WASHINGTON STATE STATUS REPORT FOR THE July 1997

Oregon Spotted Frog

by Kelly R. McAllister
and William P. Leonard

Washington Department of
FISH AND WILDLIFE
Wildlife Management Program

The Washington Department of Fish and Wildlife maintains a list of endangered, threatened and sensitive species (Washington Administrative Codes 232-12-014 and 232-12-011, Appendix). In 1990, the Washington Fish and Wildlife Commission adopted listing procedures developed by a group of citizens, interest groups, and state and federal agencies (Washington Administrative Code 232-12-297, Appendix). The procedures include how species listing will be initiated, criteria for listing and delisting, public review and recovery and management of listed species.

The first step in the process is to develop a preliminary species status report. The report includes a review of information relevant to the species' status in Washington and addresses factors affecting its status including, but not limited to: historic, current, and future species population trends, natural history including ecological relationships, historic and current habitat trends, population demographics and their relationship to long term sustainability, and historic and current species management activities.

The procedures then provide for a 90-day public review opportunity for interested parties to submit new scientific data relevant to the status report, classification recommendation, and any State Environmental Policy Act findings. During the 90-day review period, the Department holds one public meeting in each of its administrative regions. At the close of the comment period, the Department completes the Final Status Report and Listing Recommendation for presentation to the Washington Fish and Wildlife Commission. The Final Report and Recommendation are then released 30 days prior to the Commission presentation for public review.

This is a Final Status Report for the Oregon spotted frog. **Submit written comments on this report by August 3, 1997 to: Endangered Species Program Manager, Washington Department of Fish and Wildlife, 600 Capitol Way N, Olympia, WA 98501-1091.** The Department will present the results of this status review to the Fish and Wildlife Commission for action at the August 8-9 meeting in Richland, Washington.

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Washington State Status Report

for the

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Wildlife Management Program
600 Capitol Way N
Olympia, Washington 98501-1091

Prepared by

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July 1997

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ACKNOWLEDGMENTS

Dr. Marc Hayes provided a thorough and thoughtful review of an earlier draft of this report and provided considerable unpublished data, some of which we used. Joseph Engler shared his observations of Oregon spotted frog habitat use at Conboy National Wildlife Refuge. Harriet Allen provided constructive suggestions that improved this report at several points during its development. Illustrations by Jim Hunter and illustrations and cover design by Darrell Pruett add a little bit of life to this report. On the cover is a photograph taken by William P. Leonard which provides a view of Oregon spotted frog breeding habitat at Trout Lake Marsh.

EXECUTIVE SUMMARY

The Oregon spotted frog (*Rana pretiosa*) is a Pacific Northwest endemic recently differentiated from a close relative, the Columbia spotted frog (*Rana luteiventris*). Historically, the Oregon spotted frog occurred from southwestern British Columbia south to the northeast corner of California. In Washington, the Oregon spotted frog was historically found in the Puget Trough from the Canadian border to the Columbia River and east into the southern Washington Cascades.

Oregon spotted frogs breed during late winter or early spring. The low-volume calls of the males resemble the sound of the distant tapping of a woodpecker. Females lay their eggs in traditional communal oviposition sites; areas of shallow, still or slow-moving water and sparse, emergent wetland vegetation. Eggs hatch in 18 to 30 days and the tadpoles grow and develop for 13 to 16 weeks prior to metamorphosis in mid-summer. Oregon spotted frogs mature and begin breeding at two or three years of age.

Oregon spotted frogs are preyed upon during all life stages by a wide variety of predators ranging from invertebrates that prey on eggs, to garter snakes (*Thamnophis* spp.) and herons (family Ardeidae) that feed on adults. Among the most significant of predators are various introduced species. Numerous warmwater fish species (primarily of the families Centrarchidae, Percidae, and Ictaluridae) and the bullfrog (*Rana catesbeiana*) have been introduced to waters within the historic range of the Oregon spotted frog. Because of their life histories and habitat affinities, these introduced species pose serious threats to Oregon spotted frog populations.

Oregon spotted frogs are almost entirely aquatic in habit, leaving the wetlands only occasionally and for short duration. Wetlands associated with lakes, ponds, and slow-moving streams can provide suitable habitat. However, these aquatic environments must include a shallow emergent wetland component to be capable of supporting an Oregon spotted frog population. Historically, this critical element was found in the floodplains of many larger water bodies. Various emergent-wetland and floating aquatic plants are found in abundance in Oregon spotted frog habitat. Adult female and juvenile frogs, in particular, spend summers in relatively warm water of this shallow emergent wetland environment.

Historically, the shallow floodplain pools that Oregon spotted frogs inhabited were drained, diked and filled to accommodate human needs. In the Puget Sound lowlands, existing wetlands represent a small proportion of what was present in pre-settlement times. In addition, exotic plants like reed canarygrass (*Phalaris arundinacea*) have changed the character of many wetlands and reduced their value as habitat for Oregon spotted frogs.

The locations for 11 historic populations in Washington have been verified using museum specimen and published records. Only one historically known population and two recently discovered populations are known to remain in Washington. An additional 20 extant populations are known in Oregon and one in British Columbia. Based on an assessment of presence at

historical localities, the species is estimated to have been lost from 78% of its former range. However, considering the broad former range suggested by the historic data, it is likely the species has actually been lost from over 90% of its former range. Due to the limited number of extant populations and the inadequacy of existing protection for these populations, it is recommended that the Oregon spotted frog be listed as a State Endangered species.

TAXONOMY

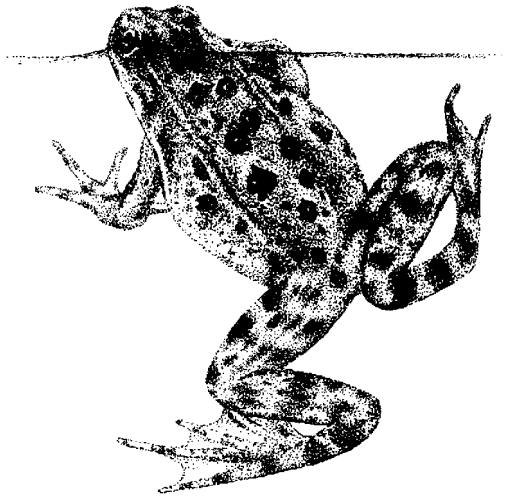
The Oregon spotted frog (*Rana pretiosa*) is a member of the order Anura, the family Ranidae, and the genus *Rana*. The genus *Rana* comprises the true frogs, which includes most of North America's larger frog species. The Oregon spotted frog was described from specimens collected at "Puget Sound" (Baird and Girard 1853). Hayes (pers. comm.) has researched the collection of these specimens by the Wilkes expedition and determined that the collection locality was likely near Fort Nisqually. The Oregon spotted frog was recently differentiated from the Columbia spotted frog (*Rana luteiventris*) based on analysis of proteins using starch gel electrophoresis (Green et al. 1996). The names for these two closely related species were established by Green et al. (1997).

Written references and museum specimen records can be misleading due to changes in taxonomy over time. Prior to the description of the Cascades frog (*Rana cascadae*) (Slater 1939), individuals of that species were considered to be spotted frogs and most museum catalogs reflected the out-dated nomenclature for decades (McAllister and Leonard 1991). Also, past references to subspecies of the spotted frog, *Rana pretiosa pretiosa* and *Rana pretiosa luteiventris*, should not be used as though these subspecies have been simply elevated to full species status. The ranges of the newly differentiated species bear little resemblance to the previously published ranges of these formerly recognized subspecies.

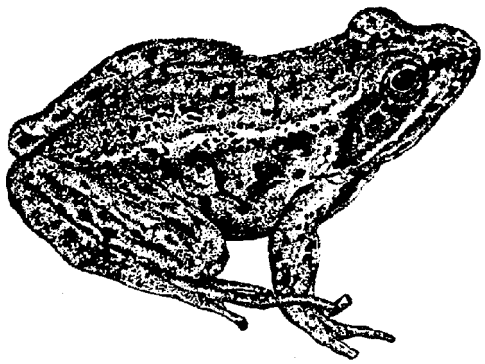
DESCRIPTION

As adults, Oregon spotted frogs reportedly range from about 1.75-4 in (44–100 mm) in body length (Wright and Wright 1949). Males in southwest British Columbia reach a maximum of 64 mm snout-vent length. Females in the same population reach 78 mm in snout-vent length (Licht 1986a). In Thurston County, adult males average 56 mm snout-vent length [range from 46–65 mm (N=56)] and adult females average 66 mm snout-vent length [range from 51–76 mm (N=66)] (unpubl. data). Using pooled samples of frogs from the two populations in the south Cascades of Washington, adult males average 57 mm [range from 46-66 mm (N=13] and adult females average 75 mm [range from 59-89 mm (N=14)]. The size disparity between males and females is typical. Females exceeding 90 mm snout-vent length are rare but a few exist in museum collections (Wright and Wright 1949, Hayes pers. comm.). Black spots with light centers are typically present on the head and back. The spots become larger and darker with age and take on an increasingly ragged-edged appearance (Hayes pers. comm.) Coloration varies with age. Juveniles are usually some shade of brown, occasionally olive green. Adults can be brown or reddish brown; tending to become increasingly red with age. Large, presumably older, frogs are often brick red over most of the dorsal surfaces (Hayes pers. comm., Dumas pers. comm., pers. obs.). The dorsal lateral folds usually are lighter in color, ranging from tan to orange. These folds extend posteriorly from behind the eyes but begin to break up or discontinue altogether midway along the dorsum. Ventrally, juveniles are white or cream in color with reddish pigments

on the underlegs and abdomen developing with age. Adults show a vivid orange-red on the underlegs and red surface pigments on the abdomen increase with age. Older animals are frequently red on the entire abdomen forward to the chest. A brown, gray, or tan mottling covers an otherwise white throat and underbelly (Hayes pers. comm., pers. obs.).



