow		•		•			•
<i>Passerella iliaca unalaschcensis</i> , Shumagin Fox Sparrow		•		•			•
<i>Passerella iliaca townsendi</i> , Townsend’s Fox Sparrow				•			•
<i>Passerella iliaca sinuosa</i> , Valdez Fox Sparrow		•		•			•
<i>Passerella iliaca annectens</i> , Yakutat Fox Sparrow		•		•			•

## Appendix B. Continued.

Species of Conservation Need	Justification							
	ESA Listed, Proposed, or Under Review <sup>1</sup>	ASRS <sup>2</sup>	AK Shorebird Plan <sup>3</sup>	AK Landbird Plan <sup>4</sup>	AACAD Priority Species <sup>5</sup>	Birds of Conservation Concern <sup>6</sup>	Stewardship	Culturally Important
<i>Passerella iliaca chilcatensis</i> , Chilkat Sooty Fox Sparrow		•		•			•	
<i>Melospiza melodia insignis</i> , Bischoff Song Sparrow		•		•			•	
<i>Melospiza melodia caurina</i> , Yakutat Song Sparrow		•		•			•	
<i>Melospiza melodia rufina</i> , Sooty Song Sparrow		•		•			•	
<i>Melospiza melodia kenaiensis</i> , Kenai Song Sparrow		•		•			•	
<i>Melospiza melodia sanaka</i> , Aleutian Song Sparrow		•		•			•	
<i>Melospiza melodia maxima</i> , Giant Song Sparrow		•		•			•	
<i>Melospiza lincolni gracilis</i> , Lincoln's Sparrow				•			•	
<b>Mice and Lemmings</b>								
<i>Lemmus trimucronatus nigripes</i> , Black-footed Brown Lemming		•						
<i>Lemmus trimucronatus harroldi</i> , Nunivak Island Brown Lemming		•						
<b>Voles and Deermice</b>								
<i>Microtus longicaudus coronarius</i> , Coronation Island Long-tailed Vole		•						
<i>Microtus longicaudus littoralis</i> , Long-tailed Vole		•						
<i>Microtus oeconomus elymocetes</i> , Montague Island Root Vole		•						
<i>Microtus oeconomus punukensis</i> , Punutuk Island Root Vole		•						
<i>Microtus oeconomus popofensis</i> , Shumagin Island Root Vole		•						
<i>Microtus oeconomus sitkensis</i> , Sitka Root Vole		•						
<i>Microtus oeconomus unalascensis</i> , Unalaska Root Vole		•						
<i>Microtus oeconomus yakutatensis</i> , Yakutat Root Vole		•						
<i>Microtus pennsylvanicus admiraltiae</i> , Admiralty Meadow Vole		•						
<i>Clethrionomys gapperi stikinensis</i> , Gapper's Southern Red-backed Vole		•						
<i>Clethrionomys gapperi phaeus</i> , Phaeus Southern Red-backed Vole		•						
<i>Clethrionomys gapperi solus</i> , Revillagigedo Island Southern Red-backed Vole		•						
<i>Clethrionomys gapperi wrangeli</i> , Wrangell Island Southern Red-backed Vole		•						
<b>Squirrels and Marmots</b>								
<i>Glaucomys sabrinus griseifrons</i> , Prince of Wales Northern Flying Squirrel		•					•	
<i>Marmota caligata vigilis</i> , Glacier Bay Hoary Marmot		•						
<i>Marmota caligata sheldoni</i> , Montague Island Hoary Marmot		•						
<i>Urocitellus parryii plesius</i> , Arctic Ground Squirrel		•						
<i>Urocitellus parryii ablusus</i> , Aleutian Arctic Ground Squirrel		•					•	
<i>Urocitellus parryii kennicottii</i> , Barrow Arctic Ground Squirrel		•					•	
<i>Urocitellus parryii kodiacensis</i> , Kodiak Island Arctic Ground Squirrel		•					•	
<i>Urocitellus parryii osgoodi</i> , Osgood's Arctic Ground Squirrel		•					•	

## Appendix B. Continued.

Species of Conservation Need	Justification						
	ESA Listed, Proposed, or Under Review <sup>1</sup>	ASRS <sup>2</sup>	AK Shorebird Plan <sup>3</sup>	AK Landbird Plan <sup>4</sup>	AACAD Priority Species <sup>5</sup>	Birds of Conservation Concern <sup>6</sup>	Culturally Important
<i>Urocitellus parryii nebulicola</i> , Shumigan Islands Arctic Ground Squirrel		•					•
<i>Urocitellus parryii lyratus</i> , St. Lawrence Island Arctic Ground Squirrel		•					•
<b>Shrews</b>							
<i>Sorex cinereus hollisteri</i> , Cinereus Shrew		•					•
<i>Sorex cinereus streatori</i> , Cinereus Shrew		•					•
<b>Mustelids</b>							
<i>Enhydra lutris kenyoni</i> , Northern Sea Otter, Southwest Alaska DPS	TH	•					• •
<i>Lontra canadensis kodiacensis</i> , Kodiak River Otter		•					
<i>Lontra canadensis mira</i> , Prince of Wales River Otter		•					
<i>Martes americana kenaiensis</i> , Kenai American Marten		•					
<b>Pinnipeds</b>							
<i>Callorhinus ursinus</i> , Northern Fur Seal, Eastern Pacific Stock		•					• •
<i>Erignathus barbatus nauticus</i> , Bearded Seal, Beringia DPS	TH	•					• •
<i>Phoca largha</i> , Spotted Seal, Bering Stock		•					• •
<i>Phoca vitulina richardii</i> , Harbor Seal, Alaska Stocks							• •
<i>Pusa hispida hispida</i> , Ringed Seal, Arctic Subspecies	TH	•					• •
<i>Eumetopias jubatus</i> , Steller Sea Lion, Western DPS	EN	•					•
<i>Odobenus rosmarus divergens</i> , Pacific Walrus, Alaska Stock	U	•					•
<b>Polar Bears</b>							
Chukchi/Bering Stock	TH						•
Southern Beaufort Sea Stock	TH	•					•
<b>Baleen Whales</b>							
<i>Balaena mysticetus</i> , Bowhead Whale, Western Arctic Stock	EN	•					• •
<i>Eubalaena japonica</i> , North Pacific Right Whale, Eastern North Pacific Stock	EN	•					•
<i>Balaenoptera acutorostrata</i> , Minke Whale, Alaska Stock		•					
<i>Balaenoptera physalus</i> , Fin Whale, Northeast Pacific Stock	EN	•					
<i>Megaptera novaeangliae</i> , Humpback Whale, Western North Pacific DPS	EN	•					•
<i>Megaptera novaeangliae</i> , Humpback Whale, Mexico DPS	TH	•					•
<b>Toothed Whales</b>							
<i>Delphinapterus leucas</i> , Beluga, Cook Inlet DPS	EN	•					• •
<i>Delphinapterus leucas</i> , Beluga, Beaufort Sea Stock							• •
<i>Delphinapterus leucas</i> , Beluga, Bristol Bay Stock							• •
<i>Delphinapterus leucas</i> , Beluga, Eastern Bering Sea Stock							• •

## Appendix B. Continued.

Species of Conservation Need	Justification							
	ESA Listed, Proposed, or Under Review <sup>1</sup>	ASRS <sup>2</sup>	AK Shorebird Plan <sup>3</sup>	AK Landbird Plan <sup>4</sup>	AACAD Priority Species <sup>5</sup>	Birds of Conservation Concern <sup>6</sup>	Stewardship	Culturally Important
<i>Delphinapterus leucas</i> , Beluga, Eastern Chukchi Sea Stock							•	•
<i>Physeter macrocephalus</i> , Sperm Whale, North Pacific Stock	EN	•						
<i>Berardius bairdii</i> , Baird's Beaked Whale, Alaska Stock		•						
<i>Mesoplodon stejnegeri</i> , Stejneger's Beaked Whale, Alaska Stock		•						
<i>Ziphius cavirostris</i> , Cuvier's Beaked Whale, Alaska Stock		•						
<b>Dolphins and Porpoises</b>								
<i>Sagmatias obliquidens</i> , Pacific White-sided Dolphin, North Pacific Stock		•						
<i>Phocoena phocoena</i> , Harbor Porpoise, Southeast Alaska Stock		•						
<i>Phocoena phocoena</i> , Harbor Porpoise, Gulf of Alaska Stock		•						
<i>Phocoena phocoena</i> , Harbor Porpoise, Bering Sea Stock		•						
<i>Phocoenoides dalli</i> , Dall's Porpoise, Alaska Stock		•						

<sup>1</sup> Endangered Species Act (ESA). EN = Endangered, TH = Threatened, P = Proposed for listing under the ESA, U = Undergoing status review currently for possible ESA listing by U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS).

<sup>2</sup> Alaska Species Ranking System (ASRS). <https://accs.uaa.alaska.edu/wildlife/alaska-species-ranking-system/>.

<sup>3</sup> Alaska Shorebird Plan. <https://alaskashorebirdgroup.com/conservation-plans/>.

<sup>4</sup> Alaska Landbird Conservation Plan. <https://www.usgs.gov/media/files/alaska-landbird-conservation-plan-version-2>.

<sup>5</sup> Avian Conservation Assessment Database (ACAD). <https://pif.birdconservancy.org/>.

<sup>6</sup> Birds of Conservation Concern. <https://www.fws.gov/media/usfws-bird-species-concern>.

Appendix C. “Species of greatest conservation need” (SGCN) in Alaska by justification—invertebrate and aquatic taxa. Chapter 4 describes SGCN justification in detail.

Species of Conservation Need	Justification						
	ESA Listed, Proposed or Under Review <sup>1</sup>	Stewardship Species	Culturally Important	Economically Important	Ecologically Important	Data Deficient	Known or Anticipated Declines in Local Populations
<b>Terrestrial Invertebrates</b>							
<i>Hymenoptera</i> (Order – ants, bees, wasps, hornets)					•	•	
<i>Bombus occidentalis</i> (Western Bumblebee) <sup>2</sup>	U				•	•	
<i>Diptera</i> (Order – flies, midges, mosquitos, gnats)					•	•	
<i>Odonata</i> (Order – dragonflies, damselflies)					•	•	
<i>Lepidoptera</i> (Order – butterflies, moths)					•	•	
<i>Euchloe ausonides</i> (Large Marble Butterfly)	U				•	•	
<i>Arachnida</i> (Order – spiders)					•	•	
<i>Coleoptera</i> (Order – beetles)					•	•	
<b>Deep-sea Corals</b>							
Deep-sea corals of Classes <i>Anthozoa</i> and <i>Hydrozoa</i>					•	•	
<b>Freshwater Invertebrates</b>							
<i>Ephemeroptera</i> (Order – Mayflies)					•	•	
<i>Odonata</i> (Order – Dragon and Damselflies)					•	•	
<i>Plecoptera</i> (Order – Stoneflies)					•	•	
<i>Trichoptera</i> (Order – Caddisflies)					•	•	
<i>Cladocera</i> (Order – Water Fleas)					•	•	
<i>Beringiana beringiana</i> , Yukon Floater Mussel		•	•				
<b>Marine Zooplankton</b>							
<i>Euphasiacea</i> , Euphasids					•	•	
<i>Copepoda</i> , Copepods, primarily Calanoida					•	•	
<i>Mysida</i> , Mysids					•	•	
<i>Amphipoda</i> , Benthic Amphipods					•	•	
<b>Crabs</b>							
<i>Chionoecetes opilio</i> , Snow Crab			•	•		•	•
<i>Lithodes aequispinus</i> , Golden King Crab		•	•	•		•	•
<i>Paralithodes camtschaticus</i> , Red King Crab		•	•	•		•	•
<i>Paralithodes platypus</i> , Blue King Crab		•	•	•		•	•
<b>Cockles, Scallops, Clams, Mussels, and Abalone</b>							
<i>Haliotis kamtschatkana</i> , Pinto Abalone			•	•		•	•
<i>Patinopecten caurinus</i> , Weathervane Scallop		•	•	•			
<i>Siliqua patula</i> , Razor Clam			•	•			•

## Appendix C. Continued.

Species of Conservation Need	Justification						
	ESA Listed, Proposed or Under Review <sup>1</sup>	Stewardship Species	Culturally Important	Economically Important	Ecologically Important	Data Deficient	Known or Anticipated Declines in Local Populations
<b>Sea Stars</b>							
<i>Pycnopodia helinathodoies</i> , Sunflower Sea Star	P				•		•
<b>Lamprey</b>							
<i>Lethenteron alaskense</i> , Alaskan Brook Lamprey		•			•		
<b>Herring</b>							
<i>Clupea pallasii</i> , Pacific Herring			•	•	•		
<b>Mudminnows</b>							
<i>Dallia pectoralis</i> , Alaska Blackfish		•	•				
<b>Smelt</b>							
<i>Mallotus villosus</i> , Capelin		•	•			•	
<i>Thaleichthys pacificus</i> , Eulachon		•	•			•	
<b>Cisco</b>							
<i>Coregonus laurettae</i> , Bering Cisco		•	•			•	
<b>Salmon</b>							
<i>Oncorhynchus keta</i> , Chum Salmon			•	•	•		•
<i>Oncorhynchus tshawytscha</i> , Chinook Salmon	U <sup>3</sup>		•	•	•		•
<b>Trout</b>							
<i>Oncorhynchus clarki clarki</i> , Coastal Cutthroat Trout			•			•	
<i>Oncorhynchus mykiss</i> , Steelhead, Rainbow Trout			•	•		•	•
<b>Rockfish</b>							
<i>Sebastes</i> spp. (Demersal)			•	•		•	•
<i>Sebastes</i> spp. (Pelagic)			•	•		•	•
<b>Greenling</b>							
<i>Ophiodon elongates</i> , Lingcod			•	•		•	•
<b>Sand Lance</b>							
<i>Ammodytes hexapterus</i> , Pacific Sand Lance			•		•	•	

<sup>1</sup> Endangered Species Act (ESA). EN = Endangered, TH = Threatened, P = Proposed for listing under the ESA, U = Undergoing status review currently for possible ESA listing by U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS).

<sup>2</sup> Taxonomy of this species in Alaska has changed to McKay's Bumblebee (*Bombus mckayi*; Williams 2021). <https://www.tandfonline.com/doi/full/10.1080/00222933.2021.1900444>

<sup>3</sup> State press release: [https://www.adfg.alaska.gov/index.cfm?adfg=pressreleases.pr&release=2024\\_05\\_23](https://www.adfg.alaska.gov/index.cfm?adfg=pressreleases.pr&release=2024_05_23).

Appendix D. Distribution of “species of greatest conservation need” (SGCN) in Alaska by biogeographic region. ● = Regular or common, naturally occurring. Subspecies, stock or Distinct Population Segment (DPS) from Appendix B is also indicated, where relevant. Distribution is not well documented for many invertebrates, but provided to the extent known.

SGCN	BIOGEOGRAPHIC REGIONS <sup>1</sup>								
	SE	SC	C	SW	W	N	BCS	BER	GOA
<b>Terrestrial Invertebrates</b>									
<i>Hymenoptera</i> (Order – ants, bees, wasps, hornets)	●	●	●	●	●	●			
<i>Bombus occidentalis</i> (Western Bumblebee) <sup>2</sup>	●	●	●	●	●				
<i>Diptera</i> (Order – flies, midges, mosquitos, gnats)	●	●	●	●	●	●			
<i>Odonata</i> (Order – dragonflies, damselflies)	●	●	●	●	●	●			
<i>Lepidoptera</i> (Order – butterflies, moths)	●	●	●	●	●	●			
<i>Euchloe ausonides</i> (Large Marble Butterfly)		●	●						
<i>Arachnida</i> (Order – spiders)	●	●	●	●	●	●			
<i>Coleoptera</i> (Order – beetles)	●	●	●	●	●	●			
<b>Deep Sea Corals</b>									
<i>Anthozoa</i> and <i>Hydrozoa</i> , sea anemones, sea pens, corals								●	●
<b>Freshwater Invertebrates</b>									
<i>Ephemeroptera</i> (Order – Mayflies)	●	●	●	●	●	●			
<i>Odonata</i> (Order – Dragon and Damselflies)	●	●	●	●	●	●			
<i>Plecoptera</i> (Order – Stoneflies)	●	●	●	●	●	●			
<i>Trichoptera</i> (Order – Caddisflies)	●	●	●	●	●	●			
<i>Cladocera</i> (Order – Water Fleas)	●	●	●	●	●	●			
<i>Beringiana beringiana</i> , Yukon Floater Mussel		●	●	●	●				
<b>Marine Zooplankton</b>									
<i>Euphasiacea</i> , Euphasids							●	●	●
<i>Copepoda</i> , Copepods, primarily Calanoida							●	●	●
<i>Mysida</i> , Mysids							●	●	●
<i>Amphipoda</i> , Benthic Amphipods							●	●	●
<b>Crabs</b>									
<i>Chionoecetes opilio</i> , Snow Crab								●	●
<i>Lithodes aequispinus</i> , Golden King Crab								●	●
<i>Paralithodes camtschaticus</i> , Red King Crab								●	●
<i>Paralithodes platypus</i> , Blue King Crab								●	●
<b>Cockles, Scallops, Clams, Mussels, and Abalone</b>									
<i>Haliotis kamtschatkana</i> , Pinto Abalone								●	●
<i>Patinopecten caurinus</i> , Weathervane Scallop									●
<i>Siliqua patula</i> , Razor Clam								●	●
<b>Sea Stars</b>									
<i>Pycnopodia helinathodoies</i> , Sunflower Sea Star								●	●
<b>Lamprey</b>									
<i>Lethenteron alaskense</i> , Alaskan Brook Lamprey				●					
<b>Herring</b>									
<i>Clupea pallasii</i> , Pacific Herring							●	●	●

## Appendix D. Continued.

SGCN	BIOGEOGRAPHIC REGIONS <sup>1</sup>								
	SE	SC	C	SW	W	N	BCS	BER	GOA
<b>Mudminnows</b>									
<i>Dallia pectoralis</i> , Alaska Blackfish		•	•	•	•	•			
<b>Smelt</b>									
<i>Mallotus villosus</i> , Capelin							•	•	•
<i>Thaleichthys pacificus</i> , Eulachon								•	•
<b>Cisco</b>									
<i>Coregonus laurettae</i> , Bering Cisco			•	•	•	•	•	•	
<b>Salmon</b>									
<i>Oncorhynchus keta</i> , Chum Salmon	•	•	•	•	•	•	•	•	•
<i>Oncorhynchus tshawytscha</i> , Chinook Salmon	•	•	•	•	•	•	•	•	•
<b>Trout</b>									
<i>Oncorhynchus clarki clarki</i> , Coastal Cutthroat Trout	•								•
<i>Oncorhynchus mykiss</i> , Steelhead	•	•						•	•
<b>Rockfish</b>									
<i>Sebastes spp.</i> (Demersal) <sup>3</sup>								•	•
<i>Sebastes spp.</i> (Pelagic)								•	•
<b>Greenling</b>									
<i>Ophiodon elongates</i> , Lingcod									•
<b>Sand Lance</b>									
<i>Ammodytes hexapterus</i> , Pacific Sand Lance							•	•	•
<b>Amphibians and Reptiles</b>									
<i>Rana luteiventris</i> , Columbia Spotted Frog	•								
<i>Ambystoma macrodactylum</i> , Long-toed Salamander	•								
<i>Ambystoma gracile</i> , Northwestern Salamander	•								
<i>Anaxyrus boreas</i> , Western Toad	•	•							
<i>Lithobates sylvaticus</i> , Wood Frog	•	•	•	•	•				
<b>Waterfowl</b>									
<i>Anser canagicus</i> , Emperor Goose				•	•				
<i>Anser albifrons elgasi</i> , Tule Greater White-fronted Goose		•		•					
<i>Anser albifrons frontalis</i> , Greater White-fronted Goose (midcontinent population)			•		•	•			
<i>Branta bernicla nigricans</i> , Pacific Black Brant		•		•	•	•			
<i>Branta hutchinsii minima</i> , Minima Cackling Goose			•	•	•				
<i>Branta hutchinsii taverneri</i> , Taverner's Cackling Goose					•	•			
<i>Branta canadensis occidentalis</i> , Dusky Canada Goose		•							
<i>Cygnus buccinator</i> , Trumpeter Swan	•	•	•	•					
<i>Anas acuta</i> , Northern Pintail	•	•	•	•	•	•			
<i>Aythya affinis</i> , Lesser Scaup	•	•	•						
<i>Aythya valisineria</i> , Canvasback		•	•		•	•			
<i>Polysticta stelleri</i> , Steller's Eider				•	•	•	•	•	•

## Appendix D. Continued.

SGCN	BIOGEOGRAPHIC REGIONS <sup>1</sup>								
	SE	SC	C	SW	W	N	BCS	BER	GOA
<i>Somateria fischeri</i> , Spectacled Eider					•	•	•	•	
<i>Somateria spectabilis</i> , King Eider				•	•	•	•	•	•
<i>Somateria mollissima v-nigrum</i> , Pacific Common Eider				•	•	•	•	•	•
<i>Melanitta perspicillata</i> , Surf Scoter	•	•	•	•	•	•	•	•	•
<i>Melanitta fusca</i> , White-winged Scoter	•	•	•	•	•				
<i>Melanitta americana</i> , Black Scoter	•	•		•	•				
<i>Clangula hyemalis</i> , Long-tailed Duck	•	•	•	•	•	•		•	
<i>Histrionicus histrionicus</i> , Harlequin Duck	•	•	•	•	•	•			
<b>Grouse and Ptarmigan</b>									
<i>Canachites canadensis</i> , Spruce Grouse	•	•	•	•					
<i>Lagopus lagopus</i> , Willow Ptarmigan	•	•	•	•	•	•			
<i>Lagopus muta</i> , Rock Ptarmigan	•	•	•	•	•	•			
<i>Dendragapus fuliginosus</i> , Sooty Grouse	•								
<b>Loons and Grebes</b>									
<i>Podiceps auritus</i> , Horned Grebe	•	•	•	•					•
<i>Podiceps grisegena</i> , Red-necked Grebe	•	•	•	•	•			•	•
<i>Aechmophorus occidentalis</i> , Western Grebe	•								•
<i>Gavia arctica</i> , Arctic Loon					•				
<i>Gavia stellata</i> , Red-throated Loon	•	•	•	•	•	•	•	•	•
<i>Gavia adamsii</i> , Yellow-billed Loon	•	•			•	•	•	•	•
<b>Swifts and Hummingbirds</b>									
<i>Cypseloides niger</i> , Black Swift	•								
<i>Chaetura vauxi</i> , Vaux's Swift	•								
<i>Selasphorus rufus</i> , Rufous Hummingbird	•	•							
<b>Cranes</b>									
<i>Antigone canadensis</i> , Sandhill Crane	•	•	•	•	•	•			
<b>Shorebirds</b>									
<i>Haematopus bachmani</i> , Black Oystercatcher	•	•		•					
<i>Pluvialis squatarola</i> , Black-bellied Plover	•	•		•	•	•			
<i>Pluvialis dominica</i> , American Golden-Plover		•	•	•	•	•			
<i>Pluvialis fulva</i> , Pacific Golden-Plover				•	•				
<i>Charadrius vociferus</i> , Killdeer	•								
<i>Bartramia longicauda</i> , Upland Sandpiper			•			•			
<i>Numenius tahitiensis</i> , Bristle-thighed Curlew					•				
<i>Numenius phaeopus</i> , Whimbrel		•	•	•	•	•			
<i>Limosa lapponica</i> , Bar-tailed Godwit				•	•	•			
<i>Limosa haemastica</i> , Hudsonian Godwit		•	•	•	•				
<i>Limosa fedoa</i> , Marbled Godwit		•		•					
<i>Arenaria interpres</i> , Ruddy Turnstone		•		•	•	•			
<i>Arenaria melanocephala</i> , Black Turnstone	•	•		•	•				

## Appendix D. Continued.

SGCN	BIOGEOGRAPHIC REGIONS <sup>1</sup>								
	SE	SC	C	SW	W	N	BCS	BER	GOA
<i>Calidris canutus roseaari</i> , Pacific Red Knot		•			•				
<i>Calidris virgata</i> , Surfbird	•	•	•	•	•				
<i>Calidris acuminata</i> , Sharp-tailed Sandpiper				•	•				
<i>Calidris himantopus</i> , Stilt Sandpiper						•			
<i>Calidris ruficollis</i> , Red-necked Stint				•	•	•			
<i>Calidris alba</i> , Sanderling	•	•		•	•	•			
<i>Calidris alpina pacifica</i> , Pacific Dunlin	•	•		•	•				
<i>Calidris alpina arctica</i> , Arctic Dunlin					•	•			
<i>Calidris ptilocnemis ptilocnemis</i> , Probilof Rock Sandpiper		•		•					
<i>Calidris ptilocnemis couesi</i> , Aleutian Rock Sandpiper				•					
<i>Calidris ptilocnemis tschuktschorum</i> , Bering Sea Rock Sandpiper	•	•		•	•				
<i>Calidris minutilla</i> , Least Sandpiper	•	•	•	•	•	•			
<i>Calidris subruficollis</i> , Buff-breasted Sandpiper						•			
<i>Calidris melanotos</i> , Pectoral Sandpiper	•	•	•	•	•	•			
<i>Calidris pusilla</i> , Semipalmated Sandpiper		•	•	•	•	•			
<i>Calidris mauri</i> , Western Sandpiper	•	•		•	•	•			
<i>Limnodromus griseus caurinus</i> , Short-billed Dowitcher	•	•		•					
<i>Limnodromus scolopaceus</i> , Long-billed Dowitcher		•	•	•	•				
<i>Gallinago delicata</i> , Wilson's Snipe	•	•	•	•	•	•			
<i>Actitis macularius</i> , Spotted Sandpiper	•	•	•	•	•				
<i>Tringa solitaria cinnamomea</i> , Solitary Sandpiper		•	•	•	•				
<i>Tringa brevipes</i> , Gray-tailed Tattler				•	•				
<i>Tringa incana</i> , Wandering Tattler	•	•	•	•	•				
<i>Tringa flavipes</i> , Lesser Yellowlegs	•	•	•	•	•				
<i>Tringa melanoleuca</i> , Greater Yellowlegs	•	•	•	•	•				
<i>Tringa glareola</i> , Wood Sandpiper				•	•				
<i>Phalaropus lobatus</i> , Red-necked Phalarope	•	•	•	•	•	•	•	•	•
<i>Phalaropus fulicarius</i> , Red Phalarope		•		•	•	•	•	•	•
<b>Gulls, Terns, and Jaegers</b>									
<i>Stercorarius pomarinus</i> , Pomarine Jaeger		•		•	•	•	•	•	•
<i>Stercorarius parasiticus</i> , Parasitic Jaeger	•	•		•	•	•	•	•	•
<i>Stercorarius longicaudus</i> , Long-tailed Jaeger		•	•	•	•	•	•	•	•
<i>Rissa tridactyla</i> , Black-legged Kittiwake	•	•		•	•	•	•	•	•
<i>Rissa brevirostris</i> , Red-legged Kittiwake				•	•			•	
<i>Pagophila eburnea</i> , Ivory Gull							•	•	
<i>Xema sabini</i> , Sabine's Gull					•	•	•	•	•
<i>Rhodostethia rosea</i> , Ross's Gull						•	•	•	
<i>Larus brachyrhynchus</i> , Short-billed Gull	•	•	•	•	•	•	•	•	•
<i>Larus argentatus</i> , Herring Gull	•	•	•					•	•
<i>Larus glaucescens</i> , Glaucous-winged Gull	•	•		•	•			•	•

## Appendix D. Continued.

SGCN	BIOGEOGRAPHIC REGIONS <sup>1</sup>								
	SE	SC	C	SW	W	N	BCS	BER	GOA
<i>Larus hyperboreus</i> , Glaucous Gull				•	•	•	•	•	•
<i>Onychoprion aleuticus</i> , Aleutian Tern		•		•	•		•	•	•
<b>Seabirds</b>									
<i>Uria aalge</i> , Common Murre	•	•		•	•		•	•	•
<i>Uria lomvia</i> , Thick-billed Murre	•	•		•	•		•	•	•
<i>Cephus grylle</i> , Black Guillemot						•	•	•	
<i>Cephus columba</i> , Pigeon guillemot	•	•		•	•			•	•
<i>Brachyramphus marmoratus</i> , Marbled Murrelet	•	•		•				•	•
<i>Brachyramphus brevirostris</i> , Kittlitz's Murrelet	•	•		•	•		•	•	•
<i>Ptychoramphus aleuticus</i> , Cassin's Auklet	•	•		•				•	•
<i>Aethia psittacula</i> , Parakeet Auklet		•		•	•		•	•	•
<i>Aethia pusilla</i> , Least Auklet				•	•		•	•	•
<i>Aethia pygmaea</i> , Whiskered Auklet				•				•	
<i>Aethia cristatella</i> , Crested Auklet				•	•		•	•	•
<i>Fratercula corniculata</i> , Horned Puffin	•	•		•	•		•	•	•
<i>Fratercula cirrhata</i> , Tufted Puffin	•	•		•	•		•	•	•
<i>Phoebastria immutabilis</i> , Laysan Albatross								•	•
<i>Phoebastria nigripes</i> , Black-footed Albatross								•	•
<i>Phoebastria albatrus</i> , Short-tailed Albatross								•	•
<i>Hydrobates furcatus furcatus</i> , Fork-tailed Storm-Petrel		•		•				•	•
<i>Hydrobates furcatus plumbeus</i> , Fork-tailed Storm-Petrel	•								•
<i>Hydrobates leucorhous leucorhous</i> , Leach's Storm-Petrel	•	•		•				•	•
<i>Fulmarus glacialis</i> , Northern Fulmar				•	•		•	•	•
<i>Pterodroma inexpectata</i> , Mottled Petrel								•	•
<i>Ardenna bulleri</i> , Buller's Shearwater									•
<i>Puffinus tenuirostris</i> , Short-tailed Shearwater							•	•	•
<i>Puffinus griseus</i> , Sooty Shearwater								•	•
<i>Puffinus creatopus</i> , Pink-footed Shearwater									•
<b>Cormorants</b>									
<i>Urile urile</i> , Red-faced Cormorant		•		•				•	•
<i>Urile pelagicus</i> , Pelagic Cormorant	•	•		•	•			•	•
<b>Hawks and Eagles</b>									
<i>Aquila chrysaetos</i> , Golden Eagle	•	•	•	•	•	•			
<i>Astur atricapillus</i> , American Goshawk	•	•	•	•	•				
<i>Astur atricapillus laingi</i> , Queen Charlotte Goshawk	•								
<i>Haliaeetus leucocephalus</i> , Bald Eagle	•	•	•	•	•	•			
<i>Buteo jamaicensis</i> , Red-tailed Hawk	•	•	•	•	•				
<i>Buteo lagopus</i> , Rough-legged Hawk		•	•	•	•	•			
<i>Falco sparverius</i> , American Kestrel			•						

## Appendix D. Continued.

SGCN	BIOGEOGRAPHIC REGIONS <sup>1</sup>								
	SE	SC	C	SW	W	N	BCS	BER	GOA
<i>Falco columbarius suckleyi</i> , Black Merlin	•								
<i>Falco rusticolus</i> , Gyrfalcon		•	•	•	•	•			
<i>Falco peregrinus</i> , Peregrine Falcon	•	•	•	•	•	•			
<i>Falco peregrinus pealei</i> , Peale's Peregrine Falcon	•	•		•					
<b>Owls</b>									
<i>Megascops kennicottii</i> , Western Screech-Owl	•	•							
<i>Bubo scandiacus</i> , Snowy Owl				•	•	•			
<i>Surnia ulula</i> , Northern Hawk Owl		•	•	•					
<i>Strix nebulosa</i> , Great Gray Owl		•	•						
<i>Asio flammeus</i> , Short-eared Owl	•	•	•	•	•	•			
<i>Aegolius funereus</i> , Boreal Owl		•	•	•					
<i>Aegolius acadicus</i> , Northern Saw-whet Owl	•	•							
<b>Woodpeckers</b>									
<i>Sphyrapicus ruber</i> , Red-breasted Sapsucker	•								
<i>Picoides dorsalis</i> , American Three-toed Woodpecker	•	•	•	•	•				
<i>Picoides arcticus</i> , Black-backed Woodpecker		•	•						
<i>Dryobates villosus sitkensis</i> , Hairy Woodpecker	•								
<b>Flycatchers</b>									
<i>Contopus cooperi</i> , Olive-sided Flycatcher	•	•	•						
<i>Contopus sordidulus</i> , Western Wood-Pewee	•	•	•						
<i>Empidonax alnorum</i> , Alder Flycatcher	•	•	•	•	•				
<b>Shrikes and Corvids</b>									
<i>Lanius borealis</i> , Northern Shrike	•	•	•	•	•	•			
<i>Perisoreus canadensis</i> , Canada Jay		•	•	•	•	•			
<i>Corvus corax kamtschaticus</i> , Common Raven				•					
<b>Chickadees, Larks, Swallows, and Leaf Warblers</b>									
<i>Poecile rufescens</i> , Chestnut-backed Chickadee	•	•							
<i>Poecile hudsonicus</i> , Boreal Chickadee		•	•	•	•				
<i>Poecile cinctus</i> , Gray-headed Chickadee			•		•	•			
<i>Eremophila alpestris</i> , Horned Lark		•	•		•	•			
<i>Riparia riparia</i> , Bank Swallow		•	•	•	•				
<i>Tachycineta bicolor</i> , Tree Swallow	•	•	•	•	•				
<i>Tachycineta thalassina</i> , Violet-green Swallow	•	•	•	•					
<i>Hirundo rustica</i> , Barn Swallow	•								
<i>Phylloscopus borealis</i> , Arctic Warbler		•	•	•	•	•			
<b>Kinglets, Creepers, and Wrens</b>									
<i>Corthylio calendula calendula</i> , Ruby-crowned Kinglet		•	•	•	•	•			
<i>Corthylio calendula grinnelli</i> , Ruby-crowned Kinglet	•	•							
<i>Regulus satrapa</i> , Golden-crowned Kinglet	•	•	•	•					
<i>Certhia americana alascensis</i> , Brown Creeper		•	•	•					
<i>Troglodytes pacificus</i> , Pacific Wren	•	•		•					

## Appendix D. Continued.

SGCN	BIOGEOGRAPHIC REGIONS <sup>1</sup>								
	SE	SC	C	SW	W	N	BCS	BER	GOA
<i>Troglodytes pacificus kiskensis</i> , Kiska Pacific Wren				•					
<i>Troglodytes pacificus helleri</i> , Kodiak Pacific Wren		•		•					
<i>Troglodytes pacificus meligerus</i> , Attu Pacific Wren				•					
<i>Troglodytes pacificus semidiensis</i> , Semidi Pacific Wren				•					
<i>Troglodytes pacificus alascensis</i> , Pribilof Pacific Wren				•					
<b>Waxwings, Dippers, and Thrushes</b>									
<i>Bombycilla garrulus</i> , Bohemian Waxwing		•	•						
<i>Bombycilla cedrorum</i> , Cedar Waxwing	•								
<i>Catharus minimus</i> , Gray-cheeked Thrush	•	•	•	•	•	•			
<i>Catharus guttatus</i> , Hermit Thrush	•	•	•	•					
<i>Ixoreus naevius</i> , Varied Thrush	•	•	•	•	•				
<i>Luscinia svecica</i> , Bluethroat					•	•			
<i>Oenanthe oenanthe</i> , Northern Wheatear		•	•		•	•			
<b>Pipits, Finches, Longspurs, and Buntings</b>									
<i>Anthus cervinus</i> , Red-throated Pipit					•				
<i>Anthus rubescens</i> , American Pipit	•	•	•	•	•	•			
<i>Fringilla montifringilla</i> , Brambling				•	•				
<i>Pinicola enucleator</i> , Pine Grosbeak	•	•	•	•	•				
<i>Leucosticte tephrocotis griseonucha</i> , Gray-crowned Rosy-Finch				•					
<i>Leucosticte tephrocotis umbrina</i> , Gray-crowned Rosy-Finch				•					
<i>Acanthis flammea</i> , Redpoll	•	•	•	•	•	•			
<i>Spinus pinus</i> , Pine Siskin	•	•		•					
<i>Calcarius lapponicus</i> , Lapland Longspur		•	•	•	•	•			
<i>Calcarius pictus</i> , Smith's Longspur		•	•			•			
<i>Plectrophenax nivalis</i> , Snow Bunting	•	•	•	•	•	•			
<i>Plectrophenax hyperboreus</i> , McKay's Bunting					•				
<b>Sparrows, Blackbirds, and New World Warblers</b>									
<i>Passerella iliaca</i> , Fox Sparrow	•	•	•	•	•				
<i>Passerella iliaca insularis</i> , Kodiak Fox Sparrow	•	•							
<i>Passerella iliaca unalaschcensis</i> , Shumagin Fox Sparrow				•					
<i>Passerella iliaca townsendi</i> , Townsend's Fox Sparrow	•								
<i>Passerella iliaca sinuosa</i> , Valdez Fox Sparrow		•							
<i>Passerella iliaca annectens</i> , Yakutat Fox Sparrow		•							
<i>Passerella iliaca chilcatensis</i> , Chilkat Sooty Fox Sparrow	•								
<i>Spizelloides arborea</i> , American Tree Sparrow	•	•	•	•	•	•			
<i>Junco hyemalis</i> , Dark-eyed Junco	•	•	•	•	•				
<i>Zonotrichia leucophrys</i> , White-crowned Sparrow	•	•	•	•	•				

## Appendix D. Continued.

SGCN	BIOGEOGRAPHIC REGIONS <sup>1</sup>								
	SE	SC	C	SW	W	N	BCS	BER	GOA
<i>Zonotrichia atricapilla</i> , Golden-crowned Sparrow	•	•		•	•				
<i>Passerculus sandwichensis</i> , Savannah Sparrow	•	•	•	•	•	•			
<i>Melospiza melodia insignis</i> , Bischoff Song Sparrow		•		•					
<i>Melospiza melodia caurina</i> , Yakutat Song Sparrow	•	•		•					
<i>Melospiza melodia rufina</i> , Sooty Song Sparrow	•								
<i>Melospiza melodia kenaiensis</i> , Kenai Song Sparrow		•							
<i>Melospiza melodia sanaka</i> , Aleutian Song Sparrow				•					
<i>Melospiza melodia maxima</i> , Giant Song Sparrow				•					
<i>Melospiza lincolnij</i> , Lincoln's Sparrow	•	•	•	•	•				
<i>Agelaius phoeniceus</i> , Red-winged Blackbird	•	•	•						
<i>Euphagus carolinus</i> , Rusty Blackbird	•	•	•	•	•				
<i>Leiothlypis celata</i> , Orange-crowned Warbler	•	•	•	•					
<i>Geothlypis tolmiei</i> , MacGillivray's Warbler	•								
<i>Setophaga ruticilla</i> , American Redstart	•								
<i>Setophaga striata</i> , Blackpoll Warbler		•	•	•	•				
<i>Setophaga coronata</i> , Yellow-rumped Warbler	•	•	•	•	•				
<i>Setophaga townsendi</i> , Townsend's Warbler	•	•	•						
<i>Cardellina pusilla</i> , Wilson's Warbler	•	•	•	•	•				
<b>Mice and Lemmings</b>									
<i>Zapus hudsonius</i> , Meadow Jumping Mouse	•	•	•	•	•				
<i>Dicrostonyx groenlandicus</i> , Nearctic Collared Lemming				•	•	•			
<i>Lemmus trimucronatus</i> , Nearctic Brown Lemming	•	•	•	•	•	•			
<i>Synaptomys borealis</i> , Northern Bog Lemming	•	•	•	•					
<b>Voles and Deermice</b>									
<i>Microtus abbreviatus</i> , Insular Vole					•				
<i>Microtus longicaudus</i> , Long-tailed Vole	•	•	•						
<i>Microtus miurus</i> , Singing Vole		•	•	•	•	•			
<i>Microtus oeconomus</i> , Root or Tundra Vole	•	•	•	•	•	•			
<i>Microtus pennsylvanicus</i> , Meadow Vole	•	•	•	•					
<i>Microtus xanthognathus</i> , Taiga or Yellow-cheeked Vole			•		•				
<i>Clethrionomys gapperi</i> , Southern Red-backed Vole	•								
<i>Peromyscus keeni</i> , Northwestern Deermouse	•								
<b>Muskrats and Woodrats</b>									
<i>Ondatra zibethicus</i> , Common Muskrat	•	•	•	•	•	•			
<i>Neotoma cinerea</i> , Bushy-tailed Woodrat	•								
<b>Squirrels and Marmots</b>									
<i>Glaucomys sabrinus</i> , Northern Flying Squirrel	•	•	•						
<i>Glaucomys sabrinus griseifrons</i> , Prince of Wales Northern Flying Squirrel	•								
<i>Marmota broweri</i> , Alaska Marmot			•		•	•			

Appendix D. Continued.

