

WOOD FROG

Rana sylvatica LeConte, 1825
(Ranidae)

Global rank G5 (18Oct1996)
State rank S2S3 (23Jun2004)

State rank reasons

Widespread and relatively common in Alaska, especially on mainland, although overall population and trends are unknown. Recent high incidence of abnormalities reported in core of range is cause for concern. Recent increase in residential development in center of range threatens habitat availability and quality.

Taxonomy

Collins (1990) listed Colorado-Wyoming populations as a separate species, *Rana maslini* (not recognized by most herpetologists familiar with wood frogs) (see Porter 1969, Bagdonas and Pettus 1976, Hammerson 1999). For information on allozyme variation and divergence among some populations in the central part of the range see Zeyl (1993).

General description

A smooth-skinned, light brown or gray frog with a usually prominent dark eye mask. Highly variable in color and pattern, ranging from light brown or gray to pinkish above and creamy white below. Many northern individuals have numerous dark spots on the dorsal surface. Identifying characteristics include dark eye mask, white jaw stripe and a light stripe running down the middle of the back. Males typically smaller than females. Breeding males have dark swollen thumbs and a duck-like staccato mating call (Hodge 1976, MacDonald 2003).

Length (cm) 8

Reproduction

Explosive breeder, with all egg laying in a given pond generally occurring within a brief period of several days. Eggs laid in winter in the Ozarks and southern Appalachians, late February in Maryland, February-March in Missouri, mainly March in southern New England, mostly late May-early June in Colorado; mean date of breeding increases 5.2 days per degree of latitude (Guttman et al. 1991). Eggs hatch in about 1-2 weeks. Larvae metamorphose within a few months, in spring or summer, depending on locality. Period from fertilization to emigration from pond averages about 11 weeks in Michigan, 13



weeks in Maryland, 15-16 weeks in Virginia (Riha and Berven 1991). In Maryland 20,262 juveniles emerged from a single pond in one year (Berven 1988). Sexually mature in 2-3 years (in Maryland, females mainly in 2 years, rarely in 1 year; Berven 1988).

Ecology

Local tadpole density may exceed 15,000/cubic meter of water (Biesterfeldt 1993). See Mazerolle (2001) for information on movement patterns in fragmented peat bogs in New Brunswick.

Migration

Migrates up to several hundred meters between breeding ponds and nonbreeding terrestrial habitats. After leaving the breeding pond, usually remains in an area without moving more than 100 m. In the Shenandoah Mountains, dispersal data indicated that ponds separated by a distance greater than 1000 m should experience little gene flow (Berven and Grudzien 1991). In Minnesota, populations were very similar in allelic frequencies even at distances greater than several kilometers, suggesting large individual movements (Squire and Newman 2002). However, sample sizes and number of loci examined were small, and genetic patterns do not necessarily reflect movement distances.

Food

Metamorphosed frogs eat various small invertebrates, mostly terrestrial forms. Larvae eat algae, plant tissue, organic debris, and minute organisms in water; they are also capable of eating amphibian eggs, hatchlings and invertebrates (Petranka et al. 1994, Petranka and Kennedy 1999, Baldwin and Calhoun 2002).

Phenology

Inactive during cold season in north and at high elevations. Primarily diurnal in northwest and in spring at high elevations, though breeding activities may occur at night as well. Most active in summer in damp conditions. Enters hibernation

as early as late August in Central Alaska (Kirton 1974).

Global habitat

Various kinds of forest/woodland habitats; edges of ponds and streams; also willow thickets and grass/willow/aspen associations. When inactive, hides in logs, humus, leaf litter, or under logs and rocks.

Eggs are laid and larvae develop usually in small fishless ponds, temporary or permanent, in wooded (usually) or open areas. In the Shenandoah Mountains, breeding adults were 100% faithful to the ponds in which they first bred; approximately 18% of the juveniles dispersed to breed in ponds other than the one of origin (Berven and Grudzien 1991). Experiments and field observations by Hopey and Petranka (1994) indicate that adults are able to assess the presence of fishes in ponds and may change breeding sites accordingly to avoid those with predatory fishes. In northern Minnesota, successful reproduction in acidic bog water either does not occur or is a rare event (Karns 1992).