Oregon spotted frogs have black, ragged-edged spots with light centers. (Illustration by Darrell Pruett)



Red-legged frogs usually have small black spots without light centers. (Illustration by Jim Hunter)

Figure 1. Comparison of appearance of the Oregon spotted frog and red-legged frog.

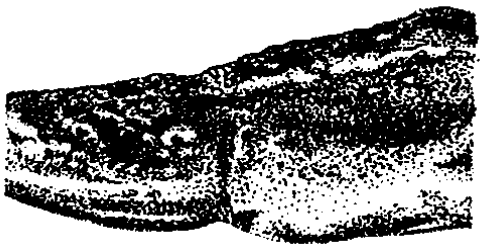
Similar Species

The Oregon spotted frog and the Columbia spotted frog (*Rana luteiventris*) are morphologically very similar. Though these two species overlap in most characters, examination of genetic differentiation provides a clear indication of significant divergence (Green et al. 1996). Hayes (1994a) found that belly morphology may reliably distinguish species in areas of adjacency of the two species' ranges. Oregon spotted frogs are mottled with dark pigments ventrally. All or some portion of the abdomen is suffused with relatively dark-colored patches, irregular in shape, but with a more or less regular spacing. In addition, the superficial red or orange-red wash on the abdomen is fragmented. In the areas of Oregon where the ranges of the two species come into close proximity, Columbia spotted frogs lack this ventral mottling and the red or orange-red pigments are more evenly distributed (Hayes 1997).

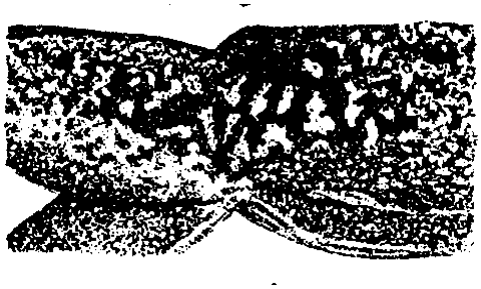
The Oregon spotted frog can be distinguished from the Cascades frog (*Rana cascadae*) by the underlegs which, in the latter, are usually yellowish tan or honey colored. The abdomen of the Cascades frog is usually yellow, though some Olympic Mountain Cascades frogs are pale cream on the abdomen (pers. obs.). The size and character of the black spots can be quite similar in

these two species though the Cascades frog's spots are usually more distinct, with very sharp edges while the Oregon spotted frog's spots have ragged or fuzzy edges. The dorsal spots on a Cascades frog sometimes have light centers. The light centers of an Oregon spotted frog's spots are usually associated with a tubercle or raised area of the skin.

The red-legged frog (*Rana aurora*) is the species most likely to be confused with the Oregon spotted frog since it is similar in size and coloration and both inhabit low elevation wetlands of western and south central Washington. The dorsum of the red-legged frog often has small black spots in an uneven arrangement. Often, the majority of a red-legged frog's spots are not much bigger than the size of a pinhead. These smaller spots are typical on the head and snout. In Oregon spotted frogs, large, light-centered spots and blotches predominate (Fig. 1). The red-legged frog has red or orange-red underlegs and red pigments on the margin of the underbelly similar to the Oregon spotted frog. However, adult red-legged frogs (and larger juveniles) have a distinctive patch of color in the groin — the area where the frog's hind legs fold against its sides. In red-legged frogs, the groin is patterned with some combination of two or more of these colors: black, red, green, or yellow. This combination and pattern of color is unlike anything found elsewhere on the frog's skin (Fig. 2).

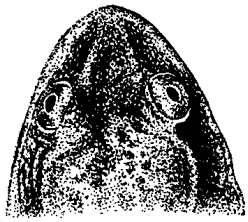


Groin mottling in the Oregon spotted frog is absent or comprised of black or gray mottling on a light background. (Illustration by Jim Hunter)

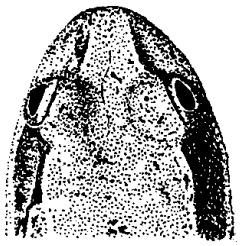


Groin mottling in the red-legged frog is brightly colored, usually a pattern of lines and spots of black, green, yellow, or red. (Illustration by Jim Hunter)

Figure 2. Comparison of mottling in the groin of the Oregon spotted frog and red-legged frog.



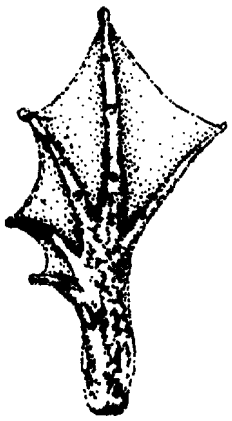
The eyes of the Oregon spotted frog tilt up. When viewed from above, you can see the iris all of the way around the pupil on both eyes at the same time. (Illustration by Darrell Pruett)



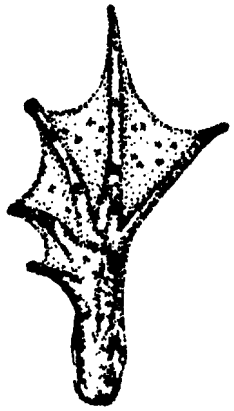
The eyes of the Red-legged frog point out to the sides. When viewed from above, the lower iris of each eye cannot be easily seen. (Illustration by Darrell Pruett)

Figure 3. Comparison of angle of orientation in the eyes of the Oregon spotted frog and red-legged frog.

Some characteristics readily separate the Oregon spotted frog from both the red-legged and Cascades frog. The eyes of the Oregon spotted frog are tilted noticeably upward. The eyes of the red-legged frog and Cascades frog are oriented outward (Fig. 3). This character gives these species distinctly different appearances. Red-legged and Cascades frogs also have longer hind legs in relation to their body size. The lower leg (fibulo-tibia) of a red-legged frog or Cascades frog is almost always more than half as long as the animal's body. In the Oregon spotted frog, it is almost always less than half the body length (snout-vent length) (Hayes 1994b). Oregon spotted frogs also have full webbing between the toes of the hind feet. When the toes are spread until the webbing is taut, the Oregon spotted frog's webbing shows little or no concavity, unlike that which is usually apparent in red-legged and Cascades frogs (Fig. 4) (Hayes 1994a). For an exhaustive discussion of the characters which distinguish these closely-related species, see Dunlap (1951, 1955).



Webbing in the hind feet of the Oregon spotted frog is relatively full. When the toes are spread, the margins form nearly straight lines between the toes. (Illustration by Darrell Pruett)



Webbing in the hind feet of the red-legged frog is reduced. When the toes are spread, the margins dip in concave arcs. (Illustration by Darrell Pruett)

Figure 4. Comparison of webbing in the hind feet of the Oregon spotted frog and red-legged frog.

Oregon spotted frogs are sympatric with red-legged frogs in some areas. Distinguishing egg masses and tadpoles of these two species can be very difficult. Ovum size in Oregon spotted frogs averages smaller (2.31 mm) than that of red-legged frogs (3.03 mm) (Licht 1971). Measurements of complete egg masses [prior to developmental stage 10 (Gosner 1960)] from the Dempsey Creek site indicate that Oregon spotted frogs have smaller egg masses, averaging 304 ml (range 50–550 ml, N=22) (unpubl. data). Red-legged frog egg masses (also prior to developmental stage 10) averaged 725 ml (range 450–1000 ml, N=6). Individual eggs, inclusive of jelly layers, also average smaller in Oregon spotted frogs. Multiple egg samples from 10 egg masses, prior to development stage 10 (Gosner 1960), produced an average egg volume of 0.54 ml (range 0.39–0.84). For red-legged frog eggs in similar early stages of development, multiple egg samples from 21 egg masses produced an average egg volume of 1.25 ml (range 0.7–2.2 ml) (unpubl. data).

Eggs apparently increase in volume during development as evidenced by samples of Oregon spotted frog eggs taken closer to hatching (stages 18–20) that averaged 0.90 ml per egg (N=6).

Also, the Oregon spotted frog's communal laying behavior and the nature of its oviposition sites will often distinguish the two species. Oregon spotted frogs typically lay in communal clusters with egg masses piled together, often with half or more of the top-most egg masses protruding above the water. The egg masses are laid in shallow water, twelve inches (30 cm) or less in depth and unattached, usually laying on top of grasses. Red-legged frog egg masses tend to be separated by some distance from one another though occasionally several egg masses may be deposited so close that they are almost touching. Red-legged frogs also lay their eggs beneath the water's surface, attached to vegetation or sticks. The attachment sometimes fails, allowing the egg mass to float or sink, depending on whether or not the egg mass has accumulated gasses in the jelly layer from the respiration of embedded algae. Cascades frogs are similar to Oregon spotted frogs in both communal laying habit and the environmental characteristics selected for oviposition. Distinguishing the egg masses of Oregon spotted frogs and Cascades frogs requires considerable experience since the primary differentiation is the distance between ova. Cascades frog eggs reportedly have a thicker jelly layer (Corkran and Thoms 1996).

Tadpoles are very difficult to distinguish. In general, Oregon spotted frog tadpoles have a lighter-colored underbelly than red-legged frog tadpoles. The underbelly of an Oregon spotted frog tadpole looks white or aluminum in color. The underbelly of a red-legged frog tadpole may look off-white, yellow or pinkish. In older Oregon spotted frog tadpoles, metallic flecks appear in clusters on the surfaces of the head, body, and anterior tail musculature. These pigments appear superficial, as if sprayed onto the surface of the skin. In older red-legged frog tadpoles, superficial metallic flecking is usually present but is accompanied by gold or brassy pigments deep below the surface of the skin. Cascades frog tadpoles are light colored on the underbelly and may be virtually indistinguishable from those of the Oregon spotted frog. Corkran and Thoms (1996) provide a thorough discussion of eggs, hatchlings, and tadpoles and describe spotted frog tadpoles (*R. pretiosa* and *R. luteiventris*) as pale gold on the belly. This may refer to the lower sides of the abdomen rather than the central underbelly. In any case, these slight differences in key characteristics should be taken as an indication that more study of regional variation and more detailed descriptions should be sought. Tail length in Oregon spotted frog tadpoles averages proportionately greater than that of red-legged frog tadpoles. Dividing total length by body length will usually produce a number larger than 2.6 if the tadpole is an Oregon spotted frog and less than 2.6 if it is a red-legged frog (Altig 1970).