SGCN	BIOGEOGRAPHIC REGIONS <sup>1</sup>								
	SE	SC	C	SW	W	N	BCS	BER	GOA
<i>Marmota caligata</i> , Hoary Marmot	•	•	•	•					
<i>Urocitellus parryii</i> , Arctic Ground Squirrel		•	•	•	•	•			
<i>Urocitellus parryii plesius</i> , Arctic Ground Squirrel		•							
<i>Urocitellus parryii ablusus</i> , Aleutian Arctic Ground Squirrel		•	•	•	•				
<i>Urocitellus parryii kennicottii</i> , Barrow Arctic Ground Squirrel						•			
<i>Urocitellus parryii kodiacensis</i> , Kodiak Island Arctic Ground Squirrel		•							
<i>Urocitellus parryii osgoodi</i> , Osgood's Arctic Ground Squirrel			•						
<i>Urocitellus parryii nebulicola</i> , Shumigan Islands Arctic Ground Squirrel				•					
<i>Urocitellus parryii lyratus</i> , St. Lawrence Island Arctic Ground Squirrel					•				
<b>Pikas, and Hares</b>									
<i>Ochotona collaris</i> , Collared Pika	•	•	•	•					
<i>Lepus americanus</i> , Snowshoe Hare	•	•	•	•	•	•			
<i>Lepus othus</i> , Alaska Hare				•	•				
<b>Shrews</b>									
<i>Sorex alaskanus</i> , Glacier Bay Water Shrew	•								
<i>Sorex cinereus</i> , Cinereus or Masked Shrew	•	•	•	•	•	•			
<i>Sorex hoyi</i> , Pygmy Shrew		•	•	•	•				
<i>Sorex jacksoni</i> , Saint Lawrence Island Shrew					•				
<i>Sorex obscurus</i> , Northern Montane Shrew	•	•	•	•	•	•			
<i>Sorex navigator</i> , Western Water Shrew	•	•	•						
<i>Sorex pacificus</i> , Pacific Shrew	•								
<i>Sorex pribilofensis</i> , Pribilof Island Shrew					•				
<i>Sorex tundrensis</i> , Tundra Shrew		•	•	•	•	•			
<i>Sorex ugyunak</i> , Barrren Ground Shrew					•	•			
<i>Sorex minutissimus</i> , Holarctic Least Shrew		•	•	•	•	•			
<b>Bats</b>									
<i>Lasionycteris noctivagans</i> , Silver-haired Bat	•								
<i>Myotis californicus</i> , California Myotis	•								
<i>Myotis lucifugus</i> , Little Brown Bat	•	•	•	•					
<i>Myotis evotis</i> , Long-eared Myotis	•								
<i>Myotis volans</i> , Long-legged Myotis	•								
<b>Canids</b>									
<i>Vulpes lagopus</i> , Arctic Fox				•	•	•			
<b>Mustelids</b>									
<i>Enhydra lutris kenyoni</i> , Northern Sea Otter, South-west Alaska DPS				•				•	•
<i>Lontra canadensis kodiacensis</i> , Kodiak River Otter				•	•				



## Appendix D. Continued.

SGCN	BIOGEOGRAPHIC REGIONS <sup>1</sup>								
	SE	SC	C	SW	W	N	BCS	BER	GOA
<b>Dolphins and Porpoises</b>									
<i>Sagmatias obliquidens</i> , Pacific White-sided Dolphin, NP Stock								•	•
<i>Phocoena phocoena</i> , Harbor Porpoise—all stocks on the list	•						•	•	•
<i>Phocoenoides dalli</i> , Dall's Porpoise, Alaska Stock								•	•

<sup>1</sup> SE = Southeast, SC = Southcentral, C = Central, SW = Southwest, W = Western, N = Northern, BCS = Beaufort/Chukchi Seas, BER = Bering Sea, GOA = Gulf of Alaska. See also Chapter 5, Figure 5.1.

<sup>2</sup> Taxonomy of this species in Alaska has changed to McKay's Bumblebee (*Bombus mckayi*; Williams 2021). <https://www.tandfonline.com/doi/full/10.1080/00222933.2021.1900444>

<sup>3</sup> Five species of demersal rockfish also occur in the BCS biogeographic region, in addition to BER and GOA.

Appendix E. Alaska population estimates for “species of greatest conservation need” (SGCN). Population size in Alaska for most SGCN is unknown, or very approximate. Estimates that report to the individual animal (e.g., 10, 209, 160, 235) are the result of quantitative surveys, and have greater reliability than rounded numbers.

Species (or subspecies, stock, DPS <sup>1</sup> )	Latin name	Population estimate	Citation
Alder Flycatcher	<i>Empidonax alnorum</i>	23,000,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Aleutian Tern	<i>Onychoprion aleuticus</i>	5,529	Renner, H. M., M. D. Romano, M. Renner, et al. 2015. Assessing the breeding distribution and population trends of the Aleutian Tern <i>Onychoprion aleutica</i> . <i>Marine Ornithology</i> 43:179–187.
American Golden-Plover	<i>Pluvialis dominica</i>	290,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
American Kestrel	<i>Falco sparverius</i>	17,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
American Pipit	<i>Anthus rubescens</i>	190,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
American Redstart	<i>Setophaga ruticilla</i>	78,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
American Tree Sparrow	<i>Spizelloides arborea</i>	9,600,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Arctic Warbler	<i>Phylloscopus borealis</i>	8,200,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Bank Swallow	<i>Riparia riparia</i>	1,200,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Barn Swallow	<i>Hirundo rustica</i>	39,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Bar-tailed Godwit ( <i>baueri</i> )	<i>Limosa lapponica baueri</i>	90,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Bearded Seal, Beringia DPS	<i>Erignathus barbatus nauticus</i>	301,836	Muto, M. M., V. T. Helker, B. J. Delean, et al. 2021. Alaska marine mammal stock assessments, 2020. <a href="https://doi.org/10.25923/yn3s-n786">https://doi.org/10.25923/yn3s-n786</a> (Accessed on 1/8/2025).
Beluga, Cook Inlet DPS	<i>Delphinapterus leucas</i>	279	Young, N. C., Brower, A. A., Muto, et al. 2024. Alaska marine mammal stock assessments, 2023. U.S. Department of Commerce, NOAA technical Memorandum NMFS-AFSC-493, 327 p.
Black Brant, Pacific	<i>Branta bernicla nigricans</i>	245,172 <sup>2</sup>	U.S. Fish and Wildlife Service. 2025. Pacific Flyway Data Book, 2025. U.S. Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Pacific Flyway Office, Washington D.C.
Black Guillemot	<i>Cephus grylle</i>	700	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Black-backed Woodpecker	<i>Picoides arcticus</i>	25,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Black-bellied Plover	<i>Pluvialis squatarola</i>	261,144	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.

## Appendix E. Continued.

Species (or subspecies, stock, DPS <sup>1</sup> )	Latin name	Population estimate	Citation
Black-capped Chickadee	<i>Poecile atricapillus</i>	1,700,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Black-legged Kittiwake	<i>Rissa tridactyla</i>	1,300,000	Hatch, S. A., G. J. Robertson, and P. H. Baird. 2020. Black-legged Kittiwake ( <i>Rissa tridactyla</i> ), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA.
Blackpoll Warbler	<i>Setophaga striata</i>	14,000,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Bohemian Waxwing	<i>Bombycilla garrulus</i>	540,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Boreal Chickadee	<i>Poecile hudsonicus</i>	3,200,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> . Accessed on 1/8/2031
Bowhead Whale, Western Arctic Stock	<i>Balaena mysticetus</i>	15,227	Young, N. C., A. A. Brower, M. M. Muto, et al. 2024. Alaska marine mammal stock assessments, 2023. U.S. Department of Commerce, NOAA technical Memorandum NMFS-AFSC-493, 327 p.
Bristle-thighed Curlew	<i>Numenius tahitiensis</i>	10,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Brown Creeper	<i>Certhia americana</i>	580,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Buff-breasted Sandpiper	<i>Calidris subruficollis</i>	14,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Canada Jay	<i>Perisoreus canadensis</i>	4,600,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Cassin's Auklet	<i>Ptychoramphus aleuticus</i>	473,000	Gotthardt, T. A., K. M. Walton, and T. L. Fields. 2012. Setting Conservation Priorities for Alaska's Wildlife Action Plan. Alaska Natural Heritage Program, University of Alaska Anchorage, AK
Cedar Waxwing	<i>Bombycilla cedrorum</i>	63,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Chestnut-backed Chickadee	<i>Poecile rufescens</i>	3,200,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="http://pif.birdconservancy.org/PopEstimates">http://pif.birdconservancy.org/PopEstimates</a> (Accessed on 1/8/2025).
Common Murre	<i>Uria aalge</i>	2,800,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Crested Auklet	<i>Aethia cristatella</i>	3,000,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Dark-eyed Junco	<i>Junco hyemalis</i>	57,000,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Dunlin, Arctic	<i>Calidris alpina arctica</i>	475,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Dunlin, Pacific	<i>Calidris alpina pacifica</i>	550,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.

## Appendix E. Continued.

Species (or subspecies, stock, DPS <sup>1</sup> )	Latin name	Population estimate	Citation
Emperor Goose	<i>Anser canagicus</i>	18,788 <sup>3</sup>	Frost, C. J., D. E. Safine, J. B. Fischer, and E. E. Osnas. 2024. Emperor Goose Population Index Update. U.S. Fish and Wildlife Service, Migratory Bird Management, Alaska Region.
Fork-tailed Storm-Petrel	<i>Hydrobates furcatus</i>	3,200,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Fox Sparrow	<i>Passerella iliaca</i>	16,000,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Glaucous Gull	<i>Larus hyperboreus</i>	100,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Glaucous-winged Gull	<i>Larus glaucescens</i>	250,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Golden-crowned Kinglet	<i>Regulus satrapa</i>	13,000,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Goshawk, American	<i>Astur atricapillus</i>	69,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Gray-cheeked Thrush	<i>Catharus minimus</i>	18,000,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Great Gray Owl	<i>Strix nebulosa</i>	5,700	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Greater Yellowlegs	<i>Tringa melanoleuca</i>	36,990	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Gray-headed Chickadee	<i>Poecile cinctus</i>	Unknown, likely not more than a few thousand	Booms, T. L., L. H. DeCicco, C. P. Barger, and J. A. Johnson. 2020. Current Knowledge and Conservation Status of the Gray-Headed Chickadee in North America. <i>Journal of Fish and Wildlife Management</i> 11: 654-664.
Gyrfalcon	<i>Falco rusticolus</i>	8,300	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a>
Harbor Porpoise, Gulf of Alaska Stock	<i>Phocoena phocoena</i>	31,046	Young, N. C., A. A. Brower, M. M. Muto, et al. 2024. Alaska marine mammal stock assessments, 2023. U.S. Department of Commerce, NOAA technical Memorandum NMFS-AFSC-493, 327 p.
Harbor Porpoise, Southeast Alaska Stock	<i>Phocoena phocoena</i>	2,509	Young, N. C., A. A. Brower, M. M. Muto, et al. 2024. Alaska marine mammal stock assessments, 2023. U.S. Department of Commerce, NOAA technical Memorandum NMFS-AFSC-493, 327 p.
Harbor Seal, Pacific	<i>Phoca vitulina richardii</i>	243,938	Young, N. C., A. A. Brower, M. M. Muto, et al. 2024. Alaska marine mammal stock assessments, 2023. U.S. Department of Commerce, NOAA technical Memorandum NMFS-AFSC-493, 327 p.
Hermit Thrush	<i>Catharus guttatus</i>	8,400,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Horned Lark	<i>Eremophila alpestris</i>	220,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).

## Appendix E. Continued.

Species (or subspecies, stock, DPS <sup>1</sup> )	Latin name	Population estimate	Citation
Horned Puffin	<i>Fratercula corniculata</i>	900,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Hudsonian Godwit	<i>Limosa haemastica</i>	21,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Humpback Whale, Western North Pacific DPS	<i>Megaptera novaeangliae</i>	1,084	Young, N. C., A. A. Brower, M. M. Muto, et al. 2024. Alaska marine mammal stock assessments, 2023. U.S. Department of Commerce, NOAA technical Memorandum NMFS-AFSC-493, 327 p.
Killdeer	<i>Charadrius vociferus</i>	20,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Kittlitz's Murrelet	<i>Brachyramphus brevirostris</i>	33,583	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Lapland Longspur	<i>Calcarius lapponicus</i>	9,700,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Least Auklet	<i>Aethia pusilla</i>	5,500,000–9,000,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Least Sandpiper	<i>Calidris minutilla</i>	266,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Lesser Yellowlegs	<i>Tringa flavipes</i>	158,400	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Lincoln's Sparrow	<i>Melospiza lincolnii</i>	12,000,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	487,500	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Macgillivray's Warbler	<i>Geothlypis tolmiei</i>	97,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Marbled Godwit ( <i>beringiae</i> )	<i>Limosa fedoa beringiae</i>	2,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Marbled Murrelet	<i>Brachyramphus marmoratus</i>	859,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
McKay's Bunting	<i>Plectrophenax hyperboreus</i>	19,481	Richardson, R. M., C. L. Amundson, J. A. Johnson, et al. 2024. Rapid population decline in McKay's Bunting, an Alaskan endemic, highlights the species' current status relative to international standards for vulnerable species. <i>Ornithological Applications</i> 126:1–12.
North Pacific Right Whale, Eastern North Pacific Stock	<i>Eubalaena japonica</i>	31	Young, N. C., A. A. Brower, M. M. Muto, et al. 2024. Alaska marine mammal stock assessments, 2023. U.S. Department of Commerce, NOAA technical Memorandum NMFS-AFSC-493, 327 p.
Northern Fulmar	<i>Fulmarus glacialis</i>	1,400,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Northern Fur Seal, Eastern Pacific Stock	<i>Callorhinus ursinus</i>	626,618	Young, N. C., A. A. Brower, M. M. Muto, et al. 2024. Alaska marine mammal stock assessments, 2023. U.S. Department of Commerce, NOAA technical Memorandum NMFS-AFSC-493, 327 p.

## Appendix E. Continued.

Species (or subspecies, stock, DPS <sup>1</sup> )	Latin name	Population estimate	Citation
Northern Sea Otter, Southwest Alaska Stock	<i>Enhydra lutris kenyoni</i>	51,935	U.S. Fish and Wildlife Service. 2023. Northern Sea Otter Stock Assessment Report Southwest Alaska. <a href="https://www.fws.gov/sites/default/files/documents/Northern-Sea-Otter-Stock-Assessment-Report-Southwest-Alaska-2023.pdf">https://www.fws.gov/sites/default/files/documents/Northern-Sea-Otter-Stock-Assessment-Report-Southwest-Alaska-2023.pdf</a> (accessed 1/8/2025).
Northern Wheatear	<i>Oenanthe oenanthe</i>	78,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Olive-sided Flycatcher	<i>Contopus cooperi</i>	430,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Orange-crowned Warbler	<i>Leiothlypis celata</i>	31,000,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Pacific Golden-Plover	<i>Pluvialis fulva</i>	42,500	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Pacific Walrus	<i>Odobenus rosmarus</i>	257,193	U.S. Fish and Wildlife Service. 2023. Pacific Walrus Stock Assessment Report. <a href="https://www.fws.gov/sites/default/files/documents/Pacific-Walrus-Stock-Assessment-Report-2023.pdf">https://www.fws.gov/sites/default/files/documents/Pacific-Walrus-Stock-Assessment-Report-2023.pdf</a> (accessed 1/8/2025)
Pacific White-sided Dolphin, North Pacific Stock	<i>Sagmatias obliquoidens</i>	26,880	Young, N. C., A. A. Brower, M. M. Muto, et al. 2024. Alaska marine mammal stock assessments, 2023. U.S. Department of Commerce, NOAA technical Memorandum NMFS-AFSC-493, 327 p.
Pacific Wren	<i>Troglodytes pacificus</i>	2,900,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Parakeet Auklet	<i>Aethia psittacula</i>	1,000,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Pectoral Sandpiper	<i>Calidris melanotos</i>	1,142,400	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Pigeon Guillemot	<i>Cephus columba</i>	49,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Pine Grosbeak	<i>Pinicola enucleator</i>	1,200,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Pine Siskin	<i>Spinus pinus</i>	4,100,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Polar Bear, Southern Beaufort Sea Stock	<i>Ursus maritimus</i>	900	U.S. Fish and Wildlife Service. 2019. Polar bear southern beaufort sea stock assessment report. <a href="https://www.fws.gov/sites/default/files/documents/polar-bear-southern-beaufort-sea-stock-assessment-report-may-2019.pdf">https://www.fws.gov/sites/default/files/documents/polar-bear-southern-beaufort-sea-stock-assessment-report-may-2019.pdf</a>
Red Knot, Pacific	<i>Calidris canutus roselaari</i>	16,786	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Red-legged Kittiwake	<i>Rissa brevirostris</i>	210,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Red-necked Phalarope	<i>Phalaropus lobatus</i>	1,250,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.

## Appendix E. Continued.

Species (or subspecies, stock, DPS <sup>1</sup> )	Latin name	Population estimate	Citation
Redpoll	<i>Acanthis flammea</i>	56,000,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Red-tailed Hawk	<i>Buteo jamaicensis</i>	21,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	21,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Ribbon Seal	<i>Histiophoca fasciata</i>	184,697	Young, N. C., A. A. Brower, M. M. Muto, et al. 2024. Alaska marine mammal stock assessments, 2023. U.S. Department of Commerce, NOAA technical Memorandum NMFS-AFSC-493, 327 p.
Rock Ptarmigan	<i>Lagopus muta</i>	590,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Rock Sandpiper, Aleutian	<i>Calidris ptilocnemis couesi</i>	75,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Rock Sandpiper, Pribilof	<i>Calidris ptilocnemis ptilocnemis</i>	19,800	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Rough-legged Hawk	<i>Buteo lagopus</i>	57,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Ruby-crowned Kinglet	<i>Corthylio calendula</i>	9,700,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Rufous Hummingbird	<i>Selasphorus rufus</i>	4,500,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Rusty Blackbird	<i>Euphagus carolinus</i>	920,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Sanderling	<i>Calidris alba</i>	2,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Savannah Sparrow	<i>Passerculus sandwichensis</i>	41,000,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Semipalmated Sandpiper	<i>Calidris pusilla</i>	1,450,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	14,400	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Short-billed Dowitcher ( <i>caurinus</i> )	<i>Limnodromus griseus caurinus</i>	60,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Short-eared Owl	<i>Asio flammeus</i>	130,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Short-tailed Albatross	<i>Phoebastria albatrus</i>	<2,000 globally	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.

## Appendix E. Continued.

Species (or subspecies, stock, DPS <sup>1</sup> )	Latin name	Population estimate	Citation
Solitary Sandpiper ( <i>cinna-momea</i> )	<i>Tringa solitaria cinnamomea</i>	49,770	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Song Sparrow	<i>Melospiza melodia</i>	910,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Spectacled Eider	<i>Somateria fisheri</i>	~369,000	USFWS. 2021. Species Status Assessment for the Spectacled Eider. US Fish and Wildlife Service, Fairbanks Field Office, Fairbanks, Alaska.
Spotted Sandpiper	<i>Actitis macularius</i>	132,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Spotted Seal, Bering Stock	<i>Phoca largha</i>	461,625	Young, N. C., A. A. Brower, M. M. Muto, et al. 2024. Alaska marine mammal stock assessments, 2023. U.S. Department of Commerce, NOAA technical Memorandum NMFS-AFSC-493, 327 p.
Steller Sea Lion, Western DPS	<i>Eumetopias jubatus</i>	49,837	Young, N. C., A. A. Brower, M. M. Muto, et al. 2024. Alaska marine mammal stock assessments, 2023. U.S. Department of Commerce, NOAA technical Memorandum NMFS-AFSC-493, 327 p.
Stilt Sandpiper	<i>Calidris himantopus</i>	124,370	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Surfbird	<i>Calidris virgata</i>	56,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Thick-billed Murre	<i>Uria lomvia</i>	2,200,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Townsend's Warbler	<i>Setophaga townsendi</i>	6,000,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Tree Swallow	<i>Tachycineta bicolor</i>	990,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Tufted Puffin	<i>Fratercula cirrhata</i>	2,300,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Upland Sandpiper	<i>Bartramia longicauda</i>	7,500	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Vaux's Swift	<i>Chaetura vauxi</i>	1,200	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Violet-green Swallow	<i>Tachycineta thalassina</i>	410,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Wandering Tattler	<i>Tringa incana</i>	9,975	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Western Sandpiper	<i>Calidris mauri</i>	3,325,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Western Wood-Pewee	<i>Contopus sordidulus</i>	150,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).

## Appendix E. Continued.

Species (or subspecies, stock, DPS <sup>1</sup> )	Latin name	Population estimate	Citation
Whimbrel ( <i>hudsonicus</i> )	<i>Numenius phaeopus hudsonicus</i>	38,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Whiskered Auklet	<i>Aethia pygmaea</i>	116,000	U.S. Fish and Wildlife Service. 2009. Alaska Seabird Conservation Plan. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage, AK. 136 pp.
Willow Ptarmigan	<i>Lagopus lagopus</i>	6,400,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).
Wilson's Snipe	<i>Gallinago delicata</i>	500,000	Alaska Shorebird Group. 2019. Alaska Shorebird Conservation Plan. Version III. Alaska Shorebird Group, Anchorage, AK.
Wilson's Warbler	<i>Cardellina pusilla</i>	35,000,000	Partners in Flight. 2025. Population Estimates Database, version 3.1. <a href="https://pif.birdconservancy.org/population-estimate-database-scores/">https://pif.birdconservancy.org/population-estimate-database-scores/</a> (Accessed on 1/8/2025).

<sup>1</sup> DPS = distinct population segment.

<sup>2</sup> Pacific Brant Fall Photographic Survey at Izembek Lagoon, estimate of Brant in fall including breeders from Russia and Canada.

<sup>3</sup> Survey index from Yukon-Kuskokwim Delta only (not a total population count).

Appendix F. Detailed habitat descriptions and distribution maps for terrestrial, freshwater, and coastal habitats in Alaska. The habitats discussed below, except for Rivers and Streams, Lakes and Ponds, and Freshwater Aquatic Vegetation are based on the draft Alaska Vegetation Map (Nawrocki et al. 2025) at the Macrogroup level of the U.S. National Vegetation Classification (USNVC Version 3.0).

## FOREST AND WOODLANDS

### Temperate Coastal Rainforest

USNVC Synonym: Vancouverian Coastal Rainforest (M024)

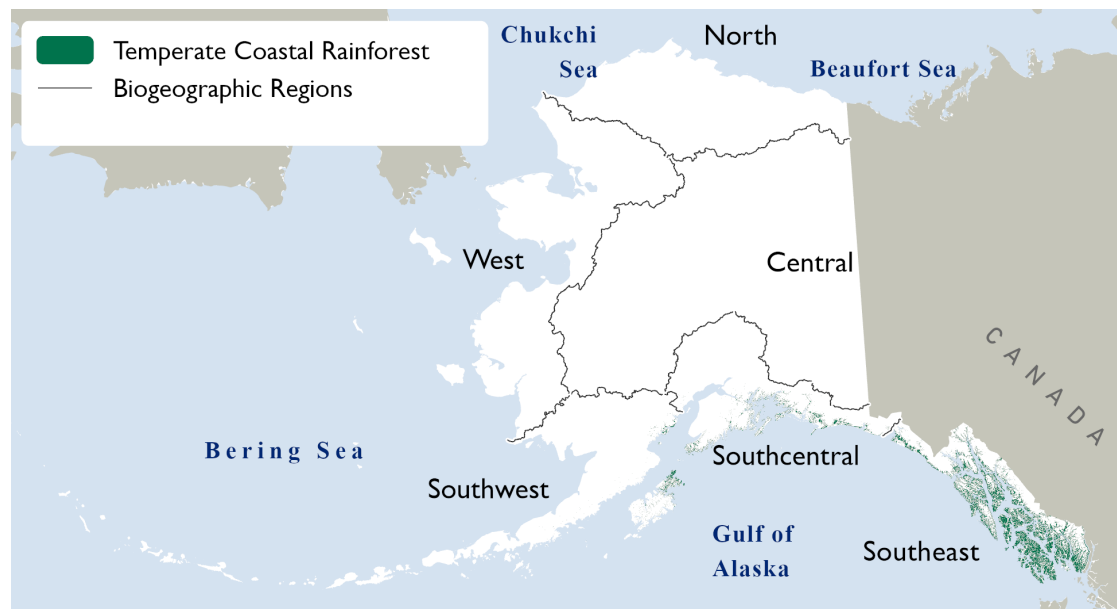


Figure F1. Distribution of temperate coastal rainforest in Alaska.

#### *Physiognomy:*

Temperate coastal rainforests are productive needleleaf forests comprised of full-stature trees. Stands develop over a broad elevational range from sea level to the subalpine. Canopy cover ranges from open with a well-developed deciduous shrub understory to closed with a species poor understory of pocket wetlands and bryophyte carpets.

#### *Floristics:*

Canopies are codominated by Sitka spruce (*Picea sitchensis*) and western hemlock (*Tsuga heterophylla*). Sitka spruce is more common on sites prone to disturbance or receiving salt spray and occurs throughout the range. Western hemlock and Alaska cedar (*Callitropsis nootkatensis*) are present throughout Southeast Alaska and westward to Prince William Sound, with western red cedar (*Thuja plicata*) restricted to the southern half of Southeast. Alaska cedar abundance increases in wetter sites. Subalpine fir (*Abies lasiocarpa*) occurs in limited areas usually associated with mainland corridors through which cold air drains from inland, continental climates. Mountain hemlock (*Tsuga mertensiana*) is common at mid- to higher elevations with deeper snow in the Southeast biogeographic region and largely replaces Western hemlock, even at lower elevations, in the Southcentral biogeographic region. Characteristic understory shrubs include blueberries (*Vaccinium ovalifolium*, *Vaccinium alaskaense*), huckleberry (*Vaccinium parvifolium*), rusty menziesia (*Rhododendron menziesii*), and devilscub (*Oplopanax horridus*). Forbs (*Circaea alpina*, *Maianthemum dilatatum*, *Tiarella trifoliata*, *Streptopus amplexifolius*), ferns (*Athyrium filix-femina*, *Dryopteris expansa*, *Gymnocarpium dryopteris*, *Struthiopteris spicant*), and bryophytes (*Hylocomium splendens*, *Rhytidiadelphus loreus*) are common components of the lower strata. Epiphytic, arboreal lichens (*Usnea lapponica*, *Bryoria capillaris*, *Alectoria sarmentosa*) can be abundant in this habitat type.

Appendix F. Continued.

**Range:**

Forming a near continuous band through the Southeast and Southcentral biogeographic regions, rimming the Gulf of Alaska and extending to upper islands of the Kodiak Archipelago (Figure F1). This habitat has also been mapped sparingly in the Southwest and Central regions.

**Climate:**

The maritime climate is cool in the summer and mild in the winter with low annual variation in temperature. Precipitation as rain, snow, and fog drip is abundant.

**Environment:**

Occurring along mountain sideslopes, footslopes, valleys, and less commonly, on beach ridges from sea level to the subalpine. Terrain slope, or in the case of beach ridges, sandy substrates, impart good drainage. Wet pockets may develop in mature forests with pit and mound topography.

**Disturbance:**

Timber harvest is the primary large-scale disturbance. At the local scale, windthrow is a driver of secondary gap succession, avalanche and landslides control the extent of the habitat type, with pests and pathogens affecting forest health. Alaska cedar is experiencing increasing occurrence of mortality, due to shallow roots freezing because of insufficient insulation by snow. This phenomenon is attributed to a greater proportion of precipitation falling as rain, rather than snow in the winter months.

**Temperate Subalpine Woodland**

USNVC Synonym: Vancouverian Subalpine-High Montane Forest (M025)



Figure F2. Distribution of temperate subalpine woodland in Alaska.

**Physiognomy:**

Temperate subalpine woodlands form as treeline communities of needleleaf forest interspersed with thickets of tall deciduous shrubs, dwarf shrub heaths, and herb meadows. Expression on the landscape ranges, with increasing elevation, from open forest, to tree islands, to woodlands. Trees become dwarf or krummholz at the upper elevational limit of growth and in exposed sites.

## Appendix F. Continued.

*Floristics:*

Subalpine-high montane forests and woodlands are dominated by mountain hemlock (*Tsuga mertensiana*) in the Southeast and Southcentral biogeographic regions; subalpine fir (*Abies lasiocarpa*) may occur as a codominant species on karst topographies or along corridors of cold air drainage in the Southeast. Thickets of low shrubs including copperbush (*Elliottia pyroliflora*), blueberries (*Vaccinium ovalifolium*, *Vaccinium alaskaense*), and rusty menziesia (*Rhododendron menziesii*) often skirt the isolated stands of trees. Dwarf shrub heaths and herb meadows grow among these tree islands. Heaths are comprised of ericaceous and other dwarf shrubs including crowberry (*Empetrum nigrum*), Alaska bellheather (*Harrimanella stelleriana*), partridgefoot (*Luetkea pectinata*), Aleutian mountainheath (*Phyllodoce aleutica*), and western moss heather (*Cassiope mertensiana*). Herb meadows are comprised of a diversity of forbs (*Nephrophyllidium cristagalli*, *Geum calthifolium*, *Cornus canadensis*, *Erigeron peregrinus*), ferns (*Dryopteris expansa*, *Gymnocarpium dryopteris*, *Struthiopteris spicant*), and graminoids (*Carex microchaeta*, *Festuca altaica*, *Hierochloë alpina*).

*Range:*

Occurring in subalpine and montane settings throughout the Southeast biogeographic region and continuing westward through Southcentral to Cook Inlet and the Kenai Peninsula (Figure F2). This subalpine habitat has also been mapped sparingly in the Central region.

*Climate:*

This habitat type spans maritime and boreal-maritime transitional climates where the extreme conditions present at high-elevations often override the influence of regional climate. Summers are short and cool and winters are long and cool with abundant wet snow.

*Environment:*

Developing on mountain sideslopes, basins, and ridges, extending from the subalpine to treeline. Most common at upper elevations that are exposed to cold temperatures and desiccating winds, but also developing at lower elevations in areas of cold air drainage. Heavy, late-lying snowpack restricts tree establishment, which contributes, in part, to the patchiness of the habitat type at elevational limits. Soils are often thin and coarse-textured over shallow bedrock.

*Disturbance:*

Avalanche and landslide tend to control local extent, with small-scale windthrow driving stand dynamics in open canopies.

Appendix F. Continued.

## Boreal Forest

USNVC Synonym: Alaskan-Yukon North American Boreal Forest (M156)



Figure F3. Distribution of boreal forest in Alaska.

### Physiognomy:

Boreal forests occur as mixed needleleaf-broadleaf closed to open forests, with a dwarf to low shrub understory with forbs and graminoids. Lichens and feathermosses are important on dry and mesic sites, respectively.

### Floristics:

Forests and woodlands dominated by white spruce (*Picea glauca*), black spruce (*Picea mariana*), Alaska birch (*Betula neoalaskana*), and quaking aspen (*Populus tremuloides*), with tamarack (*Larix laricina*), and balsam poplar (*Populus balsamifera*) occasionally present. Towards the southern, boreal-temperate transition, Alaska birch may be replaced by Kenai birch (*Betula kenaica*) and white spruce may be replaced by Lutz spruce (*Picea × lutzii*), a hybrid of white and Sitka spruce.

Canopy and understory species composition follows a moisture and productivity gradient. The driest stands, often developing on warm, south-facing slopes tend to be dominated by quaking aspen with an open understory of shrubs including kinnikinnick (*Arctostaphylos uva-ursi*), prickly rose (*Rosa acicularis*), and buffaloberry (*Shepherdia canadensis*). Characteristic forbs include fireweed (*Chamaenerion angustifolium*), subalpine aster (*Eurybia sibirica*), and northern bedstraw (*Galium boreale*).

More mesic, low productivity stands often developing on cold, north-facing slopes or over shallow permafrost, tend to be dominated by black spruce with a dwarf and low shrub understory of crowberry (*Empetrum nigrum*), bog blueberry (*Vaccinium uliginosum*), and dwarf birch (*Betula nana*). Feathermosses (*Hylocomium splendens*, *Pleurozium schreberi*) and lichens in the *Cladonia* genus are important ground covers.

Mesic, moderately productive stands developing on comparatively warmer sites tend to be dominated by white spruce, with black spruce, Alaska birch, quaking aspen, balsam poplar, and tamarack occasionally subdominant. Characteristic shrub associates include deciduous species such as Siberian alder (*Alnus alnobetula* ssp. *fruticosa*), resin birch (*Betula glandulosa*), dwarf birch, prickly rose, and shorter stature ericaceous shrubs including marsh and bog Labrador tea (*Rhododendron tomentosum* ssp. *decumbens* and *Rhododendron groenlandicum*), crowberry, bog blueberry, and lingonberry (*Vaccinium vitis-idaea*). The

## Appendix F. Continued.

herbaceous layer is sparse and often species poor. Common species include bluejoint reedgrass (*Calamagrostis canadensis*), horsetails (*Equisetum arvense*, *Equisetum sylvaticum*), oakfern (*Gymnocarpium dryopteris*), and false toadflax (*Geocaulon lividum*). Feathermosses (*Hylocomium splendens*, *Pleurozium schreberi*, *Abietinella abietina*) are important groundcovers.

Moist, productive stands developing toward the boreal temperate transition, which are rarely underlain by permafrost, may be codominated by white or Lutz spruce and Alaska or Kenai birch; mountain hemlock (*Tsuga mertensiana*) may codominate with Lutz spruce where their ranges overlap, and balsam poplar may be replaced by cottonwood (*Populus trichocarpa*). The understory becomes more typical of coastal maritime forests, with taller, deciduous shrub species such as highbush cranberry (*Viburnum edule*), rusty menziesia (*Rhododendron menziesii*), devilsclub (*Oplopanax horridus*), and blueberry (*Vaccinium ovalifolium*) becoming more common. Forb and fern diversity is high. Additional to species characteristic of mesic boreal stands, fireweed (*Chamerion angustifolium*), bluebells (*Mertensia paniculata*), woolly geranium (*Geranium erianthum*), lady fern (*Athyrium filix-femina*), and woodfern (*Dryopteris expansa*) are characteristic.

*Range:*

A common and widespread habitat type centered in the Central and Southcentral biogeographic regions, extending into Western and Southwest regions to the longitudinal limit of trees (Figure F3). Boreal forests have also been mapped sparingly in the Southeast and Northern regions.

*Climate:*

The boreal climate has long, very cold winters, allowing persistence of snow cover during all but the brief, relatively warm summer season. Annual variation in temperature is broad and total annual precipitation is relatively low. Physiological processes are often temperature controlled, although soil moisture and aspect play a role, with south-facing slopes receiving more direct solar radiation and north-facing slopes more likely to be underlain by permafrost.

*Environment:*

Developing on mountain sides, in broad valleys and across rolling hills and flat terrain. Soils are variable, ranging from well-drained coarse-grained mineral soils on hillsides to moderately drained loams in the lowlands. Permafrost is largely discontinuous in the north and absent in the south.

*Disturbance:*

The disturbance regime is characterized by large crown fires, though other disturbances, such as insect infestation and blowdown are common. Spruce beetle (*Dendroctonus rufipennis*) infestations are a major natural disturbance of spruce forests.

Appendix F. Continued.

## Boreal Subalpine and Subarctic Woodland

USNVC Synonym: North American Northern Boreal Woodland (M179)



Figure F4. Distribution of boreal subalpine and subarctic woodland in Alaska.

### Physiognomy:

Boreal woodlands occur as sparse to open stands comprised of short stature needleleaf and/or broadleaf trees, a low to dwarf shrub understory, with lower strata comprised of forbs, lichens and bryophytes and a variable contribution of graminoids. In areas of treeline expansion, trees are evenly distributed and display normal growth forms. In areas of treeline regression, or at the limit of a species' climatic tolerance, trees may be stunted or contorted.

### Floristics:

Stands tend to be dominated by white spruce (*Picea glauca*), however, black spruce (*Picea mariana*), Alaska birch (*Betula neoalaskana*), and balsam poplar (*Populus balsamifera*) may co-occur or assume dominance. The abundance of black spruce increases in nutrient-poor, mesic soils underlain by ice-rich and shallow permafrost. Alaska birch increases abundance with maritime influence and may be replaced by Kenai birch (*Betula kenaica*) towards the boreal-temperate transition. Balsam poplar often occurs on south-facing slopes within or beyond the limit of white spruce. Low deciduous shrubs including grayleaf willow (*Salix glauca*), Richardson's willow (*Salix richardsonii*), Bebb willow (*Salix bebbiana*), and resin birch (*Betula glandulosa*) are common in the understory where either a more developed tree canopy or terrain provides protection from desiccating winds and/or insulation from low temperatures. Similar to trees, the shrub understory becomes dwarfed where exposure increases. In these less-protected sites, dwarf birch (*Betula nana*), and the ericaceous species marsh Labrador tea (*Rhododendron tomentosum* ssp. *decumbens*), crowberry (*Empetrum nigrum*), bog blueberry (*Vaccinium uliginosum*), and lingonberry (*Vaccinium vitis-idaea*) are characteristic of the shrub stratum. Also depending on site productivity, composition of the herbaceous stratum varies from graminoid- to forb-rich. Tussock cottongrass (*Eriophorum vaginatum*) and Bigelow's sedge (*Carex bigelowii*) may be abundant in subarctic sites. Bryophytes and lichens are abundant in this habitat type with lichens increasing with greater site exposure and drainage. Common mosses include splendid feather moss (*Hylocomium splendens*) and *Sphagnum* species, with lichens, primarily *Cladonia* spp., *Stereocaulon* spp., *Nephroma arcticum*, *Peltigera* spp., and *Cetraria* spp., becoming an important component of the understory in mature stands.

