

VERTEBRATES

ARCTIC FOX (*VULPES LAGOPUS*) AND RED FOX (*VULPES VULPES*)

Both arctic and red foxes are native to mainland Alaska and occur naturally on some but not all Alaskan islands. Between 1750 and the 1930s, foxes, primarily the Arctic fox, were introduced intentionally to more than 450 other Alaskan islands to be hunted for the fur trade. On islands where there were abundant bird and sea mammal populations, the foxes were left to roam free. Ground and burrow-nesting seabirds such as Storm Petrels (*Oceanodroma* spp.), Cassin's Auklet (*Ptychoramphus aleuticus*), and Tufted Puffin (*Fratercula cirrhata*;) including their chicks and eggs were especially vulnerable to fox predation. Without thriving bird populations to fertilize the ecosystem, plant productivity and the populations of the rest of the ecosystem also declined. Efforts to eradicate foxes from the islands to which they were introduced began in 1949.

ATLANTIC SALMON (*SALMO SALAR*)

Atlantic salmon are native to coastal drainages in eastern North America from northern Quebec, Canada, to Connecticut, USA, and inland to Lake Ontario. They are also native to Europe. Atlantic salmon are raised in fish farming operations along the coasts of Washington and British Columbia, and escaped fish began showing up in Alaskan streams starting in 1998. This species could potentially compete with native salmon and trout species for spawning and rearing habitat. Atlantic salmonids (young salmon) are also more aggressive than Pacific salmon such as sockeye (*Oncorhynchus nerka*) and could out-compete native salmon species for food resources if this species successfully spawns in Alaska. They may also introduce disease or parasites to the native salmon populations, which could severely impact the salmon fishery in Alaska.

CARIBOU (*RANGIFER TARANDUS ARCTICUS*) AND REINDEER (*RANGIFER TARANDUS ASIATICUS*)

Caribou and reindeer are different subspecies of the same species, *Rangifer tarandus*. Caribou are native to mainland Alaska, but were introduced to Adak Island in the late 1950s for sport hunting. Reindeer are a domesticated species that is native to Eurasia and was introduced to Alaska in the 1800s.

Like the native Caribou, reindeer are herbivores, foraging for lichens, mosses, herbs, ferns, grasses, and shoots and leaves of deciduous shrubs and trees, especially *Salix* spp. (willow) and *Betula* spp. (birch). Prior to the introduction of reindeer, lichens were abundant in the vegetation on islands such as St. Matthew and Hall islands, in some places forming mats 8–12 cm thick (Klein, 1968). Reindeer introduction has resulted in overgrazing, trampling of the vegetation, soil erosion, and permanent loss of native plant communities.

EUROPEAN STARLING (*STURNUS VULGARIS*)

Native to Eurasia, the European Starling was introduced to New York City in the 1890s and has since spread all across North America. It was first reported in Alaska in the 1960s. Starlings compete with other cavity nesters for nest sites, either nesting earlier in the season or physically removing eggs and chicks from nests. They are generalists, and compete with native bird species that eat fruits, grains, and insects. Starlings are more of a concern in disturbed areas and near human habitation.

GROUND SQUIRREL (*SPERMOPHILUS PARRYII*)

Ground squirrels occur naturally on mainland Alaska and on some Alaskan islands. Two different subspecies were intentionally introduced to the Aleutian Islands and also to the islands south of

the Alaska Peninsula to provide furs and food to the and to early Russian settlers. They were also introduced to feed introduced foxes after native seabird populations declined. In addition to their impacts on native vegetation, ground squirrels eat songbird eggs as well as the eggs and chicks of seabirds.

NORTHERN PIKE (*ESOX LUCIUS*)

Northern pike occur naturally throughout Canada and the United States, but are not native to all regions. In Alaska, they do not occur naturally south and east of the Alaska Mountain Range, except for a small population near Yakutat. This species was introduced illegally by humans into waterbodies in southcentral Alaska in the 1950s for sport fishing. A top-level predator, Northern pike hunt native coho (*Oncorhynchus kisutch*), sockeye (*O. nerka*), and Chinook salmon (*O. tshawytscha*) and rainbow trout (*O. mykiss*). Northern pike are ambush predators, so the shallower, weedy habitats found in waterbodies in southcentral Alaska are prime hunting habitats and the lack of deep water means that there are few places for prey species such as native salmon and rainbow trout to hide. In lakes and rivers where pike are not native, trout, salmon, and other fish have not adapted defenses against the pike's predatory tactics; thus, this invasive species is negatively impacting those populations. Smaller populations of salmon and trout mean less fish can be harvested by Alaskans for food.