GEOGRAPHICAL DISTRIBUTION

North America

The Oregon spotted frog is a Pacific Northwest endemic, historically well-distributed in the Puget Trough/Willamette Valley province and the Cascade Mountains of south-central Washington and Oregon (Fig. 5). The lower Fraser River valley in British Columbia is the northern-most known locality (Green et al. 1997). Southern-most populations were once found in the Pit River drainage of northeast California (Hayes pers. comm., Stebbins 1985).

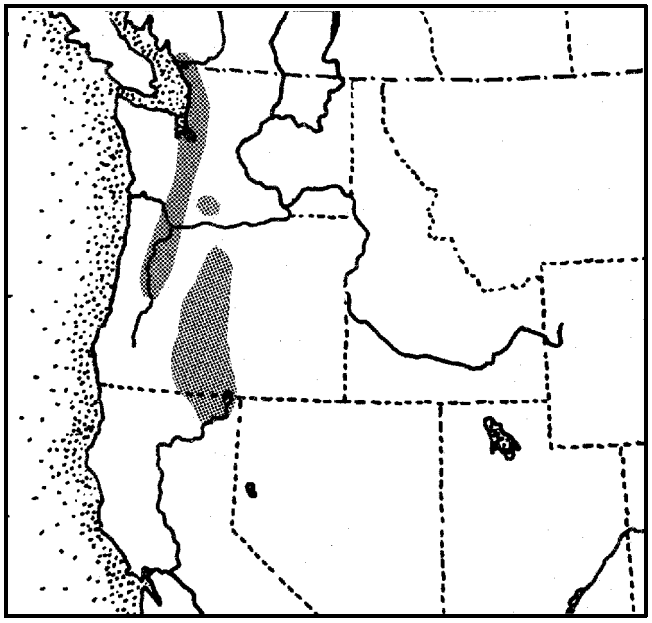


Figure 5. Range of the Oregon spotted frog.

Washington

Historically, the Oregon spotted frog was distributed through the lowlands of the Puget Trough from the Canadian border south to Vancouver and east into the southern Washington Cascades (McAllister et al. 1993, McAllister 1995). Three populations are known extant in Washington today, one in the south Puget Sound lowlands (Dempsey Creek) and two in the Cascade Mountain range in south-central Washington (Trout Lake and Conboy Lake) (Fig. 6).

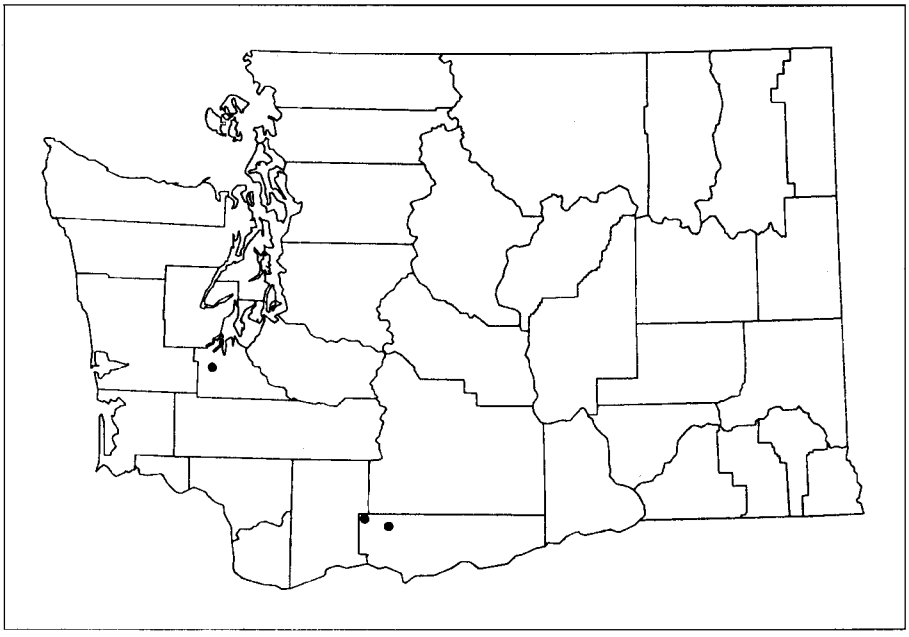


Figure 6. Locations of populations of the Oregon spotted frog in Washington.

NATURAL HISTORY

Oregon spotted frogs are highly aquatic, spending most of their lives in water. The Oregon spotted frog's life history is similar to that of many other frogs. They lay their eggs in water. The eggs hatch into tadpoles, which are predominantly herbivorous. After larval development is completed, they metamorphose into frogs and become carnivores. Predators are a constant threat and suitable habitat must provide adequate escape cover, either dense emergent or floating vegetation or a mucky substrate where adults and tadpoles may conceal themselves from predators.

Reproduction

The late winter breeding season is brief, less than four weeks in duration (Fig. 7). Males call quietly, during day or night. They call from the vicinity of traditional oviposition sites, places where females lay their eggs in communal piles. Adult females reportedly breed every year (Licht 1974) and probably produce a single egg mass each year (Olson and Leonard 1997). Though egg masses are occasionally laid singly, communal oviposition sites usually comprise the majority of the annual reproductive output. These communal clusters of egg masses are often composed of between 10 and 75 individual egg masses (pers. obs.). In British Columbia, Licht (1974) reported that each egg mass contained an average of 643 eggs. At Dempsey Creek, each egg mass averages 598 eggs (N=6) (unpubl. data). These estimates contrast with one published report of over 1,500 eggs in a single laying (Dickerson 1907) which may have been based on an imprecise visual estimate.

Oregon spotted frogs lay their eggs in exposed shallows — often seasonal pools created by rain or snow melt. Their eggs are especially vulnerable to desiccation and/or freezing. Prolonged dry conditions allow water levels to drop significantly, potentially exposing eggs to both drying and freezing conditions. However, these fully exposed, shallow waters are readily warmed by the sun and development to hatching is hastened by warm conditions (Duellman and Trueb 1986). In the lower Fraser valley, Licht (1971) reported that Oregon spotted frog egg masses were surrounded by water averaging about 68° F (20° C) during daylight hours. At this temperature, the rate of development may be near its maximum. At the Dempsey Creek site, water temperatures when adults were active at oviposition sites during 1995, 1996, and 1997 ranged from 31–55° F (-0.5 to 13° C) (pers. obs.). These included temperatures taken during both daylight and at night.

Some aspects of egg-laying are similar from one location to another (Table 1). Timing of egg-laying varies with both latitude and elevation. In southwestern British Columbia, at the northern extreme of the species' range, Licht (1969b) determined precisely the onset and completion of egg-laying during 1968 and 1969. The onset of egg-laying was March 1 in 1968 and March 13 in 1969 (a year when a 50-year record cold wave was experienced). The last eggs were laid on March 10 in 1968 and March 23 in 1969. Further south and near sea level, our observations

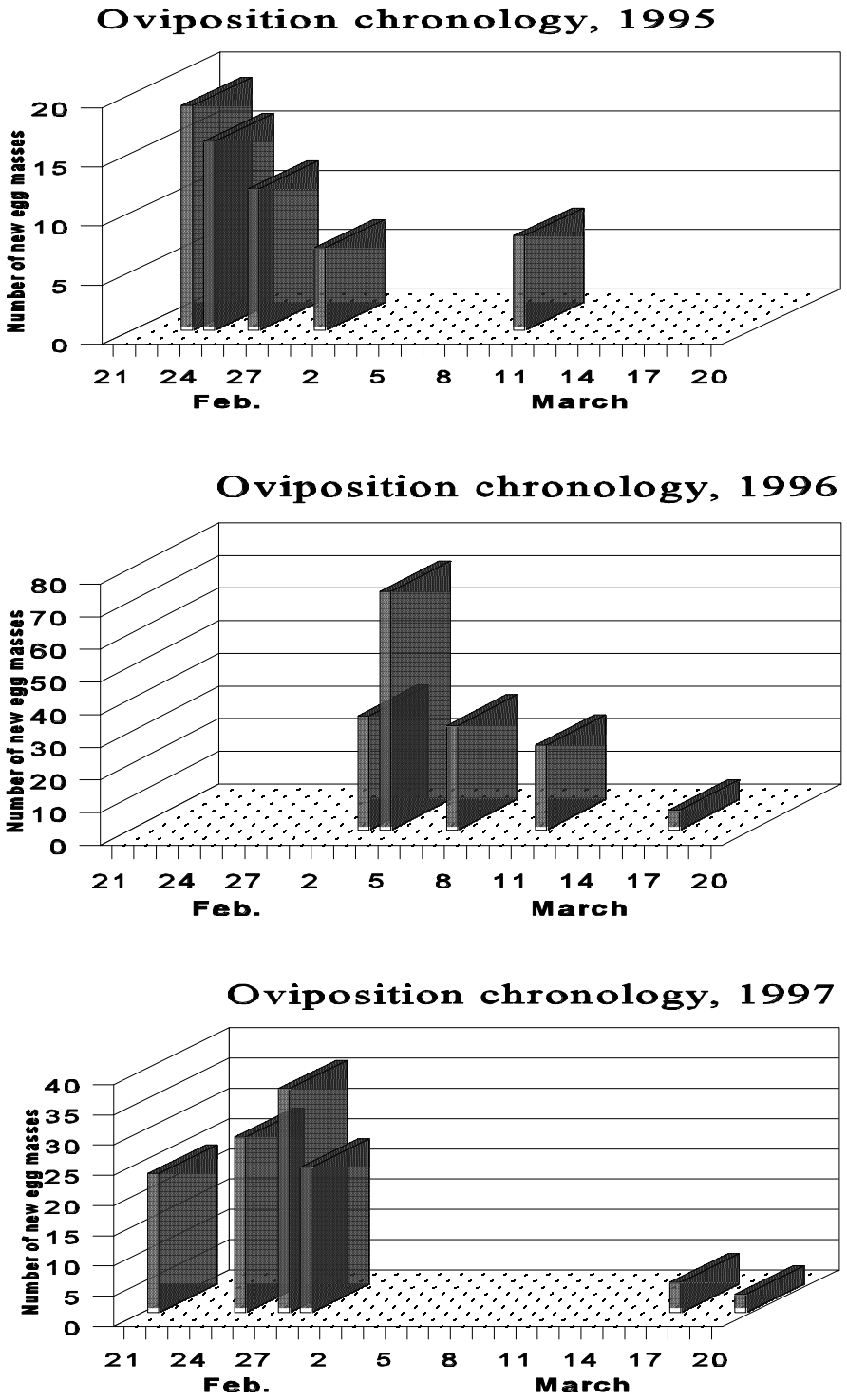


Figure 7. A comparison of oviposition chronology at Thurston County site, 1995 - 1997.