Appendix F. Continued.

*Range:*

Occurring in treeline and cold-soil settings throughout all six biogeographic regions but primarily in the Central, Western, and Southwest regions (Figure F4).

*Climate:*

The boreal continental climate is characterized by short, warm summers and long, very cold winters. Permafrost is nearly continuous, which contributes to slow tree growth and open canopies.

*Environment:*

As treelines can be limited by elevation, latitude, or longitude, this habitat type develops at the transition from subalpine to alpine habitat in the mountains, from subarctic to Arctic habitat in northern and western Alaska. Subalpine woodlands may occupy a narrow elevational band whereas subarctic woodlands may occupy a wide latitudinal or longitudinal expanse of many kilometers. Woodlands also develop in nontreeline settings where soils are abnormally cold due to shallow permafrost or cold air drainage. Soils are either thin, rocky and well-drained, developing on residual bedrock and hillside colluvium or mesic and nutrient poor, underlain by ice-rich permafrost.

*Disturbance:*

The expression of boreal woodlands on the landscape is largely dependent on climate, and the associated frequent presence of permafrost. Regional change in temperature and precipitation can cause expansion or contraction of treeline, or aggradation or degradation of permafrost. Where climate becomes milder, woodlands are likely to transition to forest or shrubland and extend their range. For example, in response to a changing climate, treeline is advancing throughout boreal Alaska and extending into the low Arctic in the western Brooks Range. Where climate becomes more extreme, subalpine and subarctic woodlands are likely to transition to alpine and Arctic tundra, respectively. Wildland fire is a common disturbance in boreal ecosystems. Depending on the severity and scale of a burn, woodlands may revert to grasslands or shrublands. Subalpine sites may be susceptible to avalanche.

## FLOODPLAIN FORESTS

### Temperate Floodplain Forest

USNVC Synonym: Vancouverian Flooded & Swamp Forest (M035)

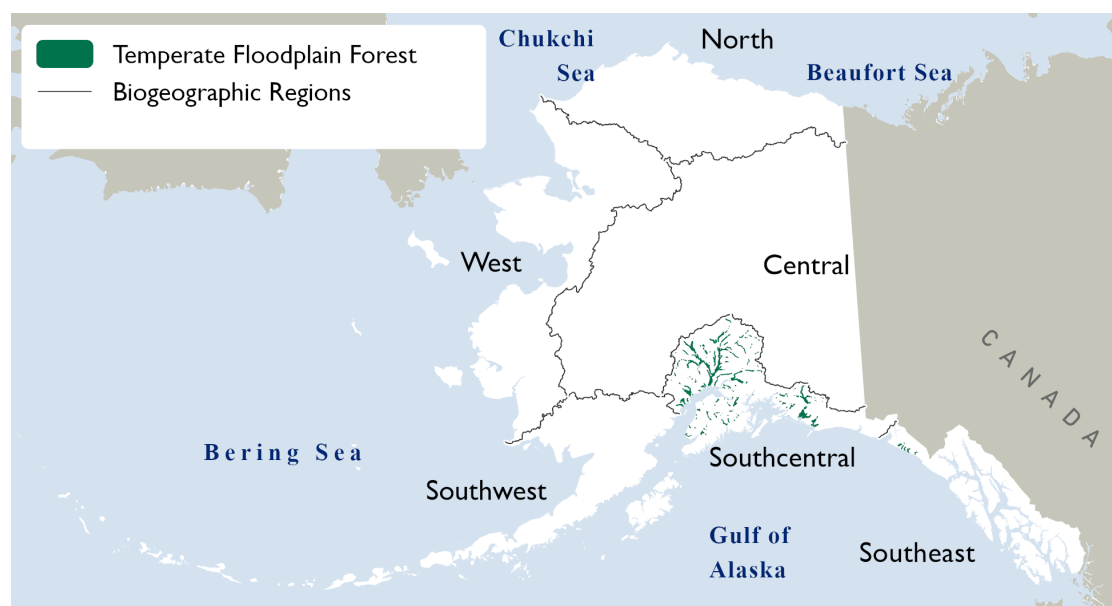


Figure F5. Distribution of temperate floodplain forests in Alaska.

Appendix F. Continued.

*Physiognomy:*

Temperate floodplain forests form broad mosaics across floodplains of high-volume rivers and narrow corridors along smaller streams. Structure varies from mixed needleleaf-broadleaf floodplain forests, to young broadleaf forests along riparian corridors. Tall to low deciduous broadleaf shrub understories are associated with frequently disturbed floodplain and riparian sites while forbs occupy more stable substrates.

*Floristics:*

In temperate floodplain forests, plant community composition is largely dependent on the source of floodwaters. Glacially-fed rivers are characterized by large-scale and frequent flood events with high sediment input. In these areas, species that can tolerate inundation and sedimentation establish. Canopies are typically dominated by black cottonwood (*Populus trichocarpa*) and red alder (*Alnus rubra*) with Sitka spruce (*Picea sitchensis*) gaining dominance as the community matures. In the understory, Sitka alder (*Alnus alnobetula* ssp. *sinuata*) occupies the most frequently disturbed sites with forbs, including threelobe foamflower (*Tiarella trifoliata*), enchanter's nightshade (*Circaea alpina*), pioneer violet (*Viola glabella*), and twisted stalk (*Streptopus amplexifolius*) indicating aerated, nutrient-rich soils with good water flow.

Nonglacial streams experience smaller-scale and less frequent overbank flooding. Along these riparian corridors, the forest canopy is dominated by Sitka spruce with red alder establishing. Characteristic understory shrubs include salmonberry (*Rubus spectabilis*), devilsclub (*Oplopanax horridus*), redosier dogwood (*Cornus sericea*), and stink currant (*Ribes bracteosum*). On the most stable sites, western hemlock (*Tsuga heterophylla*) can establish in the subcanopy but does not assume dominance. Forbs such as skunkcabbage (*Lysichiton americanus*), false lily of the valley (*Maianthemum dilatatum*), and lady fern (*Athyrium filix-femina*) grow on organic-rich or poorly-drained substrates.

*Range:*

Occurring in settings prone to riverine flooding in the Southeastern biogeographic region; continuing westward through Southcentral to Cook Inlet and the Kenai Peninsula (Figure F5).

*Climate:*

The maritime climate is cool in the summer and mild in the winter with low annual variation in temperature. Precipitation as rain, snow, and fog drip is abundant.

*Environment:*

This habitat type develops on well-drained soils subject to overbank flooding. Flooding regimes range from narrow extents driven by precipitation events along low-volume streams to broad-scale seasonal floods driven by glacial runoff and snowmelt. Glacially-fed rivers occur primarily on the mainland, while nonglacially-fed rivers occur on both the mainland and large islands in the Gulf of Alaska. Soils are alluvial, well-drained, and poorly developed. Sand, gravel, or cobble are characteristic of the active floodplain, with finer silts and clays in lower energy depositional environments. Woody debris provides important regeneration sites for spruce and hemlock seedlings.

*Disturbance:*

Flooding and the associated erosion and redeposition of sediment are the primary disturbances. Along small, low-energy streams, seasonal overbank flooding will deposit fine, often nutrient rich, sediment. Alternatively, spring breakup along glacially-fed rivers are high-energy events resulting in channel migration and occasionally, catastrophic damage to the built environment.

Appendix F. Continued.

## Boreal Floodplain Forest

USNVC Synonym: North American Boreal Flooded & Rich Swamp Forest (M300)



Figure F6. Distribution of boreal floodplain forest in Alaska.

### *Physiognomy:*

Boreal floodplain forests form broad mosaics across floodplains of high-volume rivers and narrow corridors along smaller streams. The forest canopy is dominated by broadleaf or needleleaf trees, or a mixture of both. Tall to low deciduous broadleaf shrub understories are associated with frequently disturbed floodplain settings.

### *Floristics:*

Plant community composition depends on the extent, duration, and frequency of flooding. New alluvial surfaces are pioneered by early-seral herbaceous species such as subalpine aster (*Eurybia sibirica*), alpine sweetvetch (*Hedysarum americanum*), blacktip ragwort (*Senecio lugens*), and field horsetail (*Equisetum arvense*). Mid-seral woody shrubs, such as feltleaf willow (*Salix alaxensis*), and alder species establish next. Thinleaf alder (*Alnus incana* ssp. *tenuifolia*) occurs across the region, Siberian alder (*Alnus alnobetula* ssp. *fruticosa*) is more common to the north, and Sitka alder (*Alnus alnobetula* ssp. *sinuata*) is more common in the south. Trees establish as the communities mature and the tall-shrub component is gradually shaded out. Mid-seral floodplain forests are dominated or codominated by balsam poplar (*Populus balsamifera*) and white spruce (*Picea glauca*) with an understory of alder and willow shrubs, bluejoint reedgrass (*Calamagrostis canadensis*), and bryophytes. Black cottonwood (*Populus trichocarpa*) and Lutz spruce (*Picea × lutzii*) may replace balsam poplar and white spruce towards the south. Balsam poplar does not regenerate in the understory, and consequently white spruce gains dominance on older surfaces. Here, common understory species include prickly rose (*Rosa acicularis*), highbush cranberry (*Viburnum edule*), twinflower (*Linnaea borealis*), wintergreen (*Pyrola* spp.), and bunchberry dogwood (*Cornus canadensis*). Feathermosses (*Hylocomium splendens* and *Pleurozium schreberi*) and lichens such as *Peltigera* spp. also occur on these older floodplain surfaces.

### *Range:*

Occurring in settings prone to riverine flooding in the Central, Western, and Southwest biogeographic regions (Figure F6). This habitat has also been mapped sparingly in the Southcentral region.

Appendix F. Continued.

*Climate:*

The boreal continental climate is characterized by short, warm summers and long, very cold winters. Although permafrost is nearly continuous in the region, the capacity of water to hold heat depresses the elevation of permanently frozen ground along large rivers. Local conditions related to the deep seasonal thaw of soils in combination with the extreme effects of flooding often override the influence of regional climate.

*Environment:*

This habitat type develops on well-drained soils subject to overbank flooding. Flooding regimes range from narrow extents driven by precipitation events along low-volume streams to broad-scale seasonal floods driven by glacial runoff, snowmelt, and the breakup of river ice. Soils are alluvial, well-drained, and poorly developed. Sand, gravel, or cobble are characteristic of the active floodplain, with finer silts and clays in lower energy depositional environments. Permafrost is usually deep or absent.

*Disturbance:*

Flooding and the associated erosion and redeposition of sediment are the primary disturbances. Along small, low-energy streams, seasonal overbank flooding will deposit fine, often nutrient rich, sediment. Alternatively, spring breakup along glacially-fed rivers are high-energy events resulting in channel migration and occasionally, catastrophic damage to the built environment. Ice dams and ice scour are important disturbance dynamics that can affect large areas, primarily along larger rivers. Fire frequency in floodplain systems is less than that of the surrounding terrain as channels can act as firebreaks and early-seral vegetation is less flammable than the surrounding, mature boreal forest.

## FRESHWATER WETLANDS

### Temperate Forested Wetland

USNVC Synonyms: North Pacific Bog (M559)

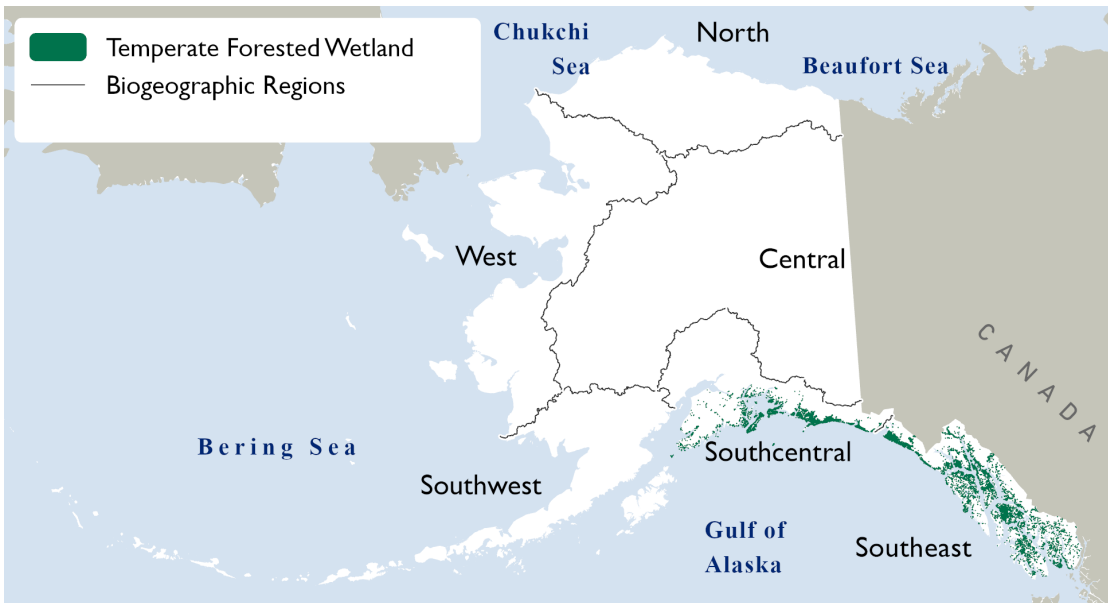


Figure F7. Distribution of temperate forested wetland in Alaska.

*Physiognomy:*

Temperate forested wetlands occur as dwarf needleleaf woodlands in bog and fen settings and as full-stature, closed canopy stands of needleleaf trees. Woodland bogs are characterized by dwarf ericaceous shrubs and

## Appendix F. Continued.

bryophytes in the understory while woodland fens support low deciduous shrubs and a diversity of forbs and graminoids. Mature wetland forests are characterized by tall needleleaf trees and a discontinuous low to tall broadleaf shrub understory punctuated by wetter pockets of obligate wetland species; bryophytes can provide a nearly continuous groundcover.

*Floristics:*

Bogs and fens differ in the source and flow of their water inputs. Bogs, which receive most of their water from nutrient-poor precipitation, have minimal throughflow of groundwater, resulting in acidic conditions, which in turn, favors the establishment of slow-growing plants such as ericaceous shrubs and *Sphagnum* moss. Conversely, fens receive water inputs from the throughflow of more nutrient-rich groundwater, resulting in circumneutral to alkaline conditions that promote a diverse growth of productive plants, such as deciduous shrubs, forbs, and brown mosses.

Woodland bogs and fens, known colloquially as ‘muskeg’, are characterized by a mosaic of trees, low shrubs, herbs, mosses, and standing water across hummocky topography. Conifers capable of growing in saturated conditions such as beach pine (*Pinus contorta* var. *contorta*), western hemlock (*Tsuga heterophylla*), mountain hemlock (*Tsuga mertensiana*), Alaska cedar (*Callitropsis nootkatensis*), and Sitka spruce (*Picea sitchensis*) are common species. Trees, together with other low and dwarf shrubs, occupy the higher, better drained ground with herbaceous species and bryophytes relegated to the wetter hollows.

In bog settings, the shrub understory is dominated by ericaceous shrubs including bog labrador tea (*Rhododendron groenlandicum*), bog blueberry (*Vaccinium uliginosum*), and crowberry (*Empetrum nigrum*). Forbs, including cloudberry (*Rubus chamaemorus*), burnet (*Sanguisorba officinalis*), sticky tofieldia (*Triantha glutinosa*), roundleaf sundew (*Drosera rotundifolia*), deercabbage (*Nephrophyllidium crista-galli*), and sedges such as tufted bulrush (*Trichophorum cespitosum*), fewflower sedge (*Carex pauciflora*), livid sedge (*Carex livida*), Arctic sedge (*Carex anthoxanthea*), manyflower sedge (*Carex pluriflora*), and variegated sedge (*Carex stylosa*) are interspersed. *Sphagnum* mosses are common in depressions and at water margins.

Woodland fens differ in supporting a greater diversity of species, many of which are calciphytes. While many taxa are common to both woodland bogs and fens, fens typically lack beach pine, ericaceous shrubs, and *Sphagnum* mosses. Woody species characteristic of fens include small trees and shrubs such as crab apple (*Malus fusca*), redosier dogwood (*Cornus sericea*), sweetgale (*Myrica gale*), and alpine laurel (*Kalmia microphylla*). The forbs: buckbean (*Menyanthes trifoliata*), darkthroat shooting star (*Dodecatheon pulchellum*), and fringed grass of parnassus (*Parnassia fimbriata*), mountain bladderfern (*Cystopteris montana*), and graminoids including yellow sedge (*Carex flava*), star sedge (*Carex echinata*), thinleaf cottonsedge (*Eriophorum viridicarinatum*), and tufted hairgrass (*Deschampsia cespitosa*) are characteristic. The moss flora of fens is typically dominated by brown mosses such as the aquatic species *Scorpidium scorpioides* and members of the *Drepanocladus* genus and wet-site species such as *Tomentypnum nitens*, *Aulacomnium turgidum*, and *Paludella squarrosa*.

Forested wetlands support an even mixture of western hemlock (*Tsuga heterophylla*), mountain hemlock (*Tsuga mertensiana*), and Alaska cedar (*Callitropsis nootkatensis*). The giant, charismatic forb, skunkcabbage, (*Lysichiton americanus*) is diagnostic of the habitat type, occupying pockets of standing water on the forest floor. Similar to coastal rainforests, common understory shrubs include blueberries (*Vaccinium ovalifolium*, *Vaccinium alaskaense*), rusty menziesia (*Rhododendron menziesii*), and devilsclub (*Oplopanax horridus*), with salal (*Gaultheria shallon*) restricted to the southern half of the range. Forbs (*Veratrum viride*, *Cornus canadensis*, *Coptis asplenifolia*, *Rubus pedatus*), ferns (*Athyrium filix-femina*, *Gymnocarpium dryopteris*) and *Sphagnum* mosses are frequent associates.

*Range:*

Occurring in peatland settings in the Southeastern biogeographic region; continuing westward through Southcentral to Cook Inlet and the Kenai Peninsula (Figure F7).

Appendix F. Continued.

*Climate:*

The maritime climate is cool in the summer and mild in the winter with low annual variation in temperature. Precipitation as rain, snow, and fog drip is abundant.

*Environment:*

Saturated soils result from high levels of precipitation and impeded drainage due to gentle terrain and shallow mineral soils with low permeability or bedrock. Owing to their depressional, concave topography, woodland bogs receive most of their water input from precipitation and surface flow. Woodland fens, which are often located in basins or toeslope positions receive water from groundwater flow. When this groundwater has passed through calcareous parent material (limestone, dolomite, or marble), soil water conditions are alkaline and unique plant communities develop. Owing also to differences in hydrology, bogs are characterized by pools of standing water among hummocks, whereas fens often support small channels across more even terrain. The saturation and inundation that, in part, defines the wetland condition, slows soil decomposition such that organic matter accumulates as woody, *Sphagnum*, or sedge peat. Poorly drained soils range from organic veneers over wet mineral soils, to peat over shallow bedrock, to deeper organics.

*Disturbance:*

Any activity that influences the balance between surface and ground water inflow and discharge will impact wetlands. Wetland sites with saturated soils and mature, full stature trees are subject to landslide and windthrow. Forested wetlands located in watersheds that are heavily managed for timber may be adversely impacted by the increased runoff following upgradient harvest.

## Boreal Forested Wetland

USNVC Synonym: North American Boreal Conifer Poor Swamp (M299)



Figure F8. Distribution of boreal forested wetland in Alaska.

*Physiognomy:*

Boreal forested wetlands have woodland to open canopies dominated by needleleaf trees. Where wetland conditions result from the presence of shallow and ice-rich permafrost, the growth of trees is stunted and dwarf shrubs and bryophytes are important components of the understory. This is a common and widespread habitat type that is colloquially referred to as “black spruce bog.” Where wetland conditions result from high

## Appendix F. Continued.

groundwater levels that are unrelated to permafrost, soil and water is warmer and needleleaf trees are more likely to reach full stature; broadleaf shrubs and herbs characterize the lower strata. Tamarack fens are a good example of this less common variant.

*Floristics:*

Forested bogs are dominated by black spruce (*Picea mariana*) and *Sphagnum* mosses are consistently present. Dwarf, often ericaceous shrubs, including lingonberry (*Vaccinium vitis-idaea*), bog blueberry (*Vaccinium uliginosum*), bog Labrador tea (*Rhododendron groenlandicum*), marsh Labrador tea (*Rhododendron tomentosum*), resin birch (*Betula glandulosa*), dwarf birch (*Betula nana*), crowberry (*Empetrum nigrum*), and small cranberry (*Oxycoccus microcarpus*) are characteristic of the understory. Herbaceous species include wet site species such as water sedge (*Carex aquatilis*) and tall cottongrass (*Eriophorum angustifolium*) and mesic site species such as tussock cottongrass (*Eriophorum vaginatum*) and cloudberry (*Rubus chamaemorus*). In addition to *Sphagnum* species, bryophytes in the *Drepanocladus*, *Campylium*, *Tomentypnum*, *Ptilium*, *Pleurozium*, and *Rhytidiadelphus* genera are common. Lichens in the *Cladonia* genus establish on drier microsites.

Forested fens are comprised of a mix of black spruce, Alaska birch (*Betula neoalaskana*), and tamarack (*Larix laricina*). Understory shrubs include bog rosemary (*Andromeda polifolia*), dwarf birch, leatherleaf (*Chamaedaphne calyculata*), sweetgale (*Myrica gale*), marsh labrador tea (*Rhododendron tomentosum* ssp. *decumbens*), and cloudberry (*Rubus chamaemorus*). The herbaceous layer may include water horsetail (*Equisetum fluviatile*), roundleaf sundew (*Drosera rotundifolia*), Bigelow's sedge (*Carex bigelowii*), narrowleaf bur-reed (*Sparganium angustifolium*), buckbean (*Menyanthes trifoliata*), and purple marshlocks (*Comarum palustre*). The moss flora often includes brown mosses such as *Tomentypnum nitens* and *Aulacomnium palustre*.

*Range:*

A common and widespread habitat type developing in peatland settings across the Central and Southcentral biogeographic regions, extending to the limit of continuous forest in the Western and Southwest regions (Figure F8). This habitat has also been mapped sparingly in the Northern and Southeast regions.

*Climate:*

The boreal climate is characterized by short, warm summers and long, very cold winters. Permafrost is nearly continuous, which contributes to slow tree growth, open canopies, and the accumulation of organic matter as peat.

*Environment:*

Boreal wetlands occur at scales ranging from discrete patches in depressions to extensive wetland complexes over large areas of level, poorly drained terrain. Soils are invariably wet with soil development and nutrient availability varying between forested bogs and fens. As nutrient-poor precipitation is the primary water source for bogs, soils are poorly developed and acidic with thick accumulations of organic matter. Permafrost is shallow with high volumes of interstitial ice, which retards the infiltration of water and maintains soil saturation. Woody species root on microsites that are elevated above the water table. Fens, which are fed by nutrient-rich groundwater and are not underlain by shallow permafrost tend to have more well-developed and alkaline soils. In these systems, high groundwater is maintained by proximity to a waterbody or change in hydrology that results in the damming or diversion of groundwater. Change in hydrology is often related to permafrost thaw but may also result from human disturbance.

*Disturbance:*

The expression of boreal wetlands on the landscape is largely dependent on climate, and the associated presence of permafrost. Where regional increase in temperature results in permafrost degradation and

## Appendix F. Continued.

improved drainage, sites may transition out of the wetland condition. Wildland fire is a common disturbance in boreal ecosystems. Depending on the severity and scale of a burn, forested wetlands may revert to grasslands or shrublands.

In forested wetlands located adjacent to a waterbody, groundwater levels change in concert with lake or pond levels. Under conditions of prolonged inundation, plants not adapted to wetland or aquatic hydrology may die. Under low water conditions, ruderal species may colonize previously inundated substrates.

Tamarack (aka larch) is susceptible to several insect pests, which have caused widespread mortality of stands in the past. These include the larch sawfly (*Pristiphora erichsonii*), larch bud moth (*Zieraphera* sp.) and eastern larch beetle (*Dendroctonus simplex*).

### Temperate Marsh, Wet Meadow, and Shrubland

USNVC Synonym: Vancouverian Lowland Marsh, Wet Meadow & Shrubland (M073)

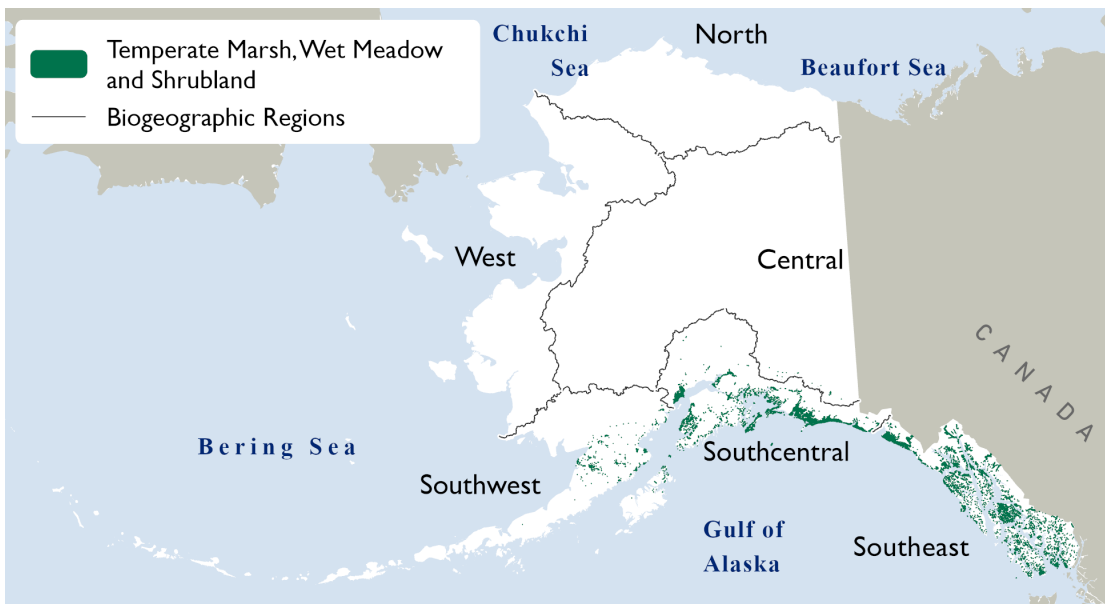


Figure F9. Distribution of temperate marsh, wet meadow, and shrubland in Alaska.

#### Physiognomy:

Temperate marshes and wet meadows and shrublands are freshwater wetland systems comprised of annual herbs, emergent, rhizomatous graminoids and forbs, and low deciduous broadleaf shrubs. The establishment of trees and lichens is impeded by inundation; however, aquatic mosses may be locally abundant. Stands include sparse, nonsaline mudflats, emergent marshes, herbaceous wet meadows, and riparian shrublands. Vegetation may occur as a near monoculture in permanently flooded basin sites or as a mosaic of herbaceous and woody types in sites with more heterogenous topography and moisture gradients.

#### Floristics:

As this habitat type occurs across a broad range of settings, it supports a variety of species. Sparse nonsaline mudflats are home to low forbs such as mountain mare's tail (*Hippuris montana*), and annuals such as toad rush (*Juncus bufonius*) and water mudwort (*Limosella aquatica*). By definition, freshwater marshes are dominated by emergent species. Rhizomatous graminoids, such as common spikerush (*Eleocharis palustris*), softstem bulrush (*Schoenoplectus tabernaemontani*), water sedge (*Carex aquatilis*), Sitka sedge (*Carex sitchensis*), Northwest Territory sedge (*Carex utriculata*), beaked sedge (*Carex rostrata*), rock sedge (*Carex saxatilis*), broadleaf cattail (*Typha latifolia*), Baltic rush (*Juncus balticus*), and narrowleaf bur-reed (*Sparganium angustifolium*) may form monocultures in such habitats. Rhizomatous forbs such as water

## Appendix F. Continued.

horesetail (*Equisetum fluviatile*), variegated scouringrush (*Equisetum variegatum*), common mare's tail (*Hippuris vulgaris*), water arum (*Calla palustris*), buckbean (*Menyanthes trifoliata*), and purple marshlocks (*Comarum palustre*) may occupy smaller, often marginal patches within the marsh. Aquatic mosses such as *Scorpidium scorpioides*, *Scorpidium revolvens*, and *Philonotis fontana* as well as the wet-site species *Tomentypnum nitens* and *Aulacomnium turgidum* may occur at the transition from water to land.

Wet meadows with some movement of groundwater and protection from wind tend to be dominated by bluejoint reedgrass (*Calamagrostis canadensis*), with a mix of subdominant forbs including fireweed (*Chamaenerion angustifolium*), seacoast angelica (*Angelica gmelinii*), field horsetail (*Equisetum arvense*), water horsetail (*Equisetum fluviatile*), marsh pea (*Lathyrus palustris*), and beachhead iris (*Iris setosa*). In the alpine, where hydrology is sustained by seepage from nearby snow melt or seeps rather than groundwater, meadows tend to be more forb rich. Typical herbs include: deercabbage (*Nephrophyllidium crista-galli*), patridgefoot (*Luetkea pectinata*), creeping sibbaldia (*Sibbaldia procumbens*), alpine mountainsorrel (*Oxyria digyna*), Mertens' rush (*Juncus mertensianus*), dwarf fireweed (*Chamaenerion latifolium*), monkey flower (*Mimulus guttatus*), marsh grass of parnassus (*Parnassia palustris*), marsh violet (*Viola epipsila*), and burnet (*Sanguisorba canadensis*). The snowbed-associated moss, *Andreaea blyttii* may be locally abundant.

Riparian or otherwise wet shrublands are typically dominated by alder in disturbed or nutrient-poor settings and willow in sites with more mature soils and available nutrients. Common alder species include thinleaf (*Alnus incana* ssp. *tenuifolia*) and Sitka (*Alnus alnobetula* ssp. *sinuata*) alder; common willows include Barclay's (*Salix barclayi*), undergreen (*Salix commutata*), grayleaf (*Salix glauca*), and tealeaf (*Salix pulchra*) willow. Shrub associates may include redosier dogwood (*Cornus sericea*), and in the southern portion of the range, rose spirea (*Spiraea douglasii*). In addition to herbaceous species associated with wet meadows, ferns and fern allies such as ladyfern (*Athyrium filix-femina*), oakfern (*Gymnocarpium dryopteris*), and field horsetail (*Equisetum arvense*) may be common in the understory.

**Range:**

Occurring in wetland settings in the Southeast, Southcentral, and Southwest biogeographic regions (Figure F9). These wetlands have also been mapped sparingly in the Central region.

**Climate:**

The maritime climate is cool in the summer and mild in the winter with low annual variation in temperature. Precipitation as rain, snow, and fog drip is abundant.

**Environment:**

Temperate marshes and wet meadows and shrublands develop at low elevations along the coast in interdune swales and inter-levee sloughs, and farther inland on floodplains, shallow lake beds, the margins of ponds and lakes, and the banks of rivers and streams. Above treeline, wet meadows may also develop in alpine floodplains. These are freshwater systems that form in areas of regular inundation (mudflats), saturation (wet meadows), or slow moving or standing water (emergent marshes and wet shrublands). Soils may be mineral silts or sands or well-decomposed organic mucks; water is nutrient-rich. These systems are highly productive and have high rates of decomposition.

**Disturbance:**

These wetlands are subject to flooding, groundwater discharge, or surface inundation resulting from proximity to waterbodies, including tidal pulses of freshwater or subsurface water due to high water table. Flooding may be accompanied by burial by sand and other coarse material. Isolated wetlands in backdune systems are subject to changes in the size and location of the wet swales as the sand dunes shift with active dune migration. Systems will be impacted by any alterations to the natural hydrology that raise or lower the elevation of the groundwater or surface water, or change the frequency of flooding or duration of inundation. Temperate wet meadows and marshes are particularly susceptible to colonization by invasive reed canarygrass (*Phalaris arundinacea*) and purple loosestrife (*Lythrum salicaria*).

Appendix F. Continued.

## Temperate Fen

USNVC Synonym: North Pacific Fen (M560)

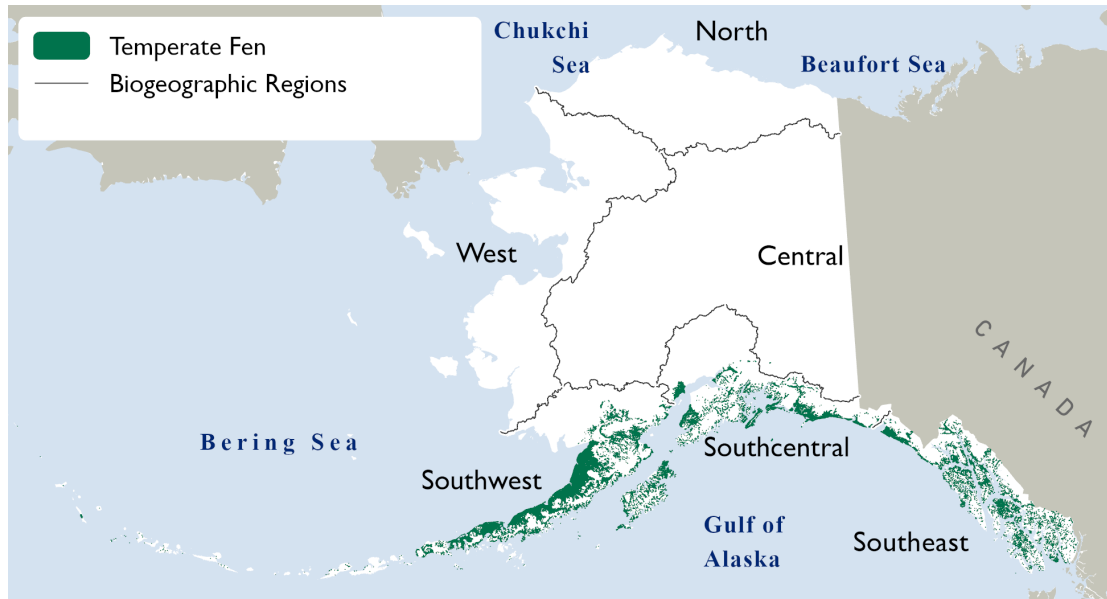


Figure F10. Distribution of temperate fen in Alaska.

### *Physiognomy:*

Temperate fens are small in extent and uncommon on the landscape. Vegetation cover is continuous and characterized by a species-rich assemblage of graminoids, forbs, and bryophytes. Low to dwarf shrubs establish but do not gain dominance.

### *Floristics:*

Fens are characterized by a high diversity of graminoids and forbs where typically no single species is dominant. Species composition is driven by hydrogeochemistry with fens categorized as poor (low pH) or rich (circumneutral to high pH). Poor fens resemble bogs and are more likely to support low and dwarf shrubs. Different from bogs, poor fens lack ericaceous shrubs and *Sphagnum* is either absent or present in small amounts. Rich fens support a diversity of herbs, many of which are calciphytes. Species characteristic of both poor and rich fens include the forbs: buckbean (*Menyanthes trifoliata*), purple marshlocks (*Comarum palustre*), deercabbage (*Nephrrophyllidium crista-galli*), burnet (*Sanguisorba canadensis*), felwort (*Swertia obtusa*), scentbottle (*Platanthera dilatata*), and graminoids including water sedge (*Carex aquatilis*), rock sedge (*Carex saxatilis*), and mud sedge (*Carex limosa*). Shrubs such as sweetgale (*Myrica gale*), alpine laurel (*Kalmia microphylla*), and rose spirea (*Spiraea douglasii*) may establish in small amounts. The moss flora of fens is typically dominated by brown mosses such as the aquatic species: *Scorpidium scorpioides*, *Scorpidium revolvens*, and *Philonotis fontana* as well as the wet-site species *Tomentypnum nitens* and *Aulacomnium turgidum*. Rich fens consistently feature the graminoids: Sitka (*Carex sitchensis*), yellow (*Carex flava*), star (*Carex echinata*), and thinleaf cotton (*Eriophorum viridicarinatum*) sedges, Suksdorf's spikerush (*Eleocharis suksdorfiana*), and tufted hairgrass (*Deschampsia cespitosa*), the forbs: shootingstar (*Dodecatheon pulchellum*), fringed grass of parnassus (*Parnassia fimbriata*), and hooded lady's tresses (*Spiranthes romanzoffiana*), and the aquatic mosses: *Meesia triquetra* and *Paludella squarrosa*.

### *Range:*

Occurring in peatland settings in the Southeastern, Southcentral, and Southwest biogeographic regions (Figure F10). This habitat has also been mapped sparingly in the Central region.

Appendix F. Continued.

*Climate:*

The maritime climate is characterized by relatively cool summers and warm winters, high annual precipitation, high humidity, and particularly along the Aleutian Archipelago, strong and consistent winds.

*Environment:*

As shallow and flowing groundwater is requisite for the formation and maintenance of fens, they typically develop across gentle slopes, or in areas of groundwater discharge such as toeslopes, alpine basins, and adjacent to ponds and small streams. In some locations, high precipitation can overcome the drainage afforded by terrain, allowing fens to develop on relatively steep slopes. The soil and water chemistry of a fen is largely determined by the bedrock composition of the surrounding watershed. Granitic rocks produce acidic waters (low pH), while limestone and volcanic rocks produce circumneutral to alkaline water (high pH). Saturation and inundation slow soil decomposition such that in fens, organic matter accumulates as sedge peat. Poorly drained soils range from organic veneers over wet mineral soils, to peat over shallow bedrock, to deeper organics. Small channels are common.

*Disturbance:*

Fens are slow-developing systems that are difficult to restore following disturbance. Fens on slopes are susceptible to soil creep and landslides whereas fens developing on gentle terrain are more stable. The dominant factor governing the dynamics of these systems is a stable hydrologic regime. Changes in water level or frequency and duration of inundation may initiate transition to a different habitat type.

### Boreal Marsh, Wet Meadow, and Shrubland

USNVC Synonym: North American Boreal Marsh, Wet Meadow & Shrubland (M894)



Figure F11. Distribution of boreal marsh, wet meadow, and shrubland in Alaska.

*Physiognomy:*

Boreal marshes and wet meadows and shrublands are freshwater wetland systems comprised of emergent, rhizomatous graminoids and forbs, and low deciduous broadleaf shrubs. The establishment of trees and lichens is impeded by inundation; however, aquatic mosses may be locally abundant. Stands include sparse, nonsaline mudflats, emergent marshes, herbaceous wet meadows, and riparian shrublands. Vegetation may occur as near monocultures in permanently-flooded basin sites or as a mosaic of herbaceous and woody types

## Appendix F. Continued.

in sites with more heterogenous topography and moisture gradients. Particularly in marsh settings, species diversity may be low.

*Floristics:*

Vegetation zonation is related to water depth and duration of inundation. A typical sequence along a gradient of decreasing water depth progresses from open water to emergent marsh to wet meadow and shrubland. Characteristic plant community composition for each habitat type is described in the following.

