Native Amphibians – Introduction

Six species of amphibians are considered native to Alaska. These are the Western Toad (*Bufo boreas*), Wood Frog (*Rana sylvatica*), Columbia Spotted Frog (*Rana luteiventris*), Rough-skinned Newt (*Taricha granulosa*), Long-toed Salamander (*Ambystoma macrodactylum*) and Northwestern Salamander (*Ambystoma gracile*). Only two of these species have been documented outside the southeast regions of the state. The Wood Frog, which is the most hardy and widespread species of frog in North America, has been found from the mainland of Southeast Alaska northward to the Brooks Range. Alaska's single toad species, the Western Toad, has been recorded throughout the southeast Panhandle and along the mainland coast to Prince William Sound.

Many large islands in Southeast Alaska have never been surveyed for amphibians, and only rudimentary species range maps are available for this region. Western Toad and Rough-skinned Newts are thought to be widely distributed throughout the mainland and islands of the Alexander Archipelago. Wood and Spotted Frog and Long-toed Salamander are reported chiefly in areas with transmontane river systems, such as the Taku and Stikine that connect Southeast Alaska to major portions of their distribution in Canada. Northwestern Salamanders are known from only a handful of locations in Southeast Alaska. Southeast Alaska populations of all but Wood Frog are near the northern edges of their geographic ranges.

In addition to these native species, two frogs from the Pacific Northwest have been introduced: Pacific Chorus Frog (*Pseudacris regilla*) and Red-legged Frog (*Rana aurora*). They apparently have viable but restricted populations in the Alexander Archipelago of Southeast Alaska on Revillagigedo Island and Chichagof Island. These populations are the result of unauthorized translocations from outside the state.

Alaska's amphibians require ponds or other still water for breeding. But the ecology of small ponds, particularly those lacking connections to fish streams, has received almost no scientific study. Effective conservation will require a better understanding of pond morphology, function, origin, and diversity.

Populations of some amphibians have declined dramatically around the world in recent decades. A variety of possible causes have been cited, including habitat loss, increased UV-B radiation, fungal infection, intensified predation by introduced fish and nonnative frogs, climate change, increased risk of disease, damage to immune systems resulting from pollutants such as pesticides, and combinations of these factors.

Amphibians are good indicators of significant environmental changes. They are sensitive to environmental factors such as habitat destruction and others listed above. Anecdotal reports from Ketchikan to Haines point to a dramatic drop in numbers of Western Toad, a species with well-documented declines outside of Alaska. Amphibians in many parts of North America including some areas in Alaska have unusually high occurrences of malformed limbs. In light of these growing amphibian conservation concerns and the importance of their habitats for other fish and wildlife species, there is a need for basic information in Alaska. This will require an understanding of amphibian taxonomy, as well as the distribution, habitat needs, life history, current status, and population trends of specific species.

A. Species group description: Six native amphibian species occur in Alaska.

Common names: Northwestern Salamander, Long-toed Salamander, Rough-skinned Newt, Western Toad, Columbia Spotted Frog, Wood Frog

Scientific names: *Ambystoma gracile, Ambystoma macrodactylum, Taricha granulosa, Bufo boreas, Rana luteiventris, Rana sylvatica*

B. Distribution and abundance

Range:

Global range comments:

Northwestern Salamander – Pacific coast of North America from northern Southeast Alaska south through western Canada and northwestern United States to Gualala River, California. Sea level to about 10,200 ft (3110 m).

Long-toed Salamander – Southeastern Alaska southward to Tuolumne County, California, east to Rocky Mountains (east-central British Columbia, west-central Alberta, western Montana, and central Idaho). Isolated populations in Santa Cruz and Monterey counties, California. Sea level to about 10,000 ft.

Rough-skinned Newt – Pacific coast from Southeast Alaska through western Canada (including Vancouver Island but not the Queen Charlotte Islands) to Santa Cruz County, California. Records from the Rocky Mountains, including 3 populations in Latah County, Idaho, in 1997. Sea level to about 9200 ft.

Western Toad – Pacific Coast from Prince William Sound in Alaska to Baja California, east through the Rocky Mountains in west-central Alberta, Montana, Wyoming, Utah, Colorado, and (formerly) northern New Mexico; absent from most of the desert Southwest. Sea level to at least 11,939 ft.