indicate a slightly earlier breeding cycle at the Dempsey Creek site. During 1995, egg-laying commenced on approximately February 23 and the last fresh egg masses were observed on March 10. In 1996, the first Oregon spotted frog eggs (35 egg masses) were found on March 3 and were known to have been laid between 1800 hrs of March 2 and 1500 hours of March 3. Egg laying was completed by March 17 (Table 1). During 1997, the first eggs were laid on February 21, the last eggs on March 20 (pers. obs.). In the south Cascades of Washington, where elevations range from 1960–2080 ft (598–634 m) at Trout Lake and 1840 ft (560 m) at Conboy Lake, the breeding season is later than at either of the aforementioned sites closer to sea level. At these higher elevations, onset of the breeding season is typically in the latter half of March (Leonard 1997, Engler pers. comm.).

Table 1. Characteristics of Oregon spotted frog oviposition.

Location	Year	Oviposition Start Date	Oviposition End Date	Mean Water Depth @ Ovipos. sites[1]	Water Temp. @ Ovipos. sites[2]
Southwest B. C.	1968	March 1	March 10	5-12 cm.	-[3]
Southwest B. C.	1969	March 13	March 23	5-12 cm.	-[3]
Dempsey Creek	1995	February 23	March 10	11.5 cm (N=2)	47° F (8.5° C)
Dempsey Creek	1996	March 3	March 17	5.8 cm (N=7)	49° F (9.5° C)
Dempsey Creek	1997	February 21	March 20	10 cm (N=3)	52° F (11° C)
Trout Lake	1997	~March 26	----------	----------	----------
Conboy Lake	1997	~March 16	~March 25	----------	----------

[1] Water depths were measured within 48 hrs of egg-laying.
[2] Water temperatures were taken within 48 hrs of egg-laying.
[3] Licht (1971) reported that egg-laying commenced when water temperature reached 43° F (6° C) in the center of the breeding pond but that termperatures adjacent to egg masses averaged 69° F (20.7° C).

Licht (1969b) found clusters of 26, 19, and 11 egg masses in areas less than two feet square. At Dempsey Creek during 1996, one cluster of eggs grew from an initial laying of 6 egg masses to completion at 55 egg masses in nine days. Other large clusters at this location reached completion at 40, 28 and 20 egg masses (pers. obs.). At Trout Lake during 1997, egg masses were found in varying-sized groups, including a group of 60 (Leonard 1997). At Conboy Lake, egg masses tended to be in loose groups rather than piled on top of one another (Leonard 1997).

When an egg mass is first laid, it is small and compact. Two freshly laid egg masses were measured at Dempsey Creek during 1997. The first measured 41 X 51 mm, the second 60 X 30 mm (unpubl. data). Within three hours, egg masses swell to many times their initial volume and become indistinguishable from older egg masses.

Hatching can occur in as little as 14 days. However, 18–30 days is probably a more typical period for development to hatching. At Dempsey Creek during 1997, the earliest laid eggs were

deposited on February 21 and began hatching between March 20 and March 24 (unpubl. data). Hatchling tadpoles can remain embedded in the thick layer of jelly in the communal oviposition site for several days. The tadpoles eventually find open water and begin grazing on algae, detritus, and bacteria. In 13 to16 weeks, the tadpoles metamorphose and become small frogs, 30–33 mm in snout-vent length (Licht 1986a). Oregon spotted frogs reportedly mature and begin to breed by three years of age (Licht 1986a). Based on sizes of breeding animals, it appears that males begin breeding at two years of age, females at three (Hayes, pers. comm.). Males may occasionally breed at one-year of age. One 32 mm snout-vent length male was found perched atop a communal egg cluster at Dempsey Creek on March 17, 1996 (pers. obs.). When captured, it was noted that this frog had enlarged nuptial pads, a characteristic indicative of breeding readiness.

Mortality

Licht (1974) gives the most thorough accounting of factors that contribute to mortality in Oregon spotted frogs. His study in 1968 and 1969 documented highly variable mortality rates for embryos, consistently high mortality for tadpoles, and relatively low mortality for post-metamorphic frogs.

In southwestern British Columbia, Licht (1974) estimated mortality in the egg, tadpole, and first year metamorph stages. During the first year of the study, survival of embryos to hatching was 68% at the pond location and 74% at the river margin location. However, during the second year of the study, all Oregon spotted frog eggs would have desiccated had the researcher not moved the eggs to water. The same phenomenon occurred at Dempsey Creek during 1995 and at Trout Lake in 1997 (pers. obs.). Most egg masses had substantial numbers of dead embryos due to freezing conditions at night and no water surrounding the eggs. The laying habit of the Oregon spotted frog makes its eggs extremely susceptible to desiccation and freezing whenever there is a prolonged dry period subsequent to oviposition.

In southwestern British Columbia, the highest mortality occurred in the tadpole stage (Licht 1974). In the pond, which dried up around July 1, 1968, Licht estimated that less than 1% of hatched tadpoles survived to metamorphosis. In the river, an estimated 7.3% of tadpoles survived to metamorphosis.

In their first year as frogs, 67% of Oregon spotted frogs in Licht's study survived. Adult survival was similar to that of juveniles with 64% of adults surviving between years. Adult males had poorer survival than adult females (45% versus 67%). These survivorship data are useful but there are many factors, including the abundance of predators, that might cause significant variability from one location to another.

Behavioral Characteristics

Mating behavior - Oregon spotted frogs have been observed in traditional breeding pools during late winter (Licht 1969b, pers. obs.). During February 1996, adults (three males and one female) were observed to be active under a layer of ice that covered a breeding pool one month before the first eggs were noted (Leonard et al. 1997a). To attract females, males emit a low series of clucks that sound like the distant tapping of a woodpecker. Licht (1969b) described the male's call as a series of short bass notes usually from 6 to 9 in number. The low-volume calls carry only 18–30 m (60–100 ft) and is often obscured by the calling of birds or Pacific treefrogs (*Hyla regilla*) (Nussbaum et al. 1983, pers. obs.). Licht measured the call of a male 4 ft away at 4–5 db using a sound meter. Davidson (1995) provided a most useful and accurate description. He described the Oregon spotted frog's call as:

> "A rapid series of 5 to 50 faint, low-pitched, hollow notes. Can be imitated by knocking on wood with a fist or clicking the tongue on the roof of the mouth."

Though seldom predictable and always soft and unobtrusive, males call during both day and night (pers. obs.). In British Columbia, calling was reportedly especially intense on sunny afternoons (Licht 1971). Calling of single males during mid-day in early autumn has also been documented (Leonard et al. 1997b).

Prior to breeding, females move to the breeding pools and remain within range of the males' mating calls. Many males congregate around egg masses during the breeding period, calling and swimming around and over the eggs in search of gravid females (pers. obs). When ready to spawn, the females move into the pools with the calling males (Licht 1969b). Upon encountering a female, the adult male frog grasps the female behind the forelimbs in a tight embrace called amplexus. Pairs in amplexus have also been found >60 ft (>20 m) from known oviposition sites so it is assumed that pairs in amplexus occasionally move some distance to reach oviposition sites (pes. obs.). When the female has selected the chosen place for oviposition, she extrudes an egg mass which the male simultaneously fertilizes. Licht (1969b) demonstrated that females frequently choose to lay their eggs on top of the eggs laid by other females.

Egg-laying has been reported to occur during daylight, primarily during mid-afternoon (Licht 1969b, 1971) but also occurs at night (pers. obs.). Licht also reported that seven of eight pairs in amplexus were encountered during mid-afternoon, in bright sunshine and air temperatures of 59–61° F (15–16° C). At Dempsey Creek during 1995 and 1996, circumstances were quite different. Egg mass counts were conducted regularly during the breeding period and adults engaged in oviposition were never observed. Four out of five pairs in amplexus were encountered at night and oviposition most likely was occurring at night (pers. obs.). At Dempsey Creek during 1997, pairs were observed in amplexus during daylight hours and some, perhaps most, of the eggs were laid during the day (pers. obs.)

Presumably, male and female Oregon spotted frogs separate soon after egg-laying and females likely go back to leading fairly solitary lives. Males may stay at the breeding site for several weeks — until all oviposition is completed. Dropping water levels may be partly responsible for these movements. Many breeding pools are reduced to a very thin layer of water by the time the tadpoles are free-swimming (pers. obs.).