By definition, marshes are dominated by emergent species, many of which are rhizomatous. Graminoids, such as water sedge (*Carex aquatilis*), Northwest Territory sedge (*Carex utriculata*), softstem bulrush (*Schoenoplectus tabernaemontani*), and broadleaf cattail (*Typha latifolia*), and forbs such as purple marshlocks (*Comarum palustre*), buckbean (*Menyanthes trifoliata*), water horesetail (*Equisetum fluviatile*), marsh horsetail (*Equisetum palustre*), and common mare's-tail (*Hippuris vulgaris*) are common. Pendant grass (*Arctophila fulva*) becomes more common in the northern portions of the range. Aquatic mosses such as *Scorpidium scorpioides*, *Scorpidium revolvens*, and *Philonotis fontana* as well as the wet-site species *Tomentypnum nitens* and *Aulacomnium turgidum* may occur at the transition from water to land.

Wet meadows in wind-protected sites are dominated by bluejoint reedgrass (*Calamagrostis canadensis*), with a mix of subdominant herbs including fireweed (*Chamaenerion angustifolium*), woolyfruit sedge (*Carex lasiocarpa*), bluebells (*Mertensia paniculata*), and field horsetail (*Equisetum arvense*). In the alpine, where sites are exposed and hydrology is sustained by the melt of upgradient snow or seeps rather than groundwater, meadows tend to be more forb rich and shorter in stature. Typical herbs include dwarf fireweed (*Chamaenerion latifolium*), creeping sibbaldia (*Sibbaldia procumbens*), alpine mountainsorrel (*Oxyria digyna*), nodding saxifrage (*Saxifraga cernua*), meadow bistort (*Bistorta plumosa*), marsh grass of parnassus (*Parnassia palustris*), marsh violet (*Viola epipsila*), burnet (*Sanguisorba canadensis*), Bigelow's sedge (*Carex bigelowii*), and ice grass (*Phippsia algida*). The snowbed-associated moss *Andreaea blyttii* may be locally abundant.

Riparian or otherwise wet shrublands are typically dominated by alder in disturbed or nutrient-poor settings and willow in sites with more mature soils and available nutrients. Common alder species include thinleaf (*Alnus incana* ssp. *tenuifolia*) and Sitka (*Alnus alnobetula* ssp. *sinuata*) alder; common willows include tealeaf (*Salix pulchra*) and Richardson's (*Salix richardsonii*) willow. Shrub birch (*Betula nana*, *Betula glandulosa*) and sweetgale (*Myrica gale*) may be present in organic-rich depressions. On floodplains and deltas, shrub dominance transitions to feltleaf willow (*Salix alaxensis*) and grayleaf willow (*Salix glauca*). Common understory species include subalpine aster (*Eurybia sibirica*), blacktipped ragwort (*Senecio lugens*), merckia (*Wilhelmsia physodes*), and field horsetail (*Equisetum arvense*).

*Range:*

Developing in wetland settings primarily in the Central and Western biogeographic regions (Figure F11). These habitats have also been mapped sparingly in the other four terrestrial biogeographic regions.

*Climate:*

The boreal climate is characterized by short, warm summers and long, very cold winters. While permafrost is nearly continuous, the high capacity of water to store heat reduces the effects of permafrost in these near-aquatic systems.

*Environment:*

Boreal marshes and wet meadows and shrublands are freshwater wetland systems that form in areas of regular inundation (floodplains), saturation (wet meadows), or slow moving or standing water (emergent marshes and wet shrublands). The habitat type develops in a variety of settings. At low elevations wetlands develop in interdune swales, across the lower energy portions of floodplains, on inland deltas where rivers drain into large lakes, and along the margins of ponds, lakes, and streams. Above treeline, wet meadows may

Appendix F. Continued.

also develop in alpine floodplains. Soils may be mineral silts or sands or well-decomposed organic matter, and water is nutrient-rich. These systems are highly productive and have high rates of decomposition. Permafrost may contribute to waterlogging of sites where it is ice-rich and shallow.

*Disturbance:*

These wetlands are subject to flooding, groundwater discharge, or surface inundation, resulting from proximity to waterbodies, or subsurface water due to high water table. Flooding may be accompanied by burial by sand and other coarse material. Isolated wetlands in inland dune systems are subject to changes in the size and location of the wet swales as the sand dunes shift with active dune migration. Systems are impacted by any alterations to the natural hydrology that raise or lower the elevation of the groundwater or surface water, or change the frequency of flooding or duration of inundation. Beaver, through their dam-building activities, can cause substantial hydrologic change to wetland systems, either causing flooding or the lowering of the water table, depending on the location of the site in relation to the dam. Wildland fire is a common disturbance in boreal ecosystems. Depending on the severity and scale of a burn, wetlands may revert to upland grasslands or shrublands.

### Boreal Bog

USNVC Synonym: North American Boreal & Subboreal Bog & Acidic Fen (M876)



Figure F12. Distribution of boreal bog in Alaska.

*Physiognomy:*

Boreal bogs develop as mosaics of low to dwarf shrubs, graminoids, and bryophytes. Ericaceous shrubs and *Sphagnum* are consistently present. Dwarf trees encroach on drier margins and ridges but do not gain dominance. Sites are nutrient poor and species diversity is low.

*Floristics:*

Bogs are characterized by low to dwarf, often ericaceous shrubs, including bog blueberry (*Vaccinium uliginosum*), lingonberry (*Vaccinium vitis-idaea*), bog labrador tea (*Rhododendron groenlandicum*), marsh labrador tea (*Rhododendron tomentosum*), crowberry (*Empetrum nigrum*), bog rosemary (*Andromeda polifolia*), small cranberry (*Oxycoccus microcarpus*), resin birch (*Betula glandulosa*), dwarf birch (*Betula nana*), and leatherleaf (*Chamaedaphne calyculata*). The graminoids: tussock cotton grass (*Eriophorum*

## Appendix F. Continued.

*vaginatum*), water sedge (*Carex aquatilis*), and smallawn sedge (*Carex microchaeta*) may be locally abundant. *Sphagnum* mosses are consistently present providing nearly continuous ground cover. The nitrogen-fixing feathermosses *Hylocomium splendens* and *Pleurozium schreberi* may be locally abundant. Lichens occur in low abundance on drier microsites. While forbs are not frequent, cloudberry (*Rubus chamaemorus*) and Arctic sweet coltsfoot (*Petasites frigidus*) show fidelity to this habitat type. Insectivorous plants such as roundleaf sundew (*Drosera rotundifolia*), butterwort (*Pinguicula vulgaris*), and bladderwort (*Utricularia intermedia*) are common features of nutrient-poor bogs. Dwarf black spruce (*Picea mariana*) may establish on drier margins and inclusions. The occurrence of tamarack (*Larix laricina*), sweet gale (*Myrica gale*), and leatherleaf (*Chamaedaphne calyculata*) increases with the availability of soil nutrients.

**Range:**

Occurring in peatland settings primarily across the Central, Western, Southwest, and Southcentral biogeographic regions (Figure F12). Boreal bogs have also been mapped sparingly in the other two terrestrial biogeographic regions.

**Climate:**

The boreal climate is characterized by short, warm summers and long, very cold winters. Permafrost is nearly continuous, which contributes to the slow growth of woody species and the accumulation of organic matter as peat.

**Environment:**

As nutrient-poor precipitation is the primary water source for bogs, soils are poorly developed and acidic, with thick accumulations of organic matter. Permafrost ranges from continuous in the central and western regions to isolated towards the south. Where permafrost is shallow with high volumes of interstitial ice, the infiltration of water is retarded and soil saturation is maintained. Anerobic conditions in combination with low temperatures slows decomposition and allows organic matter to accumulate as *Sphagnum* peat. The surface morphology of a bog may be flat to gently undulating with microtopography characterized by hummocks and hollows. As peat accumulates, elevated strings and depressed flarks may form, leading to extreme gradients of pH and moisture over short distances. The water table is at or just above the surface, allowing small pools to form in depressions. Woody species root on microsites that are elevated above the water table.

**Disturbance:**

The expression of boreal wetlands on the landscape is largely dependent on climate, and the associated presence of permafrost. Where regional increase in temperature results in permafrost degradation and improved drainage, sites may transition out of a wetland condition. Wildland fire is a common disturbance in boreal ecosystems. Depending on the severity and scale of a burn, bogs may transition to wet meadows or shrublands. Beaver, through their dam-building activities, can cause substantial hydrologic change to peatland systems, either causing flooding or the lowering of the water table, depending on the location of the site in relation to the dam.

Appendix F. Continued.

## Arctic Marsh, Wet Meadow, and Shrubland

USNVC Synonym: Arctic Freshwater Marsh & Wet Meadow (M870)



Figure F13. Distribution of Arctic marsh, wet meadow, and shrubland in Alaska.

### *Physiognomy:*

Arctic marshes, wet meadows, and wet shrublands establish as well-vegetated areas of emergent graminoids and broadleaf shrubs. Emergent graminoids often form monocultures. Shrubs tend to be low-statured in areas of ice-rich permafrost, and taller on well-drained substrates where seasonal thaw is deep. Aquatic mosses are abundant in waterlogged sites with ice-rich permafrost and lichens are typically absent. Species diversity is low in marsh settings, becoming richer in wet meadows and shrublands.

### *Floristics:*

Plant community composition follows a gradient of water depth and persistence. Deep and permanently flooded standing water often supports monocultures of pendant grass (*Arctophila fulva*) with dominance transitioning to creeping sedge (*Carex chordorrhiza*), water sedge (*Carex aquatilis*), and tall cottongrass (*Eriophorum angustifolium*) as the water shallows. Emergent forbs such as purple marshlocks (*Comarum palustre*), common mare's tail (*Hippuris vulgaris*), buckbean (*Menyanthes trifoliata*), and water horsetail (*Equisetum fluviatile*) are commonly associated species. Characteristic aquatic mosses include *Scorpidium scorpioides*, *Scorpidium revolvens*, *Sarmentypnum sarmentosum*, and *Drepanocladus* and *Sphagnum* species.

Where soils are inundated to oversaturated, a greater diversity of sedges flourish. In addition to water sedge, rock sedge (*Carex saxatilis*), round sedge (*Carex rotundata*), fragile sedge (*Carex membranacea*), looseflower alpine sedge (*Carex rariflora*), white cottongrass (*Eriophorum scheuchzeri*), and red cottongrass (*Eriophorum russeolum*) are common.

Low-statured wet shrublands are often dominated by tealeaf willow (*Salix pulchra*), bog willow (*Salix fuscescens*), and dwarf birch (*Betula nana*), with many of the above-mentioned sedges occurring in the wettest portions of the site. Mosses in the *Hylocomium*, *Sphagnum*, *Aluocomium*, and *Dicranum* genera show relatively high cover and constancy.

Floodplain and riparian shrublands often support taller willows such as *Salix arbusculoides*, *Salix glauca*, *Salix niphoclada*, *Salix pulchra*, and *Salix richardsonii* in areas receiving seasonal floods of low velocity water. Inactive portions of the floodplain subject to seasonal inundation are often dominated by mats of the

## Appendix F. Continued.

prostrate shrub entireleaf mountain-avens (*Dryas integrifolia*). Members of the horsetail genus (*Equisetum*) and fen-associated bryophytes in the *Tomentypnum*, *Calliergon*, and *Meesia* genera are consistently present.

*Range:*

Occurring in wetland settings primarily in the Northern and Western biogeographic regions (Figure F13). These wetlands have also been mapped sparingly in the Central and Southwest regions.

*Climate:*

The Arctic climate is dry and cold, characterized by very short summers and long winters. Most of the region is above the Arctic Circle and consequently receives continuous sunlight for several weeks in summer and continuous dark for several weeks in winter.

*Environment:*

Arctic freshwater marshes, wet meadows, and wet shrublands occur on the margins of ponds and lakes, in drained lake basins, low-center polygons, and polygon troughs, and along beaded streams and water tracks, and across string and flark topographies. They are also found on large to small floodplains in wet depressions, oxbows, and abandoned channels. Sites experience seasonal to semi-permanent flooding and water is at, or above, the surface for most of the short growing season. Soils are muck or mineral, and water is often nutrient-rich. The vegetation in this area is underlain by continuous permafrost; however, the active-layer thickness on floodplains alongside Arctic rivers is typically deeper than in the surrounding landscape. This results in deeper rooting depths and better-drained soils compared to adjacent tundra outside the floodplain.

*Disturbance:*

The dynamics of these habitats are influenced by periglacial and fluvial processes. In areas of fine-grained, ice-rich sediment, periglacial processes such as permafrost degradation and aggregation, cryoturbation, and solifluction are active. On the landscape scale, the cyclic development of patterned ground such as polygon tundra, thaw lakes, and string and flark fens is ongoing. The development of polygonal ground follows a cycle of ice wedge formation in thermal contraction cracks in permafrost, followed by ice wedge growth and connection to form a reticulate network of higher polygon centers and lower, wetland troughs. Over decades, ridges flanking the ice wedges are built by freeze thaw action and the comparatively lower polygon centers may become flooded. In a related process, thaw lakes may develop in flooded polygons and expand as adjacent terrain is inundated. Lakes are eventually drained by an intersecting stream or failure of a damming feature. Once drained, permafrost aggrades, water collects, and the cycle begins again. String and flark fens may develop where there is directional flow of surface water over shallow, ice-rich permafrost.

In floodplain settings, low-energy flooding may transport and deposit silt, but generally does not damage vegetation. Aggradation of sediment or channel migration away from sites can transition these wetlands of the elevational range or lateral reach of floodwaters thereby allowing development of upland tundra types. Conversely, erosion of sediment and channel migration towards sites can transition these wetlands into the active floodplain.

Appendix F. Continued.

## SHRUBLANDS AND GRASSLANDS

### Temperate Shrubland and Grassland

USNVC Synonym: Northern Vancouverian Lowland-Montane Grassland & Shrubland (M172)

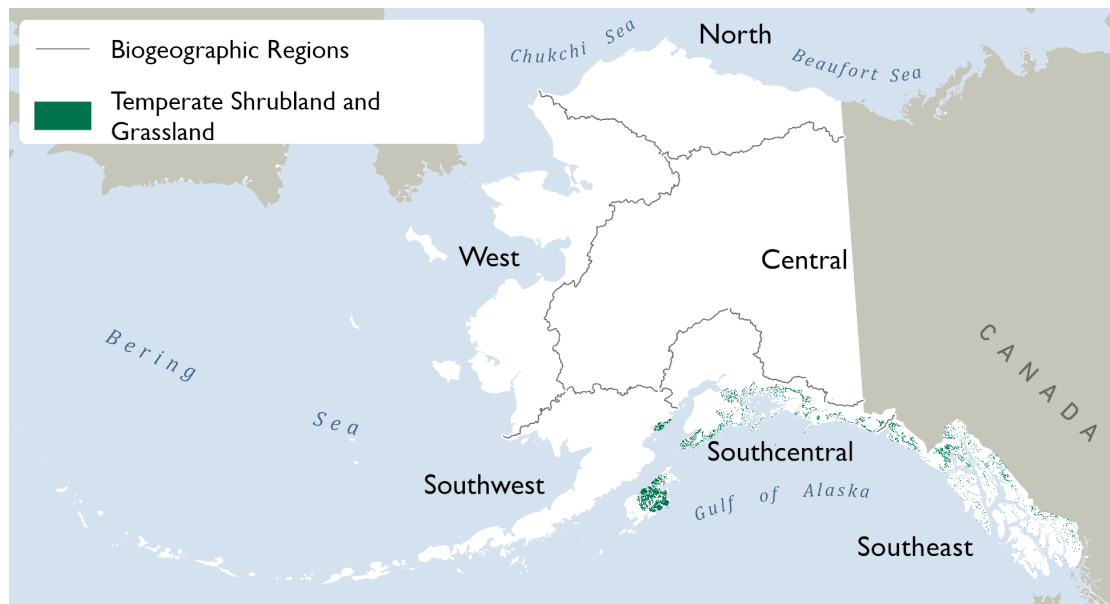


Figure F14. Distribution of temperate shrubland and grassland in Alaska.

#### *Physiognomy:*

Temperate shrublands and grasslands form as open to closed thickets of low to tall deciduous shrubs and herbaceous meadows, or mosaics of the types. Herbaceous species either establish as understory to the shrub stratum or as species-rich meadows.

#### *Floristics:*

Characteristic shrubs include Sitka alder (*Alnus alnobetula* ssp. *sinuata*), salmonberry (*Rubus spectabilis*), devilsclub (*Oplopanax horridus*), copperbush (*Elliottia pyroliflora*), and blueberry (*Vaccinium ovalifolium*). Willows, such as feltleaf willow (*Salix alaxensis*), Barclay's willow (*Salix barclayi*), grayleaf willow (*Salix glauca*), and Sitka willow (*Salix sitchensis*) occur as associated species in wetter sites. In meadows, a mix of ferns, forbs, and graminoids including ladyfern (*Athyrium filix-femina*), bluejoint reedgrass (*Calamagrostis canadensis*), fireweed (*Chamaenerion angustifolium*), cowparsnip (*Heracleum maximum*), false hellebore (*Veratrum viride*), and Sitka valerian (*Valeriana sitchensis*) are common. Dunegrass (*Leymus mollis*) and Pacific reedgrass (*Calamagrostis nutkaensis*) are important components of coastal meadows.

#### *Range:*

Occurring in upland settings throughout the Southeast and Southcentral biogeographic regions; extending into the Southwestern region along the Alaska Peninsula and upper islands of the Kodiak Archipelago (Figure F14). These shrubland and grassland habitats have been mapped sparingly in the Central region as well.

#### *Climate:*

The maritime climate is cool in the summer and mild in the winter with low annual variation in temperature. Precipitation as rain, snow, and fog drip is abundant.

Appendix F. Continued.

*Environment:*

Shrublands occur in upland settings where forest development is precluded by either disturbance or climate. The habitat type is common on mountain sideslopes steep enough to produce frequent avalanches, along coastal headlands, and above elevational treeline. Herbaceous meadows are often associated with shrublands, but occur across a greater variety of landforms and topographic positions. Additional to settings where shrublands occur, meadows establish on coastal bluffs, old beach ridges, uplifted tide flats, hillside slopes, stabilized talus, alluvial fans, and rolling hills. Soils are typically mesic to moist, well-drained, shallow, and stony; they can be ash-covered, and underlain by colluvium, alluvium, glacial drift, or glacial residium.

*Disturbance:*

Landslides, avalanches, and soil creep are the primary disturbance factors for shrublands establishing on sideslopes. Meadows establishing on more gentle terrain are relatively stable, but may be subject to wind and salt spray in coastal settings.

### Aleutian Heath and Meadow

USNVC Synonym: North Pacific-Bering Maritime Heath & Meadow (M539)



Figure F15. Distribution of Aleutian heath and meadow in Alaska.

*Physiognomy:*

Aleutian heath and meadows develop as open canopies of tall and low deciduous shrubs to dwarf shrubs, herbaceous meadows, or mosaics of the types, where dominated by ericaceous dwarf shrubs, the type is referred to as “heath.” Shrub stature generally decreases as maritime influence increases. Graminoids, ferns, and forbs may comprise the shrub understory or be interspersed as patches of meadow.

*Floristics:*

As this habitat type is typically centered across an area of species exchange between the Russian Far East and western Alaska, its floristics are somewhat unique. During previous glaciation events the Aleutian Islands provided a corridor through which species from the Kamchatka and Alaska Peninsulas dispersed. As glaciers subsequently melted and sea level rose, novel assemblages of species became isolated along the islands of the Aleutian chain. Today, the region supports many rare and endemic plant species such

## Appendix F. Continued.

as Aleutian saxifrage (*Saxifraga aleutica*). Common low shrubs include Sitka alder (*Alnus alnobetula* ssp. *sinuata*), a variety of willow species (*Salix* spp.), salmonberry (*Rubus spectabilis*), and bog blueberry (*Vaccinium uliginosum*). Common ericaceous dwarf shrubs include crowberry (*Empetrum nigrum*), Aleutian mountainheath (*Phyllodoce aleutica*), and Alaska bellheather (*Harrimanella stelleriana*). While not in the heath family, the dwarf shrub partridge foot (*Luetkea pectinata*) is often associated with heath communities. Common graminoids, ferns, and forbs include dunegrass (*Leymus mollis*), bluejoint reedgrass (*Calamagrostis canadensis*), Pacific reedgrass (*Calamagrostis nutkaensis*), ladyfern (*Athyrium felix-femina*), seacoast angelica (*Angelica gmelinii*), cowparsnip (*Heracleum lanatum*), and Kamchatka aconite (*Aconitum maximum*). Owing to the preponderance of coastline among the islands and narrow peninsulas of the region, species such as dunegrass and Pacific reedgrass, which in other regions are restricted to supratidal beaches and coastal headlands and bluffs, become more widespread. Members of the orchid family are abundant in this habitat type.

*Range:*

Occurring in the Southwest biogeographic region from the lower Alaska Peninsula and lower Kodiak Archipelago extending through the Aleutian Islands to the Kamchatka Peninsula (Figure F15). These heath and meadow habitats with Aleutian Island floristic affinities have also been mapped sparingly in the Western, Southcentral, and Central regions.

*Climate:*

The maritime climate is characterized by relatively cool summers and warm winters, high annual precipitation, high humidity, and strong and consistent winds. The maritime influence becomes most intense in the middle of the Aleutian Islands where it largely precludes the establishment of tall and low shrubs.

*Environment:*

Occurring on moist to mesic sites along a broad elevational range from sea level to the barren alpine, on all aspects and slope positions. While volcanic ash and pumice are common throughout the range, other parent material, such as bedrock or till, are also common. Young soils are highly mineral with abundant coarse fragments. Older soils become more organic with no exposed mineral fragments.

*Disturbance:*

Volcanism and deglaciation are primary agents of landscape-scale disturbance. Otherwise, wind exposure affects plant community structure and distributions. For example, heath is more common at sites with higher wind exposure than herbaceous plant communities, and tall shrub communities become more common in protected, inland topographies.

Appendix F. Continued.

## Boreal Shrubland and Grassland

USNVC Synonym: North American Boreal Shrubland & Grassland (M537)

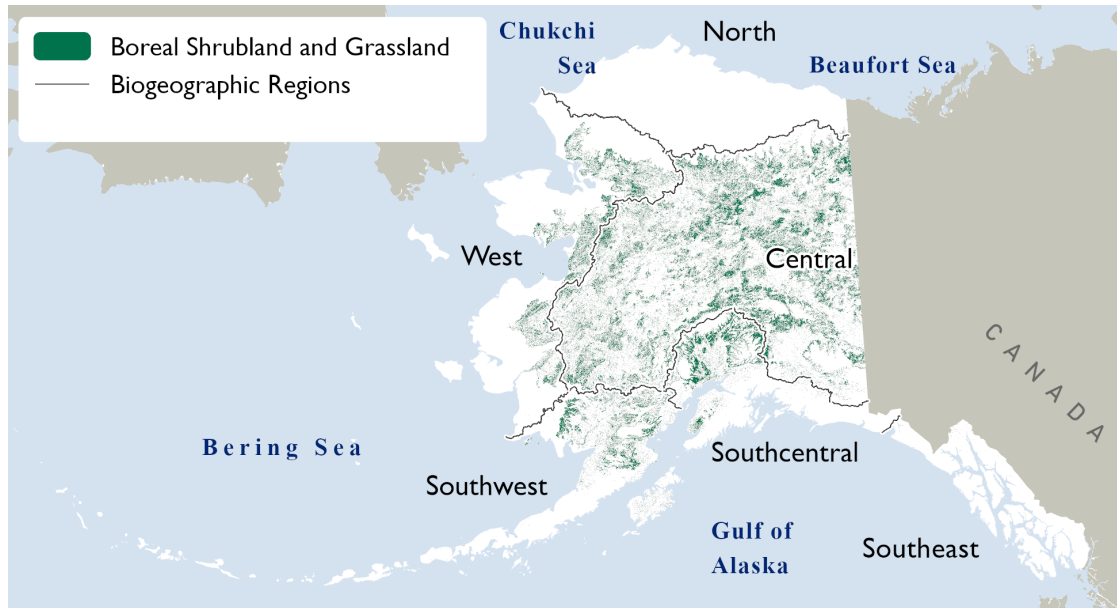


Figure F16. Distribution of boreal shrubland and grassland in Alaska.

### *Physiognomy:*

Boreal shrublands and grasslands develop as shrublands, grasslands, herbaceous meadows, or mosaics of the types. Shrublands vary considerably in cover and composition due to the diverse ecological drivers that produce this type of habitat. Cover ranges from open to closed and may be comprised of deciduous or evergreen shrubs, and can include, or be dominated by dwarf shrubs. Herbaceous communities tend to be dominated by graminoids on dry, wind-exposed sites with the proportion of forbs increasing in more protected sites that are better able to retain moisture. Nonvascular species can contribute ground cover with lichens occurring in drier areas and mosses occurring in wetter areas. As shrublands and grasslands typically represent mid-successional sites, the occurrence of tree seedlings and saplings can increase as the community develops.

### *Floristics:*

Stands are characterized by one or more of the following deciduous shrub species: Siberian alder (*Alnus alnobetula* ssp. *fruticosa*), tealeaf willow (*Salix pulchra*), grayleaf willow (*Salix glauca*), Richardson's willow (*Salix richardsonii*), resin birch (*Betula glandulosa*), and/or dwarf birch (*Betula nana*). South of the Alaska Range, alder dominance transitions to Sitka alder (*Alnus alnobetula* ssp. *sinuata*) and the abundance of Barclay's willow (*Salix barclayi*) and Scouler's willow (*Salix scouleriana*) increases at the expense of more boreal-centric willows. Red elderberry (*Sambucus racemosa*) and species of mountain ash (*Sorbus scopulina*, *Sorbus sitchensis*) may contribute to the shrub canopy in the Southwest and Southcentral regions.

More productive, alder-dominated sites typically support an herb-rich understory including bluejoint reedgrass (*Calamagrostis canadensis*), fireweed (*Chamaenerion angustifolium*), field horsetail, (*Equisetum arvense*), oakfern (*Gymnocarpium dryopteris*), woodfern (*Dryopteris expansa*), cowparsnip (*Heracleum lanatum*), starflower (*Lysimachia europaea*), burnet (*Sanguisorba canadensis*), and larkspurleaf monkshood (*Aconitum delphinifolium*). These moist site herbs can occur in species-rich meadows in areas of late-lying snow.

## Appendix F. Continued.

Less productive, birch-willow sites are dominated by resin or dwarf birch and/or tealeaf willow. Shrubs associated with birch-dominated scrub include bog blueberry (*Vaccinium uliginosum*), crowberry (*Empetrum nigrum*), lingonberry (*Vaccinium vitis-idaea*), and marsh Labrador tea (*Rhododendron tomentosum* ssp. *decumbens*). Willow-dominated sites support an understory of shrub and sub-shrubs including Arctic raspberry (*Rubus arcticus*) and beauverd spirea (*Spiraea stevenii*). Herbaceous species are sparse and may include boreal sagebrush (*Artemisia arctica*), Altai fescue (*Festuca altaica*), and alpine sweetgrass (*Hierochloë alpina*). Feathermosses (*Hylocomium splendens* and *Pleurozium schreberi*) and lichens in the *Cladonia* genus are common.

In an uncommon setting, boreal shrublands and grasslands also develop on inland dunes and steppe bluffs. Here vegetation forms dry, open low shrub and herbaceous associations. Dune vegetation is represented by grayleaf willow (*Salix glauca*), feltleaf willow (*Salix alaxensis*), and bareground willow (*Salix niphoclada*), and grasses: Pumpelly's brome (*Bromus pumpellianus* var. *pumpellianus*), purple reedgrass (*Calamagrostis purpurascens*), and red fescue (*Festuca rubra*). Steppe bluffs are additionally characterized by the low shrubs: prairie sagewort (*Artemisia frigida*), serviceberry (*Amelanchier alnifolia*), silverberry (*Elaeagnus commutata*), buffaloberry (*Shepherdia canadensis*), common juniper (*Juniperus communis*), and kinnikinnick (*Arctostaphylos uva-ursi*). Dry site herbs include Altai fescue, boreal sagebrush, Alaska wormwood (*Artemisia kruhsiana* ssp. *alaskana*), American thoroughwort (*Bupleurum americanum*), and three toothed saxifrage (*Saxifraga tricuspidata*). Biological soil crust and lichens are important mechanisms for the stabilization of dune and bluff soils.

*Range:*

Occurring in upland settings where extreme site conditions produce shrub or herb vegetation within a climate that would otherwise support forest. Centered in the Central biogeographic region and extending into the Western, Southwest, and Southcentral regions (Figure F16). The habitat has also been mapped sparingly in the Northern and Southeast regions.

*Climate:*

The boreal continental climate is characterized by short, warm summers and long, very cold winters. For this habitat type, extreme site conditions tend to override the influence of regional climate.

*Environment:*

Developing in uplands where extreme site conditions preclude the establishment of trees. Site conditions may be generalized as those related to landscape position and those related to disturbance. With respect to landscape position, alders form continuous bands in montane settings above treeline, birch and willow form thickets at high-elevations and along cold air drainages, and meadows occupy areas of late-lying snow. Excessively drained and easily erodible sands of inland dunes favor the establishment of rhizomatous graminoids and shrubs over trees. With respect to disturbance, boreal shrubland and grasslands may develop on sites temporarily returned to an early successional stage by wildland fire, or held in early succession by slope instability, noncohesive soils, or near constant wind. In the case of steppe bluffs, trees are excluded by dry and warm conditions, which are promoted by excessive drainage across steep slopes, low accumulation and residence of snow, exposure to wind, and high soil temperature, and evaporation and transpiration caused by the slopes' direct orientation to the low-angled sun. These varied ecological drivers result in the diversity of environments across which boreal shrublands and grasslands exist. Soils range from well-drained sand or sandy loams on dunes and bluffs, to thin rocky soils over shallow bedrock in exposed montane settings, to thick mesic loams in sheltered montane settings. While permafrost is nearly continuous in the region, its influence is varied. Where soils are well-drained due to coarse, mineral composition or terrain slope, interstitial ice volumes are low and the effects of permafrost are negligible. In poorly-drained, organic soils, interstitial ice volume may be high and the influence of seasonal freeze-thaw cycles is significant.

Appendix F. Continued.

### *Disturbance:*

Disturbance processes are varied in type and extent. Wildland fire is a major landscape-scale disturbance capable of reverting large areas of forest to shrub and grasslands. Localized disturbances such as exposure to wind and susceptibility to mass wasting events may hold montane, dune, and bluff communities in a mid-successional stage. In response to a changing climate, alder and willow are increasing abundance within their current ranges and notably, alder is extending its range into the low Arctic. Alder defoliators and willow leafblotch miners may cause defoliation, branch dieback, and mortality in rare cases of severe and sustained infestation.

## TUNDRA

### Temperate Alpine Tundra

USNVC Synonym: Vancouverian Alpine Tundra (M101)



Figure F17. Distribution of temperate alpine tundra in Alaska.

### *Physiognomy:*

Temperate alpine tundra establishes as treeless, sparsely to well-vegetated areas of dwarf shrubs, graminoids, and forbs at high elevations. Bare rock, lichens, and mosses are common ground covers. Dwarf, prostrate, creeping, and cushion growth forms are adapted to reduce wind exposure and heat loss.

### *Floristics:*

Alpine tundra communities largely establish in relation to elevation and exposure. In the most wind-exposed and rocky sites, tundra develops in protected microsites as a sparse cover of prostrate shrubs, graminoids, forbs, and lichens. Shrubs include dry-site species such as mountain-avens (*Dryas ajanensis*, *Dryas alaskensis*), and graminoids such as longawn sedge (*Carex macrochaeta*) and alpine fescue (*Festuca brachyphylla*). Associated forbs including boreal sagebrush (*Artemisia arctica*), narcissus anemone (*Anemonastrum sibiricum*), and meadow bistort (*Bistorta plumosa*) are characteristic of these habitats. Nonvascular taxa such as *Racomitrium lanuginosum*, *Umbilicaria hyperborea*, and *Stereocaulon alpinum* provide ground cover.

In more protected areas, tundra forms a semi-continuous cover of dwarf ericaceous or willow shrub. Common ericaceous dwarf shrubs include western moss heather (*Cassiope mertensiana*), yellow mountainheath

## Appendix F. Continued.

(*Phyllodoce glanduliflora*), Alaska bellheather (*Harrimanella stelleriana*), bog blueberry (*Vaccinium uliginosum*), dwarf bilberry (*Vaccinium caespitosum*), and crowberry (*Empetrum nigrum*); western moss heather is replaced by white Arctic mountain heather (*Cassiope tetragona*) in the northern portion of the range. While not ericaceous, the dwarf shrubs partridgefoot (*Luetkea pectinata*) and species of mountain avens (*Dryas ajanensis*, *Dryas alaskensis*) are common in the habitat type throughout the region. Dwarf willow communities include Arctic (*Salix arctica*), sprouting leaf (*Salix stolonifera*), and netleaf (*Salix reticulata*) willows. The feathermosses *Hylocomium splendens*, *Pleurozium schreberi*, and species of *Rhytidiadelphus* are common in tundra settings where shrubs provide some protection from desiccating winds; lichens, particularly those in the *Peltigera* genus, become more common in areas where ericaceous shrubs dominate.

In the most wind-protected sites, lush herbaceous meadows develop. Plant communities in these meadows tend to be forb-rich and include larkspurleaf monkshood (*Aconitum delphiniifolium*), burnet (*Sanguisorba canadensis*), Sitka valerian (*Valeriana sitchensis*), Kamchatka fritillary (*Fritillaria camschatcensis*), Alaska Indian paintbrush (*Castilleja unalaschcensis*), wooly geranium (*Geranium erianthum*), and Nootka lupine (*Lupinus nootkatensis*). Dwarf shrubs and bryophytes associated with dwarf shrub tundra are often interspersed in the understory or present as small patches on higher and drier topographies.

*Range:*

Occurring in alpine and montane settings throughout the Southeast and Southcentral biogeographic regions; extending into the Central and Southwest regions in the area of overlap with the Alaska Range (Figure F17).

*Climate:*

This habitat type spans maritime and boreal-maritime transitional climates where the extreme conditions present at high-elevations and otherwise exposed sites often override the influence of regional climate. Summers are short and cool and winters are long and cool with abundant wet snow.

*Environment:*

This habitat type develops at high-elevation or otherwise exposed sites that are typically above the elevational limit of trees. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth. Broadleaf, meadow, dwarf shrub, and sparse tundra communities establish as zones of vegetation in relation to increasing elevation and exposure. Herbaceous sites are often fed by some source of sustained water provided by the melt of upgradient snow or groundwater seeps. Soils range from well-drained, thin and rocky mineral soils on convex topographies to moderately drained loams in concave topographies that are better able to retain snow and organic matter. While permafrost is generally absent, seasonal frost is deep and may persist well into the growing season.

*Disturbance:*

Alpine tundra communities are relatively stable. Disturbances include wind, soil and snow creep, and freeze-thaw action; steeper sites may be subject to avalanche. By moving snow, wind creates microhabitats of varying snow depths, influencing the length of snow-free periods and soil moisture conditions. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth. Small mammal activity may have minor impacts. Due to the discontinuous cover of vegetation, low fuel loads, and moist conditions, this habitat type is unlikely to carry fire. On mountain summits where treeline is advancing due to a warming climate, the extent of alpine tundra is expected to be reduced.

Appendix F. Continued.

## Boreal Alpine Tundra

USNVC Synonym: Western Boreal Alpine Tundra (M404)

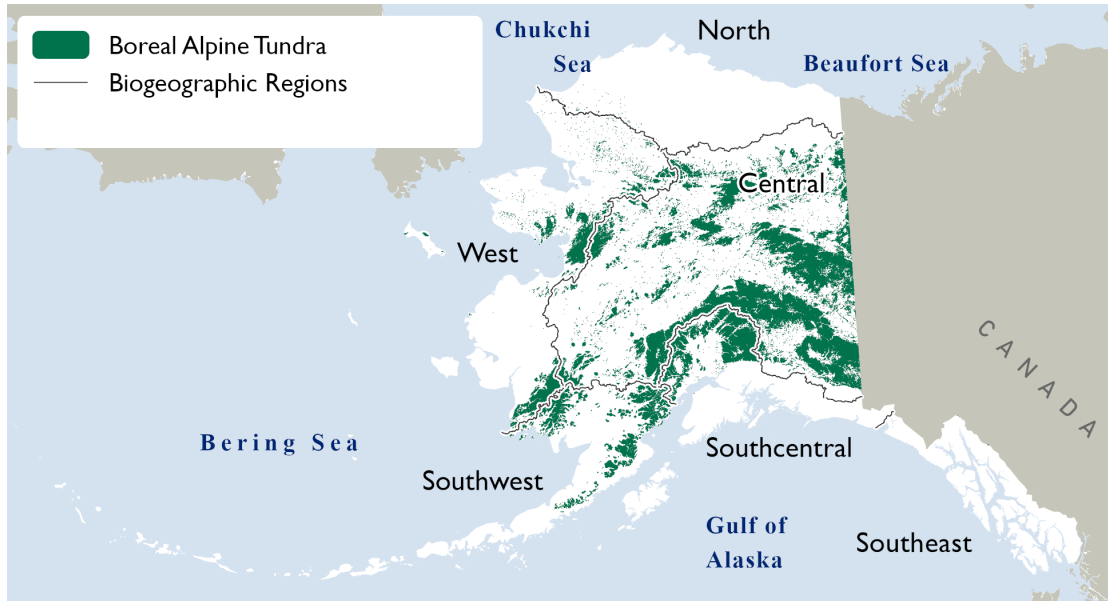


Figure F18. Distribution of boreal alpine tundra in Alaska.

### *Physiognomy:*

Boreal alpine tundra establishes as treeless, sparsely to well-vegetated areas of low to dwarf shrubs, graminoids, and forbs at higher elevations. Bare rock, lichens, and mosses are common ground covers. Dwarf, prostate, creeping, and cushion growth forms reduce wind exposure and heat loss.

### *Floristics:*

Alpine tundra communities largely establish in relation to elevation and exposure. In the most wind-exposed and rocky sites, tundra develops in protected microsites as a sparse cover of prostrate shrubs, graminoids, forbs, and lichens. Shrubs include dry-site species such as mountain avens (*Dryas ajanensis*, *Dryas alaskensis*), pincushion plant (*Diapensia obovata*), and alpine bearberry (*Arctous alpina*). Graminoids including Altai fescue (*Festuca altaica*), alpine sweetgrass (*Hierochloë alpina*), Bigelow's sedge (*Carex bigelowii*), spike trisetum (*Trisetum spicatum*), and smallawned sedge (*Carex microchaeta*) grow in scattered tufts. Forbs with cushion or creeping growth forms such as Arctic stitchwort (*Cherleria arctica*), moss campion (*Silene acaulis*), blackish oxytrope (*Oxytropis bryophila*), Arctic cinquefoil (*Potentilla nana*), and three toothed saxifrage (*Saxifraga tricuspidata*) are characteristic. Lichens, which have high tolerance to desiccation, are more common than mosses. Typical lichen species are: *Umbilicaria hyperborea*, *Thamnolia vermicularis*, *Stereocaulon alpinum*, and *Flavocetraria nivalis*.