Wood Frog – Widespread throughout northern North America and ranges farther north than any other American amphibian. Northern Alaska to Labrador, south to New Jersey, northern Georgia, and northern Idaho; spotty distribution south to northern Colorado in Rocky Mountains; also disjunct populations in Arkansas and Missouri.

Columbia Spotted Frog – Southeast Alaska, southwestern Yukon, northern British Columbia, and western Alberta south through Washington east of the Cascades, eastern Oregon, Idaho, and western Montana. Disjunct populations found in Nevada, southwestern Idaho, Utah, and western and north-central Wyoming. Elevation range is from sea level to about 10,000 ft.

State range comments:

Northwestern Salamander – Found in coastal forests of Southeast Alaska. Collected in 2 localities only: southeast of Ketchikan on Mary Island, and on northwest Chichagof Island near Pelican. A globular egg mass, presumably of this species, was found in Figure Eight Lake, Stikine River. Recently, a single northwestern salamander was reported from the outer coast of Glacier Bay National Park in Graves Harbor.

Long-toed Salamander – Alaska distribution restricted to southeastern coastal forests adjacent to the Stikine and Taku River watersheds. Reported near the mouth of Stikine River at Figure Eight Lake (Twin Lakes), Mallard Slough, Cheliped Bay, Andrew Slough, Farm Island and Sokolof Island. Also collected on the Alaska side of the Coast Range in the Taku River Valley.

Rough-skinned Newt – Found throughout Southeast Alaska as far north as Juneau, and on the Alexander Archipelago on Admiralty Island, Shelter Island, and on many islands south of Fredrick Sound. They have also been reported on Bamdoroshni Island, and more recently on Rockwell Island in Sitka Sound. Newts on mainland near Juneau and Bamdoroshni and Rockwell islands may be the result of transplants from Shelter Sound around 1980 and Ketchikan in the 1960s respectively. Unverified and questionable reports from farther north along Gulf Coast and perhaps as far west as Cook Inlet.

Western Toad – This species as the widest distribution of all amphibians in Southeast Alaska. Found in coastal rain forests on the mainland and islands throughout Southeast Alaska, northward along Gulf Coast to Prince William Sound (PWS). In PWS, they have been documented on Montague and Hawkins islands, on the mainland as far west as the Columbia Glacier and as far north as the Tasnuna River, a tributary of the Copper River.

Wood Frog – Widely distributed throughout Alaska and is the only amphibian found above the Arctic Circle. Documented on the mainland in Southeast Alaska, throughout Central Alaska to at least Anaktuvuk Pass with unverified reports farther north and east on the North Slope, westward to Kobuk River valley, southward to the base of the Alaska Peninsula, and the Kenai Peninsula. Apparently, absent from Prince William Sound, though reported near Valdez, and the Copper River basin (Anderson 2004). A localized population of wood frogs on Douglas Island near Juneau are suspected transplants.

Columbia Spotted Frog – Present in coastal forests of Southeast Alaska, although range limits are not precisely known. Present distribution confined to coastal transboundary river corridors of continental mainland, such as Salmon, Taku, Stikine and Unuk Rivers and the Agassiz Peninsula. Have been documented on Mitkof, Sergief and Vank Islands within the adjacent Alexander Archipelago. Mitkof Island population (in and near the city of Wrangell) possibly introduced. Report in 2003 of frogs at one location along the Juneau road system suspected to be an introduction. Also reported but not confirmed in Haines area. Its regular presence on the Chilkoot Trail and within the White Pass areas lake system on the Canadian side of the border indicates high potential for the species to be found in nearby Alaska.

Abundance:

Global abundance comments:

Northwestern Salamander – Total adult population size unknown but likely exceeds 10,000 and possibly exceeds 100,000.

Long-toed Salamander – Total adult population size is unknown but expected to exceed 10,000.

Rough-skinned Newt – Total adult population size unknown but likely exceeds 100,000.

Western Toad – Total adult population size unknown but likely exceeds 100,000.

Wood Frog – Total adult population unknown but is likely more than 1,000,000.

Columbia Spotted Frog – Total adult population size unknown but surely exceeds 100,000.

State abundance comments:

Northwestern Salamander – Unknown, but suspected rare.

Long-toed Salamander – Alaska population size unknown but considered relatively small. Waters (1992) surveyed the Stikine River Basin during summer 1991 and failed to observe this species.

Rough-skinned Newt – The most common tailed amphibian in Alaska; fairly common throughout Southeast Alaska.