Foraging - Tadpoles are grazers. Their mouth parts are equipped with rough tooth rows that allow them to scrape plant surfaces and ingest plant tissue and bacteria. They also consume algae, detritus and, probably, carrion. Juvenile and adult Oregon spotted frogs are predominantly "sit and wait" predators, often sitting motionless for over an hour. From their position on a muddy shore or floating with eyes protruding above aquatic vegetation, the frogs will strike at small prey that come near them. On dry days, they remain in the water, often within two feet (one half meter) from the shore. However, during or immediately after a rain, they will move away from standing water to feed in wet vegetation (Licht 1986a). Like many frogs, Oregon spotted frogs capture prey with a lunge forward, extending a sticky tongue to entrap small prey which are pulled back into the frog's mouth and swallowed. Licht (1986a) noted that Oregon spotted frogs swallow their prey while in the water. He tempted frogs to leave the water to take a prey item on the riverbank and reported that Oregon spotted frogs would always return to the water and often submerge to swallow. However, there is evidence to the contrary. In captivity, Oregon spotted frogs will readily eat crickets without being in the water, even though it is available (pers. obs.).

Escape - Licht (1986b) described the escape behavior of Oregon spotted frogs. Frogs in the water usually dive or slowly sink to the bottom to take cover in the silty substrate. Frogs on land hop directly toward the water to dive to the bottom seeking cover in dense vegetation or a soft substrate.

Interspecific Relationships

Garter snakes (*Thamnophis* spp.) are important predators of post-metamorphic Oregon spotted frogs (Licht 1986b, Hayes 1994b, pers. obs.). Common garter snakes (*Thamnophis sirtalis*) have been captured with Oregon spotted frogs in their digestive tracts (pers. obs., Hayes pers. comm.). During 1997, an adult female common garter snake (21.75 in snout-vent length) ate a female Oregon spotted frog (69 mm snout-vent length) fitted with a belt-mounted 1.8 gram transmitter (pers. obs.). Bullfrogs (*Rana catesbeiana*), when present, may be similarly important as predators on Oregon spotted frogs. At Conboy Lake, a sample of digestive tracts from 25 adult bullfrogs was found to contain nine Oregon spotted frogs, including seven adults (Engler and Hayes pers. comm.). Other potential predators include great blue herons (*Ardea herodias*), green herons (*Butorides virescens*), raccoons (*Procyon lotor*), belted kingfishers (*Ceryle alcyon*), sandhill cranes (*Grus canadensis*), coyotes (*Canis latrans*), striped skunks (*Mephitis mephitis*), mink (*Mustela vison*), river otters (*Lutra canadensis*), and feral housecats (*Felis domesticus*).

Tadpoles may be killed and eaten by numerous vertebrate and invertebrate predators. Among the vertebrates are belted kingfishers, hooded mergansers (*Lophodytes cucullatus*), common garter

snakes, western terrestrial garter snakes (*Thamnophis elegans*), larval and adult roughskin newts (*Taricha granulosa*), larval northwestern salamanders (*Ambystoma gracile*), and, possibly, fish like cutthroat (*Oncorhynchus clarki*), Olympic mudminnows (*Novumbra hubbsi*), and three-spine sticklebacks (*Gasterosteus aculeatus*). Invertebrate predators include dytiscid beetles (*Dytiscus* spp.), giant water bugs (*Lethocerus americanus*), backswimmers (*Notonecta undulata* and *N. kirbyi*), water scorpions (*Ranatra* sp.), dragonfly nymphs (Odonata), and leeches (*Lethocerus americanus*). Egg predators may include leeches and other invertebrates, roughskin newts, and northwestern salamanders .

With the exception of the bullfrog, which is found at Conboy Lake, exotic aquatic predators are not known to co-occur with Oregon spotted frogs in Washington. However, many exotic species, including largemouth bass (*Micropterus salmoides*), pumpkinseed (*Pomoxis gibbosus*), yellow perch (*Perca flavescens*), bluegill (*Lepomis macrochirus*), brown bullhead (*Ameiurus nebulosus*), black crappie (*Pomoxis nigromaculatus*), warmouth (*Lepomis gulosus*), and rainbow trout (*Oncorhynchus mykiss*) have been introduced to waters within the historic range of the Oregon spotted frog and may have played a role in losses of Oregon spotted frog populations (see Hayes and Jennings 1986 for a thorough discussion). Hayes (1994a) also mentioned the potential for harm from an introduced warmwater crayfish (*Procambarus clarkii*) which has not been verified to occur in Washington (C. Burley, pers. comm.).

Bullfrogs, which are native to eastern North America, have the potential to displace native frogs, including Oregon spotted frogs. Adult bullfrogs are large and will consume almost any moving object which will fit in their mouths. Newly metamorphosed bullfrogs are significantly larger than native ranids and will eat newly metamorphosed red-legged frogs, a species similar in size to the Oregon spotted frog (pers. obs.). Bullfrogs co-evolved with many of the exotic warmwater fish that now inhabit Washington waters. As is typical for amphibians which breed in waters inhabited by predatory fish, bullfrogs developed defenses against these predators. Bullfrog larvae are unpalatable to fish (Kruse and Francis 1977). Fish avoid eating bullfrog tadpoles and will generally not eat them unless starved. It appears that piscivorous birds are similarly unwilling to eat bullfrog tadpoles. Radke (pers. comm.) monitored an abundance of piscivorous birds visiting drying ponds on the Columbia National Wildlife Refuge in Adams County. These birds fed daily at the ponds until there were no more sunfish or other small fish in the ponds. The birds then ceased visiting the ponds despite an abundance of bullfrog tadpoles remaining. At least one species, the common garter snake, will readily eat bullfrog tadpoles (pers. obs.). However, common garter snakes are probably unusual in this regard. They are among the few predators that can eat the highly toxic rough-skinned newt with little or no ill effect (Brodie 1968). Interestingly, the ovarian eggs of bullfrogs are palatable and readily eaten by a variety of predators (Licht 1969a).

There are also behavioral interactions that may bear upon the survival of native ranids sympatric with bullfrog populations. Bullfrog tadpoles were shown in experiments to displace red-legged frog tadpoles from the warmer, shallower waters that provide optimal conditions for growth. In the presence of bullfrog tadpoles, red-legged frog tadpoles frequented deeper water, grew more

slowly, and metamorphosed at lower body weight (Kiesecker pers. comm.). There is also evidence that bullfrogs are more resistant to the effects of toxicants (e.g. pesticides and heavy metals) than some other ranid frogs. Bullfrog tadpoles are tolerant of numerous pesticides (see review in Hayes and Jennings 1986). All of the aforementioned factors combine to favor bullfrogs in many environments formerly suitable for other frogs. One of the key problems with assigning the blame for frog declines to introduced bullfrogs is the potential that habitat alterations are at least as responsible as bullfrogs for creating conditions in which native species are lost and bullfrogs become abundant (Hayes and Jennings 1986).

Hybridization between Oregon spotted frogs and Cascades frogs was demonstrated in the laboratory by Haertel and Storm (1970). Using adults collected in the Oregon Cascades, one hundred percent fertilization was achieved using an adult female Cascades frog and an adult male Oregon spotted frog. The hybrid progeny were reared through metamorphosis. Hybridization in nature was verified by Green (1985) who examined frogs collected from Gold Lake in the Oregon Cascades. The offspring from such pairings are infertile as chromosomes fail to pair during meiosis. In Oregon, historically, Oregon spotted frogs were more frequently sympatric with Cascades frogs so opportunities for hybrization were more prevalent (Hayes pers. comm.). Today, these two species are rarely sympatric so naturally occurring hybrids are expected to be rare.

At this time, there are no known sympatric populations of the Oregon spotted frog and Columbia spotted frog.

Food

Post-metamorphic Oregon spotted frogs feed on a variety of live animal prey, including mostly insects. The eight most important prey groups in southwestern British Columbia were leaf beetles (Chrysomelidae), ground beetles (Carabidae), spiders (Arachnidae), rove beetles (Staphylinidae), syrphid flies (Syrphidae), long-legged flies (Dolichopodidae), ants (Formicidae), and water striders (Gerridae) (Licht 1986a). Dickerson (1907) reported that Oregon spotted frogs fed greedily on small fish but this is doubtful in view of more recent and thorough research. Oregon spotted frogs have been observed to eat newly metamorphosed red-legged frogs (Licht 1986a).

Tadpoles feed on algae, rotting vegetation, and detritus (Licht 1974), apparently deriving significant nutritional benefit from the bacteria present in some of these foods.

HABITAT REQUIREMENTS

General

The Oregon spotted frog inhabits emergent wetlands within forested landscapes. Historically, it was also associated with lakes in the prairie landscape of the Puget Sound lowlands (Slipp 1940). Hayes (1994b) developed data suggesting a relationship with fairly large marshes which are more likely to achieve suitably warm summer temperatures. Hayes' Oregon study sites had surface areas of 4 hectares (9 acres) or more, a size that might represent the minimum size necessary to sustain an Oregon spotted frog population. Larger marshes may also be necessary to support a large enough frog population to persist despite the high predation rates associated with occupation of the aquatic environment the year around (Hayes 1994b).

Though not typically found under a forest canopy, Oregon spotted frogs have been found in riparian forests and areas with dense shrub cover (Engler pers. comm., pers. obs.). At Trout Lake during early spring, numerous adults have been found in shallow pools under a canopy of black cottonwood (*Populus trichocarpa*) (pers. obs.).

The Oregon spotted frog is a highly aquatic frog that seldom strays from areas of standing water. Bodies of water (i.e., wetlands, lakes and slow-moving streams) that include zones of shallow water with abundant emergent or floating aquatic plants are suitable for Oregon spotted frogs. Mats of aquatic vegetation are used for basking. These habitats often provide a thin layer of unusually warm water which the frogs appear to prefer. Escape from danger is also achieved by a quick dive beneath the cover of the vegetation (pers. obs.).