In more protected areas, tundra forms a semi-continuous cover of dwarf ericaceous or willow shrub. Common shrub species include the ericaceous species: crowberry (*Empetrum nigrum*), alpine azalea (*Kalmia procumbens*), bog blueberry (*Vaccinium uliginosum*), and white Arctic mountain heather (*Cassiope tetragona*), and the willows: Arctic (*Salix arctica*), polar (*Salix polaris*), skeletonleaf (*Salix phlebophylla*), and netleaf (*Salix reticulata*) willow. Graminoids include many of the species present in sparse tundra communities. Characteristic forbs are boreal sagebrush (*Artemisia arctica*), alpine bistort (*Bistorta vivipara*), creeping sibbaldia (*Sibbaldia procumbens*), mountain harebell (*Campanula lasiocarpa*), ledge stonecrop (*Rhodiola integrifolia*), and narcissus anemone (*Anemonastrum sibiricum*). Mosses such as big red stem (*Pleurozium*

## Appendix F. Continued.

*schreberi*) and *Polytrichum juniperium* become more abundant in these sheltered sites; common lichens include species in the *Cetraria*, and *Cladonia* genera.

In the most wind-protected sites, tundra may develop as lush herbaceous meadows. Meadow species, including larkspurleaf monkshood (*Aconitum delphiniifolium*), longawn sedge (*Carex macrochaeta*), Altai fescue (*Festuca altaica*), wooly geranium (*Geranium erianthum*), forget-me-not (*Myosotis alpestris* ssp. *asiatica*), fringed grass of Parnassus (*Parnassia fimbriata*), western buttercup (*Ranunculus occidentalis*), Canadian burnet (*Sanguisorba canadensis*), arrowleaf ragwort (*Senecio triangularis*), Sitka valerian (*Valeriana sitchensis*), and alpine speedwell (*Veronica wormskjoldi*) are common. Dwarf shrubs and bryophytes characteristic of dwarf shrub tundra are often interspersed in the understory or present as small patches on higher and drier topographies.

**Range:**

Occurring in alpine and montane settings primarily in the Central, Southcentral, Southwest, and Western biogeographic regions (Figure F18). This habitat has also been mapped sparingly in the other two terrestrial biogeographic regions.

**Climate:**

The boreal continental climate is characterized by short, warm summers and long, very cold winters. Permafrost is nearly continuous, which contributes to the slow growth of woody species. The extreme conditions present at high-elevations and otherwise exposed sites often override the influence of regional climate.

**Environment:**

This habitat type develops at high-elevation or otherwise exposed sites typically above elevational treeline. By moving snow, wind creates microhabitats of varying snow depths, influencing the length of snow-free periods and soil moisture conditions. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth. Meadow, dwarf shrub, and sparse tundra communities tend to establish as zones of vegetation in relation to increasing elevation and exposure. Soils range from well-drained, thin and rocky mineral soils on convex topographies to moderately drained loams in concave topographies that are better able to retain snow and organic matter. Permafrost is nearly continuous.

**Disturbance:**

Alpine tundra is relatively stable. Disturbances include wind, soil and snow creep, and freeze-thaw action; steeper sites may be subject to avalanche. By moving snow, wind creates microhabitats of varying snow depths, influencing the length of snow-free periods and soil moisture conditions. Exposure to desiccating winds, rocky and sometimes unstable substrates, and a short growing season limit plant growth. Small mammal activity may have minor impacts. The effect of permafrost is variable; well-drained rocky soils with low interstitial ice volumes are less affected by freeze thaw action than wetter organic soils, which are susceptible to solifluction and cryoturbation. Due to the discontinuous cover of vegetation, low fuel loads, and moist conditions, this habitat type has low susceptibility to fire. On mountain summits where treeline is advancing due to a warming climate, the extent of alpine tundra is expected to be reduced.

Appendix F. Continued.

## Arctic Tundra

USNVC Synonym: Arctic Dry-Moist Tundra (M173)

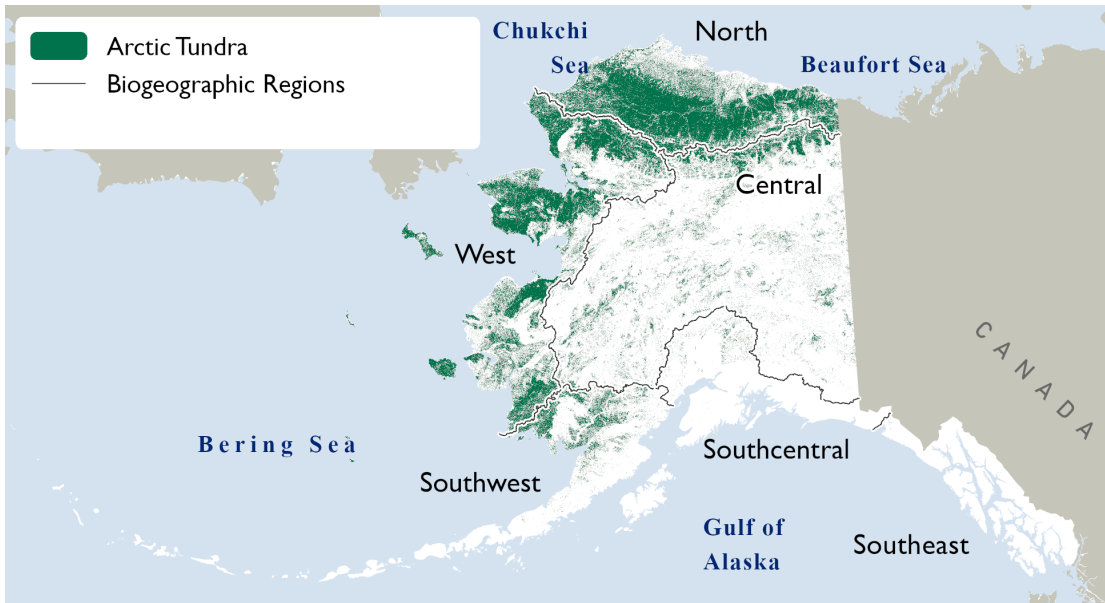


Figure F19. Distribution of Arctic tundra in Alaska.

### *Physiognomy:*

Arctic tundra establishes as treeless, sparsely to well-vegetated areas of shrubs, graminoids, and forbs; mosses and lichens are important components of the understory in mesic and dry settings, respectively. Generally, the stature and cover of vegetation and the abundance of woody species increases as sites become more protected from wind, insulated from freezing temperatures, or gain a sustained source of water through the growing season. Because of this, tundra communities range in structure and composition from sparse assemblages of prostrate shrubs, low-stature herbs, mosses, and lichens in the most exposed, often high-elevation sites, to a continuous cover of low and dwarf shrubs interspersed with tussock-forming sedges, forbs, and a diversity of nonvascular species across the more protected, low elevation coastal plains. Variants of Arctic tundra are present as species-rich and lush herbaceous meadows in mesic, protected sites as well as deciduous shrub communities with a sparse understory of graminoids and forbs on floodplains and inland dunes. The rate and form of plant growth is largely affected by permafrost. A tussocked growth form allows sedges to elevate their live root mass above the level of seasonal or diurnal freeze thaw cycles. Together with thick mats of *Sphagnum* and other nonvascular species, tussocks provide warmer microsites for the establishment of less cold-adapted species. Conversely, in areas of deep seasonal thaw, such as dunes and floodplains, deep-rooted and tall shrubs are able to establish.

### *Floristics:*

Arctic tundra may occur as purely herbaceous associations, but most commonly develops as a mix of herbs and shrubs. Tussock tundra is a common coastal plain type characterized by high abundance of the tussock-forming sedge tussock cottongrass (*Eriophorum vaginatum*) often in combination with low and dwarf shrubs. Characteristic woody species include the low shrubs: dwarf birch (*Betula nana*), tealeaf willow (*Salix pulchra*), and marsh Labrador tea (*Rhododendron tomentosum* ssp. *decumbens*); and the dwarf shrubs: lingonberry (*Vaccinium vitis-idaea*), white Arctic mountain heather (*Cassiope tetragona*), entireleaf mountain-avens (*Dryas integrifolia*), and netleaf willow (*Salix reticulata*). Associated herbaceous species are the forbs: meadow bistort (*Bistorta plumosa*), cloudberry (*Rubus chamaemorus*), and narrowleaf saw-wort (*Saussurea angustifolia*), and the graminoids: Bigelow's sedge (*Carex bigelowii*) and wideleaf polargrass (*Arctagrostis*

## Appendix F. Continued.

*latifolia*). Common nonvascular species include the bryophytes *Ptilidium ciliare*, *Dicranum elongatum*, *Hylocomium splendens*, and *Aulacomnium turgidum*, and the lichens, *Cetraria ericetorum*, *Cladonia arbuscula*, and *Flavocetraria cucullata*.

Shrub-dominated tundra may be broadly grouped by *Dryas*, ericaceous, or willow species dominance. *Dryas* prostrate shrub tundra occurs in dry, windswept areas with little retention of snow and is dominated by either eightpetal mountain-avens (*Dryas ajanensis*) in the Brooks Range and foothills or entireleaf mountain-avens (*Dryas integrifolia*) on the Arctic Coastal Plain. Characteristic herbs include blackish oxytrope (*Oxytropis bryophila*), curly sedge (*Carex rupestris*), and purple mountain saxifrage (*Saxifraga oppositifolia*), and dry-site lichens such as *Alectoria nigricans*, *Flavocetraria cucullata*, *Cetraria islandica*, and *Dactylina arctica*.

Dwarf willow shrub tundra occurs in small patches on moderately exposed sites and is characterized by netleaf, polar (*Salix polaris*), least (*Salix rotundifolia*), and skeletonleaf (*Salix phlebophylla*) willows. Ericaceous dwarf-shrub tundra is common in more protected, mesic sites where snow cover is retained. This habitat type is characterized by the ericaceous shrubs: marsh labrador tea (*Rhododendron tomentosum* ssp. *decumbens*), white Arctic mountain heather (*Cassiope tetragona*), and lingonberry (*Vaccinium vitis-idaea*). In both willow and ericaceous dwarf shrub tundra, characteristic herbaceous plants include the graminoids: Altai fescue (*Festuca altaica*), alpine sweetgrass (*Hierochloë alpina*), wideleaf polargrass (*Arctagrostis latifolia*), spike trisetum (*Trisetum spicatum*), Bigelow's sedge (*Carex bigelowii*), shortstalk sedge (*Carex podocarpa*), and Arctic bluegrass (*Poa arctica*); and the forbs: meadow bistort (*Bistorta plumosa*), narrowleaf saw-wort (*Saussurea angustifolia*), narcissus anemone (*Anemonastrum sibiricum*), and capitate lousewort (*Pedicularis capitata*). Bryophytes and lichens include those listed for tussock tundra with the additions of *Flavocetraria nivalis*, *Masonhalea richardsonii*, *Ochrolechia frigida*, *Racomitrium lanuginosum*, *Polytrichum juniperinum*, *Rhytidium rugosum*, and *Tomentypnum nitens*. Lichen abundance tends to be higher in willow-dominated dwarf shrub tundra.

Low-shrub tundra commonly occurs on mesic to moist sideslopes and ridges and high-centered polygonal tundra and may be dominated by low willows such as Richardson's willow (*Salix richardsonii*), tealeaf willow (*Salix pulchra*), and grayleaf willow (*Salix glauca*), or dwarf birch (*Betula nana*). Lower woody and herbaceous strata are largely similar to tussock and dwarf shrub tundras. Bigelow's sedge tends to be more abundant than tussock sedge, and forbs, such as Arctic sweet coltsfoot (*Petasites frigidus*), tall Jacob's-ladder (*Polemonium acutiflorum*), capitate valerian (*Valeriana capitata*), capitate lousewort (*Pedicularis capitata*), and field horsetail (*Equisetum arvense*), and bryophytes such as *Hylocomium splendens*, *Tomentypnum nitens*, and *Rhytidium rugosum* tend to occur at greater frequency.

Mesic herbaceous tundra is an uncommon variant occupying small patches in areas of late-lying snow, seeps, and streamsides. Characteristic species include the forbs: dwarf fireweed (*Chamaenerion latifolium*), fourpart dwarf gentian (*Gentianella propinqua*), Arctic sweet coltsfoot (*Petasites frigidus*), Arctic lupine (*Lupinus arcticus*), northern Jacob's-ladder (*Polemonium boreale*), and capitate valerian (*Valeriana capitata*), and the grasses: slimstem reedgrass (*Calamagrostis neglecta*), wideleaf polargrass (*Arctagrostis latifolia*), hairgrass (*Deschampsia cespitosa*), and Arctic bluegrass (*Poa arctica*).

Floodplain shrublands are characterized by low to tall deciduous shrubs such as feltleaf willow (*Salix alaxensis*), Richardson's willow (*Salix richardsonii*), and Siberian alder (*Alnus alnobetula* ssp. *fruticosa*) on active floodplains, and entireleaf mountain-avens (*Dryas integrifolia*) or Drummond's mountain-avens (*Dryas drummondii*) on the inactive portions of the floodplain. Characteristic herbaceous plants include the forbs: subalpine aster (*Eurybia sibirica*), Tilesius' wormwood (*Artemisia tilesii*), Kotzebue's grass of Parnassus (*Parnassia kotzebuei*), tansy (*Tanacetum bipinnatum*), merckia (*Wilhelmsia physodes*), and dwarf fireweed (*Chamaenerion latifolium*). The horsetails *Equisetum arvense* and *Equisetum variegatum*, and the grass red fescue (*Festuca rubra*) are also characteristic.

The floristics of inland dunes largely resemble the active portion of Arctic floodplains. Willow shrubs such as grayleaf willow (*Salix glauca*), feltleaf willow, and bareground willow (*Salix niphoclada*) are dominant. The

## Appendix F. Continued.

dry-site graminoids: red fescue (*Festuca rubra*), Eurasian Junegrass (*Koeleria asiatica*), Arctic rush (*Juncus arcticus*), dunegrass (*Leymus mollis*), and Pumpelly's brome (*Bromus pumpellianus*) as well as the forbs: field sagewort (*Artemisia borealis*) and northern groundsel (*Packera hyperborealis*) are characteristic components of the understory.

*Range:*

Occurring in wind-exposed settings north of latitudinal treeline in the Northern biogeographic region and beyond the longitudinal extent of treeline in the Western and Southwest regions (Figure F19). The habitat has also been mapped in the Central and Southcentral regions.

*Climate:*

The Arctic climate is dry and cold, characterized by very short summers and long winters. Most of the region is above the Arctic Circle and consequently receives continuous sunlight for several weeks in summer and continuous dark for several weeks in winter.

*Environment:*

Arctic tundra establishes across strong elevational and continentality gradients ranging from the high-latitude, low-elevation Arctic tundra of the Arctic and Bering Sea coastal plains to the high-elevation, alpine tundra of the Brooks Range. The entire area is underlain by continuous permafrost. Where soils are ice-rich, periglacial processes ranging in scale from cryoturbation, and solifluction, to thaw slumping and the development of patterned ground are active. Polygonal tundra, a network of tundra polygons bounded by an orthogonal network of subsurface ice-wedges is particularly common, with shrub and tussock tundra types occupying topographic highs such as polygon ridges and high centers, and wet sedge tundra occupying the bounding troughs and low centers. Where sediment is well-drained with low interstitial ice volumes, such as floodplains, dunes, and high-elevation rocky substrates, the effects of permafrost are negligible.

*Disturbance:*

Under a warming climate, the degradation of ice-rich permafrost can cause the collapse of the overlying substrate with consequences for man-made infrastructure these terrains may support. While infrequent, wildland fire may have extensive and severe impact on tundra ecosystems. Fire may revert shrub types to a graminoid-dominated system, whereas shrubs may assume dominance with a milder climate or less extreme local conditions. In floodplain settings, inundation and the associated erosion and redeposition of sediment are primary disturbances. In dune settings, the main disturbance process, which both creates and maintains these systems, is the erosion, transport, and deposition of sand by wind.

Appendix F. Continued.

## CLIFF, SCREE, AND ROCK

### Temperate Cliff, Scree, and Rock Vegetation

USNVC Synonym: Western North American Cliff, Scree & Rock Vegetation (M887)



Figure F20. Distribution of temperate cliff, scree, and rock vegetation in Alaska.

#### *Physiognomy:*

Temperate cliff, scree, and rock vegetation consists of sparsely vegetated scree, talus, and bedrock shields, outcrops, and cliffs. Vegetation establishes in protected microsities and overall, there is less than 10% vascular plant cover with a variable cover of mosses and lichens. Forbs and woody species are uncommon and species diversity is low.

#### *Floristics:*

Communities range from lichen-encrusted bedrock, to cryptobiotic crust, to a sparse cover of graminoids, dry-site mosses, and fruticose lichens; prostrate shrubs and wind- and cold-adapted forbs are occasional components. On the harshest, driest sites, crustose lichen communities including *Rhizocarpon geographicum*, *Ophioparma lapponica*, *Umbilicaria hyperborea*, and *Pertusaria* species form. In more protected sites, dry-site mosses such as *Racomitrium lanuginosum*, *Racomitrium canescens*, and species of *Dicranum*, and fruticose lichens such as *Stereocaulon paschale*, *Cladonia uncialis*, and *Cladonia stellaris* are characteristic. Where upgradient snowmelt flushes glaciated bedrock, the moss, *Andreaea blyttii* is dominant. The liverworts *Anthelia juratzkana* and *Gymnomitrium corallioides* are major components of cryptogamic crust forming over volcanic deposits.

Increasing nonvascular plant cover provides substrate for the subsequent establishment of graminoids such as Piper's woodrush (*Luzula piperi*), curved woodrush (*Luzula arcuata*), spike trisetum (*Trisetum spicatum*), Pyrenean sedge (*Carex micropoda*), and tufted hairgrass (*Deschampsia cespitosa*). Forbs, including purple mountain saxifrage (*Saxifraga oppositifolia*), moss campion (*Silene acaulis*), and Ross' avens (*Geum rossii*), establish in microsities able to retain moisture. Prostrate shrubs such as alpine azalea (*Kalmia procumbens*), oval-leaf willow (*Salix ovalifolia*), kinnikinnick (*Arctostaphylos uva-ursi*), and crowberry (*Empetrum nigrum*) establish in protected concavities that can retain organic matter and moisture.

Appendix F. Continued.

**Range:**

Occurring in exposed settings throughout the Southeast and Southcentral biogeographic regions; extending into the Central and Southwest regions where the Alaska and Aleutian ranges overlap (Figure F20).

**Climate:**

This habitat type spans maritime and boreal-maritime transitional climates where the extreme conditions present at high-elevations and otherwise exposed sites often override the influence of regional climate. Summers are short and cool, and winters are long and cool with abundant wet snow.

**Environment:**

This habitat type develops in sites that are exposed due to high elevation, recent disturbance, or prominent landscape position. Typically, these sparse communities develop above the elevational limit of trees, but are also found at lower elevations on recently deglaciated substrates, rockfall, volcanic deposits, or wind-exposed sites. Exposure to desiccating winds, rocky and unstable substrates, and a short growing season limit plant growth. The depth and persistence of wind deposited snow influences the length of snow-free periods and soil moisture conditions. Where present, soils are well-drained, thin, and rocky. While permafrost is generally absent, seasonal frost is deep and may persist well into the growing season.

**Disturbance:**

These sparse vegetation communities are exposed to the regular disturbances of wind, substrate and snow creep, and freeze-thaw action; steeper sites may be subject to avalanche. Small mammal activity may have minor impacts. In particular contexts, colonies of nesting seabirds on cliffs and scree can cause ground disturbance and affect available nutrients. On mountain summits where woody vegetation is advancing due to a warming climate, the extent of high-alpine rocky habitats is expected to be reduced.

### Boreal Cliff, Scree, and Rock Vegetation

USNVC Synonym: North American Boreal Cliff, Scree & Rock Vegetation (M895)



Figure F21. Distribution of boreal, cliff, scree, and rock vegetation in Alaska.

Appendix F. Continued.

*Physiognomy:*

Boreal cliff, scree, and rock vegetation consists of sparsely vegetated scree, talus, and bedrock shields, outcrops, and cliffs. Vegetation establishes in protected microsites and overall, there is less than 10% vascular plant cover with a variable cover of mosses and lichens. Forbs and woody species are uncommon and species diversity is low.

*Floristics:*

Communities range from lichen-encrusted bedrock, to cryptobiotic crust, to a sparse cover of graminoids, dry-site mosses, and fruticose lichens; prostrate shrubs and wind- and cold-adapted forbs are occasional components. On the harshest, driest sites, crustose lichen communities including *Rhizocarpon geographicum*, *Ophioparma lapponica*, *Umbilicaria hyperborea*, and *Pertusaria* species form. In more protected sites, dry-site mosses in the *Racomitrium* genus and lichens such as *Thamnolia vermicularis*, and members of the *Stereocaulon* and *Cladonia* genera are common. The liverworts *Anthelia juratzkana* and *Gymnomitrium coralloides* are major components of cryptogamic crust forming over volcanic deposits.

Nonvascular cover provides microsites for the subsequent establishment of graminoids such as tufted hairgrass (*Deschampsia cespitosa*), spike trisetum (*Trisetum spicatum*), and coiled sedge (*Carex circinata*), and forbs including purple mountain saxifrage (*Saxifraga oppositifolia*), Wright's golden saxifrage (*Chrysosplenium wrightii*), moss campion (*Silene acaulis*), Arctic stitchwort (*Cherleria arctica*), and Ross' avens (*Geum rossii*). Prostrate shrubs such as crowberry (*Empetrum nigrum*), alpine azalea (*Kalmia procumbens*), kinnikinnick (*Arctostaphylos uva-ursi*), various species of willow (*Salix*) and mountain avens (*Dryas*), and mountain heather (*Cassiope tetragona*, *Cassiope lycopodioides*) establish in protected concavities that are able to retain organic matter and moisture.

*Range:*

Occurring in exposed settings throughout the Central, Southcentral, and Southwest biogeographic regions (Figure F21). This habitat has also been mapped in the Western and Northern regions.

*Climate:*

The boreal continental climate is characterized by short, warm summers and long, very cold winters. Permafrost is nearly continuous, which contributes to the slow growth of species. The extreme conditions present at high-elevations and otherwise exposed sites often override the influence of regional climate.

*Environment:*

This habitat type develops in sites that are exposed due to high elevation, recent disturbance, or prominent landscape position. Typically, these sparse communities develop above the elevational limit of trees, but are also found at lower elevations on recently deglaciated substrates, volcanic deposits, rockfall, or wind-exposed sites. Exposure to desiccating winds, rocky and unstable substrates, and a short growing season limit plant growth. The depth and persistence of wind deposited snow influences the length of snow-free periods, insulation from freezing temperatures, and soil moisture conditions. Where present, soils are well-drained, thin, and rocky. Permafrost is nearly continuous.

*Disturbance:*

These sparse vegetation communities are exposed to the regular disturbances of wind, substrate and snow creep, and freeze-thaw action; steeper sites may be subject to avalanche. Small mammal activity may have minor impacts. The effect of permafrost is variable; well-drained rocky soils with low interstitial ice volumes are less affected by freeze thaw action than wetter organic soils, which are susceptible to solifluction and cryoturbation. On mountain summits where woody vegetation is advancing due to a warming climate, the extent of high-alpine rocky habitats is expected to be reduced.

Appendix F. Continued.

### Arctic Cliff, Scree, and Rock Vegetation

USNVC Synonym: Arctic Scree, Rock & Cliff Barrens (M175)

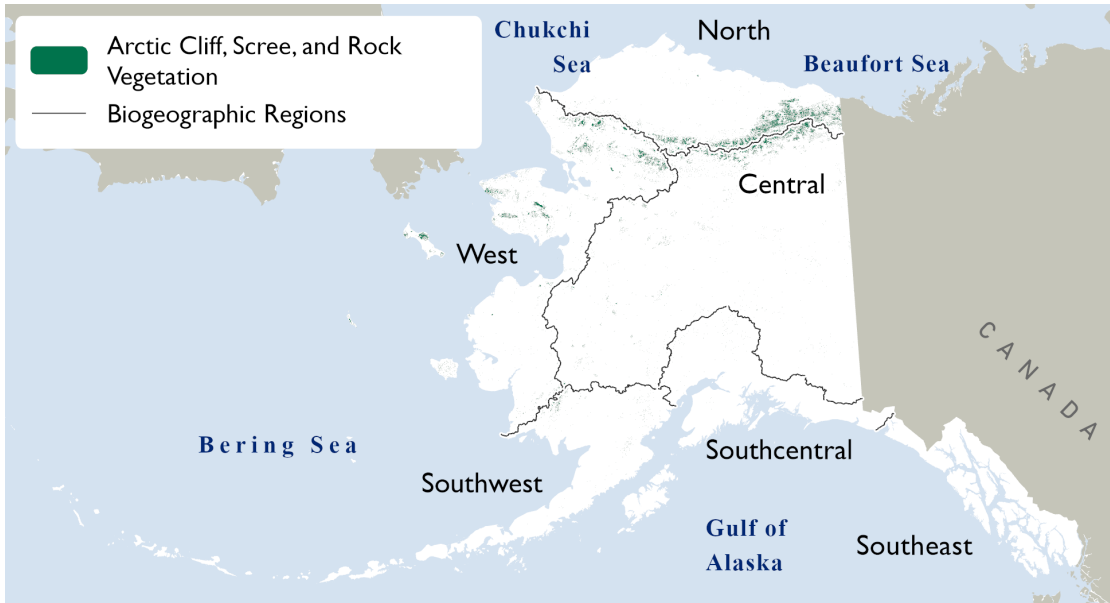


Figure F22. Distribution of Arctic cliff, scree, and rock vegetation in Alaska.

#### *Physiognomy:*

Arctic cliff, scree, and rock vegetation consists of sparsely vegetated scree, talus, and bedrock shields, outcrops, and cliffs. Vegetation establishes in protected microsites and overall, there is less than 10% vascular plant cover with a variable cover of mosses and lichens. Forbs and woody species are uncommon and species diversity is low.

#### *Floristics:*

Communities range from lichen-encrusted bedrock, to a sparse cover of graminoids, dry-site mosses, and fruticose lichens; prostrate shrubs and wind- and cold-adapted forbs are occasional components. On the harshest, driest sites, crustose lichen-dominated communities are common within which *Rhizocarpon geographicum*, *Ophioparma lapponica*, *Umbilicaria hyperborea*, and *Pertusaria* species are prominent. Vascular plants, when they do occur, are typically dwarf or prostrate shrubs, graminoids, and rosette- or cushion-forming forbs. Common dwarf-shrubs include alpine azalea (*Kalmia procumbens*), alpine bearberry (*Arctous alpina*), skeletonleaf willow (*Salix phlebophylla*), Arctic willow (*Salix arctica*), pincushion plant (*Diapensia obovata*), white Arctic mountain heather (*Cassiope tetragona*), and various species of mountain-avens (*Dryas*). Commonly occurring species in the herb layer include the graminoids: northern singlespike sedge (*Carex scirpoidea*), smallawned sedge (*Carex microchaeta*), Pyrenean sedge (*Carex micropoda*), alpine fescue (*Festuca brachyphylla*), and Arctic sweetgrass (*Hierochloë alpina*), and the forbs: moss campion (*Silene acaulis*), purple mountain saxifrage (*Saxifraga oppositifolia*), and Arctic stitchwort (*Cherleria arctica*). Lichens associated with more protected sites are: *Alectoria ochroleuca*, and species in the *Cladonia*, *Cetraria*, and *Flavocetraria* genera.

#### *Range:*

Occurring in exposed settings north of latitudinal treeline in the Northern biogeographic region and beyond the longitudinal extent of treeline in the Western and Southwest regions (Figure F22). These rocky habitats have also been mapped sparingly in the Southcentral and Central regions.

Appendix F. Continued.

*Climate:*

The Arctic climate is dry and cold, characterized by very short summers and long winters. Much of the region is above the Arctic Circle and consequently receives continuous sunlight for several weeks in summer and continuous dark for several weeks in winter.

*Environment:*

This habitat type develops in sites that are exposed due to high elevation, recent disturbance, or prominent landscape position. Typically, these sparse communities develop in alpine settings, but in the Arctic are also found at lower elevations beyond the latitudinal or longitudinal limit of trees on recent volcanic deposits, rockfall, or wind-exposed sites. Exposure to desiccating winds, intense solar radiation, rocky and unstable substrates, and a short growing season limit plant growth. The depth and persistence of wind deposited snow influences the length of snow-free periods, insulation from freezing temperatures, and soil moisture conditions. Soils are either absent or thin, rocky, and well to excessively drained with little pedogenic development. Permafrost is continuous.

*Disturbance:*

These sparse vegetation communities are exposed to the regular disturbances of wind, substrate and snow creep, and freeze-thaw action; steeper sites may be subject to avalanche. Small mammal activity may have minor impacts. The effect of permafrost is variable; well-drained rocky soils with low interstitial ice volumes are less affected by freeze thaw action than wetter organic soils, which are susceptible to solifluction and cryoturbation.

## COASTAL HABITATS

### Temperate Salt Marsh

USNVC Synonym: North American Pacific Coastal Salt Marsh (M081)



Figure F23. Distribution of temperate salt marsh in Alaska.

*Physiognomy:*

Temperate salt marshes are subject to regular tidal inundation and are dominated by salt-tolerant forbs and graminoids. Vegetation ranges from sparse cover of herbaceous species on mudflats, to lush stands of

## Appendix F. Continued.

emergent graminoids in estuaries, to well-vegetated graminoid-shrub communities at the upper reach of tidal influence. Woody and nonvascular plant species are uncommon and species diversity is low.

*Floristics:*

Vegetation patterns are ultimately related to elevation in so far that it directs the frequency and duration of tidal inundation. Along stable coastlines, the vegetation pattern is zonal with plants establishing according to their tolerance to salinity and inundation.

The low marsh is subject to twice daily tidal inundation. At the seaward margin of vegetation, the halophyte, creeping alkaligrass (*Puccinellia phryganodes*) colonizes bare mud. Moving inland, alkaligrass dominance transitions to Nootka alkaligrass (*Puccinellia nutkaensis*) and succulent, annual forbs such as slender grasswort (*Salicornia maritima*), Canadian sandspurry (*Spergularia canadensis*), Danish scurvygrass (*Cochlearia groenlandica*), and Pursh seepweed (*Suaeda calceoliformis*) occur more frequently. Tidal sloughs and levees spanning low to mid-marsh transition areas support mats of saltmarsh starwort (*Stellaria humifusa*) in slough bottoms and associations of Ramensk's sedge (*Carex ramenskii*), Pacific silverweed (*Potentilla anserina* ssp. *groenlandica*), and sea milkwort (*Lysimachia maritima*) on higher slough banks. Higher levees are codominated by seaside arrowgrass (*Triglochin maritima*) and goose tongue (*Plantago maritima*).

The mid marsh occupies the reach of land that is inundated only at the highest tides. It typically supports dense swards of Lyngbye's (*Carex lyngbyei*) or Ramensk's (*Carex ramenskii*) sedge, with largeflower speargrass (*Arctopoa eminens*) occupying higher or better-drained ground. Herbs associated with the mid marsh at lower abundances include the sedges: manyflower (*Carex pluriflora*), Mackenzie's (*Carex mackenziei*), and lesser saltmarsh (*Carex glareosa*), and the forb Alaska orache (*Atriplex gmelinii* var. *alaskensis*).

The high marsh ranges from the level of seasonal high tides to the maximum reach of storm surges and salt spray. This zone supports a diversity of graminoid, forb, and shrubs with minimal tolerance of saline conditions and inundation. Accordingly, there is a general shift in dominance from sedges to grasses and greater occurrence of woody species. Common grasses include: dunegrass (*Leymus mollis*), Bering's tufted hairgrass (*Deschampsia beringensis*), red fescue (*Festuca rubra*), Pacific reedgrass (*Calamagrostis nutkaensis*), mountain hairgrass (*Vahlodea latifolia*), and bluejoint reedgrass (*Calamagrostis canadensis*). The low shrubs sweetgale (*Myrica gale*) and dune willow (*Salix hookeriana*) may be locally abundant.

*Range:*

Occurring in coastal settings in the Southeast, Southcentral, and Southwest biogeographic regions (Figure F23). This habitat has also been mapped sparingly in the Western region.

*Climate:*

The maritime climate is characterized by relatively cool summers and warm winters, high annual precipitation, high humidity, and strong and consistent coastal winds.

*Environment:*

Salt marshes develop where relatively flat land receives periodic input of tidal waters. As an interface between the ocean and land, marshes combine aquatic and terrestrial habitats, anoxic and oxygenated conditions, as well as saline and fresh waters. This dynamic environment supports vegetation adapted to saturation and saline conditions. Along the Gulf of Alaska coastline, salt marshes are uncommon, developing in protected topographic pockets, or as larger complexes on major river deltas. Substrate ranges from cobble and gravel to fine-grained silts.

*Disturbance:*

Due to their landscape position, salt marshes are highly susceptible to impacts from development, oil spills, sea level rise, and earthquake-induced slides and tsunamis. Because salt marshes in Southeast Alaska provide flat land along an otherwise rocky coastline, cities, towns, and villages are often located adjacent to these habitats.

Appendix F. Continued.

Along the Gulf of Alaska coastline, land is rising due to isostatic rebound and tectonic uplift, and falling due to tectonic down-warping and climate change-induced sea level rise. Changes in relative sea level have a dramatic effect on coastal systems. Along a rising coastline, the high marsh will pass out of tidal influence and transition to vegetation characteristic of the surrounding nontidal habitats; at the same time, low marsh plants may invade newly exposed mudflats. Along a falling coastline, salt marshes migrate inland with tidewater inundating previously nontidal sites, while low marsh vegetation may erode or drown. Frequent strong winds in the Aleutian Islands and Alaska Peninsula cause erosive waves, retarding seaward marsh development. Consequently, salt marshes are more infrequent along the peninsula and island chain than one would expect based on topography.

### Temperate Intertidal Vegetation

USNVC Synonyms: Temperate Pacific Seaweed Intertidal Vegetation (M106) and Temperate Pacific Seagrass Intertidal Vegetation (M184)

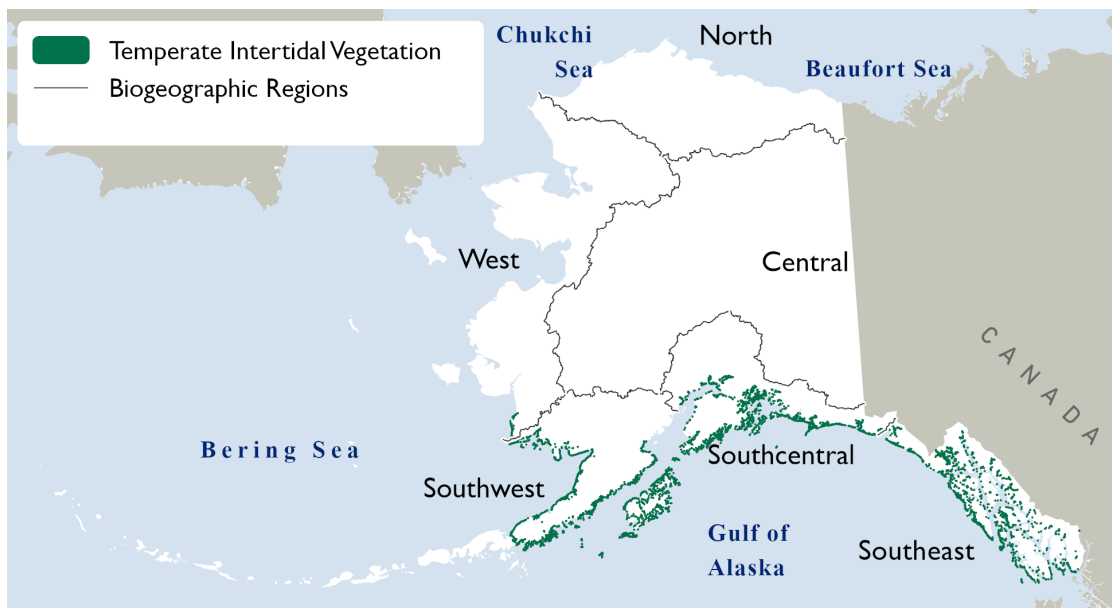


Figure F24. Distribution of temperate intertidal vegetation in Alaska.

#### *Physiognomy:*

Temperate intertidal vegetation is a linear coastal habitat type comprised of low-statured macroalgae (seaweed), and vascular and lichen species tolerant of periodic inundation by brackish or saltwater.

#### *Floristics:*

The distribution of vegetation is influenced by tidal regime with species establishing in relation to their tolerance to inundation and salinity. The width and number of bands of vegetation is related to substrate mobility and exposure to wave action. Narrow bands of a limited number of species typically develop across low-energy, fine-grained beaches where tidal reach is restricted and substrates are susceptible to erosion and redeposition. In contrast, numerous and wide bands tend to develop across high-energy, bedrock beaches where tidal reach is large and substrates are stable.

Along protected shorelines with mud, sand, or cobble shorelines, the low intertidal zone, which may only be exposed once a day, is often vegetated with a band of the flowering plant eelgrass (*Zostera marina*). The mid intertidal zone commonly supports soft brown kelps in the *Saccharina* genus, green seaweeds in the *Ulva* genus, red seaweeds in the *Palmaria* genus, and brown rockweeds such as *Fucus distichus*. Rockweed

## Appendix F. Continued.

has high tolerance for fresh water and freezing temperatures and as such it defines and often dominates the reach of regular tidal inundation.

Along exposed shorelines with boulder or bedrock shorelines, a typical sequence of species, listed from the low to mid intertidal begins with the flowering plant scouler's surfgrass (*Phyllospadix scouleri*) at the water's edge, followed by wide bands of ribbon kelp (*Alaria marginata*), or dark brown kelps in the *Laminaria* genus with patchy red seaweeds in the *Porphyra* genus. A barnacle band intermixed with red sea moss (*Endocladia muricata*) may develop in the high intertidal zone.

Marine lichens often form bands in the high-intertidal to supratidal zone. Black seaside lichen (*Hydropunctaria maura*) forms the lowest band, indicating the wave break zone. Seaside lichens may form bands in the higher, supratidal zone that is exposed to storm surge and salt spray. White seaside lichens (*Coccotrema maritimum*) are common on north-facing granitic rocks or areas shaded by overhanging trees. Orange seaside lichens in the *Caloplaca* and *Xanthoria* genera form supratidal bands in areas of high nutrient input, such as seabird rookeries.

Regardless of protection and substrate, these intertidal communities may be bound by canopy kelp forests (e.g., *Eualaria fistulosa*, *Macrocystis pyrifera*, *Nereocystis luetkeana*) in the low intertidal to subtidal salt marsh or beach and dune plant communities typically bound high intertidal to supratidal areas.

**Range:**

Occurring in coastal settings in the Southeast, Southcentral, and Southwest biogeographic regions (Figure F24). This habitat has also been mapped sparingly in the Western region.

**Climate:**

The maritime climate is characterized by relatively cool summers and warm winters, high annual precipitation, high humidity, and strong and consistent coastal winds.

**Environment:**

Intertidal vegetation establishes where land is regularly inundated by brackish or salt waters. This dynamic environment supports life adapted to inundation and saline conditions with the type of species present largely dependent on shoreline substrate and exposure. The substrate is categorized as mud, sand, gravel, cobble, boulder, and bedrock. Wave exposure ranges from very protected tidal flats to very exposed bedrock cliffs. Tide regime ranges from mesotidal (2 m) along the Aleutian Island chain to extreme in upper Cook Inlet tides (12 m).