Western Toad – Overall population unknown. Formerly considered abundant and widespread in Southeast Alaska; more recently, reports of long-time residents from Haines to Ketchikan have noted sharp declines.

Wood Frog – Wood frogs are the most common amphibian in Alaska. Apparently more abundant on the mainland than in Southeast.

Columbia Spotted Frog – Current population size unknown.

Trends:

Global trends:

Northwestern Salamander – Unknown.

Long-toed Salamander – Unknown.

Rough-skinned Newt – Likely stable in extent of occurrence and probably stable to slightly declining in population size, proportion of sites occupied and number/condition of occurrences.

Western Toad – Rocky Mountain populations in Colorado and Wyoming have undergone a drastic decline since the 1970s. Declining in coastal southern British Columbia and questionable status in lower Pacific Northwest of United States. Has declined greatly in the Yosemite area of the Sierra Nevada, California, where surveys in 1915 and 1919 described them as “exceedingly abundant.” Apparently declining in Yellowstone National Park, Montana, and locally elsewhere.

Wood Frog – Population trend is unknown but probably stable to slightly declining.

Columbia Spotted Frog – Relatively stable in most of the range, but populations in the arid southern portion of the range have declined.

State trends:

Northwestern Salamander – Unknown.

Long-toed Salamander – Unknown.

Rough-skinned Newt – Unknown.

Western Toad – Formerly considered abundant and widespread in Southeast Alaska; more recently, reports of long-time residents from Haines to Ketchikan suggest declines.

Wood Frog – Population trend is unknown but probably stable to slightly declining. Numerous reports from the Kenai Peninsula, the Anchorage Bowl, and Talkeetna area that indicate wood frogs are no longer present at historical breeding sites.

Columbia Spotted Frog – Unknown.

References: Carstensen et al. 2003, MacDonald 2003, Anderson 2004

C. Problems, issues, or concerns for species group

- Lack of information on taxonomic/evolutionary relationships, distribution, abundance, trends, habitat associations, and life history in Alaska
  - a) existing data are not compiled and field inventories are not completed
  - b) data are not available in a centralized database where they can be made available to managers, planners and developers
  - c) amphibian populations are not monitored in a systematic fashion.
  - d) little is known about requirements of amphibians outside of the breeding phase
- Potential loss of endemic taxa, distinct populations, and unique lineages (potential units of evolutionary significance—ESUs)
- Lack information about occurrence, frequency, causation, and magnitude of amphibian deformities
- Lack of information to understand the impacts of climate change on population viability
  - a) diminishing snow pack
  - b) increased depth of ground freeze
  - c) increased UV radiation affecting unprotected skin of amphibians
  - d) possible occurrence and spread of chytrid and other pathological fungi
  - e) effect of drought on precipitation regime and ponds/wetlands
  - f) expansion of the ranges of other amphibian species; some may expand their territories and thus affect the survival of extant species
  - g) glacial uplift eliminating some wetland habitats in Southeast Alaska

- Habitat loss and degradation
    a) loss of wetlands due to draining, filling, pollution
    b) potential direct and indirect effects from timber harvest
    c) herbicide use; application of toxics
- Habitat fragmentation reduces ability of dispersal to/from breeding sites, colonization dynamics, expansion potential, and metapopulation dynamics and gene flow
    a) timber harvesting (clearcutting)
    b) roads cause significant mortality (i.e. roadkill) and may impair dispersal
    c) development/wetland loss
    d) loss of stream functionality as dispersal corridors
- Pollution
    a) oil and chemical spills, PCBs (example: Kenai National Wildlife Refuge), and other contaminants
    b) potential for atmospheric pollution and associated precipitation
    c) road dust
    d) runoff from agricultural and lawn care chemicals
- Accelerated eutrophication
    a) direct fertilization of aquatic systems could change the allevin components in lakes (agencies have history of fertilizing lakes for fish growth; recently in Sitka, Redoubt Lake fertilization is ongoing)
    b) runoff from urban and agricultural use of fertilizer
- Predation
    a) fish introduction, although several species have adaptations to reduce this threat
    b) increased predator populations in developed areas, such as concentration of ravens around landfills
- Collecting
    a) potential to eliminate breeding individuals from populations
    b) reintroduction of collected individuals to the wild could spread diseases and negatively affect native populations
    c) lack of coordination sometimes causes duplication of collection for scientific purposes