Dickerson (1907) noted that eggs are laid in shallow, marshy pools near a lake, but never in the deep lake-water itself. Other work substantiates the importance of shallow pools, often temporary in duration (Licht 1969b, pers. obs.), and highlights the value of small floodplain wetlands associated with permanent bodies of water. Shallow, emergent wetlands appear to provide habitat critical to the persistence of this species (Hayes 1994a, pers. obs.).

The physiological significance of warm summer water temperatures has not been investigated, however it may be a requirement of adult females being readied for the next breeding cycle or for the proper development of juveniles. At all three Washington sites, numerous adult females have been observed out of the water (presumably basking) during summer and early fall. Males are rarely observed at this time of year (pers. obs.). At Dempsey Creek, juveniles are numerous in warm, shallow water during late summer (pers. obs.). In the Oregon Cascades, Oregon spotted frogs were found in water that averaged 83° F (28.6° C). Less than 5% of temperatures taken next to active frogs were <68° F (20° C) (Hayes 1994b). During breeding, however, Oregon spotted frogs are active at substantially lower water temperatures. Frogs at Dempsey Creek were active in water consistently <50° F (10° C) and frogs were found active under ice (including a pair in amplexus) where the water temperature was 31° F. (-0.5° C.) (Leonard et al. 1997a).

Food

Oregon spotted frogs are primarily found in emergent wetland habitats which are well known for their productivity. These systems support an abundance of aquatic and emergent vegetation during the growing season and each year's growth contributes dead vegetation to a detritus-based food web. The decomposing vegetation that comprises much of the muck on the bottom of the wetland supports a diverse community of invertebrates that, in turn, support many vertebrates, including the Oregon spotted frog.

Breeding Habitat

Oregon spotted frogs breed in shallow water, often 2–12 inches (5–30 cm) deep. Grasses, sedges, and rushes are usually present though eggs are laid where the vegetation is low or sparse (pers. obs.). In southwestern British Columbia, Licht (1974) described breeding habitat identical in many ways to the Oregon spotted frog breeding habitat at Dempsey Creek. In both areas, breeding habitat is lightly grazed by cows and vegetation is characterized by soft rush (*Juncus effusus*), slough sedge (*Carex obnupta*), and creeping buttercup (*Ranunculus repens*).

Oregon spotted frogs breed in the shallowest pools, some of them along the margins of flowing water and others that may only be connected to larger water bodies during seasonally high water or at flood stage. Licht (1974) described improved hatching success for egg masses laid in river margin areas where flowing water improved oxygenation and cleansed the eggs of algae and fungus. At Dempsey Creek, Oregon spotted frogs lay eggs in quiet backwaters associated with an intermittent run-off channel. Communal oviposition sites found to date are sufficiently removed from run-off channels such that surface water movement is imperceptible, except during periods of high water (pers. obs.).

Seasonal Habitat

Oregon spotted frogs inhabit relatively shallow water where there is cover of emergent or aquatic plants. They will shift in response to changing water levels. During periods of prolonged and severe cold, they may become inactive, possibly burying themselves in a silty substrate or burrowing into clumps of emergent vegetation. A rather unusual situation was observed at Dempsey Creek in early February, 1996 when four adults were found active under cover of 2 cm of ice (Leonard et al. 1997a). Among them was a pair in amplexus. Not until the sixth visit after this phenomenon (two weeks later) were additional Oregon spotted frogs found. Eggs were not observed until one month after the first frogs were observed under the ice. This observation indicates some activity during freezing temperatures.

In the Oregon Cascades, Oregon spotted frogs inhabit lakes and marshes at relatively high elevations. In these areas, where snow and ice cover their habitat for months, Oregon spotted

frogs are believed to retreat to springs where they spend the winter in a state of torpor in the highly oxygenated and ice-free water (Hayes pers. comm.).

POPULATION STATUS

Past

Past populations of the Oregon spotted frog in Washington are largely undocumented. Museum specimen records provide a basis to begin an assessment of the distribution of the species. Major herpetological collections throughout North America have contributed to the inventory of locations where the Oregon spotted frog once occurred (Table 2). Nine widely separated populations were verified by records associated with specimens. The localities that are verifiable using museum specimens can be referred to as Concrete, Sedro Woolley, Mount Vernon, Monroe, Seattle, Kapowsin, Spanaway, Vancouver, and Trout Lake (McAllister and Leonard 1990, McAllister and Leonard 1991, McAllister et al. 1993). An additional two historic localities, Pattison Lake and Kent, are considered reliable based on the experience and credibility of the observers (Professor James Slater and Warren Jones).

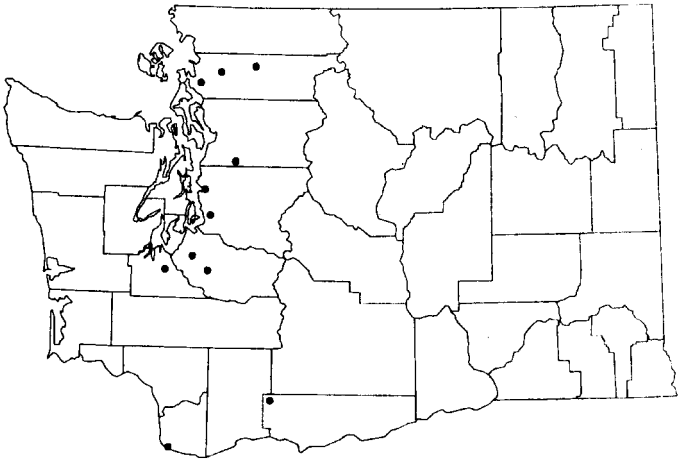


Figure 8. Locations of Oregon spotted frog populations known prior to 1990.

Written accounts of historic populations provide corroboration for the museum specimen data and, occasionally, information on populations not represented in museum collections. Dickerson (1907) described a population in Lake Washington (represented by specimens labeled as taken in "Seattle") and published the first Oregon spotted frog photograph. Wright and Wright (1949) described the relative abundance of the species at a pond and ditch complex adjacent to Spanaway Lake in Pierce County (another population well represented in museum collections). This was a favorite collecting locality for several local scientists, including James Slater and John Slipp, zoologists with the University of Puget Sound, and Jens Knudsen, a professor at Pacific Lutheran University. Slipp (1940) considered the Oregon spotted frog a species associated with prairies. An Oregon spotted frog was reportedly collected near Brush Prairie, Washington (considered synonomous with the historic Vancouver population) by Ed Nelson of Clark College

Table 2. Oregon spotted frog localities in Washington based on museum records (sorted by county).

Location	County	Date	Source[1]
"Puget Sound"	unknown	pre-1853	USNM498959, 498960, 11409, 5975, 9421, 9467, 131512, 310765
Vancouver	Clark	30 Sept 1909	USNM45866, 45867
Orchards	Clark	15 March 1962	PSM9614 (Specimen lost)
Seattle	King	1905	USNM35638, 35639; AMNH34, 35
Trout Lake, 0.5 mi North	Klickitat	25 June 1958	WSU75-1127
Trout Lake, 0.5 mi Northeast	Klickitat	25 June 1958	WSU58-378
Trout Lake, 1 mi North	Klickitat	25 June 1958	WSU58-369, 58-370
Trout Lake	Klickitat	30 August 1918 2 Sept 1938 2 Sept 1947 11 Sept 1947 21 August 1950 22 August 1950 2 Sept 1947 21 August 1992	USNM61473, 61474 MVZ41432 PSM5596 through 5602 PSM5607 PSM7371, 7372 PSM7386, 7387, 7388; FLM3333 UOK30236 RM1008
Trout Lake Creek, Guler	Klickitat	2 Sept 1938	MVZ41433
Conboy National Wildl Refuge	Klickitat	21 August 1992	RM1004 through 1007, 1019, 1020
Spanaway Lake pond	Pierce	unknown 2 August 1937 10 August 1937 7 June 1938 23 August 1939 24 February 1959	CAS7295 PSM2100 PSM2071 PSM2712, 2713 USNM312413, 312414 PLUA40 through 43
Kapowsin, 3 mi West	Pierce	10 August 1937	PSM2069
Mount Vernon, 3 mi West	Skagit	9 October 1937	PSM2134 through 2137
Sedro Woolley, 3 mi East	Skagit	23 August 1930	PSM1444, 1446

Table 2. (continued)

Concrete, 2 mi Northwest	Skagit	23 April 1930	PSM1441
Monroe, 3 mi South	Snohomish	7 Sept 1939	PSM2667
Dempsey Creek floodplain	Thurston	24 October 1990 18 May 1994	UWBM2217 (photos) RM1001 through 1003

[1] Museum acronyms as follows: AMNH-American Museum of Natural History, New York; CAS-California Academy of Sciences; FLM-Florida Museum of Natural History; MVZ-Museum of Vertebrate Zoology, University of California, Berkeley; PLU-Pacific Lutheran University; PSM-Slater Museum of Natural History, University of Puget Sound, Tacoma; RM-Redpath Museum, McGill University, Montreal; UOK-University of Kansas, Museum of Natural History; USNM-U.S. National Museum, Washington D.C.; UWBM-University of Washington Burke Museum, Seattle; WSU-Charles R. Conner Museum, Washington State Univ., Pullman.

in Vancouver. The specimen was identified by Dr. Robert Storm at Oregon State University (Nussbaum et al. 1983). This specimen has been lost. Slater (1955) described his personal inspection of three specimens of the Oregon spotted frog from Thurston County and listed "Patterson Lake" (=Pattison Lake) as a known locality. Nevertheless, no Thurston County specimens from this era are known today. Another reliable sighting report is based on the catalog of the teaching collection of the Zoology Department of the University of Washington. A single specimen cataloged as *Rana pretiosa* was listed as having been collected "near Kent" in April 1957 by W. Jones. Two knowledgeable herpetologists have described Warren Jones as extremely competent in identifying reptiles and amphibians (Snyder pers. comm., Slavens pers. comm.). This specimen is lost. In addition, Kent is situated in a broad valley that was once an extensive emergent wetland complex. The final appraisal of the historic distribution of the Oregon spotted frog in Washington includes 11 localities (Fig. 3). A complete list of museum specimen data for both historic and extant sites is provided in Table 2.