**Disturbance:**

Intertidal vegetation is subject to the twice daily inundation of saline water, wave action, and during periods of exposure, wind, and extreme cold. Herbivory by echinoderms, crustaceans, and mollusks can strongly influence the community structure of seaweed beds. As an extreme example, sea urchin grazing on kelp may produce an "urchin barren" devoid of macroalgae. Subsistence harvest targeting wakame (*Alaria marginata*), rockweed (*Fucus distichus*), sea lettuce (*Ulva lactuca*), dulse (*Palmaria mollis*), and species of kelp (*Laminaria*) and nori (*Porphyra*) may have minor impacts. Mariculture of oysters and kelp typically occurs in the subtidal, but may impact the adjacent intertidal zone. Due to their topographic location, intertidal zones are highly susceptible to impacts from oil spills, sea level rise, and earthquake-induced slides and tsunamis.

Appendix F. Continued.

## Arctic Salt Marsh

USNVC Synonym: Arctic Tidal Salt Marsh (M403)

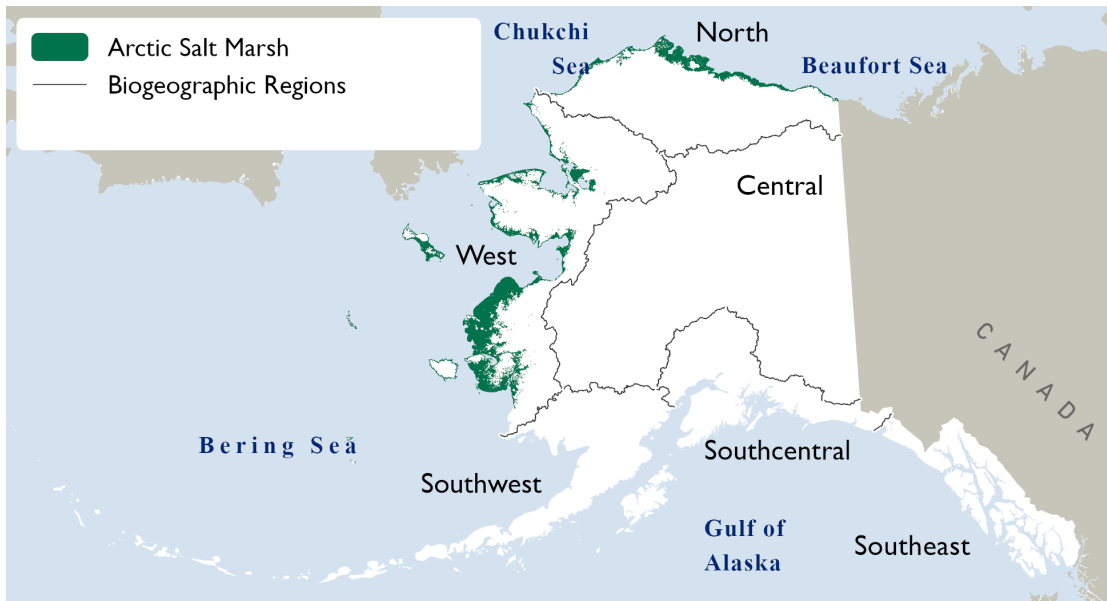


Figure F25. Distribution of Arctic salt marsh in Alaska.

### *Physiognomy:*

Arctic salt marshes are subject to regular tidal inundation and are comprised of salt-tolerant forbs and graminoids. Vegetation ranges from sparse cover of herbaceous species on mudflats, to lush stands of emergent graminoids in estuaries, to well-vegetated graminoid-shrub communities at the upper reach of tidal influence. Except for a single species of prostrate willow, woody and nonvascular plant species are absent and species diversity is low.

### *Floristics:*

Vegetation patterns are related to elevation, which influences the frequency and duration of tidal inundation. Along coastlines with stable elevations, the vegetation pattern is zonal with plants establishing according to their tolerance to salinity and inundation. Along coastlines experiencing subsidence and erosion due to thermokarst, the vegetation pattern is relict of the preexisting, nontidal type.

The most exposed, unvegetated mudflats are pioneered by the clonal, halophytic graminoids: creeping alkaligrass (*Puccinellia phryganodes*) and Hoppner's sedge (*Carex subspathacea*), with the halophytic, succulent forbs: saltmarsh starwort (*Stellaria humifusa*) and Danish scurvygrass (*Cochlearia groenlandica*) colonizing once the graminoids stabilize the substrate.

In contrast, extensive marshes with continuous cover of emergent vegetation may develop in sheltered lagoons and brackish estuaries. Here, the salt-tolerant grasses pendantgrass (*Arctophila fulva*) and Fisher's tundra grass (*Dupontia fisheri*), the forb fourleaf mare's tail (*Hippuris tetraphylla*), and Ramensk's sedge (*Carex ramenskii*) are common.

Across higher ground that is exposed to storm surges and salt spray only, more structurally-complex plant communities develop. Characteristic species include: prostrate oval-leaf willow (*Salix ovalifolia*), and the herbs: Arctic daisy (*Arctanthemum arcticum*), looseflower alpine sedge (*Carex rariflora*), lesser saltmarsh sedge (*Carex glareosa*), circumpolar reedgrass (*Calamagrostis deschampsoides*), tufted hairgrass (*Deschampsia cespitosa*), and Anderson's alkaligrass (*Puccinellia andersonii*).

## Appendix F. Continued.

Sedge dominance transitions from Hoppner's sedge along the Arctic Coastal Plain to Ramensk's sedge along the Bering Sea coast. Lyngbye's sedge (*Carex lyngbyei*) may occur in slightly brackish or freshwater marshes inland of salt marshes dominated by Ramensk's sedge, but does not occur along the Arctic Coastal Plain. With respect to associated salt marsh species, bear sedge (*Carex ursina*), Fisher's tundra grass, Anderson's alkaligrass, and Arctic alkaligrass (*Puccinellia arctica*) occur exclusively along the Arctic Coastal Plain; species with distributions restricted to the Bering Sea Coast include: Mackenzie's sedge (*Carex mackenziei*), Pacific silverweed (*Potentilla anserina* ssp. *groenlandica*), and marsh arrowgrass (*Triglochin palustris*).

*Range:*

Occurring in coastal settings primarily in the Northern and Western biogeographic regions (Figure F25). This habitat has also been mapped sparingly in the Southwest region.

*Climate:*

The Arctic climate is dry and cold, characterized by very short summers and long winters. Coastal winds are strong and persistent. Most of the region is above the Arctic Circle and consequently receives continuous sunlight for several weeks in summer and continuous dark for several weeks in winter. River and sea ice may remain frozen from approximately October to June.

*Environment:*

Salt marshes develop where relatively flat land receives periodic input of tidal waters. As an interface between the ocean and land, tidal marshes combine aquatic and terrestrial habitats, anoxic and oxygenated conditions, as well as saline and fresh waters. This dynamic environment supports vegetation adapted to saturation and saline conditions. Salt marshes along the Arctic Ocean and Bering Sea coasts range from small patches forming in protected topographies, to large lagoon systems forming behind barrier beaches, to extensive inland complexes lining the tidally-influenced waters of large river deltas. Substrates are typically fine-grained silts and peats.

Permafrost ranges from continuous along the Arctic Ocean coast to discontinuous along the Bering Sea coast. Where present, shallow, ice-rich permafrost promotes the inundation of tidal marshes by restricting drainage. However, in all areas underlain by permafrost, the depth of thaw increases with proximity to water bodies due to the capacity of water to retain heat.

Tide regimes vary from microtidal (0.1 m) in the Arctic Ocean to mesotidal (4.5 m) in Bristol Bay. The microtidal regime of the Arctic Ocean reduces the elevational range across which salt marshes develop, however, storm surges across the low-angle topography of coastal plains and deltas can expand the inland extent of salt marshes. The development of salt marshes along high-energy coastlines is further limited by erosion, which truncates the seaward expansion of marsh systems.

*Disturbance:*

Arctic salt marshes are regularly inundated by storm surges which flood coastal and low-lying inland tundra. Permafrost degradation along the Arctic Ocean coast facilitates the inundation of nearshore basins and polygonal tundra resulting in the conversion of freshwater wetlands to salt marshes. Additionally, an increase in ice-free days exposes the coastline to coastal erosion, ice-rafting, and storm surges for a greater period of time, thereby exacerbating the cumulative impacts of these processes. Sediment deposition within river deltas can change the distribution and extent of estuarine marshes. Grazing by large flocks of geese has been shown to shape species composition and structure of salt marshes on the Arctic Coastal Plain and Yukon-Kuskokwim Delta.

Appendix F. Continued.

## Temperate Coastal Beach and Dune

USNVC Synonym: Pacific Coastal Beach & Dune (M059)



Figure F26. Distribution of temperate coastal beach and dune in Alaska.

### *Physiognomy:*

Temperate coastal beach and dune habitats are represented by sparsely vegetated grasslands and herbaceous meadows developing across coastal beaches and dunes. Rhizomatous, stoloniferous, and salt-tolerant graminoids and forbs are typically dominant. Species diversity is low and nonvascular and woody plant species are uncommon.

### *Floristics:*

Species and plant community diversity increases with substrate stability. Grasslands typically occupy mobile substrates on the lower beach with herb meadows developing on more stable stretches of the upper beach and dunes. The dominant plant species occupying the lower beach include the succulent, halophytic forb seaside sandplant (*Honckenya peploides*), dunegrass (*Leymus mollis*), seaside ragwort (*Senecio pseudoarnica*), oysterleaf (*Mertensia maritima*), and beach pea (*Lathyrus japonicus*). In the upper beach, additional grasses, such as red fescue (*Festuca rubra*), meadow barley (*Hordeum brachyantherum*), largeglume bluegrass (*Poa macrocalyx*), largeflower speargrass (*Arctopoa eminens*), Pacific reedgrass (*Calamagrostis nutkaensis*), and Bering's tufted hairgrass (*Deschampsia beringensis*) may intergrade.

Beach meadow communities are characterized by a diversity of associated herbs including the large umbels: common cow parsnip (*Heracleum lanatum*), Scottish licorice-root (*Ligusticum scoticum*), Pacific hemlockparsely (*Conioselinum pacificum*), and seacoast angelica (*Angelica gmelinii*); sedges such as largehead sedge (*Carex macrocephala*), Gmelin's sedge (*Carex gmelini*), Mackenzie's sedge (*Carex mackenziei*), and longawned sedge (*Carex macrochaeta*); and the forbs: silverweed cinquefoil (*Potentilla anserina*), fragrant bedstraw (*Galium triflorum*), Nootka lupine (*Lupinus nootkatensis*), wooly geranium (*Geranium erianthum*), false lily of the valley (*Maianthemum dilatatum*), and Kamchatka aconite (*Aconitum maximum*). Boreal yarrow (*Achillea millefolium* ssp. *borealis*), Tilesius' wormwood (*Artemisia tilesii*), and Arctic rush (*Juncus arcticus*) tend to increase in abundance on more recently disturbed, mineral soils. Sitka spruce (*Picea sitchensis*) saplings may be colonizing in meadows that are lifting out of the range of storm surge and salt spray due to isostatic rebound or regional tectonics.

Appendix F. Continued.

**Range:**

Occurring in the Southeast and Southcentral biogeographic regions; extending into the Southwest region through the Kodiak Island Archipelago, the Alaska Peninsula, and the Aleutian Island chain (Figure F26).

**Climate:**

The maritime climate is characterized by relatively cool summers and warm winters, high annual precipitation, high humidity, and strong and consistent coastal winds.

**Environment:**

This coastal habitat type typically develops along high-energy and exposed coastlines along mainland shores, spits, and barrier islands. Substrates range from coarse sand and gravel along the lower beach to sandy loams in interdune swales. Beach gradients tend to be steep, storm berms are often present, and tidal marshes tend to be absent. Vegetation occupies the elevational range from the upper intertidal zone to the inland extent of salt spray.

**Disturbance:**

Temperate beaches and dunes are exposed to wind, salt spray, and storm surges. Owing to their landscape position, dunes and beaches are highly susceptible to impacts from oil spills and human use. Degree of damage from an oil spill to nearshore waters is expected to vary with factors such as degree of tidal influx, tide level, location, season, and extent and duration of the spill. Off road vehicle use along beaches is frequent near villages and towns.

**Temperate Coastal Cliff and Bluff**

USNVC Synonym: Pacific Coastal Cliff & Bluff (M058)



Figure F27. Distribution of temperate coastal cliff and bluff in Alaska.

**Physiognomy:**

Temperate coastal cliff and bluff vegetation consists of sparsely to moderately vegetated sea cliffs, bluffs, scree slopes, and rocky coastlines exposed to salt spray and ocean wave action. Vascular plants typically have some salt-tolerance and communities are composed of creeping and succulent forbs, low grasses, dwarf

## Appendix F. Continued.

shrubs, and stunted trees, which are restricted to small cracks in rock, or slight, sheltered depressions. Lichen and moss cover can be extensive.

*Floristics:*

Dominant vascular species include the grasses: longawn sedge (*Carex macrochaeta*), Bering's tufted hairgrass (*Deschampsia beringensis*), and red fescue (*Festuca rubra*); and the forbs: goatsbeard (*Aruncus dioicus*), bluebell bellflower (*Campanula rotundifolia*), dwarf fireweed (*Chamaenerion latifolium*), beach strawberry (*Fragaria chiloensis*), alpine heuchera (*Heuchera glabra*), Nootka lupine (*Lupinus nootkatensis*), villous cinquefoil (*Potentilla villosa*), western rattlesnakeroot (*Prenanthes alata*), and ledge stonecrop (*Rhodiola integrifolia*); and the fern long beechfern (*Phegopteris connectilis*). Associated species may include additional forbs such as common yarrow (*Achillea millefolium*), Pacific hemlockparsley (*Conioselinum pacificum*), false lily of the valley (*Maianthemum dilatatum*), seep monkeyflower (*Mimulus guttatus*), and goose tongue (*Plantago maritima*). Sitka spruce (*Picea sitchensis*) tolerates salt spray and stunted individuals may grow from cracks in rocky headlands. Lichen cover can be high, with representation from species in the *Xanthoria* and *Ramalina* genera; dry-site mosses in the *Racomitrium* and *Dicranum* genera also occur.

*Range:*

Occurring in the Southeast and Southcentral biogeographic regions; extending into the Southwest region through the Kodiak Island Archipelago and the Alaska Peninsula (Figure F27).

*Climate:*

The maritime climate is characterized by relatively cool summers and warm winters, high annual precipitation, high humidity, and strong and consistent coastal winds.

*Environment:*

This habitat type consists of sparse yet diverse assemblages of plants on sea cliffs, scree slopes, and rocky coastlines exposed to salt spray and ocean wave action. Soils are thin and limited to fine materials retained in cracks and fissures in the bedrock or rocky substrate.

*Disturbance:*

Exposure to wave, wind and sheet erosion may create substrates that are unstable and subject to failure.

Appendix F. Continued.

## Arctic Coastal Shore

USNVC Synonym: North American Arctic Coastal Shore (M402)



Figure F28. Distribution of Arctic coastal shore in Alaska.

### Physiognomy:

The Arctic coastal shore occurs as sparsely vegetated grasslands and herbaceous meadows developing across coastal beaches and dunes. Rhizomatous and salt-tolerant graminoids and forbs are typically dominant. Species diversity is low and nonvascular and woody plant species are generally absent.

### Floristics:

Species and plant association diversity increases with substrate stability. Grasslands typically occupy mobile substrates on the lower beach with herb meadows developing on stable portions of the upper beach and dunes. Pioneer species tolerant of salt and sand accumulation are the first to establish on newly exposed or created substrates. Dunegrass (*Leymus mollis*) occupies topographic highs, with the succulent, halophytic forb seaside sandplant (*Honckenya peploides*) occurring on lower, often tidally-influenced substrates. Due to the challenges of germination posed by wind and desiccation in a dune environment, most species reproduce vegetatively and quickly develop to clonal stands. Sand dunes may become stabilized by dunegrass and beach pea (*Lathyrus japonicus*) with seaside sandplant, oysterleaf (*Mertensia maritima*), curved sedge (*Carex maritima*), and Baffin fescue (*Festuca baffinensis*) occurring as minor associates along the Arctic Ocean coast. Stable dune communities become more diverse along the Bering Sea coast and may include additional species such as the grasses: Lapland reedgrass (*Calamagrostis lapponica*), red fescue (*Festuca rubra*), tufted hairgrass (*Deschampsia beringensis*), and the forbs: boreal yarrow (*Achillea millefolium* ssp. *borealis*), boreal sagebrush (*Artemisia arctica*), Tilesius' wormwood (*Artemisia tilesii*), Pacific hemlockparsley (*Conioselinum pacificum*), and Lake Huron tansy (*Tanacetum bipinnatum*).

### Range:

Occurring in coastal settings in the Northern and Western biogeographic regions; extending into the Southwest region through the Aleutian Island chain (Figure F28). The habitat has also been mapped sparingly in the Southcentral region.

Appendix F. Continued.

*Climate:*

The Arctic coastal climate is dry and cold, characterized by very short summers and long winters. Winds are strong and persistent. Most of the region is above the Arctic Circle and consequently receives continuous sunlight for several weeks in summer and continuous dark for several weeks in winter. Sea ice remains frozen from approximately October to June.

*Environment:*

Coastal vegetation develops on beaches above the elevation of maximum high tide as well as on dunes along mainland shores and barrier islands. Beach meadows may occupy well-drained stable portions of the upper beach and dunes. Permafrost is present at depth along the Arctic Ocean coast but becomes discontinuous along the Bering Sea coast. Among the barrier islands, vegetated dunes are more common on remnant types, which represent relict coastline, rather than constructed types, which are highly dynamic systems representing comparatively recent depositions of sediment. Soils are dry to mesic and typically sandy with small pebbles; surficial bedrock is absent along the Beaufort Sea Coast and rare along the Chukchi and Bering Sea coasts.

*Disturbance:*

Arctic beaches and dunes are exposed to wind, salt spray, and storm surges. Rafted ice may scour vegetated surfaces and dredge sediment shoreward. An increase in ice-free days exposes the coastline to fetch-dependent processes such as wave action and storm surge for a greater period of time, thereby increasing their cumulative impacts. Owing to their landscape position, dunes and beaches are highly susceptible to impacts from oil spills and human use. Degree of damage from an oil spill to nearshore waters is expected to vary with factors such as degree of tidal influx, tide level, location, season and extent and duration of the spill. Off-road vehicle use along beaches is frequent near villages and towns.

## FRESHWATER AQUATIC HABITATS

### Rivers and Streams

Alaska's flowing waters range from small, ephemeral streams, to intermittent or groundwater-fed channelized rivers, to large, braided glacial and meandering systems. This aquatic habitat is not mapped in the draft Alaska Vegetation Map (Nawrocki et al. 2025). Perennial rivers and streams support numerous aquatic species, including both anadromous and resident fish. Mainstems and tributaries provide critical spawning, rearing, and overwintering habitats, with the type and ratio of substrate materials determining suitability of the habitat for aquatic species during different life stages. Stream and riverbed substrates vary from large boulders to glacial silt or flour, clay, and mud. Large boulders form eddies providing resting areas for fish, while smaller cobbles and gravels allow for the required aeration and subsequent development of fish eggs buried in the streambed. Larger substrates provide greater surface area for aquatic invertebrates, algae, and mosses. The size of substrate materials decreases with the depositional energy of the waterway. Boulder and cobble bed streams are usually found in the high-energy, upper portion of a watershed. These streams often have pockets of gravel and fine sediment in the pools, behind large rocks, and on the inside of bends and other low velocity areas. Mud, silt, or clay are found in the low-energy, lower reaches of a watershed. Along larger, meandering rivers, sediment eroded from upstream cut banks is deposited along downstream point bars. In broad valleys of major rivers, extensive meanders create oxbow lakes in abandoned channels. Braided channels are formed as a result of erosional and depositional processes and are typical of high-volume glacial rivers with episodic flow. Riparian vegetation and large woody debris are an important component of rivers and streams that help stabilize banks and substrate, preserve spawning bed integrity, provide cover from terrestrial predators, and create habitat for aquatic invertebrates, all of which elevate in-stream productivity.

## Appendix F. Continued.

Rivers and streams can be broadly categorized as glacial and nonglacial. Glaciers feed into nearly all major rivers in Alaska and provide the headwaters to some of the state's largest rivers, including the Yukon, Copper, Susitna, Kuskokwim, and Tanana Rivers. Here, the glacial input determines the chemical and physical characteristics of the water, depending on the extent of glacial input relative to other inputs, such as snowmelt and groundwater. Glacial meltwater has high levels of bioavailable nutrients, which fuel high and sustained levels of primary productivity. Glacially driven rivers exhibit variable rates of fluvial activity and channel adjustments from erosional and depositional processes. Rivers originating from glaciers tend to have pronounced daily and seasonal stream flow fluctuations near the glacier, and large interannual fluctuations in discharge along lower reaches. Peak, sediment-laden flows occur during the warmest months of the year, typically May through August. During the winter, when baseflow is derived entirely from groundwater, glacial rivers generally run clear and low.

Nonglacial, or clearwater rivers and streams exhibit low turbidity, high clarity, and flow derived primarily from groundwater and precipitation. Different from glacial waterways, clearwater systems have less variable interannual flow, relatively narrower channel widths, stable and well-defined beds and banks, low sediment loads, and increased habitat complexity in the form of pools, riffles, and large woody debris. Overwintering habitat for anadromous fish can be reduced due to the smaller volume of water available. However, crucial upwelling areas in groundwater-fed streams and perennial spring pools provide some of the most important winter habitats for freshwater aquatic species in Alaska.

## Lakes and Ponds

Alaska's lakes and ponds range from small alpine ponds underlain by bedrock to Arctic thermokarst lakes, to large bodies of water occupying glacial troughs carved in the Pleistocene. This aquatic habitat is not mapped in the draft Alaska Vegetation Map (Nawrocki et al. 2025). Lake and pond habitats vary with substrate, bathymetry, and shoreline contour. In the relatively still waters of lakes and ponds, flow regimes of inlets and outlets, and basin contours influence nutrient cycling, hydraulic retention time, and biological productivity. Glacially carved lakes tend to be deep and bedrock bound with permanent surface water connections. Most of the state's larger lakes, particularly those in Southwest and Southcentral Alaska, resulted from glaciation and are important to both resident and anadromous fish species for overwintering. For example, while Kenai Lake and Iliamna Lake differ in their glacial and nonglacial inputs, both are connected to rivers that support large and valuable runs of salmon.

Different from glacial lakes, lakes and ponds of thermokarst, fluvial, and volcanic origin generally lack connecting tributaries. These isolated waterbodies may instead be connected by seasonal or subsurface waterways. For example, thermokarst ponds are often connected by the subsurface flow of groundwater over perennially frozen soil (permafrost), and through connections to deeper aquifers through taliks. In the north, the depth of lakes and ponds is important for the survival of aquatic species. In general, waterbodies less than six feet deep will freeze to the bottom, leaving no free water for the survival of resident fish.

## Freshwater Aquatic Vegetation

USNVC Synonym: Western North American Freshwater Aquatic Vegetation (M109) and Boreal Freshwater Aquatic Vegetation (M871).

### *Physiognomy:*

Freshwater aquatic vegetation consists of rooted, submerged, and free-floating herbaceous plants growing in fresh, standing water and slow-moving streams. Vegetation cover is greater than 25%. Woody species are not present and emergent graminoids and nonvascular plants are uncommon. Species diversity is typically low.

## Appendix F. Continued.

*Floristics:*

Aquatic plant communities and the life forms of their constituent species can be partially differentiated by the depth of water in which they occur. Littoral, or nearshore communities are often dominated by robust emergent species intermixed with rooted, often submerged forbs and nonvascular species. Common mare's tail (*Hippuris vulgaris*)\* is an emergent forb that forms monocultures along fine-grained, mineral shorelines and gravel. Similar to mare's tail, the emergent bur-reeds: shortspike (*Sparganium angustifolium*) and northern (*Sparganium hyperboreum*)\* also form shoreline monocultures, often in more organic-rich sediment. Submerged and often cryptic species of quillwort (*Isoetes*), water-starwort (*Callitriche*), water mudwort (*Limosella aquatica*), and waterawlwort (*Subularia aquatica*) grow in shallow portions of the littoral zone. Nonvascular plants such as the aquatic mosses *Fontinalis antipyretica* and *Sarmentypnum sarmentosum*, the liverwort *Scapania paludosa*, and the lichen *Siphula ceratites* may grow submerged in shallow waters or on pond margins. Free-floating duckweed (*Lemna turionifera*) can form dense mats on the surface of nutrient-rich, sun-exposed waters. While they can occur anywhere on a lake or pond surface, duckweed mats are often blown to the shoreline where they are caught by emergent vegetation. While rarely dominant, aquatic buttercups including threadleaf crowfoot (*Ranunculus trichophyllus*), white water crowfoot (*Ranunculus mongolicus*), high northern buttercup (*Ranunculus hyperboreus*)\*, Gemlin's buttercup (*Ranunculus gmelinii*)\*, and Pallas buttercup (*Coptidium pallasii*) are commonly associated with shoreline communities and slow-moving waters. In the boreal zone, fineleaf pondweed (*Stuckenia filiformis*)\*, Yenisei River pondweed (*Potamogeton subsibiricus*)\*, small pondweed (*Potamogeton berchtoldii*)\*, Fries' pondweed (*Potamogeton friesii*), and leafy pondweed (*Potamogeton foliosus*), and the insectivorous bladderwort (*Utricularia*)\*, may be intermixed in deeper water sections of the littoral zone.

Rocky Mountain pond-lily (*Nuphar polysepala*) frequently occupies the transition from the littoral to limnetic zone in the temperate regions of Alaska. This is a rooted, vascular species with floating leaf pads that is associated with muck-bottomed ponds in forested settings. Deeper, limnetic waters in the temperate zone are dominated by pondweeds including floating pondweed (*Potamogeton natans*), alpine pondweed (*Potamogeton alpinus*)\*, whitestem pondweed (*Potamogeton praelongus*)\*, variableleaf pondweed (*Potamogeton gramineus*), and Richardson's pondweed (*Potamogeton perfoliatus* ssp. *richardsonii*). Watermilfoil (*Myriophyllum sibiricum*) is a commonly associated, submerged species in these deeper water communities. While not plants, the macroscopic algae species *Chara* and *Nitella* and freshwater sponges, such as *Spongilla lacustris*, resemble submerged aquatic species and perform many of the same ecological functions, including the production of food and protection from predators.

*Range:*

Occurring in freshwater aquatic settings in all 6 biogeographic regions in Alaska. This aquatic habitat is not mapped in the draft Alaska Vegetation Map (Nawrocki et al. 2025).

*Climate:*

The maritime climate in the Southeast, Southcentral, and Southwestern biogeographic regions is cool in the summer and mild in the winter with low annual variation in temperature. Precipitation as rain, snow, and fog drip is abundant. The boreal and Arctic biogeographic regions (Central, Western, and Northern) are characterized by short, warm summers and long, very cold winters. The region above the Arctic Circle receives continuous sunlight for several weeks in summer and continuous twilight for several weeks in winter. Permafrost is continuous in the Arctic, becoming discontinuous in the southern boreal region.

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\* Relatively few aquatic plants are found in the Arctic regions of Alaska; they are denoted here with an asterisk.

Appendix F. Continued.

**Environment:**

The occurrence of aquatic vegetation tends to be limited in spatial extent and patchy or linear in spatial pattern. Stands develop in lakes, ponds, oxbows, and slow-moving portions of rivers and streams. In large waterbodies, aquatic vegetation tends to be restricted to the littoral region where the penetration of light does not limit growth. Sediment is typically fine grained, organic-rich muck. Waterbodies in the southern Alaska regions, especially smaller lakes and ponds freeze in the winter although permafrost is absent. Permafrost is continuous in the Arctic and nearly continuous in the boreal zone but may be depressed under large waterbodies that are able to retain heat through the winter.

**Disturbance:**

Freshwater aquatic beds represent early-successional communities that may be replaced by wetland marshes, wet meadows, fens, floating bogs, or permafrost plateaus. Shallow lakes and small ponds freeze to the bottom in the winter; vegetation in larger lakes with sufficient fetch may be damaged by scour of wind-blown and rafted ice. Increase in nutrients, such as nitrogen and phosphorus, may prompt a shift from oligotrophic or mesotrophic to eutrophic conditions and a subsequent change in plant community composition towards fast-growing plant and algal species. Such lakes are particularly susceptible to the establishment of the invasive aquatic waterweed *Elodea canadensis*.

## GLACIAL HABITATS

### Perennial Snow, Ice, and Glacial Outwash

USNVC Synonyms: North American Glacier & Ice Field and North American Glacial Outwash



Figure F29. Distribution of perennial snow, ice, and glacial outwash in Alaska.

Glaciers, perennial snow fields, and glacial outwash occur on mountain slopes and valleys in the Southeast, Southcentral, Southwest, and Central regions (Figure F29). Perennial snow and ice represent glaciers and ice fields. Glaciers occur on moderately steep to steep mountain slopes and in mountain valleys. Crevasses, seracs, and moulins are common glacial features. On the lower reaches of glaciers there is often a relatively thin veneer of very to extremely cobbly, stony, or bouldery glacier sediments over glacier ice. Ice fields are

## Appendix F. Continued.

broad ice-covered areas high in the mountains typically on nearly level to strongly sloping gradients. Soils are generally nonexistent, although glacier ice is sometimes covered by a thin veneer of rocky till. Vegetation is absent except in low-elevation ablation zones, where early-successional species, such as Sitka alder (*Alnus alnobetula* ssp. *sinuata*), can become established on thick till overlying glacial ice.

Glacial outwash consists of recently deglaciated material at the toe of a receding glacier. Surface organics are typically absent or very thin and extremely patchy. Mineral soils are very to extremely gravelly, cobbly, stony, or bouldery loamy sand, and sand and as a result are excessively drained. Depth to bedrock is generally deep. Vegetation is sparsely distributed but can include patches of early successional plants, such as alder shrubs, Drummond's mountain avens (*Dryas drummondii*), lichens, and bryophytes.

Appendix G. Scientific and common names of plant taxa referenced in Chapter 6 and Appendix F, organized by life form. Plant taxonomy follows the *Flora of Alaska* ([floraofalaska.org](http://floraofalaska.org)); plant common names follow the U.S. Department of Agriculture (USDA) Plants Database ([plants.usda.gov](http://plants.usda.gov)).

Life Form	Scientific Name	Common Name
tree	<i>Abies lasiocarpa</i>	subalpine fir
	<i>Alnus rubra</i>	red alder
	<i>Betula kenaica</i>	Kenai birch
	<i>Betula neoalaskana</i>	Alaska birch
	<i>Callitropsis nootkatensis</i>	Alaska cedar
	<i>Larix laricina</i>	tamarack
	<i>Picea × lutzii</i>	Lutz spruce
	<i>Picea glauca</i>	white spruce
	<i>Picea mariana</i>	black spruce
	<i>Picea sitchensis</i>	Sitka spruce
	<i>Pinus contorta</i> var. <i>contorta</i>	beach pine
	<i>Populus balsamifera</i>	balsam poplar
	<i>Populus tremuloides</i>	quaking aspen
	<i>Populus trichocarpa</i>	black cottonwood
	<i>Thuja plicata</i>	western red cedar
	<i>Tsuga heterophylla</i>	western hemlock
	<i>Tsuga mertensiana</i>	mountain hemlock
	<i>Alnus alnobetula</i> ssp. <i>fruticosa</i>	Siberian alder
	<i>Alnus alnobetula</i> ssp. <i>sinuata</i>	Sitka alder
	<i>Alnus incana</i> ssp. <i>tenuifolia</i>	thinleaf alder
	<i>Amelanchier alnifolia</i>	Saskatoon serviceberry
	<i>Betula glandulosa</i>	resin birch
	<i>Betula nana</i>	dwarf birch
<i>Chamaedaphne calyculata</i>	leatherleaf	
<i>Cornus sericea</i>	redosier dogwood	
shrub	<i>Elaeagnus commutata</i>	silverberry
	<i>Elliottia pyroliflora</i>	copperbush
	<i>Gaultheria shallon</i>	salal
	<i>Juniperus communis</i>	common juniper
	<i>Malus fusca</i>	Oregon crab apple
	<i>Myrica gale</i>	sweetgale
	<i>Oplopanax horridus</i>	devilsclub
	<i>Rhododendron groenlandicum</i>	bog labrador tea
	<i>Rhododendron menziesii</i>	rusty menziesia
	<i>Rhododendron tomentosum</i> ssp. <i>decumbens</i>	marsh labrador tea
	<i>Ribes bracteosum</i>	stink currant
	<i>Rosa acicularis</i>	prickly rose
	<i>Rubus spectabilis</i>	salmonberry
	<i>Salix alaxensis</i>	feltleaf willow
	<i>Salix arbusculoides</i>	littletree willow
	<i>Salix barclayi</i>	Barclay's willow

## Appendix G. Continued.

Life Form	Scientific Name	Common Name
shrub	<i>Salix bebbiana</i>	Bebb willow
	<i>Salix commutata</i>	undergreen willow
	<i>Salix fuscescens</i>	Alaska bog willow
	<i>Salix glauca</i>	grayleaf willow
	<i>Salix hookeriana</i>	dune willow
	<i>Salix niphoclada</i>	barrenground willow
	<i>Salix pulchra</i>	tealeaf willow
	<i>Salix richardsonii</i>	Richardson's willow
	<i>Salix scouleriana</i>	Scouler's willow
	<i>Salix sitchensis</i>	Sitka willow
	<i>Sambucus racemosa</i>	red elderberry
	<i>Shepherdia canadensis</i>	buffaloberry
	<i>Sorbus scopulina</i>	Greene's mountain ash
	<i>Sorbus sitchensis</i>	western mountain ash
	<i>Spiraea douglasii</i>	rose spirea
	<i>Spiraea stevenii</i>	beauverd spirea
	<i>Vaccinium alaskaense</i>	Alaska blueberry
	<i>Vaccinium ovalifolium</i>	oval-leaf blueberry
	<i>Vaccinium parvifolium</i>	red huckleberry
<i>Viburnum edule</i>	highbush cranberry	
dwarf shrub	<i>Andromeda polifolia</i>	bog rosemary
	<i>Arctostaphylos uva-ursi</i>	kinnikinnick
	<i>Arctous alpina</i>	alpine bearberry
	<i>Cassiope lycopodioides</i>	clubmoss mountain heather
	<i>Cassiope mertensiana</i>	western moss heather
	<i>Cassiope tetragona</i>	white arctic mountain heather
	<i>Diapensia obovata</i>	pincushion plant
	<i>Dryas ajanensis</i>	eightpetal mountain-avens
	<i>Dryas alaskensis</i>	Alaskan mountain-avens
	<i>Dryas drummondii</i>	Drummond's mountain-avens
	<i>Dryas integrifolia</i>	entireleaf mountain-avens
	<i>Empetrum nigrum</i>	crowberry
	<i>Harrimanella stelleriana</i>	Alaska bellheather
	<i>Kalmia microphylla</i>	alpine laurel
	<i>Kalmia procumbens</i>	alpine azalea
	<i>Linnaea borealis</i>	twinflower
	<i>Luetkea pectinata</i>	partridgefoot
	<i>Oxycoccus microcarpus</i>	small cranberry
	<i>Phyllodoce aleutica</i>	Aleutian mountainheath
	<i>Phyllodoce glanduliflora</i>	yellow mountainheath
	<i>Salix arctica</i>	Arctic willow
	<i>Salix ovalifolia</i>	oval-leaf willow
	<i>Salix phlebophylla</i>	skeletonleaf willow
<i>Salix polaris</i>	polar willow	

## Appendix G. Continued.

Life Form	Scientific Name	Common Name
dwarf shrub	<i>Salix reticulata</i>	netleaf willow
	<i>Salix rotundifolia</i>	least willow
	<i>Salix stolonifera</i>	sprouting leaf willow
	<i>Vaccinium caespitosum</i>	dwarf bilberry
	<i>Vaccinium uliginosum</i>	bog blueberry
	<i>Vaccinium vitis-idaea</i>	lingonberry
forb	<i>Achillea millefolium</i>	common yarrow
	<i>Achillea millefolium</i> ssp. <i>borealis</i>	boreal yarrow
	<i>Aconitum delphiniifolium</i>	larskspurleaf monkshood
	<i>Aconitum maximum</i>	Kamchatka aconite
	<i>Anemonastrum sibiricum</i>	narcissus anemone
	<i>Angelica gmelinii</i>	seacoast angelica
	<i>Arctanthemum arcticum</i>	arctic daisy
	<i>Artemisia arctica</i>	boreal sagebrush
	<i>Artemisia borealis</i>	field sagewort
	<i>Artemisia frigida</i>	prairie sagewort
	<i>Artemisia kruhsiana</i> ssp. <i>alaskana</i>	Alaska wormwood
	<i>Artemisia tilesii</i>	Tilesius' wormwood
	<i>Aruncus dioicus</i>	goatsbeard
	<i>Atriplex gmelinii</i> var. <i>alaskensis</i>	Alaska orache
	<i>Bistorta plumosa</i>	meadow bistort
	<i>Bistorta vivipara</i>	alpine bistort
	<i>Bupleurum americanum</i>	American thoroughwort
	<i>Calla palustris</i>	water arum
	<i>Callitriche</i> spp.	water star-wort
	<i>Campanula lasiocarpa</i>	mountain harebell
	<i>Campanula rotundifolia</i>	bluebell bellflower
	<i>Castilleja unalaschcensis</i>	Alaska Indian paintbrush
	<i>Chamaenerion angustifolium</i>	fireweed
	<i>Chamaenerion latifolium</i>	dwarf fireweed
	<i>Cherleria arctica</i>	arctic stitchwort
	<i>Chrysosplenium wrightii</i>	Wright's golden saxifrage
	<i>Circaea alpina</i>	enchanter's nightshade
	<i>Cochlearia groenlandica</i>	Danish scurvygrass
	<i>Comarum palustre</i>	purple marshlocks
	<i>Conioselinum pacificum</i>	Pacific hemlockparsley
	<i>Coptidium pallasii</i>	Pallas' buttercup
	<i>Coptis aspleniifolia</i>	fernleaf goldthread
	<i>Cornus canadensis</i>	bunchberry dogwood
	<i>Dodecatheon pulchellum</i>	darkthroat shooting star
	<i>Drosera rotundifolia</i>	roundleaf sundew
	<i>Erigeron peregrinus</i>	subalpine fleabane
<i>Eurybia sibirica</i>	subalpine aster	
<i>Fragaria chiloensis</i>	beach strawberry	