- Disease; lack information about occurrence, frequency, and magnitude of this threat
    a) exotic amphibian species introductions may introduce fungi
    b) release of pets or captive animals
    c) disease transmission by humans (on gear/boots)
    d) parasitic infections
    e) Ribeiroia is fairly common in normal frog populations, but is thought to cause malformations if other stressors are present
    f) potential for unknown diseases (i.e. Ranaviruses)
    g) lack of information on the elements affecting the immune system
    h) lack of information on disease pathology
- Taxonomic and genetics concerns
    a) Unknown taxonomic and genetic relatedness of mainland and specific island populations
    b) Potential for genetic bottlenecks
    c) Unknown genetic relatedness for Wood Frogs, Western Toads, and Rough-skinned Newts (e.g., are there separate Wood Frog subspecies or evolutionary significant units [ESUs] north and south of the Alaska Range?)
    d) Need to further assess conservation priorities:
        i. Island versus mainland populations
        ii. Gene pool contamination
- Natural Succession
    a) Extent of natural change in important habitats, especially changes in pH and dissolved organic carbons (DOC) in the water, and natural succession of riparian areas affecting temperature, and other important environmental indicators at breeding sites is unknown
    b) Degree of impact for each species is unknown
    c) Conservation strategies to mitigate these impacts are not evaluated
    d) Acceleration of wetland succession to upland due to climatic changes

D. Location and condition of key or important habitat areas

- *Northwestern Salamander* – Eggs are laid in ponds, lakes, and slow-moving streams; usually attached to vegetation in shallows. During the breeding season, they often are found under rocks and logs. In Alaska, known breeding sites include muskeg ponds and freshwater lakes that supply a permanent water source.

This species may have an affinity for forested areas of glacial refugia. This species probably returns to its natal ponds for breeding.

- *Long-toed Salamander* – Found in a wide variety of habitats, including dry woodlands, humid forests, subalpine meadows, and rocky shores of mountain lakes. Common elements appear to be well-drained areas with thick litter on the forest floor and close to relatively permanent water bodies. Adults are subterranean except during the breeding season. Salamanders also were found in seral stages ranging from 3-year-old clearcuts to 180-year-old forests and occurred in active logging areas. Breeds in temporary or permanent ponds, or in quiet water at the edge of lakes and streams. During the breeding season adults may be found under logs, rocks, and other debris near water. Eggs are attached to vegetation or loose on bottom.
- *Rough-skinned Newt* – Uses forested cover adjacent to aquatic habitat for breeding and overwintering. Found in and about small permanent bodies of water (ponds, lakes, reservoirs, and slow-moving streams) with abundant vegetation. On Wrangell Island, species found using backwater lakes and muskegs. Lays eggs singly on aquatic plants or submerged twigs.
- *Western Toad* – Broad range of habitat use. Can be found from sea level to well up in the mountains. Primarily terrestrial, they enter water to breed in a variety of shallow ponds, lakes, streams, backwaters, ephemeral and sometimes brackish pools warmed by the sun. Hibernates in burrows below frostline in forested cover up to several kilometers from aquatic habitat. Tolerant of, and possibly prefers, young landscapes and disturbed areas near forest cover, such as riverine oxbows, ponds recently created due to glaciation, and gravel extraction ponds for breeding.
- *Wood Frog* – This species is closely associated with Alaska's Interior forests. Inhabits a diversity of vegetation types from grassy meadows to open forest, muskeg, and even tundra. Breeds in early spring in shallow bodies of permanent or ephemeral water. Hibernates under the snow in shallow depressions of compacted forest litter.
- *Columbia Spotted Frog* – Highly aquatic. Closely associated with permanent water. Found predominantly in outwash ponds and backwater lakes, beaver ponds, muskeg ponds, river channels, and streams. Emerges and breeds very early and in colder conditions compared to other species.

E. Concerns associated with key habitats

- Climate change and warming (See fourth bullet in C above)
    a) Also affects water depth, temperature, and permanence of wetlands
    b) Expect changes in seral patterns and vegetation types.
- Habitat loss, fragmentation and degradation (See C above)
- Natural succession (See C above)

F. Goal: Conserve and manage native amphibian populations, assemblages, and metapopulations throughout their natural range to ensure sustainable use of these resources.

G. Conservation objectives and actions

State conservation and management needs:

Objective 1: Maintain local amphibian distributions within natural variability.

Target: Establish and maintain occupancy rate (proportion of sites occupied) at baseline levels for native amphibians in selected areas within their ranges within 5 years.

Measure: Occupancy rate for selected areas and species.