State habitat

This species is closely associated with Alaska's Interior forests. Inhabits diverse vegetation types from grassy meadows to open forest, muskeg, and even tundra. Breeds in early spring in shallow bodies of permanent or ephemeral water (Hodge 1976, MacDonald 2003). A resident of grassland and open forest, is often found considerable distances from water (Hodge 1976). Hibernates under the snow in shallow depressions of compacted forest litter (MacDonald 2003).

Global range

Northern Alaska to Labrador (Chubbs and Phillips 1998), south to New Jersey, northern Georgia, and northern Idaho; spotty distribution south to northern Colorado in Rocky Mountains; also disjunct populations in Arkansas-Missouri (Stebbins 1985, Conant and Collins 1991). Range extends farther north than for any other North American amphibian.

State range

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 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 (MacDonald 2003).

Global abundance

Total adult population size is likely more than 1,000,000.

State abundance

Wood frogs are the most common amphibian in Alaska (MacDonald 2003). Total Alaskan population is unknown but suspected abundant (Hodge 1976). Apparently more abundant on the mainland than in Southeast. Carstensen et al. (2003) surveyed 352 ponds in northern Southeast Alaska and found wood frogs in only one location; considered the local population to be small.

Global trend

Population trend is unknown but probably stable to slightly declining.

State trend

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 (Gotthardt, pers. comm. 2004).

Global protection

Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has listed the wood frog as a species of Special Concern (01Nov2002). World Conservation Union (IUCN) has listed the wood frog as "endangered". In March 1995, USFWS determined that listing of the Southern Rocky Mountain population under the Endangered Species Act is warranted but precluded by actions of higher priority (Federal Register, 23 March 1995, USFWS 1995). This species occurs in many national parks, wildlife refuges, and wilderness areas, however, protection of land may not protect the species where declines may be caused by acidification, ozone depletion, disease, or other causes.

State protection

In Alaska, amphibians are managed by Alaska Department of Fish and Game under statute 16.05.030 in which amphibians are legally included in the definition of "fish". This statute makes it illegal for anyone to "hold, transport or release" any native amphibians without a valid permit. Wood frog habitat is protected where it occurs in Denali, Kobuk Valley, Gates of the

Arctic, Katmai, Lake Clark, Wrangell-St. Elias and Yukon-Charley National Parks and Preserves (Anderson 2004), and in various National Wildlife Refuges throughout the state.

Global threats

Not threatened overall, but threats to local populations include intensive timber harvesting practices that reduce canopy closure, understory vegetation, uncompacted forest litter, or coarse woody debris (moderately to well-decayed) in areas surrounding breeding sites (deMaynadier and Hunter 1999). Negative impacts of intensive timber harvesting extend at least 25-35m into uncut forest (deMaynadier and Hunter 1998).

Not likely to be at risk from present acidification inputs in the Rocky Mountains (Corn and Vertucci 1992).

State threat

One factor affecting this species is loss and fragmentation of habitat due to rapid residential and commercial development, particularly in southcentral Alaska. Filling or draining of wetland breeding habitat and alterations to ground or surface water flow from development are potential hazards.

Recent studies in Alaska National Wildlife Refuges (NWRs) have found a prevalence of abnormalities in wood frogs, including missing, shrunken, or misshapen limbs, or abnormal eyes. Highest incidence of abnormalities reported from Kenai NWR ranged from 5.5% to 9.9% (0 to 19% at individual ponds) (Trust and Tangerman 2002); abnormalities were also detected in frogs from the Arctic NWR. Reasons for the abnormalities are unknown and are currently under investigation. Abnormalities from other geographic areas have been linked to disease agents, increased UV-B exposure, nutritional deficiencies, exposure to environmental contaminants, or a combination of these factors (Trust and Tangerman 2002).