## Appendix G. Continued.

Life Form	Scientific Name	Common Name
forb	<i>Fritillaria camschatcensis</i>	Kamchatka fritillary
	<i>Galium boreale</i>	northern bedstraw
	<i>Galium triflorum</i>	fragrant bedstraw
	<i>Gentianella propinqua</i>	fourpart dwarf gentian
	<i>Geocaldon lividum</i>	false toadflax
	<i>Geranium erianthum</i>	woolly geranium
	<i>Geum calthifolium</i>	calthaleaf avens
	<i>Geum rossii</i>	Ross' avens
	<i>Hedysarum americanum</i>	alpine sweetvetch
	<i>Heracleum lanatum</i>	common cowparsnip
	<i>Heracleum maximum</i>	cowparsnip
	<i>Heuchera glabra</i>	alpine heuchera
	<i>Hippuris montana</i>	mountain mare's tail
	<i>Hippuris tetraphylla</i>	fourleaf mare's tail
	<i>Hippuris vulgaris</i>	common mare's tail
	<i>Honckenya peploides</i>	seaside sandplant
	<i>Iris setosa</i>	beachhead iris
	<i>Lathyrus japonicus</i>	beach pea
	<i>Lathyrus palustris</i>	marsh pea
	<i>Lemna turionifera</i>	turion duckweed
	<i>Ligusticum scoticum</i>	Scottish licorice-root
	<i>Limosella aquatica</i>	water mudwort
	<i>Lupinus arcticus</i>	Arctic lupine
	<i>Lupinus nootkatensis</i>	Nootka lupine
	<i>Lysichiton americanus</i>	skunkcabbage
	<i>Lysimachia europaea</i>	arctic starflower
	<i>Lysimachia maritima</i>	sea milkwort
	<i>Lythrum salicaria</i>	purple loosestrife (invasive)
	<i>Maianthemum dilatatum</i>	false lily of the valley
	<i>Menyanthes trifoliata</i>	buckbean
	<i>Mertensia maritima</i>	oysterleaf
	<i>Mertensia paniculata</i>	tall bluebells
	<i>Mimulus guttatus</i>	seep monkeyflower
	<i>Myosotis alpestris ssp. asiatica</i>	Asian forget-me-not
	<i>Myriophyllum sibiricum</i>	shortspike watermilfoil
	<i>Nephrophyllidium crista-galli</i>	deercabbage
	<i>Nuphar polysepala</i>	Rocky Mountain pond lily
	<i>Oxyria digyna</i>	alpine mountainsorrel
	<i>Oxytropis bryophila</i>	blackish oxytrope
	<i>Packera hyperborealis</i>	northern groundsel
	<i>Parnassia fimbriata</i>	fringed grass of parnassus
	<i>Parnassia kotzebuei</i>	Kotzebue's grass of Parnassus
<i>Parnassia palustris</i>	marsh grass of parnassus	
<i>Pedicularis capitata</i>	capitate lousewort	

## Appendix G. Continued.

Life Form	Scientific Name	Common Name
forb	<i>Petasites frigidus</i>	arctic sweet coltsfoot
	<i>Phyllospadix scouleri</i>	Scouler's surfgrass
	<i>Pinguicula vulgaris</i>	butterwort
	<i>Plantago maritima</i>	goose tongue
	<i>Platanthera dilatata</i>	scentbottle
	<i>Polemonium acutiflorum</i>	tall Jacob's ladder
	<i>Polemonium boreale</i>	northern Jacob's ladder
	<i>Potamogeton alpinus</i>	alpine pondweed
	<i>Potamogeton berchtoldii</i>	small pondweed
	<i>Potamogeton foliosus</i>	leafy pondweed
	<i>Potamogeton friesii</i>	Fries' pondweed
	<i>Potamogeton gramineus</i>	variableleaf pondweed
	<i>Potamogeton natans</i>	floating pondweed
	<i>Potamogeton perfoliatus ssp. richardsonii</i>	Richardson's pondweed
	<i>Potamogeton praelongus</i>	whitestem pondweed
	<i>Potamogeton subsibiricus</i>	Yenisei River pondweed
	<i>Potentilla anserina</i>	silverweed cinquefoil
	<i>Potentilla anserina ssp. groenlandica</i>	Pacific silverweed
	<i>Potentilla nana</i>	Arctic cinquefoil
	<i>Potentilla villosa</i>	villous cinquefoil
	<i>Prenanthes alata</i>	western rattlesnakeroot
	<i>Pyrola spp.</i>	wintergreen
	<i>Ranunculus gmelinii</i>	Gmelin's buttercup
	<i>Ranunculus hyperboreus</i>	high northern buttercup
	<i>Ranunculus mongolicus</i>	white water crowfoot
	<i>Ranunculus occidentalis</i>	western buttercup
	<i>Ranunculus trichophyllus</i>	threadleaf crowfoot
	<i>Rhodiola integrifolia</i>	ledge stonecrop
	<i>Rubus arcticus</i>	Arctic raspberry
	<i>Rubus chamaemorus</i>	cloudberry
	<i>Rubus pedatus</i>	strawberryleaf raspberry
	<i>Salicornia maritima</i>	slender grasswort
	<i>Sanguisorba canadensis</i>	Canadian burnet
	<i>Sanguisorba officinalis</i>	great burnet
	<i>Saussurea angustifolia</i>	narrowleaf saw-wort
	<i>Saxifraga aleutica</i>	Aleutian saxifrage
	<i>Saxifraga cernua</i>	nodding saxifrage
	<i>Saxifraga oppositifolia</i>	purple mountain saxifrage
	<i>Saxifraga tricuspidata</i>	three toothed saxifrage
	<i>Senecio lugens</i>	small blacktip ragwort
	<i>Senecio pseudoarnica</i>	seaside ragwort
	<i>Senecio triangularis</i>	arrowleaf ragwort
<i>Sibbaldia procumbens</i>	creeping sibbaldia	

## Appendix G. Continued.

Life Form	Scientific Name	Common Name
forb	<i>Silene acaulis</i>	moss campion
	<i>Sparganium angustifolium</i>	narrowleaf bur-reed
	<i>Sparganium hyperboreum</i>	northern bur-reed
	<i>Spergularia canadensis</i>	Canadian sandspurry
	<i>Spiranthes romanzoffiana</i>	hooded lady's tresses
	<i>Stellaria humifusa</i>	saltmarsh starwort
	<i>Streptopus amplexifolius</i>	claspleaf twistedstalk
	<i>Stuckenia filiformis</i>	fineleaf pondweed
	<i>Suaeda calceoliformis</i>	Pursh seepweed
	<i>Subularia aquatica</i>	waterawlwort
	<i>Swertia obtusa</i>	felwort
	<i>Tanacetum bipinnatum</i>	Lake Huron tansy
	<i>Tiarella trifoliata</i>	threeleaf foamflower
	<i>Triantha glutinosa</i>	sticky tofieldia
	<i>Typha latifolia</i>	broadleaf cattail
	<i>Utricularia intermedia</i>	bladderwort
	<i>Valeriana capitata</i>	capitate valerian
	<i>Valeriana sitchensis</i>	Sitka valerian
	<i>Veratrum viride</i>	green false hellebore
	<i>Veronica wormskjoldi</i>	American alpine speedwell
	<i>Viola epipsila</i>	dwarf marsh violet
	<i>Viola glabella</i>	pioneer violet
<i>Wilhelmsia physodes</i>	merckia	
<i>Zostera marina</i>	eelgrass	
graminoid	<i>Arctagrostis latifolia</i>	wideleaf polargrass
	<i>Arctophila fulva</i>	pendant grass
	<i>Arctopoa eminens</i>	largeflower speargrass
	<i>Bromus pumpellianus</i>	Pumpelly's brome
	<i>Bromus pumpellianus</i> var. <i>pumpellianus</i>	Pumpelly's brome
	<i>Calamagrostis canadensis</i>	bluejoint reedgrass
	<i>Calamagrostis deschampsoides</i>	circumpolar reedgrass
	<i>Calamagrostis lapponica</i>	Lapland reedgrass
	<i>Calamagrostis neglecta</i>	slimstem reedgrass
	<i>Calamagrostis nutkaensis</i>	Pacific reedgrass
	<i>Calamagrostis purpurascens</i>	purple reedgrass
	<i>Carex anthoxanthea</i>	grassyslope Arctic sedge
	<i>Carex aquatilis</i>	water sedge
	<i>Carex bigelowii</i>	Bigelow's sedge
	<i>Carex chordorrhiza</i>	creeping sedge
	<i>Carex circinata</i>	coiled sedge
	<i>Carex echinata</i>	star sedge
	<i>Carex flava</i>	yellow sedge
	<i>Carex glareosa</i>	lesser saltmarsh sedge

## Appendix G. Continued.

Life Form	Scientific Name	Common Name
graminoid	<i>Carex gmelini</i>	Gmelin's sedge
	<i>Carex lasiocarpa</i>	woollyfruit sedge
	<i>Carex limosa</i>	mud sedge
	<i>Carex livida</i>	livid sedge
	<i>Carex lyngbyei</i>	Lyngbye's sedge
	<i>Carex mackenziei</i>	Mackenzie's sedge
	<i>Carex macrocephala</i>	largehead sedge
	<i>Carex macrochaeta</i>	longawn sedge
	<i>Carex maritima</i>	curved sedge
	<i>Carex membranacea</i>	fragile sedge
	<i>Carex microchaeta</i>	smallawned sedge
	<i>Carex micropoda</i>	Pyrenean sedge
	<i>Carex pauciflora</i>	fewflower sedge
	<i>Carex pluriflora</i>	manyflower sedge
	<i>Carex podocarpa</i>	shortstalk sedge
	<i>Carex ramenskii</i>	Ramensk's sedge
	<i>Carex rariflora</i>	looseflower alpine sedge
	<i>Carex rostrata</i>	beaked sedge
	<i>Carex rotundata</i>	round sedge
	<i>Carex rupestris</i>	curly sedge
	<i>Carex saxatilis</i>	rock sedge
	<i>Carex scirpoidea</i>	northern singlespike sedge
	<i>Carex sitchensis</i>	Sitka sedge
	<i>Carex stylosa</i>	variegated sedge
	<i>Carex subspathacea</i>	Hoppner's sedge
	<i>Carex ursina</i>	bear sedge
	<i>Carex utriculata</i>	Northwest Territory sedge
	<i>Deschampsia beringensis</i>	Bering's tufted hairgrass
	<i>Deschampsia cespitosa</i>	tufted hairgrass
	<i>Dupontia fisheri</i>	Fisher's tundra grass
	<i>Eleocharis palustris</i>	common spikerush
	<i>Eleocharis suksdorfiana</i>	Suksdorf's spikerush
	<i>Eriophorum angustifolium</i>	tall cottongrass
	<i>Eriophorum russeolum</i>	red cottongrass
	<i>Eriophorum scheuchzeri</i>	white cottongrass
	<i>Eriophorum vaginatum</i>	tussock cottongrass
	<i>Eriophorum viridicarinatum</i>	thinleaf cotton sedge
	<i>Festuca altaica</i>	Altai fescue
	<i>Festuca baffinensis</i>	Baffin fescue
	<i>Festuca brachyphylla</i>	alpine fescue
	<i>Festuca rubra</i>	red fescue
<i>Hierochloa alpina</i>	alpine sweetgrass	
<i>Hordeum brachyantherum</i>	meadow barley	

## Appendix G. Continued.

Life Form	Scientific Name	Common Name
graminoid	<i>Juncus arcticus</i>	Arctic rush
	<i>Juncus balticus</i>	Baltic rush
	<i>Juncus bufonius</i>	toad rush
	<i>Juncus mertensianus</i>	Merten's rush
	<i>Koeleria asiatica</i>	Eurasian Junegrass
	<i>Leymus mollis</i>	American dunegrass
	<i>Luzula arcuata</i>	curved woodrush
	<i>Luzula piperi</i>	Piper's woodrush
	<i>Phalaris arundinacea</i>	reed canarygrass (invasive)
	<i>Phippsia algida</i>	icegrass
	<i>Poa arctica</i>	Arctic bluegrass
	<i>Poa macrocalyx</i>	largeglume bluegrass
	<i>Puccinellia andersonii</i>	Anderson's alkaligrass
	<i>Puccinellia arctica</i>	Arctic alkaligrass
	<i>Puccinellia nutkaensis</i>	Nootka alkaligrass
	<i>Puccinellia phryganodes</i>	creeping alkaligrass
	<i>Schoenoplectus tabernaemontani</i>	softstem bulrush
	<i>Trichophorum cespitosum</i>	tufted bulrush
	<i>Triglochin maritima</i>	seaside arrowgrass
	<i>Triglochin palustris</i>	marsh arrowgrass
<i>Trisetum spicatum</i>	spike trisetum	
<i>Vahlodea latifolia</i>	mountain hairgrass	
fern and allies	<i>Athyrium filix-femina</i>	lady fern
	<i>Cystopteris montana</i>	mountain bladderfern
	<i>Dryopteris expansa</i>	woodfern
	<i>Equisetum arvense</i>	field horsetail
	<i>Equisetum fluviatile</i>	water horsetail
	<i>Equisetum palustre</i>	marsh horsetail
	<i>Equisetum sylvaticum</i>	woodland horsetail
	<i>Equisetum variegatum</i>	variegated scouringrush
	<i>Gymnocarpium dryopteris</i>	western oakfern
	<i>Isoetes</i> spp.	quillwort
	<i>Phegopteris connectilis</i>	long beechfern
<i>Struthiopteris spicant</i>	deer fern	
bryophyte	<i>Abietinella abietina</i>	abietinella moss
	<i>Andreaea blyttii</i>	Blytt's andreaea moss
	<i>Aulacomnium palustre</i>	aulacomnium moss
	<i>Aulacomnium turgidum</i>	turgid aulacomnium moss
	<i>Calliergon</i> spp.	calliergon moss
	<i>Campylium</i> spp.	campylium moss
	<i>Ceratodon purpureus</i>	ceratodon moss
	<i>Dicranum elongatum</i>	elongate dicranum moss
	<i>Drepanocladus</i> spp.	drepanocladus moss

## Appendix G. Continued.

Life Form	Scientific Name	Common Name
bryophyte	<i>Fontinalis antipyretica</i>	anitifever fontinalis moss
	<i>Hylocomium splendens</i>	splendid feather moss
	<i>Meesia triquetra</i>	meesia moss
	<i>Paludella squarrosa</i>	angled paludella moss
	<i>Philonotis fontana</i>	philontis moss
	<i>Pleurozium schreberi</i>	Schreber's big red stem moss
	<i>Pleurozium</i> spp.	big red stem moss
	<i>Polytrichum juniperinum</i>	polytrichum moss
	<i>Ptilium</i> spp.	ptilium moss
	<i>Racomitrium canescens</i>	racomitrium moss
	<i>Racomitrium lanuginosum</i>	racomitrium moss
	<i>Rhytidiadelphus loreus</i>	goose neck moss
	<i>Rhytidium rugosum</i>	rhytidium moss
	<i>Sarmentypnum sarmentosum</i>	sarmentypnum moss
	<i>Scorpidium revolvens</i>	scorpidium moss
	<i>Scorpidium scorpioides</i>	scorpidium moss
	<i>Sphagnum</i> spp.	sphagnum
	<i>Tomentypnum nitens</i>	tomentypnum moss
liverwort	<i>Anthelia juratzkana</i>	N/A
	<i>Gymnomitrium corallioides</i>	N/A
	<i>Marchantia polymorpha</i>	N/A
	<i>Ptilidium ciliare</i>	N/A
	<i>Scapania paludosa</i>	N/A
lichen	<i>Alectoria nigricans</i>	witch's hair lichen
	<i>Alectoria ochroleuca</i>	witch's hair lichen
	<i>Alectoria sarmentosa</i>	witch's hair lichen
	<i>Bryoria capillaris</i>	horsehair lichen
	<i>Caloplaca</i> spp.	orange seaside lichen
	<i>Cetraria ericetorum</i>	cetraria lichen
	<i>Cetraria islandica</i>	island cetraria lichen
	<i>Cladonia arbuscula</i>	reindeer lichen
	<i>Cladonia stellaris</i>	star reindeer lichen
	<i>Cladonia uncialis</i>	cup lichen
	<i>Coccotrema maritimum</i>	white seaside lichen
	<i>Dactylina arctica</i>	arctic dactylina lichen
	<i>Flavocetraria cucullata</i>	N/A
	<i>Flavocetraria nivalis</i>	N/A
	<i>Hydropunctaria maura</i>	black seaside lichen
	<i>Masonhalea richardsonii</i>	Richardson's masonhalea lichen
	<i>Nephroma arcticum</i>	arctic kidney lichen
	<i>Ochrolechia frigida</i>	cold crabseye lichen
	<i>Ophioparma lapponica</i>	ophioparma lichen
	<i>Peltigera</i> spp.	felt lichen
<i>Pertusaria</i> spp.	pore lichen	

## Appendix G. Continued.

Life Form	Scientific Name	Common Name
lichen	<i>Ramalina</i> spp.	cartilage lichen
	<i>Rhizocarpon geographicum</i>	world map lichen
	<i>Siphula ceratites</i>	whitefingers lichen
	<i>Stereocaulon alpinum</i>	alpine snow lichen
	<i>Stereocaulon paschale</i>	snow lichen
	<i>Thamnolia vermicularis</i>	whiteworm lichen
	<i>Umbilicaria hyperborea</i>	navel lichen
	<i>Usnea lapponica</i>	Lapland beard lichen
	<i>Xanthoria</i>	orange seaside lichen
algae: saltwater (seaweed)	<i>Alaria marginata</i>	ribbon kelp
	<i>Endocladia muricata</i>	sea moss
	<i>Eualaria fistulosa</i>	dragon kelp
	<i>Fucus distichus</i>	rockweed
	<i>Laminaria</i> spp.	laminarian kelp
	<i>Macrocystis pyrifera</i>	giant kelp
	<i>Nereocystis luetkeana</i>	bull kelp
	<i>Palmaria mollis</i>	red ribbon
	<i>Porphyra</i> spp.	laver
	<i>Saccharina</i> spp.	brown kelp
	<i>Ulva lactuca</i>	sea lettuce
algae: freshwater	<i>Chara</i> spp.	N/A
	<i>Nitella</i> spp.	N/A

Appendix H. Examples of recent and ongoing habitat and wildlife monitoring efforts in Alaska, 2015–2025.

Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
<b>Air and Water</b>					
Air Quality	NPS	Air Quality, Central Alaska Network Inventory and Monitoring Program (CAKN)	<a href="https://www.nps.gov/im/cakn/airquality.htm">https://www.nps.gov/im/cakn/airquality.htm</a>	Central	Ongoing
Air Quality	NPS	Air Quality, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.NPS.gov/im/swan/airquality.htm">https://www.NPS.gov/im/swan/airquality.htm</a>	Southwest	Ongoing
Air Quality	ConocoPhillips Alaska	Nuiqsut Air Quality Monitoring Program Annual Reports (1999–2024)	<a href="https://catalog.northslopescience.org/nl/dataset/2316">https://catalog.northslopescience.org/nl/dataset/2316</a>	Northern	Ongoing
Atmospheric Science	NOAA	Air Resources Laboratory (ARL)	<a href="https://www.arl.noaa.gov/research/">https://www.arl.noaa.gov/research/</a>	Statewide	Ongoing
Hydrology	NPS	Water Quantity, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.NPS.gov/im/swan/waterquantity.htm">https://www.NPS.gov/im/swan/waterquantity.htm</a>	Southwest	Ongoing
Lake and Stream Ecology, Vegetation, Soils	LTER Network	Arctic Long-term Ecological Research (LTER) site	<a href="https://lternet.edu/site/arctic-liter/">https://lternet.edu/site/arctic-liter/</a>	Northern	Ongoing
Lakes	NPS	Shallow Lake Monitoring, Central Alaska Network Inventory and Monitoring Program (CAKN)	<a href="https://www.NPS.gov/im/cakn/shallowlakes.htm">https://www.NPS.gov/im/cakn/shallowlakes.htm</a>	Central	Ongoing
River and Stream Hydrology	NPS	Streams and Rivers, Central Alaska Network Inventory and Monitoring Program (CAKN)	<a href="https://www.nps.gov/im/cakn/streams.htm">https://www.nps.gov/im/cakn/streams.htm</a>	Central	Ongoing
Rivers and Streams	BLM	Lotic Indicators Hub, Assessment, Inventory, and Monitoring (AIM) program	<a href="https://gpb-blm-egis.hub.arcgis.com/datasets/BLM-EGIS::blm-natl-aim-lotic-indicators-hub/about">https://gpb-blm-egis.hub.arcgis.com/datasets/BLM-EGIS::blm-natl-aim-lotic-indicators-hub/about</a>	Statewide	Ongoing
Soundscape	NPS	Soundscapes, Denali National Park	<a href="https://www.NPS.gov/dena/learn/nature/soundscape.htm">https://www.NPS.gov/dena/learn/nature/soundscape.htm</a>	Central	Ongoing
Streamflow, Water Quality	NPS	Streamflow and Water Quality, Southeast Alaska Inventory and Monitoring Network (SEAN)	<a href="https://www.NPS.gov/im/sean/streamflow.htm">https://www.NPS.gov/im/sean/streamflow.htm</a>	Southeast	Ongoing
Water and Air Quality, Traditional Knowledge	Copper River Native Association	Indian Environmental General Assistance Program (IGAP)	<a href="https://crnative.org/what-we-do/tribal-community-services/indian-general-assistance-program/">https://crnative.org/what-we-do/tribal-community-services/indian-general-assistance-program/</a>	Southcentral	Ongoing
Water Quality	Bristol Bay Native Corporation	Indian Environmental General Assistance Program (IGAP)	<a href="https://bbna.com/our-programs/natural-resources/environmental-program/">https://bbna.com/our-programs/natural-resources/environmental-program/</a>	Bering Sea, Southwest	Ongoing
Water Quality	Anvik Tribal Council	Indian Environmental General Assistance Program (IGAP)	<a href="https://anviktribalcouncil.com/igap.html">https://anviktribalcouncil.com/igap.html</a>	Western	Ongoing
Water Quality	ADEC	Water Quality Reports and Watershed Plans	<a href="https://dec.alaska.gov/water/water-quality/nonpoint-source-control/water-quality-reports/reports">https://dec.alaska.gov/water/water-quality/nonpoint-source-control/water-quality-reports/reports</a>	Statewide	Ongoing
Water Quality	ADEC, EPA	Freshwater Monitoring	<a href="https://dec.alaska.gov/water/water-quality/monitoring-and-assessment/watershed-health-and-data-analysis/targeted-monitoring">https://dec.alaska.gov/water/water-quality/monitoring-and-assessment/watershed-health-and-data-analysis/targeted-monitoring</a>	Statewide	Ongoing

Appendix H. Continued.

Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
Water Quality	Yukon River Inter-tribal Watershed Council	Indigenous Observation Network (ION)	<a href="https://www.yritwc.org/science">https://www.yritwc.org/science</a>	Statewide	Ongoing
<b>Air and Water</b>					
Water Quality	Anchorage Waterways Council	Citizen's Environmental Monitoring Program (CEMP)	<a href="https://www.anchoragecreeks.org/projecto-5">https://www.anchoragecreeks.org/projecto-5</a>	Central	Ongoing
Water Temperature	USFWS, ACCS, various Alaska Native tribal groups	Alaska Online Aquatic Temperature Site (AKOATS)	<a href="https://accscatalog.uaa.alaska.edu/dataset/akoats">https://accscatalog.uaa.alaska.edu/dataset/akoats</a>	Statewide	Ongoing
Water Temperature	ADEC, ACCS	AKTEMP water temperature database	<a href="https://aktemp.uaa.alaska.edu/">https://aktemp.uaa.alaska.edu/</a>	Statewide	Ongoing
<b>Land</b>					
Coastal Change	NPS	Geomorphic Coastal Change, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.NPS.gov/im/swan/coastal.htm">https://www.NPS.gov/im/swan/coastal.htm</a>	Southwest	Ongoing
Coastal Change	NPS	Coastal Shoreline Change, Arctic Inventory and Monitoring Network	<a href="https://www.nps.gov/im/arcn/coastalerosion.htm">https://www.nps.gov/im/arcn/coastalerosion.htm</a>	Northern	Ongoing
Coastal Ecology	NPS	Nearshore Marine Systems, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.NPS.gov/im/swan/nearshore.htm">https://www.NPS.gov/im/swan/nearshore.htm</a>	Southwest	Ongoing
Land Cover	NPS	Terrestrial Landscape Patterns and Dynamics, Arctic Inventory and Monitoring Network	<a href="https://www.nps.gov/im/arcn/landscapedynamics.htm">https://www.nps.gov/im/arcn/landscapedynamics.htm</a>	Northern	Ongoing
Land Cover	NPS	Land Cover Change, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.NPS.gov/im/swan/landcover.htm">https://www.NPS.gov/im/swan/landcover.htm</a>	Southwest	Ongoing
Uplands	BLM	Terrestrial Hub Data Summary, Assessment, Inventory, and Monitoring (AIM) program	<a href="https://gbbp-blm-egis.hub.arcgis.com/search?groupIds=a67028668c2e402580001d61a5f59389&amp;tags=dryland">https://gbbp-blm-egis.hub.arcgis.com/search?groupIds=a67028668c2e402580001d61a5f59389&amp;tags=dryland</a>	Statewide	Ongoing
Wetlands, Floodplains	BLM	Riparian and Wetland Hub Data Summary, Assessment, Inventory, and Monitoring (AIM) program	<a href="https://gbbp-blm-egis.hub.arcgis.com/datasets/BLM-EGIS::blm-natl-aim-riparian-and-wetland-indicators-hub/about">https://gbbp-blm-egis.hub.arcgis.com/datasets/BLM-EGIS::blm-natl-aim-riparian-and-wetland-indicators-hub/about</a>	Statewide	Ongoing
Wetlands	USFWS	Inventory, Mapping, and Digitizing the Wetlands of Alaska's Refuges	<a href="https://www.fws.gov/project/inventory-mapping-and-digitizing-wetlands-alaskas-refuges">https://www.fws.gov/project/inventory-mapping-and-digitizing-wetlands-alaskas-refuges</a>	Statewide	Ongoing
<b>Vegetation</b>					
Alpine Vegetation, Soils	USFWS, NPS, USFS, and others	Global Observation Research Initiative on Alpine Environments (GLORIA)	<a href="https://gloria.ac.at/home">https://gloria.ac.at/home</a>	Statewide	Ongoing
Land Cover Change	Conservation of Arctic Flora and Fauna (CAFF)	Land Cover Change	<a href="https://caff.is/work/projects/land-cover-change/">https://caff.is/work/projects/land-cover-change/</a>	Circumpolar	Ongoing
Land Cover Change	UAF	Exploring Land Cover Change Through Repeat Photography, Denali National Park	<a href="https://denalirepeatphotos.uaf.edu/">https://denalirepeatphotos.uaf.edu/</a>	Central	Ongoing

Appendix H. Continued.

Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
Plant Phenology, NDVI	UAF	Biotic Monitoring, Toolik Field Station	<a href="https://www.uaf.edu/toolik/edc/monitoring/biotic/index.php">https://www.uaf.edu/toolik/edc/monitoring/biotic/index.php</a>	Northern	Ongoing
Vegetation	NPS	Sensitive Plant Communities, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.NPS.gov/im/swan/sensplants.htm">https://www.NPS.gov/im/swan/sensplants.htm</a>	Southwest	Ongoing
Vegetation	NPS	Terrestrial Vegetation and Soils, Arctic Inventory and Monitoring Network	<a href="https://www.nps.gov/im/arcn/vegsoils.htm">https://www.nps.gov/im/arcn/vegsoils.htm</a>	Northern	Ongoing
Vegetation	NPS	Vegetation Structure and Composition, Central Alaska Network Inventory and Monitoring Program (CAKN)	<a href="https://www.nps.gov/im/cakn/veg.htm">https://www.nps.gov/im/cakn/veg.htm</a>	Central	Ongoing
Vegetation	NPS	Vegetation Composition and Structure, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.NPS.gov/im/swan/veg.htm">https://www.NPS.gov/im/swan/veg.htm</a>	Southwest	Ongoing
Vegetation	NPS	Vegetation Structure and Composition, Central Alaska Network Inventory and Monitoring Program (CAKN)	<a href="https://www.NPS.gov/im/cakn/veg.htm">https://www.NPS.gov/im/cakn/veg.htm</a>	Central	Ongoing
<b>Climate Change</b>					
Arctic Shelf Ecosystems	Various	Danielson, S.L., et al. Monitoring Alaskan Arctic Shelf Ecosystems Through Collaborative Observation Networks. Oceanography. April 28, 2022	<a href="https://tos.org/oceanography/assets/docs/35-danielson.pdf">https://tos.org/oceanography/assets/docs/35-danielson.pdf</a>	Beaufort/Chukchi Seas, Bering Sea	Ongoing
Climate	Alaska Climate Adaptation Science Center	Various	<a href="https://akcasc.org/about-us/projects-overview/">https://akcasc.org/about-us/projects-overview/</a>	Statewide	Ongoing
Climate	NPS	Climate, Arctic Inventory and Monitoring Network	<a href="https://www.nps.gov/im/arcn/climate.htm">https://www.nps.gov/im/arcn/climate.htm</a>	Northern	Ongoing
Climate	NPS	Climate, Central Alaska Network Inventory and Monitoring Program (CAKN)	<a href="https://www.NPS.gov/im/cakn/climate.htm">https://www.NPS.gov/im/cakn/climate.htm</a>	Central	Ongoing
Climate, Ocean Acidification	UAF	International Arctic Research Center (IARC) Datasets	<a href="https://uaf-iarc.org/our-work/data/">https://uaf-iarc.org/our-work/data/</a>	Statewide	Ongoing
Climate, Citizen Science, Traditional Ecological Knowledge	Alaska Native Tribe Health Consortium	<a href="https://www.leonetwork.org/en/docs/about/about">https://www.leonetwork.org/en/docs/about/about</a>	<a href="https://www.anthc.org/what-we-do/climate-initiatives/leo-network/">https://www.anthc.org/what-we-do/climate-initiatives/leo-network/</a>	Statewide	Ongoing
Glaciers	NPS	Glaciers, Central Alaska Network Inventory and Monitoring Program (CAKN)	<a href="https://www.NPS.gov/im/cakn/glaciers.htm">https://www.NPS.gov/im/cakn/glaciers.htm</a>	Central	Ongoing
Glaciers	NPS	Glacial Dynamics, Southeast Alaska Inventory and Monitoring Network (SEAN)	<a href="https://www.NPS.gov/im/sean/glaciers.htm">https://www.NPS.gov/im/sean/glaciers.htm</a>	Southeast	Ongoing
Glaciers	NPS	Glacial Extent, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.NPS.gov/im/swan/glaciers.htm">https://www.NPS.gov/im/swan/glaciers.htm</a>	Southwest	Ongoing

## Appendix H. Continued.

Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
Glaciers	UAF and others	McCall Glacier Monitoring	<a href="https://drmattnolan.com/mccall">https://drmattnolan.com/mccall</a>	Northern	Ongoing
Marine Ecosystems	NOAA	Arctic-Beaufort and Chukchi seas Regional Action Plan	<a href="https://www.fisheries.noaa.gov/news/arctic-beaufort-and-chukchi-seas-regional-action-plan">https://www.fisheries.noaa.gov/news/arctic-beaufort-and-chukchi-seas-regional-action-plan</a>	Beaufort/Chukchi Seas	Ongoing
Marine Ecosystems	NOAA	Alaska-Eastern Bering Sea Regional Action Plan	<a href="https://www.fisheries.noaa.gov/climate/alaska-eastern-bering-sea-regional-action-plan">https://www.fisheries.noaa.gov/climate/alaska-eastern-bering-sea-regional-action-plan</a>	Bering Sea	Ongoing
Marine Ecosystems	NOAA	Alaska-Gulf of Alaska Regional Action Plan	<a href="https://www.fisheries.noaa.gov/news/alaska-gulf-alaska-regional-action-plan">https://www.fisheries.noaa.gov/news/alaska-gulf-alaska-regional-action-plan</a>	Gulf of Alaska	Ongoing
Ocean Acidification	Alaska Ocean Observing System (AOOS)	Long-term Ocean Acidification Moorings	<a href="https://aoos.org/project/long-term-ocean-acidification-moorings/">https://aoos.org/project/long-term-ocean-acidification-moorings/</a>	Beaufort/Chukchi Seas, Bering Sea, Gulf of Alaska	Ongoing
Ocean Acidification	NOAA	Ocean Acidification Program	<a href="https://oceanacidification.noaa.gov/ocean-acidification-data/">https://oceanacidification.noaa.gov/ocean-acidification-data/</a>	Beaufort/Chukchi Seas, Bering Sea, Gulf of Alaska	Ongoing
Ocean Acidification	UAF	Ocean Acidification Research Center	<a href="https://www.uaf.edu/cfos/research/oarc/">https://www.uaf.edu/cfos/research/oarc/</a>	Beaufort/Chukchi Seas, Bering Sea, Gulf of Alaska	Ongoing
Permafrost	Arctic Data Center	Circumpolar Active Layer Monitoring Program (CALM)	<a href="https://arcticdata.io/catalog/portals/CALM">https://arcticdata.io/catalog/portals/CALM</a>	Circumpolar	Ongoing
Permafrost	NPS	Permafrost, Arctic Inventory and Monitoring Network	<a href="https://www.nps.gov/im/arcn/permafrost.htm">https://www.nps.gov/im/arcn/permafrost.htm</a>	Northern	Ongoing
Permafrost	NPS	Permafrost, Central Alaska Network Inventory and Monitoring Program (CAKN)	<a href="https://www.NPS.gov/im/cakn/permafrost.htm">https://www.NPS.gov/im/cakn/permafrost.htm</a>	Central	Ongoing
Permafrost and Climate	USGS, BLM, USFWS	Real Time Permafrost and Climate Monitoring network in Arctic Alaska	<a href="https://alaska.usgs.gov/portal/project.php?project_id=32">https://alaska.usgs.gov/portal/project.php?project_id=32</a>	Statewide	Ongoing
Sea Ice Biota	Conservation of Arctic Flora and Fauna (CAFF)	Sea-ice Biota Expert Network	<a href="https://www.caff.is/work/projects/circumpolar-biodiversity-monitoring-program-cbmp/cbmp-marine-biodiversity-monitoring/sea-ice-biota-expert-network/">https://www.caff.is/work/projects/circumpolar-biodiversity-monitoring-program-cbmp/cbmp-marine-biodiversity-monitoring/sea-ice-biota-expert-network/</a>	Beaufort/Chukchi Seas, Bering Sea	Ongoing
Sea Ice	NOAA	Alaska Sea Ice Program (ASIP)	<a href="https://www.weather.gov/atc/ice">https://www.weather.gov/atc/ice</a>	Gulf of Alaska, Beaufort/Chukchi Seas, Bering Sea	Ongoing
Sea Ice	Study of Environmental Arctic Change (SEARCH)	Sea Ice for Walrus Outlook (SIWO)	<a href="https://www.arcus.org/siwo">https://www.arcus.org/siwo</a>	Bering Sea, Beaufort/Chukchi Seas	Ongoing
Sea Ice	Alaska Ocean Observing System (AOOS)	Alaska Historical Sea Ice Atlas	<a href="https://AlaskaOceanObservingSystem(AOOS).org/project/alaska-historical-sea-ice-atlas/">https://AlaskaOceanObservingSystem(AOOS).org/project/alaska-historical-sea-ice-atlas/</a>	Beaufort/Chukchi Seas, Bering Sea, Gulf of Alaska	Complete

Appendix H. Continued.

Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
Phenology	NPS	Seasonal Processes, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.nps.gov/im/swan/phenology.htm">https://www.nps.gov/im/swan/phenology.htm</a>	Southwest	Ongoing
Snow and Ice	National Snow and Ice Data Center	National Snow and Ice Data Center	<a href="http://nsidc.org/data/masie/">http://nsidc.org/data/masie/</a>	Beaufort/Chukchi Seas, Bering Sea	Ongoing
Snowpack	NPS	Snowpack, Arctic Inventory and Monitoring Network	<a href="https://www.nps.gov/im/arcn/snow.htm">https://www.nps.gov/im/arcn/snow.htm</a>	Northern	Ongoing
Snowpack	NPS	Snowpack, Central Alaska Network Inventory and Monitoring Program (CAKN)	<a href="https://www.nps.gov/im/cakn/snow.htm">https://www.nps.gov/im/cakn/snow.htm</a>	Central	Ongoing
Weather and Climate	NPS	Weather and Climate, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.nps.gov/im/swan/climate.htm">https://www.nps.gov/im/swan/climate.htm</a>	Southwest	Ongoing
Weather and Climate	NPS	Weather and Climate, Southeast Alaska Inventory and Monitoring Network (SEAN)	<a href="https://www.nps.gov/im/sean/climate.htm">https://www.nps.gov/im/sean/climate.htm</a>	Southeast	Ongoing
Wildlife Population Trends	Conservation of Arctic Flora and Fauna (CAFF)	Arctic Species Trend Index	<a href="https://www.caff.is/work/projects/arctic-species-trend-index/">https://www.caff.is/work/projects/arctic-species-trend-index/</a>	Circumpolar	Ongoing
<b>Contaminants</b>					
Airborne, Freshwater, Marine Contaminants	NPS	Contaminants, Southeast Alaska Inventory and Monitoring Network (SEAN)	<a href="https://www.nps.gov/im/sean/contaminants.htm">https://www.nps.gov/im/sean/contaminants.htm</a>	Southeast	Ongoing
Hydrocarbons	Gulf Watch Alaska	Lingering Oil: Weathering and Tracking	<a href="https://gulfwatchalaska.org/monitoring/lingering-oil/lingering-oil-weathering-and-tracking/">https://gulfwatchalaska.org/monitoring/lingering-oil/lingering-oil-weathering-and-tracking/</a>	Gulf of Alaska, Southcentral	Complete
Hydrocarbons, Mussels	Prince William Sound RCAC	Long-Term Environmental Monitoring (LTEMP)	<a href="https://www.pwsrca.org/programs/environmental-monitoring/lttemp/">https://www.pwsrca.org/programs/environmental-monitoring/lttemp/</a>	Gulf of Alaska	Ongoing
Shellfish, PST	Southeast Alaska Tribal Ocean Research	Shellfish Data and Testing	<a href="http://seator.org/">http://seator.org/</a>	Southeast	Ongoing
<b>Marine and Intertidal</b>					
Biodiversity, Nutrient Cycling	NPS, WCS, and others	Coastal Lagoon Monitoring project	<a href="https://library.wcs.org/Scientific-Research/Research-Publications/Publications-Library/ct/view/mid/40093/pubid/DMX4371200000.aspx">https://library.wcs.org/Scientific-Research/Research-Publications/Publications-Library/ct/view/mid/40093/pubid/DMX4371200000.aspx</a>	Beaufort/Chukchi Seas	Complete
Ecosystem Monitoring	Gulf Watch Alaska	The Seward Line: Marine Ecosystem Monitoring in the Northern Gulf of Alaska	<a href="https://gulfwatchalaska.org/monitoring/environmental-drivers/the-seward-line-marine-ecosystem-monitoring-in-the-northern-gulf-of-alaska/">https://gulfwatchalaska.org/monitoring/environmental-drivers/the-seward-line-marine-ecosystem-monitoring-in-the-northern-gulf-of-alaska/</a>	Southcentral, Gulf of Alaska	Ongoing
Ecosystem Monitoring	National Centers for Coastal Ocean Science	Ecological Assessment for Kachemak Bay	<a href="https://coastalscience.noaa.gov/project/ecological-assessment-for-kachemak-bay-alaska-science-tools-to-inform-management/">https://coastalscience.noaa.gov/project/ecological-assessment-for-kachemak-bay-alaska-science-tools-to-inform-management/</a>	Southcentral	Complete
Environmental Studies	Bureau of Ocean Energy Management (BOEM)	Environmental Studies for Alaska	<a href="https://www.Bureau of Ocean Energy Management.gov/ongoing-environmental-studies/current-environmental-studies">https://www.Bureau of Ocean Energy Management.gov/ongoing-environmental-studies/current-environmental-studies</a>	Statewide	Ongoing

## Appendix H. Continued.

Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
Intertidal Communities	NPS	Intertidal Communities, Southeast Alaska Inventory and Monitoring Network (SEAN)	<a href="https://www.nps.gov/im/sean/intertidal.htm">https://www.nps.gov/im/sean/intertidal.htm</a>	Southeast	Ongoing
Intertidal Communities	Gulf Watch Alaska	Intertidal Communities, Nearshore Ecosystems	<a href="https://gulfwatchalaska.org/monitoring/nearshore-ecosystems-4/nearshore-intertidal-communities/">https://gulfwatchalaska.org/monitoring/nearshore-ecosystems-4/nearshore-intertidal-communities/</a>	Southcentral, Gulf of Alaska	Ongoing
Intertidal Temperature	Gulf Watch Alaska	Intertidal Temperature, Nearshore Ecosystems	<a href="https://gulfwatchalaska.org/monitoring/nearshore-ecosystems-4/nearshore-intertidal-temperature/">https://gulfwatchalaska.org/monitoring/nearshore-ecosystems-4/nearshore-intertidal-temperature/</a>	Southcentral, Gulf of Alaska	Ongoing
Kelp and Eelgrass	NPS	Kelp and Eelgrass, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.nps.gov/im/swan/kelp.htm">https://www.nps.gov/im/swan/kelp.htm</a>	Southwest	Ongoing
Kelp and Eelgrass	USFWS	Eelgrass Abundance and Productivity Monitoring	<a href="https://www.fws.gov/project/eelgrass-abundance-and-productivity-monitoring">https://www.fws.gov/project/eelgrass-abundance-and-productivity-monitoring</a>	Southwest	Ongoing
Marine Biototoxin Monitoring	ADEC	Alaska Marine Biototoxin Monitoring and Contingency Plan for Bivalve Shellfish other than Geoducks	<a href="https://dec.alaska.gov/eh/fss/shellfish/resources/bivalve-shellfish-biototoxin-monitoring-plan/">https://dec.alaska.gov/eh/fss/shellfish/resources/bivalve-shellfish-biototoxin-monitoring-plan/</a>	Statewide	Ongoing
Marine Predators	NPS	Marine Predators, Southeast Alaska Inventory and Monitoring Network (SEAN)	<a href="https://www.nps.gov/im/sean/marinepredators.htm">https://www.nps.gov/im/sean/marinepredators.htm</a>	Southeast	Ongoing
Oceanography	Gulf Watch Alaska	Oceanographic Conditions in Lower Cook Inlet and Kachemak Bay	<a href="https://gulfwatchalaska.org/monitoring/environmental-drivers/oceanographic-conditions-in-lower-cook-inlet-and-kachemak-bay/">https://gulfwatchalaska.org/monitoring/environmental-drivers/oceanographic-conditions-in-lower-cook-inlet-and-kachemak-bay/</a>	Southcentral, Gulf of Alaska	Ongoing
Oceanography	Gulf Watch Alaska	Oceanographic Conditions in Prince William Sound	<a href="https://gulfwatchalaska.org/monitoring/environmental-drivers/oceanographic-conditions-in-prince-william-sound/">https://gulfwatchalaska.org/monitoring/environmental-drivers/oceanographic-conditions-in-prince-william-sound/</a>	Southcentral, Gulf of Alaska	Ongoing
Oceanography	LTER Network	Northern Gulf of Alaska Long-term Ecological Research (LTER) site	<a href="https://lternet.edu/site/northern-gulf-alaska/">https://lternet.edu/site/northern-gulf-alaska/</a>	Gulf of Alaska	Ongoing
Oceanography	NPS	Oceanography, Southeast Alaska Inventory and Monitoring Network (SEAN)	<a href="https://www.nps.gov/im/sean/oceanography.htm">https://www.nps.gov/im/sean/oceanography.htm</a>	Southeast	Ongoing
Oceanography, Sea Ice, others	Alaska Ocean Observing System (AOOS)	Ocean Data Explorer	<a href="https://portal.aooos.org/">https://portal.aooos.org/</a>	Statewide	Ongoing
Plankton	Conservation of Arctic Flora and Fauna (CAFF)	Plankton Expert Network	<a href="https://caff.is/work/projects/circumpolar-biodiversity-monitoring-program-cbmp/cbmp-marine-biodiversity-monitoring/plankton-expert-network/">https://caff.is/work/projects/circumpolar-biodiversity-monitoring-program-cbmp/cbmp-marine-biodiversity-monitoring/plankton-expert-network/</a>	Circumpolar	Ongoing
Plankton	Gulf Watch Alaska	Continuous Plankton Recorder	<a href="https://gulfwatchalaska.org/monitoring/environmental-drivers/continuous-plankton-recorder/">https://gulfwatchalaska.org/monitoring/environmental-drivers/continuous-plankton-recorder/</a>	Southcentral, Gulf of Alaska	Ongoing

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Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
Sea Surface Temperatures	NOAA National Centers for Environmental Information	Extended Reconstructed Sea Surface Temperature (ERSST)	<a href="https://www.nci.noaa.gov/news/tracking-sea-surface-temperatures">https://www.nci.noaa.gov/news/tracking-sea-surface-temperatures</a>	Bering Sea, Beaufort/Chukchi Seas	Ongoing
Shoreline	NOAA	Alaska Shorezone Project	<a href="https://www.fisheries.noaa.gov/alaska/habitat-conservation/alaska-shorezone">https://www.fisheries.noaa.gov/alaska/habitat-conservation/alaska-shorezone</a>	Statewide	Complete
Water Chemistry	NPS	Marine Water Chemistry, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.NPS.gov/im/swan/marinechem.htm">https://www.NPS.gov/im/swan/marinechem.htm</a>	Southwest	Ongoing
Water Quality	ADEC, EPA	Marine Water Quality Monitoring	<a href="https://dec.alaska.gov/water/water-quality/monitoring-and-assessment/watershed-health-and-data-analysis/ambient-marine-water-quality-monitoring">https://dec.alaska.gov/water/water-quality/monitoring-and-assessment/watershed-health-and-data-analysis/ambient-marine-water-quality-monitoring</a>	Statewide	Ongoing
<b>Birds</b>					
Aleutian Tern	USFWS, USFS, and others	Aleutian Tern Surveys	<a href="https://www.fws.gov/project/aleutian-tern-surveys">https://www.fws.gov/project/aleutian-tern-surveys</a>	Statewide	Ongoing
American Goshawk	USFWS, DOD	American Goshawk Abundance, Distribution, and Ecology in Southcentral Alaska	<a href="https://www.fws.gov/project/american-goshawk-abundance-distribution-and-ecology-south-central-alaska">https://www.fws.gov/project/american-goshawk-abundance-distribution-and-ecology-south-central-alaska</a>	Southcentral	Ongoing
Bald Eagle	NPS	Bald Eagles, Central Alaska Network Inventory and Monitoring Program (CAKN)	<a href="https://www.NPS.gov/im/cakn/baldeagles.htm">https://www.NPS.gov/im/cakn/baldeagles.htm</a>	Central	Complete
Bar-tailed Godwit	ADF&G, USFWS, USGS	Co-stewardship of the Bar-tailed Godwit	<a href="https://www.fws.gov/project/co-stewardship-bar-tailed-godwit">https://www.fws.gov/project/co-stewardship-bar-tailed-godwit</a>	Northern	Ongoing
Black Brant	USFWS, USGS	The Pacific Flyway Winter Brant Survey	<a href="https://www.fws.gov/project/pacific-flyway-winter-brant-survey">https://www.fws.gov/project/pacific-flyway-winter-brant-survey</a>	Statewide	Ongoing
Black Brant	USFWS, USGS	Black Brant Age Ratio Survey	<a href="https://www.fws.gov/project/black-brant-age-ratio-survey">https://www.fws.gov/project/black-brant-age-ratio-survey</a>	Southwest	Ongoing
Black Brant	USFWS, USGS	Fall Brant Photo Survey	<a href="https://www.fws.gov/project/fall-brant-photo-survey">https://www.fws.gov/project/fall-brant-photo-survey</a>	Southwest	Ongoing
Black Oystercatcher	NPS	Black Oystercatcher, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.NPS.gov/im/swan/blloy.htm">https://www.NPS.gov/im/swan/blloy.htm</a>	Southwest	Ongoing
Black Oystercatcher	Gulf Watch Alaska	Near Shore Ecosystem Monitoring	<a href="https://gulfwatchalaska.org/monitoring/near-shore-ecosystems-4/nearshore-bloy/">https://gulfwatchalaska.org/monitoring/near-shore-ecosystems-4/nearshore-bloy/</a>	Southcentral, Gulf of Alaska	Ongoing
Black-legged Kitiwake	Conservation of Arctic Flora and Fauna (CAFF)	Circumpolar Seabird Expert Group International Conservation Strategy and Action Plan 2020	<a href="https://oaarchive.arctic-council.org/server/api/core/bitstreams/f54e4ff7-f8cb-45e8-b958-fb3241933c2b/content">https://oaarchive.arctic-council.org/server/api/core/bitstreams/f54e4ff7-f8cb-45e8-b958-fb3241933c2b/content</a>	Circumpolar	Ongoing
Common Murre	USFWS	Monitoring the Common Murre mass mortality in coastal Alaska	<a href="https://www.fws.gov/project/monitoring-common-murre-mass-mortality-coastal-alaska">https://www.fws.gov/project/monitoring-common-murre-mass-mortality-coastal-alaska</a>	Southcentral, Southeast, Gulf of Alaska	Ongoing

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Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
Dusky Canada Goose	USFWS	Dusky Canada Goose Aerial Breeding Pair Survey	<a href="https://www.fws.gov/project/dusky-canada-goose-aerial-breeding-pair-survey">https://www.fws.gov/project/dusky-canada-goose-aerial-breeding-pair-survey</a>	Southcentral	Ongoing
Eiders	ABR, ConocoPhillips Alaska, and others	Eider Surveys (1994–2024)	<a href="https://catalog.northsiopescience.org/nl/dataset/2336">https://catalog.northsiopescience.org/nl/dataset/2336</a>	Northern	Ongoing
Golden Eagle	NPS	Golden Eagles, Central Alaska Network Inventory and Monitoring Program (CAKN)	<a href="https://www.NPS.gov/im/cakn/goldeneagles.htm">https://www.NPS.gov/im/cakn/goldeneagles.htm</a>	Central	Complete
Golden Eagle	ADF&G, NPS, USFWS, Hawkwatch	Golden Eagle Abundance in Alaska, Threatened, Endangered, and Diversity Program	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=wildlivediversity.projects&amp;project=golden-eagle">https://www.adfg.alaska.gov/index.cfm?adfg=wildlivediversity.projects&amp;project=golden-eagle</a>	Statewide	Complete
Golden Eagle	USFWS	Space Use, Movement, and Survival of Golden Eagles in Alaska	<a href="https://www.fws.gov/project/space-use-movement-and-survival-golden-eagles-alaska">https://www.fws.gov/project/space-use-movement-and-survival-golden-eagles-alaska</a>	Statewide	Ongoing
Gray-headed Chickadee	ADF&G	Gray-headed Chickadee Conservation, Threatened, Endangered, and Diversity Program	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=wildlivediversity.projects&amp;project=gray-headed-chickadee">https://www.adfg.alaska.gov/index.cfm?adfg=wildlivediversity.projects&amp;project=gray-headed-chickadee</a>	Northern, Western	Ongoing
Harlequin Duck	Gulf Watch Alaska	Harlequin Ducks and Sea Otters	<a href="https://gulfwatchalaska.org/monitoring/completed-projects/harlequin-ducks-and-sea-otters/">https://gulfwatchalaska.org/monitoring/completed-projects/harlequin-ducks-and-sea-otters/</a>	Southcentral, Gulf of Alaska	Complete
Kittlitz's Murrelet	NPS, ADF&G	Kittlitz's Murrelet, Southeast Alaska Inventory and Monitoring Network (SEAN)	<a href="https://www.NPS.gov/im/sean/kimu.htm">https://www.NPS.gov/im/sean/kimu.htm</a>	Southeast	Ongoing
Landbirds	USGS, USFWS	North American Breeding Bird Survey (BBS)	<a href="https://www.usgs.gov/centers/eesc/science/north-american-breeding-bird-survey">https://www.usgs.gov/centers/eesc/science/north-american-breeding-bird-survey</a>	Statewide	Ongoing
Landbirds	USFWS, USGS	Alaska Landbird Monitoring Survey (ALMS)	<a href="https://www.usgs.gov/centers/alaska-science-center/science/alaska-landbird-monitoring-survey">https://www.usgs.gov/centers/alaska-science-center/science/alaska-landbird-monitoring-survey</a>	Statewide	Ongoing
Landbirds	National Audubon Society	Christmas Bird Count	<a href="https://www.audubon.org/community-science/christmas-bird-count">https://www.audubon.org/community-science/christmas-bird-count</a>	Statewide	Ongoing
McKay's Bunting	USFWS, USGS, ADF&G	McKay's Bunting Breeding Surveys	<a href="https://www.fws.gov/project/mckays-bunting-breeding-surveys">https://www.fws.gov/project/mckays-bunting-breeding-surveys</a>	Bering Sea	Ongoing
Passerines	NPS	Passerines, Central Alaska Network Inventory and Monitoring Program (CAKN)	<a href="https://www.NPS.gov/im/cakn/passerines.htm">https://www.NPS.gov/im/cakn/passerines.htm</a>	Central	Ongoing
Peregrine Falcon	NPS	Peregrine Falcons, Central Alaska Network Inventory and Monitoring Program (CAKN)	<a href="https://www.NPS.gov/im/cakn/pefa.htm">https://www.NPS.gov/im/cakn/pefa.htm</a>	Central	Ongoing
Pigeon Guillemot	NPS, USFWS	Nearshore Marine Bird Surveys - Kodiak NWR	<a href="https://www.fws.gov/project/nearshore-marine-bird-monitoring">https://www.fws.gov/project/nearshore-marine-bird-monitoring</a>	Southwest	Ongoing
Raptors	ADF&G	Alaska Raptor Group Metadata Database for Alaska Raptor Projects	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=raptormetadata.login">https://www.adfg.alaska.gov/index.cfm?adfg=raptormetadata.login</a>	Statewide	Ongoing

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Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
Red Knot	USFWS, ADF&G	Roselaari Red Knot Breeding Project	<a href="https://www.fws.gov/project/roselaari-red-knot-breeding-project">https://www.fws.gov/project/roselaari-red-knot-breeding-project</a>	Southeast, Gulf of Alaska	Ongoing
Seabirds	University of Washington	Coastal Observation and Seabird Survey Team (COASST)	<a href="https://coasst.org/">https://coasst.org/</a>	Southeast	Ongoing
Seabirds	NOAA	Seabird Bycatch Reduction program	<a href="https://www.fisheries.noaa.gov/alaska/bycatch/seabird-bycatch-alaska">https://www.fisheries.noaa.gov/alaska/bycatch/seabird-bycatch-alaska</a>	Beaufort/Chukchi Seas, Bering Sea, Gulf of Alaska	Ongoing
Seabirds	USFWS	Alaska Maritime National Wildlife Refuge	<a href="https://www.fws.gov/project/seabird-science-alaska-sized-scale">https://www.fws.gov/project/seabird-science-alaska-sized-scale</a>	Southwest, Beaufort/Chukchi Seas, Gulf of Alaska, Bering Sea	Ongoing
Seabirds	USFWS, Axiom Data Science	USFWS Aleutian Island Seabird Vulnerability Assessment	<a href="https://www.axiomdatascience.com/projects/seabird-vulnerability-assessment/">https://www.axiomdatascience.com/projects/seabird-vulnerability-assessment/</a>	Southwest	Ongoing
Seabirds	USFWS and Bureau of Ocean Energy Management (BOEM)	Arctic Marine Bird Survey	<a href="https://www.fws.gov/project/arctic-marine-bird-surveys">https://www.fws.gov/project/arctic-marine-bird-surveys</a>	Beaufort/Chukchi Seas, Bering Sea	Ongoing
Seabirds	Conservation of Arctic Flora and Fauna (CAFF)	CBIRD: Seabird Expert Group	<a href="https://www.caff.is/work/projects/cbird/">https://www.caff.is/work/projects/cbird/</a>	Circumpolar	Ongoing
Seabirds	Gulf Watch Alaska	Near Shore Ecosystem Monitoring	<a href="https://gulfwatchalaska.org/monitoring/near-shore-ecosystems-4/nearshore-marine-birds/">https://gulfwatchalaska.org/monitoring/near-shore-ecosystems-4/nearshore-marine-birds/</a>	Southcentral, Gulf of Alaska	Ongoing
Seabirds	NPS	Marine Birds, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.NPS.gov/im/swan/marinebirds.htm">https://www.NPS.gov/im/swan/marinebirds.htm</a>	Southwest	Ongoing
Seabirds	Gulf Watch Alaska	Pelagic Ecosystem Monitoring	<a href="https://gulfwatchalaska.org/monitoring/pelagic-ecosystem/long-term-monitoring-of-seabird-abundance-and-habitat-associations-during-late-fall-and-winter-in-prince-william-sound/">https://gulfwatchalaska.org/monitoring/pelagic-ecosystem/long-term-monitoring-of-seabird-abundance-and-habitat-associations-during-late-fall-and-winter-in-prince-william-sound/</a>	Southcentral, Gulf of Alaska	Ongoing
Seabirds	Gulf Watch Alaska	Prince William Sound Marine Bird Population Trends	<a href="https://gulfwatchalaska.org/monitoring/pelagic-ecosystem/pws-marine-bird-population-trends/">https://gulfwatchalaska.org/monitoring/pelagic-ecosystem/pws-marine-bird-population-trends/</a>	Southcentral, Gulf of Alaska	Ongoing
Shorebirds	ABR, ConocoPhillips Alaska, and others	Shorebird Monitoring in the Willow Project Area (2021–2024)	<a href="https://catalog.northslopescience.org/dataset/3017">https://catalog.northslopescience.org/dataset/3017</a>	Northern	Ongoing
Shorebirds	USFWS	Shorebird Movements during Migration and on Wintering Grounds	<a href="https://www.fws.gov/project/shorebird-migration-tracking">https://www.fws.gov/project/shorebird-migration-tracking</a>	Statewide	Ongoing
Shorebirds	Manomet Conservation Sciences and others	Arctic Shorebird Demographic Network (ASDN)	<a href="https://www.manomet.org/project/arctic-shorebird-demographics-network-asdn/">https://www.manomet.org/project/arctic-shorebird-demographics-network-asdn/</a>	Circumpolar	Ongoing

## Appendix H. Continued.

Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
Shorebirds	USFWS, ADF&G, and others	Program for Regional and International Shorebird Monitoring (PRISM)	<a href="https://www.fws.gov/project/estimating-alaska-shorebird-populations">https://www.fws.gov/project/estimating-alaska-shorebird-populations</a>	Western, Northern	Ongoing
Shorebirds	Manomet Conservation Sciences, USGS, UAF, and USFWS	International Shorebird Survey, ANWR and Yukon River Delta	<a href="https://www.manomet.org/project/international-shorebird-survey/">https://www.manomet.org/project/international-shorebird-survey/</a>	Northern, Western	Ongoing
Shorebirds	USFWS	Breeding Ecology of Shorebirds in Utqiagvik, Alaska	<a href="https://www.fws.gov/project/breeding-ecology-shorebirds-utqiagvik-alaska">https://www.fws.gov/project/breeding-ecology-shorebirds-utqiagvik-alaska</a>	Northern	Ongoing
Shorebirds	NPS, USGS	Inventory of Alpine and Montane Nesting Shorebirds in Alaska	<a href="https://www.usgs.gov/data/data-inventory-montane-nesting-birds-arctic-network-national-parks-alaska">https://www.usgs.gov/data/data-inventory-montane-nesting-birds-arctic-network-national-parks-alaska</a>	Northern, Western	Complete
Snowy Owl	Owl Research Institute	Snowy Owl Breeding Ecology and Lemming Population Study	<a href="https://www.owlresearchinstitute.org/snowy-owl-research">https://www.owlresearchinstitute.org/snowy-owl-research</a>	Northern	Ongoing
Waterfowl, Yellow-billed Loon	ABR, ConocoPhillips Alaska, and others	Avian Studies for the Alpine Oilfield (1998–2024)	<a href="https://catalog.northslopescience.org/dataset/2321">https://catalog.northslopescience.org/dataset/2321</a>	Northern	Ongoing
Waterfowl	USFWS	Waterfowl Breeding Population and Habitat Survey	<a href="https://www.fws.gov/project/waterfowl-breeding-population-and-habitat-survey-alaska">https://www.fws.gov/project/waterfowl-breeding-population-and-habitat-survey-alaska</a>	Statewide	Ongoing
Waterfowl	USFWS	Arctic Coastal Plain Aerial Breeding Pair Survey	<a href="https://www.fws.gov/project/arctic-coastal-plain-aerial-breeding-pair-survey">https://www.fws.gov/project/arctic-coastal-plain-aerial-breeding-pair-survey</a>	Northern	Ongoing
Waterfowl	USFWS	Yukon-Kuskokwim Delta Aerial Breeding Pair Survey	<a href="https://www.fws.gov/project/yukon-kuskokwim-delta-aerial-breeding-pair-survey">https://www.fws.gov/project/yukon-kuskokwim-delta-aerial-breeding-pair-survey</a>	Western	Ongoing
Wetland Birds	ADF&G	Birds 'n' Bogs (formerly Loon and Grebe Watch program)	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=wildlivediversity.citizenscience&amp;project=birds-n-bogs">https://www.adfg.alaska.gov/index.cfm?adfg=wildlivediversity.citizenscience&amp;project=birds-n-bogs</a>	Southcentral	Ongoing
White-fronted Goose	USFWS	Midcontinent Greater White-fronted Goose Banding in Alaska	<a href="https://www.fws.gov/project/midcontinent-greater-white-fronted-geese-banding-alaska">https://www.fws.gov/project/midcontinent-greater-white-fronted-geese-banding-alaska</a>	Northern, Central, Western	Ongoing
Yellow-billed Loon	NPS, USFWS	Collaborative Conservation of the Rare Alaskan Yellow-billed Loon	<a href="https://www.nps.gov/articles/aps-16-1-17.htm">https://www.nps.gov/articles/aps-16-1-17.htm</a>	Western	Ongoing
<b>Marine Mammals</b>					
Beluga Whale	ADF&G	Beluga Whale Research – Bristol Bay and Cook Inlet	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.belugaresearch">https://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.belugaresearch</a>	Beaufort/Chukchi Seas, Gulf of Alaska	Ongoing
Beluga Whale, Citizen Science	NOAA and others	Alaska Beluga Monitoring Program	<a href="https://akbmp.org/">https://akbmp.org/</a>	Southcentral	Ongoing
Bowhead Whale	ADF&G	Satellite Tracking of Western Arctic Bowhead Whales	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.bowhead">https://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.bowhead</a>	Beaufort/Chukchi Seas, Bering Sea	Complete

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Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
Harbor Seal	ADF&G	Harbor Seal Research Projects	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.harborsealresearch">https://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.harborsealresearch</a>	Southcentral, Southwest, Gulf of Alaska, Bering Sea	Ongoing
Humpback Whale	Gulf Watch Alaska	Pelagic Ecosystem Monitoring	<a href="https://gulfwatchalaska.org/monitoring/pelagic-ecosystem/humpback-whales/">https://gulfwatchalaska.org/monitoring/pelagic-ecosystem/humpback-whales/</a>	Southcentral, Gulf of Alaska	Ongoing
Ice Seals, Subsistence	ADF&G	Ice Seal Research, Harvest Monitoring	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.iceseal-monitoring">https://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.iceseal-monitoring</a>	Northern, Beaufort/Chukchi Seas	Ongoing
Ice Seals	NOAA	Ice Seal Research in Alaska	<a href="https://www.fisheries.noaa.gov/alaska/marine-mammal-protection/ice-seal-research-alaska">https://www.fisheries.noaa.gov/alaska/marine-mammal-protection/ice-seal-research-alaska</a>	Northern, Beaufort/Chukchi Seas	Ongoing
Marine Mammals	NOAA	Marine Mammal Stock Assessment Reports	<a href="https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock">https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock</a>	Beaufort/Chukchi Seas, Bering Sea, Gulf of Alaska	Ongoing
Marine Mammals	ADF&G	Marine Mammal Acoustic Monitoring – Bering Strait	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.acoustics">https://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.acoustics</a>	Beaufort/Chukchi Seas, Bering Sea, Gulf of Alaska	Complete
Polar Bear	USFWS, USGS	Summary of Wildlife-Related Research on the Coastal Plain of the Arctic National Wildlife Refuge, Alaska, 2002–17	<a href="https://pubs.usgs.gov/of/2018/1003/ofr20181003.pdf">https://pubs.usgs.gov/of/2018/1003/ofr20181003.pdf</a>	Northern	Complete
Polar Bear	USFWS	Polar Bear Program, Alaska Marine Mammals Management Office	<a href="https://www.fws.gov/program/alaska-marine-mammals-management-office/polar-bear-program">https://www.fws.gov/program/alaska-marine-mammals-management-office/polar-bear-program</a>	Northern, Beaufort/Chukchi Seas	Ongoing
Polar Bear	ADF&G	Polar Bear Research	<a href="https://www.adfg.alaska.gov/index.cfm?adfg+polarbearresearch">https://www.adfg.alaska.gov/index.cfm?adfg+polarbearresearch</a>	Northern, Beaufort/Chukchi Seas	Ongoing
Sea Otter	USFWS, Alaska Marine Mammals Management Office	Sea Otter Program	<a href="https://www.fws.gov/program/alaska-marine-mammals-management-office/alaska-sea-otter-program">https://www.fws.gov/program/alaska-marine-mammals-management-office/alaska-sea-otter-program</a>	Southcentral, Southwest	Ongoing
Sea Otter	Gulf Watch Alaska	Near Shore Ecosystem Monitoring	<a href="https://gulfwatchalaska.org/monitoring/near-shore-ecosystems-4/nearshore-sea-otter/">https://gulfwatchalaska.org/monitoring/near-shore-ecosystems-4/nearshore-sea-otter/</a>	Southcentral, Gulf of Alaska	Ongoing
Sea Otter	NPS	Sea Otters, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.nps.gov/im/swan/seaotters.htm">https://www.nps.gov/im/swan/seaotters.htm</a>	Southwest	Ongoing
Steller Sea Lion	ADF&G	Steller Sea Lion Research Projects	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.steller-research">https://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.steller-research</a>	Bering Sea	Ongoing

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Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
Steller Sea Lion	NOAA	Steller Sea Lion: Science	<a href="https://www.fisheries.noaa.gov/species/steller-sea-lion/science">https://www.fisheries.noaa.gov/species/steller-sea-lion/science</a>	Southwest, Gulf of Alaska, Bering Sea, Southeast	Ongoing
Walrus	USFWS, Alaska Marine Mammals Management Office	Walrus Program	<a href="https://www.fws.gov/program/alaska-marine-mammals-management-office/alaska-walrus-program">https://www.fws.gov/program/alaska-marine-mammals-management-office/alaska-walrus-program</a>	Beaufort/Chukchi Seas, Bering Sea	Ongoing
Walrus	ADF&G	Walrus Research Projects	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.walrusre-search">https://www.adfg.alaska.gov/index.cfm?adfg=marinemammalprogram.walrusre-search</a>	Beaufort/Chukchi Seas	Complete
<b>Terrestrial Mammals</b>					
Alaska Hare	ADF&G, UAF	Alaska Hare Research	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=wildlivediversity.projects&amp;project=alaska-hare">https://www.adfg.alaska.gov/index.cfm?adfg=wildlivediversity.projects&amp;project=alaska-hare</a>	Western	Ongoing
Bats	USGS, Bat Conservation International, USFWS, USFS, BLM, CWS, WCS, ERDC	North American Bat Monitoring Program (NABat)	<a href="https://www.nabatmonitoring.org/">https://www.nabatmonitoring.org/</a>	Statewide	Ongoing
Bats	ADF&G	Alaska Bat Monitoring Program	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=wildlivediversity.projects&amp;project=bats">https://www.adfg.alaska.gov/index.cfm?adfg=wildlivediversity.projects&amp;project=bats</a>	Southwest, Southeast	Ongoing
Collared Pika	ADF&G and others	Collared Pika, Threatened, Endangered, and Diversity Program	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=wildlivediversity.projects&amp;project=collared-pika">https://www.adfg.alaska.gov/index.cfm?adfg=wildlivediversity.projects&amp;project=collared-pika</a>	Central, South-central	Ongoing
Small Mammals	Owl Research Institute	Snowy Owl Breeding Ecology and Lemming Population Study in Barrow	<a href="https://www.owlresearchinstitute.org/snowy-owl-research">https://www.owlresearchinstitute.org/snowy-owl-research</a>	Northern	Ongoing
Small Mammals	NPS	Small Mammals, Central Alaska Network Inventory and Monitoring Program (CAKN)	<a href="https://www.nps.gov/im/cakn/smammals.htm">https://www.nps.gov/im/cakn/smammals.htm</a>	Central	Ongoing
<b>Invertebrates</b>					
Clams and Mussels	Gulf Watch Alaska	Bivalves, Near Shore Ecosystem Monitoring	<a href="https://gulfwatchalaska.org/monitoring/near-shore-ecosystems-4/nearshore-bivalves/">https://gulfwatchalaska.org/monitoring/near-shore-ecosystems-4/nearshore-bivalves/</a>	Southcentral, Gulf of Alaska	Ongoing
Freshwater Invertebrates, Fish, Periphyton, Water Quality	ADF&G	Habitat Research: Biomonitoring	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=uselicense.biomonitoring">https://www.adfg.alaska.gov/index.cfm?adfg=uselicense.biomonitoring</a>	Western, Southeast, Central	Ongoing
Freshwater Macroinvertebrates	NPS	Using Aquatic Invertebrates to Measure the Health of Stream Ecosystems: New Bioassessment Tools for Alaska's Parklands	<a href="https://www.nps.gov/articles/000/aps-20-1-11.htm">https://www.nps.gov/articles/000/aps-20-1-11.htm</a>	Central, South-central	Ongoing

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Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
Marine Invertebrates	NPS	Marine Intertidal Invertebrates, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.nps.gov/im/swan/marineinverts.htm">https://www.nps.gov/im/swan/marineinverts.htm</a>	Southwest	Ongoing
Pollinators	ACCS and others	Alaska Bee Atlas	<a href="https://accs.uaa.alaska.edu/wildlife/ak-bee-atlas/">https://accs.uaa.alaska.edu/wildlife/ak-bee-atlas/</a>	Statewide	Ongoing
<b>Amphibians and Fish</b>					
Anadromous Fish	ADF&G	Anadromous Waters Catalog	<a href="https://www.adfg.alaska.gov/sf/sarr/awc/">https://www.adfg.alaska.gov/sf/sarr/awc/</a>	Statewide	Ongoing
Anadromous Fish	ABR, MJM Research, ConocoPhillips Alaska, and others	Fish Surveys and Subsistence Reports for Colville River and Vicinity (1985–2024)	<a href="https://catalog.northslopescience.org/nl/dataset/2354">https://catalog.northslopescience.org/nl/dataset/2354</a>	Northern	Ongoing
Fisheries, Subsistence	Federal Subsistence Management Program	Fisheries Monitoring Reports	<a href="https://www.doi.gov/subsistence/frmp">https://www.doi.gov/subsistence/frmp</a>	Statewide	Ongoing
Herring	Gulf Watch Alaska	Herring Research and Monitoring	<a href="https://gulfwatchalaska.org/monitoring/herring-2/">https://gulfwatchalaska.org/monitoring/herring-2/</a>	Southcentral	Ongoing
Marine Fish	Gulf Watch Alaska	Forage Fish, Pelagic Ecosystem Monitoring	<a href="https://gulfwatchalaska.org/monitoring/pelagic-ecosystem/forage-fish-2/">https://gulfwatchalaska.org/monitoring/pelagic-ecosystem/forage-fish-2/</a>	Southcentral, Gulf of Alaska	Ongoing
Marine Fish	NOAA	Alaska Fish Research Surveys for understanding of marine life abundance in Alaska	<a href="https://www.fisheries.noaa.gov/alaska/ecosystems/alaska-fish-research-surveys">https://www.fisheries.noaa.gov/alaska/ecosystems/alaska-fish-research-surveys</a>	Statewide	Ongoing
Nearshore Fish	NOAA	National Marine Fisheries Service	<a href="https://www.fisheries.noaa.gov/alaska/habitat-conservation/nearshore-fish-atlas-alaska">https://www.fisheries.noaa.gov/alaska/habitat-conservation/nearshore-fish-atlas-alaska</a>	Statewide	Ongoing
Salmon	NPS	Salmon, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.nps.gov/im/swan/salmon.htm">https://www.nps.gov/im/swan/salmon.htm</a>	Southwest	Ongoing
Amphibians	Alaska Herpetological Society	Stikine Long-term Amphibian Monitoring Program (SLAMP)	<a href="https://www.akherpsociety.org/slamp">https://www.akherpsociety.org/slamp</a>	Southeast	Ongoing
<b>Non-native and Problematic Species</b>					
Harmful Algal Blooms	Alaska Ocean Observing System (AOOS)	Alaska Harmful Algal Bloom Network	<a href="https://ahab.aooos.org/">https://ahab.aooos.org/</a>	Statewide	Ongoing
Harmful Algal Blooms, Marine Invasive Species, Water Quality	EPA, Craig Tribal Association	Indian Environmental General Assistance Program (IGAP)	<a href="http://www.craigtribe.org/environmental-department.html">http://www.craigtribe.org/environmental-department.html</a>	Southeast	Ongoing
Insect Outbreaks	NPS	Insect Outbreaks, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.nps.gov/im/swan/insects.htm">https://www.nps.gov/im/swan/insects.htm</a>	Southwest	Ongoing

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Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
Invasive Plants	NPS	Alaska Invasive Plant Management Team (IPMT)	<a href="https://www.nps.gov/subjects/invasive/ak.htm">https://www.nps.gov/subjects/invasive/ak.htm</a>	Southeast	Ongoing
Invasive Species	ADF&G	Technical Guidance and Management Plan for Invasive Northern Pike in Southcentral Alaska	<a href="https://www.adfg.alaska.gov/static/species/nonnative/invasive/pike/pdfs/2022_invasive_pike_management_plan.pdf">https://www.adfg.alaska.gov/static/species/nonnative/invasive/pike/pdfs/2022_invasive_pike_management_plan.pdf</a>	Southcentral	Ongoing
Invasive Species	ACCS	Alaska Exotic Plant Information Clearinghouse (AKEPIC)	<a href="https://accs.uaa.alaska.edu/invasive-species/non-native-plants/">https://accs.uaa.alaska.edu/invasive-species/non-native-plants/</a>	Statewide	Ongoing
Invasive Species	USFWS and others	Early Detection of Invasive Species in Alaska	<a href="https://www.fws.gov/project/early-detection-invasive-species-alaska">https://www.fws.gov/project/early-detection-invasive-species-alaska</a>	Statewide	Ongoing
Marine Invasive Species	ADF&G and others	Community-based Early Detection Monitoring for Marine Invasive Species	<a href="https://www.adfg.alaska.gov/index.cfm?adfg=invasive.main">https://www.adfg.alaska.gov/index.cfm?adfg=invasive.main</a>	Statewide	Ongoing
Marine Invasive Species	Smithsonian Environmental Research Center	Plate Watch (Invasive Tunicate Monitoring)	<a href="https://platewatch.nisbase.org/">https://platewatch.nisbase.org/</a>	Statewide	Ongoing
Marine Invasive Species, Harmful Algal Bloom	NOAA, ACCS	Kachemak Bay National Estuarine Research Reserve	<a href="https://accs.uaa.alaska.edu/kbnerr/research/">https://accs.uaa.alaska.edu/kbnerr/research/</a>	Southcentral	Ongoing
<b>Fire Ecology</b>					
Fire Ecology	Conservation of Arctic Flora and Fauna (CAFF)	Arctic Wildland Fire Ecology Mapping and Monitoring Project (ARCTICFIRE)	<a href="https://www.caff.is/work/projects/arctic-wildland-fire-ecology-mapping-and-monitoring-project-arcticfire/">https://www.caff.is/work/projects/arctic-wildland-fire-ecology-mapping-and-monitoring-project-arcticfire/</a>	Statewide	Ongoing
Fire Ecology	NPS	Fire Extent and Severity, Arctic Inventory and Monitoring Network	<a href="https://www.nps.gov/im/arcn/fire.htm">https://www.nps.gov/im/arcn/fire.htm</a>	Northern	Ongoing
Fire Ecology	NPS	Fire Science, Ecology, and Research	<a href="https://www.nps.gov/locations/alaska/fire-science-ecology-and-research.htm">https://www.nps.gov/locations/alaska/fire-science-ecology-and-research.htm</a>	Statewide	Ongoing
Fire Monitoring	BLM and others	Alaska Wildland Fire Information Map Series	<a href="https://blm-egis.maps.arcgis.com/apps/instant/portfolio/index.html?appid=240bd83e9ba34a63b46f7d18c524cb73&amp;sectionId=924f70cc3ee9419c81a77b46216f65b1">https://blm-egis.maps.arcgis.com/apps/instant/portfolio/index.html?appid=240bd83e9ba34a63b46f7d18c524cb73&amp;sectionId=924f70cc3ee9419c81a77b46216f65b1</a>	Statewide	Ongoing
<b>Human Use</b>					
Bycatch	NOAA	National Bycatch Report and updates	<a href="https://www.fisheries.noaa.gov/resource/document/national-bycatch-report">https://www.fisheries.noaa.gov/resource/document/national-bycatch-report</a>	Gulf of Alaska, Bering Sea, Beaufort/Chukchi Seas	Ongoing
Climate Change, Subsistence, Traditional Knowledge	Aleut International Association	Community Observation Network for Adaptation and Security (CONAS)	<a href="https://conas-ak.org/">https://conas-ak.org/</a>	Circumpolar	Ongoing

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Subject	Agency or Organization	Program	More Information	Biogeographic Region	Research Status
Vegetation, Subst- tence, Citizen Science	UAF, Alaska Climate Ad- aptation Science Center	Alaska Berry Futures	<a href="https://sites.google.com/alaska.edu/alaska-berry-futures/home">https://sites.google.com/alaska.edu/alaska-berry-futures/home</a>	Statewide	Ongoing
Visitor Use	NPS	Visitor Use, Southwest Alaska Inventory and Monitoring Network (SWAN)	<a href="https://www.NPS.gov/im/swan/visitoruse.htm">https://www.NPS.gov/im/swan/visitoruse.htm</a>	Southwest	Ongoing
<b>Biodiversity</b>					
Arctic Biodiversity	Conservation of Arctic Flora and Fauna (CAFF)	Arctic Biodiversity Assessment	<a href="https://www.caff.is/work/projects/arctic-biodiversity-assessment/">https://www.caff.is/work/projects/arctic-biodiversity-assessment/</a>	Circumpolar	Ongoing
Ecological Monitoring	USFS	Forest Inventory and Analysis Database, Coastal and Interior Alaska	<a href="https://research.fs.usda.gov/pnw/products/dataandtools/tools/pnw-fiadb-forest-inventory-and-analysis-databases">https://research.fs.usda.gov/pnw/products/dataandtools/tools/pnw-fiadb-forest-inventory-and-analysis-databases</a>	Statewide	Ongoing