Across its range, the Oregon spotted frog has been documented from 59 historical localities; one in British Columbia, 11 in Washington, 44 in Oregon, and 3 in California (Hayes 1997).

Present

Range wide, Oregon spotted frogs have been found at only 13 of the 59 historical localities where there is verification that they once occurred. Based on current status at specific historic sites, loss of populations is estimated to have effected 78% of the species' former range (Hayes 1997). However, when considering the much broader range suggested by the historical data, it is estimated that the species has been lost from over 90% of its former range (Hayes 1997). In addition to the extant populations known at 13 historic sites, extensive searches have found 11 previously unknown populations; one in British Columbia (Friis, pers. comm.), two in Washington, and eight in Oregon (Hayes 1997).

In Washington, only three populations of the Oregon spotted frog are known to exist today - one at a historically known location, the other two at locations that were undocumented prior to 1990 (Fig. 6). The three known populations of Oregon spotted frogs in Washington appear to be healthy. Censuses of egg masses at Dempsey Creek found 62 egg masses in 1995, 172 in 1996, and 121 in 1997. Based on these counts and assuming one egg mass per adult female, an annual breeding cycle, and one-to-one sex ratio, the Dempsey Creek population was, during 1997, comprised of at least 242 adults and an unknown number of juveniles. The two southern Washington Cascades populations inhabit large expanses of marsh. Surveys during 1997 at Trout Lake produced a minimum egg mass count of 572, suggesting a minimum adult population of 1,144 frogs (Leonard 1997). Engler (pers. comm.) reported that surveys at Conboy Lake covered an estimated 35-40% of suitable habitat and counted 664 egg masses. Based on this survey, this population is estimated to include at least 1,328 adult frogs.

Future

It is extremely difficult to predict the fate of populations now known to be surviving and successfully reproducing. The life span of the Oregon spotted frog is not known so the ability of the species to persist during prolonged periods of unfavorable environmental conditions, e.g. drought, is unknown. Given suitable environmental conditions, the species does have considerable reproductive potential. Therefore, short-lived periods of drought or severe winter weather may be unlikely to eliminate the known populations.

The sizes and geographic extent of the three known Oregon spotted frog populations in Washington are poorly known. Therefore, it is not possible to assess the potential for inbreeding or other problems associated with small populations.

It is likely that the fate of Washington's Oregon spotted frog populations will depend upon the future status of their habitat which may be increasingly vulnerable to changes brought about by an increasing human population and the continued spread of exotic species.

HABITAT STATUS

Past

In the distant past, there was probably considerably more suitable habitat for Oregon spotted frogs than exists today, particularly in the Puget Trough. Prior to the 19th century, lakes and ponds were free of many of the warmwater fish that flourish there today. These include many species in the families Centrarchidae, Percidae, and Ictaluridae. Neither did reed canarygrass (*Phalaris arundinacea*) flourish in shallow floodplain marshes, covering much of the formerly shallow open water areas with a thick growth of grass. River courses were often broad, braided channels, flanked by oxbows and shallow depressions that held water from the onset of winter

flooding to the first days of summer. Even lakeshores had considerable numbers of associated shallow wetlands, shallow basins that captured floodwater or were charged by groundwater. The abundant wetlands within floodplains retained run-off water which was eventually discharged via streams emptying to larger streams or the marine environment. Because of the abundance of these wetlands and their water retention capabilities, the fluctuation of water levels was moderated, even in streams which drained the largest watersheds. Oregon spotted frogs breed in such shallow wetlands and probably benefitted from prolonged water retention and relative stability in water levels.

All of these shallow-water habitats in the Puget Trough were likely suitable Oregon spotted frog habitat, particularly those in sizeable natural openings such as the prairies of southern Puget Sound.

Agriculture and increasing numbers of people in the region brought increasing desire for dry uplands for grazing livestock, raising crops, and building homes and businesses. Floodplain wetlands were drained using ditches, underground drain tiles, and re-contouring of the landscape. Many wetlands were drained, diked, and filled. Conservative estimates of wetlands losses indicate that over 33 percent of wetlands were lost between pre-settlement times and the early 1980s (Canning and Stevens 1990). Losses in the heavily developed low elevations of the Puget Trough, the historic range of the Oregon spotted frog, are higher. Using USGS quadrants as their analysis units, Boule et al. (1983) reported the following wetland losses: Tenino and Yelm - 55%; Tacoma South - 82%; and Lake Washington - 70%. These figures do not reflect losses of suitable habitat due to wetland degradation. Historic losses of suitable Oregon spotted frog habitat likely exceed these estimates.

Present

Today, most ponds and lakes within the historic range of the Oregon spotted frog contain non-native fish, particularly largemouth bass, black crappie, yellow perch, pumpkinseed, bluegill, and brown bullhead. One non-native amphibian, the bullfrog, is now present in most ponds and lakes within the historic range of the Oregon spotted frog.

Many wetlands have been drained and many more have been filled and developed. A tremendous number of former wetlands, as well as uplands, are now covered by impervious surfaces such as roof-tops, asphalt, or compacted soil. These impervious surfaces shed run-off water quickly, putting increased demands on existing wetlands and stream courses to retain or carry the run-off water. As a result of these changes to the landscape, water levels fluctuate more dramatically. Rain or meltwater quickly enters the remaining wetlands and streams and fills them to capacity, often overflowing into non-wetland areas. Many streams have been dredged and straightened to help carry these floodwaters more quickly away from human developments. The floodwaters rise and fall at an increased rate.

Oregon spotted frog breeding habitat (the margins of shallow wetlands) can be dramatically affected by these hydrologic changes. Eggs laid during or immediately following late winter rains are often left exposed to freezing and desiccation by rapidly dropping water levels. Many amphibians are affected by this phenomenon and it may be the single most harmful factor affecting amphibian populations in rapidly urbanizing areas (Richter and Azous 1995).

Future

The most predictable future for the habitat of Oregon spotted frogs is the continued human development of their surroundings. It is expected that this development will contribute to additional pollution and filling of wetland habitats. Perhaps more importantly, hydrologic and plant community changes are certain to occur. Increasing water level fluctuations will likely increase the frequency of years in which most of the Oregon spotted frog's eggs and larvae are lost. If left unchecked, this may eventually result in the extirpation of populations. The spread of invasive exotics like reed canarygrass will continue.

Changes in wetland plant communities will likely be unfavorable to Oregon spotted frogs. Exotic species, like reed canarygrass, can completely change the structure of wetland environments, creating a density of vegetation that is unsuitable as habitat for the Oregon spotted frog.

The effects of introduced predators and competitors is less predictable. Some species will likely spread into or be introduced to Oregon spotted frog habitat. To varying degrees, this is expected to be harmful to Oregon spotted frog populations. However, the degree to which Oregon spotted frog populations will sustain themselves in the face of increased predation or competition will depend upon a variety of factors. It is not possible, at this time, to predict the effects of increasing populations of introduced aquatic predators but their effects are potentially devastating.

CONSERVATION STATUS

Legal Status

In 1989, the Utah Nature Study Society petitioned the U.S. Fish and Wildlife Service to list the spotted frog as a threatened or endangered species throughout its range. The petition was found to be substantial and a status review was initiated [FR 54(199):42529]. On May 7, 1993, the U.S. Fish and Wildlife Service published a notice in the Federal Register [FR 58(87):27260-3] indicating that four distinct populations of the spotted frog complex warranted listing under the provisions of the federal Endangered Species Act. These were the Great Basin population, the west desert population, the Wasatch Front population, and the Pacific Coast population. However, the actual listing of these populations was precluded by higher priority actions. Today, the Pacific Coast population of the spotted frog complex is known as a separate and distinct

species, the Oregon spotted frog. It remains a candidate for listing under the federal Endangered Species Act.

In Washington State, the Oregon spotted frog is a State Candidate for listing as endangered, threatened, or sensitive. Under the provisions of the Wildlife Code of Washington the species is unclassified and receives little legal protection.

Management Activities

The three Washington populations are subjects of varying levels of research, inventory, and habitat protection. Federal and state agencies as well as a private landowner are contributing to these efforts.

The Dempsey Creek population is on land in private ownership. The landowner is involved in a detailed assessment of the wetlands on the property, including the development of a model of the site's hydrology. The wetlands are currently part of a pasture area leased for grazing dairy cows. Adjacent uplands are managed for timber production. The U.S. Fish and Wildlife Service has funded research that will be conducted by the Washington Department of Fish and Wildlife, with additional support from Port Blakely Tree Farms, to answer questions concerning habitat selection and the potential influence of grazing on Oregon spotted frog habitat. This site is part of a proposed National Wildlife Refuge.

The Trout Lake population is well-distributed over a mixture of state and private land. The site was approved for a new Natural Area Preserve and money has been appropriated to acquire privately-owned lands. Acquisition of this site is ongoing. Meanwhile, Oregon spotted frog surveys are conducted each year to identify key habitats such as overwintering and oviposition sites. Much of this marsh is currently grazed, including the oviposition sites found to date. Once established as a Natural Area Preserve, grazing will likely be discontinued (unless grazing is shown to be important to maintaining habitat conditions which benefit Oregon spotted frogs).

The Conboy Lake population is predominately within a National Wildlife Refuge. It is the only population in Washington known to be surviving in close contact with a population of introduced bullfrogs. Portions of this large marsh and ditch network have been surveyed for Oregon spotted frogs. The U.S. Fish and Wildlife Service has completed an initial evaluation of bullfrog predation on Oregon spotted frogs at this site (Engler and Hayes pers. comm.).