Issue 1: Historical information is currently dispersed and must be used to inform the development of occupancy-based protocols.

Conservation actions:

a) Synthesize existing published and unpublished data on amphibian locations.

b) Initiate a Traditional Ecological Knowledge project to collect and summarize anecdotal amphibian information from Native and other long-time residents.

c) Assemble existing Alaska-based publications (articles, final reports, etc.) in a centralized location and make it accessible for education/research.

Issue 2: Occupancy-based protocols for monitoring and supporting data systems are not in place for Alaska.

Conservation actions:

a) Develop a central, statewide amphibian database to track historical, contemporary, and future observations, genetic samples, voucher specimens, changes in occupancy, malformation locations, and temporal/spatial data gaps in real time. Develop quality control standards for inclusion of future data.

b) Develop, promote, and initiate a stratified, regional amphibian inventory project using shared protocols that allow data to be pooled and analyzed across jurisdictions (regionally/statewide). Protocols would include the preservation of scientific samples for future morphological, genetic, epidemiological and other studies, and ideally also be consistent with national efforts (i.e., USGS Amphibian Research and Monitoring Initiative).

c) Support a statewide “Citizen Science” effort to collect and validate public reports on amphibian distribution, threats, and other appropriate issues. Develop standards for credibility of reports.

Issue 3: Many threats are hypothesized, but few have been fully investigated and documented.

Conservation action: Identify which potential threats or stressors may be influencing observed changes in occupancy in a given area. Design future inventory and monitoring efforts to test the validity of these potential hypotheses.

Issue 4: Native amphibians may be susceptible to declines due to known factors (introduced species, wetland loss) before all threats are fully understood.

Conservation actions:

a) Support implementation of the Alaska Amphibian Working Group to promote collaboration at regional, statewide, and international levels.

b) Promote development of outreach and educational information to inform state, federal, and tribal land management agencies of the serious deleterious effects of the factors currently identified as responsible for declines in occupancy.

c) Limit habitat fragmentation through the use of buffer zones and around breeding habitats and planning road construction to protect connectivity of populations.

d) Initiate active monitoring of known exotic amphibians in Southeast Alaska. Study feasibility of eradication methods.

e) Promote development of outreach and educational information to inform the public and school teachers on the effects of introduced nonnative (store bought) amphibians into natural systems, the illegality and dangers of the collection of endemic amphibians as pets, and the harmful effects of reintroduction of endemic amphibians collected as pets.

Issue 5: Habitat destruction and degradation in key areas could threaten the sustainability of amphibian populations.

Conservation actions:

a) Identify specific locations that appear to be of particular importance for survival/productivity.

b) Investigate and document the effects of potential threats, including clearcutting and other logging practices, siltation, and fish introductions.

c) Use plans, information on pending land exchanges, and personal interviews with local residents and land managers to assess potential threats to key local areas, including road building, settlement, development, logging, dumping fertilizer discharge, and fish introduction.

d) Support the protection of any areas identified as being of key importance to any amphibian species from overt anthropogenic change.

Objective 2: Monitor and maintain low malformation rates for Alaska amphibians.

Target: Maintain a malformation rate for Alaskan amphibians that approaches the suggested natural background malformation rate of 3%.

Measure: Rate of malformations of native amphibian species.

Issue 1: The current statewide malformation rates are not currently documented.

Conservation actions:

a) Determine the statewide proportion of malformations due to simple trauma or injury and initiate statewide surveys of amphibian malformations and their types.

b) Initiate/continue statewide surveys of amphibian malformations to determine if there are “malformation hotspots.”

Issue 2: The proportional contributions of each of the potential causal agents to the malformation rate statewide are unknown.

Conservation actions:

a) Support laboratory research on the actual effects of the various hypothetical causes for amphibian malformation. Thoroughly test the natural background rate for various populations and species across the state.

b) Initiate studies to determine which potential causes may be operating in different malformation hotspots. If no hotspots exist, initiate studies to determine which of the potential causes is likely the greatest contributor to malformation.

Issue 3: The effects of malformations on population dynamics are unknown.

Conservation action: Support field studies to determine what level of malformations result in population losses.

H. Plan and time frames for monitoring species and their habitats

State and federal agencies, universities, Native entities and NGOs should coordinate to establish a monitoring plan within the next 2 years that would begin bi-annual monitoring with evaluation at 5-year intervals.

I. Recommended time frame for reviewing species status and trends

Review at 5 years.

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