State research needs

Establish programs to monitor population trends; identify threats or limiting factors. Genetic research needed to determine Alaska population genetic structure. Research is needed on the extent of and causes for abnormalities, such as those that have been reported from the Kenai National Wildlife Refuge.

State inventory needs

Additional inventory to precisely determine the species' range and identification of critical habitat areas is needed; population estimates for each area of occurrence and statewide are needed.

Global conservation and management needs

Readily colonizes newly constructed suitable breeding habitat (Hopey and Petranka 1994). See Guttman et al. (1991) for information on a population that was successfully reintroduced into a portion of St. Louis County, Missouri.

State conservation and management needs

Prevent loss of known breeding areas. The current population trend should be evaluated, and threats to populations identified. If specific threats are identified, priority should be placed on reducing these threats such that the population would remain secure into the future. Public outreach is needed to emphasize the importance of amphibians to Alaska's biodiversity. Also should emphasize that collection and release of all amphibian species, during any life stage, is strongly discouraged.

LITERATURE CITED

- Anderson, B.C. 2004. An opportunistic amphibian inventory in Alaska's national parks 2001-2003. Anchorage, AK: National Park Service, Inventory and Monitoring Program.
- Bagdonas, K.R., and D. Pettus. 1976. Genetic compatibility in wood frogs. *J. Herpetol.* 10:105-112.
- Baldwin, R.F. and A.J.K. Calhoun. 2002. *Ambystoma laterale* (Blue-spotted Salamander) and *Ambystoma maculatum* (Spotted Salamander). *Herpetological Review* 33(1):44-45.
- Berven, K.A. 1988. Factors affecting variation in reproductive traits within a population of wood frogs (*Rana sylvatica*). *Copeia* 1988:605-615.
- Berven, K.A. and T.A. Grudzien. 1991. Dispersal in the wood frog (*Rana sylvatica*): implications for genetic population structure. *Evolution* 44:2047-2056.
- Biesterfeldt, J.M., J.W. Petranka, and S. Sherbondy. 1993. Prevalence of chemical interference competition in natural