RATS (NORWAY RAT *RATTUS NORVEGICUS* AND BLACK (SHIP) RAT *RATTUS RATTUS*)

Norway rats spread to Europe from Asia in the Middle Ages and are now found in most major human settlements around the world. The Black rat is native to the Indian subcontinent, but has similarly spread throughout the world, living both in forests and woodlands, and in and around buildings. Rats are frequent stowaways on ships, and most of Alaska's rat infestations have resulted from rats coming ashore while a ship is in port or as a result of a shipwreck. Norway rats were first introduced to Alaska in the 1780s, when a shipwreck occurred on the shores of Hawadax Island (formerly Rat Island) in the Aleutian Islands. Since that time the Norway rat has been accidentally introduced on many of the islands and on the mainland as far north as Nome, Alaska. It is also now found on more than 16 of the islands within the Alaska Maritime National Wildlife Refuge (AMNWR). Black rats are thought to occur at low densities on Shemya Island, also in the Aleutians.

RED-LEGGED FROG (*RANA AURORA*)

Red-legged frogs are native to western North America. In Alaska, they were introduced to Chichagof Island in 1982, where they are successfully reproducing and spreading into nearby wetlands. The tadpoles of the red-legged frog compete with the native wood frog (*Lithobates sylvaticus*) and western toad (*Anaxyrus boreas*) for algae, their primary food source. This may alter the abundance and species composition of algae, which in turn could cause changes to the aquatic food web in the wetlands they invade. Red-legged frogs may also spread disease or pathogens to native amphibians.

ROCK DOVE (*COLUMBA LIVIA*)

Rock doves are native to western and southern Europe, North Africa, and south Asia. A domesticated form is now common throughout the world, especially in cities. Once established, this species often occurs in large flocks, displacing native birds, and damaging grain crops. They may also spread parasites and diseases to native bird populations and are a known carrier of avian influenza, which may affect humans.

APPENDIX V

INVASIVE SPECIES IN ALASKA

INVERTEBRATES

DIDEMNUM TUNICATE (*DIDEMNUM VEXILLUM*)

D. vexillum (a marine invertebrate) was first identified in Alaska in 2010 in Whiting Harbour, and the public has been asked to avoid using this waterway to prevent the possible spread of this highly invasive species to other parts of Alaska. Thought to have originated in Japan, *D. vexillum* is a colonial tunicate or ascidian, sometimes called “carpet tunicate” or “leather glove tunicate” because of its spreading character and soft, leather-like appearance. It is accidentally introduced to new locations by ships (by attaching to the hull or being transported in the ship’s ballast water), and has undergone rapid population expansions wherever it has been reported, including Europe, Japan, New Zealand, and on the east and west coasts of North America. The invasive character of this tunicate results in dramatic habitat modifications. It spreads rapidly on hard surfaces underwater, smothering and killing native sessile (unable to move) marine animals and serving as a barrier between demersal (living close to the ocean or lake floor) and benthic (on the ocean floor) organisms. Potential economic impacts to the mariculture industry, shell fisheries, and ground fisheries are also a concern.

LARCH SAWFLY (*PRISTIPHORA ERICHSONII*)

Native to Europe, the Larch Sawfly was first introduced to Alaska in 1965. Today, it occurs throughout Canada and the northeastern US, where it attacks Larch trees (*Larix* spp.). In Alaska, larval stages of this species defoliate (feed on the leaves) native tamarack (*Larix laricina*) and ornamental Siberian larch (*Larix siberica*, also introduced), leaving them weakened and susceptible to infestation by other insects. Sustained infestations by this species have caused the mortality of up to 80% of the tamarack trees in Alaska.

PLANTS

JAPANESE KNOTWEED (*FALLOPIA JAPONICA*)

Native to Asia, Japanese knotweed is one of the worst plant invaders globally. Originally imported to North America as an ornamental plant in the late 1800s, it is now found throughout the continent, including in southeast Alaska. Once established, this species forms dense, monotypic stands that rapidly grow to reach 10 feet tall, outcompeting native vegetation, clogging waterways and reducing stream habitat quality for native trout and salmon species, and causing damage to man-made structures such as drainage ditches and pavement. It spreads both by seeds and via underground rhizomes, which can extend as far as 65 feet from the original plant, and can sprout from root and stem fragments as small as half an inch, making it extremely difficult to eradicate.

ORANGE HAWKWEED (*PILOSELLA AURANTIACA*)

Orange hawkweed is a perennial plant that is native to northern and central Europe. First reported in Alaska in 1961, it is now found throughout southeast and south-central Alaska, where it can form near-monotypic (only one species) stands on roadsides, in pastures, and in grassy riparian and wildlife areas, reducing native plant diversity, decreasing pasture productivity, and reducing forage for wildlife. Established plants spread and form dense patches locally via stolons (a horizontal stem or runner) and new patches are formed by windblown seeds. This species is highly invasive and difficult to eradicate.