- populations of wood frogs, *Rana sylvatica*. Copeia 1993: 688-695.
- Carstensen, R., M. Willson and R. Armstrong. 2003. Habitat use of amphibians in northern southeast Alaska. Unpublished report to Alaska Department of Fish and Game. Juneau, AK: Discovery Southeast.
- Chubbs, T.E. and F.R. Phillips. 1998. Distribution of the wood frog, *Rana sylvatica*, in Labrador: an update. Canadian Field-Naturalist 112:329-331.
- Collins, J.T. 1990. Standard common and current scientific names for North American amphibians and reptiles. SSAR Herpetol. Circular No. 19. 41 pp.
- Conant, R. and J.T. Collins. 1991. A field guide to reptiles and amphibians: eastern and central North America. Third edition. Houghton Mifflin Co., Boston, Massachusetts. 450 pp.
- Corn, P.S. and F.A. Vertucci. 1992. Descriptive risk assessment of the effects of acidic deposition on Rocky Mountain amphibians. J. Herpetol. 26:361-369.
- deMaynadier, P.G., and M.L. Hunter, Jr. 1998. Effects of silvicultural edges on the distribution and abundance of amphibians in Maine. Conservation Biology 12:340-352.
- deMaynadier, P.G. and M.L. Hunter, Jr. 1999. Forest canopy closure and juvenile emigration by pool-breeding amphibians in Maine. Journal of Wildlife Management 63:441-450.
- Gotthardt, T. 2004. Zoologist. Alaska Natural Heritage Program, Environment and Natural Resources Institute, University of Alaska Anchorage. 707 A Street, Anchorage, Alaska, 99501.
- Guttman, D., J.E. Bramble, and O. J. Sexton. 1991. Observations on the breeding immigration of wood frogs *Rana sylvatica* reintroduced in east-central Missouri. Am. Midl. Nat. 125:269-274.
- Hammerson, G.A. 1999. Amphibians and reptiles in Colorado. Second edition. University Press of Colorado, Boulder. xxvi + 484 pp.
- Hodge, R.P. 1976. Amphibians & reptiles in Alaska, the Yukon, & Northwest Territories. Alaska Northwest Publishing Company, Anchorage, AK. 89 pp.
- Hopey, M.E. and J.W. Petranka. 1994. Restriction of wood frogs to fish-free habitats: how important is adult choice? Copeia 1994:1023-1025.
- Karns, D.R. 1992. Effects of acidic bog habitats on amphibian reproduction in a northern Minnesota peatland. J. Herpetol. 26:401-412.
- Kirton, M.P. 1974. Fall movements and hibernation of the Wood Frog, *Rana sylvatica*, in interior Alaska. M.S. thesis. University of Alaska, Fairbanks.
- MacDonald, S.O. 2003. The amphibians and reptiles of Alaska. A Field Handbook. Unpublished report to U.S. Fish and Wildlife Service, Juneau, AK.
- Mazerolle, M.J. 2001. Amphibian activity, movement patterns, and body size in fragmented peat bogs. Journal of Herpetology 35:13-20.
- Petranka, J.W. and C.A. Kennedy. 1999. Pond tadpoles with generalized morphology: is it time to reconsider their functional roles in aquatic communities? Oecologia 120(4):621-631.
- Petranka, J.W., S.J. Boone, M.E. Hopey, S.D. Baird, and B. Jennings. 1994. Breeding habitat segregation of wood frogs and American toads: the role of inter-specific tadpole predation and adult choice. Copeia 1994:691-697.
- Porter, K.R. 1969. Description of *Rana maslini*, a new species of wood frog. Herpetologica 25:212-215.
- Riha, V.F. and K.A. Berven. 1991. An analysis of latitudinal variation in the larval development of the wood frog (*Rana sylvatica*). Copeia 1991:209-221.
- Squire, T. and R.A. Newman. 2002. Fine-scale population structure in the wood frog (*Rana sylvatica*) in a northern woodland. Herpetologica 58:119-130.

Stebbins, R.C. 1985. A Field Guide to Western Reptiles and Amphibians. Second Edition. Houghton Mifflin Company, Boston, Massachusetts. xiv + 336 pp.

Trust, K.A. and H. Tangermann. 2002. National malformed amphibian study. FY 2000: Kenai National Wildlife Refuge. Annual Progress Report. U.S. Fish and Wildlife Service. Anchorage, AK. 16 pp.

U.S. Fish and Wildlife Service. 1995. Endangered and threatened wildlife and plants; notice of finding on the petition to emergency list the Amargosa toad (*Bufo nelsoni*) as endangered. Federal Register March 23, 1995. 60(56):15280.

Zeyl, C. 1993. Allozyme variation and divergence among populations of *Rana sylvatica*. J. Herpetol. 27:233-236.

Acknowledgements

State Conservation Status, Element Ecology & Life

History Author(s): Gotthardt,
T.A.

State Conservation Status, Element Ecology &
Life History Edition Date: 23Mar2005



Reviewer(s): Stephen MacDonald, University of New Mexico; Blain Anderson, National Park Service, Anchorage, Alaska.

Life history and Global level information were obtained from the on-line database, NatureServe Explorer (www.natureserve.org/explorer). In many cases, life history and Global information were updated for this species account by Alaska Natural Heritage Program zoologist, Tracey Gotthardt. All Global level modifications will be sent to NatureServe to update the on-line version.

NatureServe Conservation Status Factors
Edition Date: 15Apr2002

NatureServe Conservation Status Factors

Author: Hammerson, G.

Global Element Ecology & Life History Edition
Date: 15Oct2003

Global Element Ecology & Life History

Author(s): Hammerson, G.