FACTORS AFFECTING CONTINUED EXISTENCE

Adequacy of Existing Regulatory Mechanisms

The recognition of the Oregon spotted frog as a species vulnerable to extinction led to its appearance on both federal and state lists of candidates for listing. Despite the fact that no special protection has been in force under either state or federal law, there has been considerable conservation activity directed at this species. The adequacy of these ongoing activities in forestalling decline and eventual extinction is unknown. The factors which contributed to loss of populations throughout the range of the species are largely unknown. However, some of the suspected factors, such as introduced exotic predators, are virtually impossible to control once established.

Present and Threatened Habitat Loss

At present, Oregon spotted frog habitat is most likely to be altered by residential development and changes in grazing practices. The Dempsey Creek site is surrounded by uplands with considerable residential development potential. The first Oregon spotted frog found at the site (McAllister et al. 1993) was in an area proposed for subdivision and sale for homes. This proposal was not approved, largely because the county enforced requirements that the applicant safeguard the wetlands and hydrology that support Oregon spotted frogs.

Grazing is potentially harmful to Oregon spotted frog habitat, particularly where springs that serve as overwintering habitat are affected (Hayes pers. comm.). However, in highly disturbed wetland communities, grazing is also reported to be important for maintaining an open vegetation structure which Oregon spotted frogs select for breeding (Hayes pers. comm., Licht pers. comm., Schirato pers. comm.). Therefore, depending on the condition of the vegetative community, grazing has the potential to be beneficial or harmful to Oregon spotted frog habitat.

Other Natural and Manmade Factors

Other factors have been suggested as causes of amphibian declines in the Pacific Northwest, most notably UV-B radiation and the fungus *Saprolegnia* (Blaustein et al. 1994a, 1994b). Experiments to determine the vulnerability of Oregon spotted frogs to UV-B radiation were conducted in 1996 (Kiesecker, pers. comm.). The results of the experiments are not yet available. Although fungus has been observed to destroy the embryos of developing Oregon spotted frog egg masses (pers. obs.), this is unusual and has not approached the magnitude described for western toads (*Bufo boreas*) in the Oregon Cascades (Blaustein et al. 1994b).

Exotic aquatic predators must be considered among the most serious threats to Oregon spotted frog populations. Although the introduced bullfrog has received much of the blame for declines in

native frogs (Lardie 1963, Storm 1966, Nussbaum et al. 1983), many other introduced predators may be equally detrimental (Hayes and Jennings 1986, Hayes 1994a).

CONCLUSIONS AND RECOMMENDATION

The over-riding consideration in the assessment of status of the Oregon spotted frog is the history of population losses which has reduced the species to only three known populations in Washington. Although theories about the factors which caused these population losses are many, conclusive evidence of the importance of any one factor is lacking. Therefore, each potential threat must be taken as though it is equally serious. Human population growth is expected to continue within the range of the species. Under current approaches to managing the effects of this growth, hydrology of many areas will continue to change. The amplitude and frequency of flood events will increase in even the smallest of watersheds bringing increased reproductive failure for amphibians like the Oregon spotted frog which breed in shallow, wetland margins. Continual change in plant community structure to conditions less suited to Oregon spotted frogs is another serious threat. Exotic aquatic predators like bullfrogs and warmwater fishes are likely to continue to spread, both by their own devices as well as with the aid of people. The presence of these introduced predators in Oregon spotted frog habitat will be harmful to the species and, in combination with other factors, may extirpate populations. The potential harmful effects of pesticides, UV-B radiation, and the fungus *Saprolegnia* are poorly known and cannot, at this time, be treated as important threats. However, because the Oregon spotted frog is reduced to three populations inhabiting three restricted areas, each threat, whether regarded as imminent or potential, could cause serious damage before there is time for effective preventative or reactive measures. Therefore, due to the limited number of extant populations and the inadequacy of existing protection for these populations, it is recommended that the Oregon spotted frog be listed as a State Endangered species.

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Appendix

Washington Administrative Codes 232-12-011, 232-12-014, 232-12-297

WAC 232-12-011 Wildlife classified as protected shall not be hunted or fished.

Protected wildlife are designated into three subcategories: Threatened, sensitive, and other.
(1) Threatened species are any wildlife species native to the state of Washington that are likely to become endangered within the foreseeable future throughout a significant portion of their range within the state without cooperative management or removal of threats. Protected wildlife designated as threatened include:

Common Name	Scientific Name
western gray squirrel	*Sciurus griseus*
Steller (northern) sea lion	*Eumetopias jubatus*
North American lynx	*Lynx canadensis*
bald eagle	*Haliaeetus leucocephalus*
ferruginous hawk	*Buteo regalis*
marbled murrelet	*Brachyramphus marmoratus*
green sea turtle	*Chelonia mydas*
loggerhead sea turtle	*Caretta caretta*

(2) Sensitive species are any wildlife species native to the state of Washington that are vulnerable or declining and are likely to become endangered or threatened in a significant portion of their range within the state without cooperative management or removal of threats. Protected wildlife designated as sensitive include:

Common Name	Scientific Name
Larch Mountain salamander	*Plethodon larselli*

(3) Other protected wildlife include:

Common Name	Scientific Name
cony or pika	*Ochotona princeps*
least chipmunk	*Tamius minimus*
yellow-pine chipmunk	*Tamius amoenus*
Townsend's chipmunk	*Tamius townsendii*
red-tailed chipmunk	*Tamius ruficaudus*
hoary marmot	*Marmota caligata*
Olympic marmot	*Marmota olympus*
Cascade golden-mantled ground squirrel	*Spermophilus saturatus*
golden-mantled ground squirrel	*Spermophilus lateralis*
Washington ground squirrel	*Spermophilus washingtoni*
red squirrel	*Tamiasciurus hudsonicus*
Douglas squirrel	*Tamiasciurus douglasii*
northern flying squirrel	*Glaucomys sabrinus*
fisher	*Martes pennanti*
wolverine	*Gulo gulo*
painted turtle	*Chrysemys picta*
California mountain kingsnake	*Lampropeltis zonata*;

All birds not classified as game birds, predatory birds or endangered species, or designated as threatened species or sensitive species; all bats, except when found in or immediately adjacent to a dwelling or other occupied building; mammals of the order *Cetacea,* including whales, porpoises, and mammals of the order *Pinnipedia* not otherwise classified as endangered species, or designated as threatened species or sensitive species. This section shall not apply to hair seals and sea lions which are threatening to damage or are damaging commercial fishing gear being

utilized in a lawful manner or when said mammals are damaging or threatening to damage commercial fish being lawfully taken with commercial gear. Statutory Authority: RCW 77.12.020. 90-11-065 (Order 441), § 232-12-011, filed 5/15/90, effective 6/15/90. Statutory Authority: RCW 77.12.040. 89-11-061 (Order 392), § 232-12-011, filed 5/18/89; 82-19-026 (Order 192), § 232-12-011, filed 9/9/82; 81-22-002 (Order 174), § 232-12-011, filed 10/22/81; 81-12-029 (Order 165), § 232-12-011, filed 6/1/81.]

WAC 232-12-014 Wildlife classified as endangered species.

Endangered species include:

Columbian white-tailed deer	*Odocoileus virginianus leucurus*
Mountain caribou	*Rangifer tarandus*
Blue whale	*Balaenoptera musculus*
Bowhead whale	*Balaena mysticetus*
Finback whale	*Balaenoptera physalus*
Gray whale	*Eschrichtius gibbosus*
Humpback whale	*Megaptera novaeangliae*
Right whale	*Balaena glacialis*
Sei whale	*Balaenoptera borealis*
Sperm whale	*Physeter catodon*
Wolf	*Canis lupus*
Peregrine falcon	*Falco peregrinus*
Aleutian Canada goose	*Branta canadensis leucopareia*
Brown pelican	*Pelecanus occidentalis*
Leatherback sea turtle	*Dermochelys coriacea*
Grizzly bear	*Ursus arctos horribilis*
Sea otter	*Enhydra lutris*
White pelican	*Pelecanus erythrorhynchos*
Sandhill crane	*Grus canadensis*
Snowy plover	*Charadrius alexandrinus*
Upland sandpiper	*Bartramia longicauda*
Northern spotted owl	*Strix occidentalis*

[Statutory Authority: RCW 77.12.020(6). 88-05-032 (Order 305), § 232-12-014, filed 2/12/88. Statutory Authority: RCW 77.12.040. 82-19-026 (Order 192), § 232-12-014, filed 9/9/82; 81-22-002 (Order 174), § 232-12-014, filed 10/22/81; 81-12-029 (Order 165), § 232-12-014, filed 6/1/81.]

WAC 232-12-297
Endangered, threatened, and sensitive wildlife species classification.

PURPOSE

1.1 The purpose of this rule is to identify and classify native wildlife species that have need of protection and/or management to ensure their survival as free-ranging populations in Washington and to define the process by which listing, management, recovery, and delisting of a species can be achieved. These rules are established to ensure that consistent procedures and criteria are followed when classifying wildlife as endangered, or the protected wildlife subcategories threatened or sensitive.

DEFINITIONS

For purposes of this rule, the following definitions apply:

2.1 "Classify" and all derivatives means to list or delist wildlife species to or from endangered, or to or from the protected wildlife subcategories threatened or sensitive.

2.2 "List" and all derivatives means to change the classification status of a wildlife species to endangered, threatened, or sensitive.

2.3 "Delist" and its derivatives means to change the classification of endangered, threatened, or sensitive species to a classification other than endangered, threatened, or sensitive.

2.4 "Endangered" means any wildlife species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state.

2.5 "Threatened" means any wildlife species native to the state of Washington that is likely to become an endangered species within the forseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.

2.6 "Sensitive" means any wildlife species native to the state of Washington that is vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats.

2.7 "Species" means any group of animals classified as a species or subspecies as commonly accepted by the scientific community.

2.8 "Native" means any wildlife species naturally occurring in Washington for purposes of breeding, resting, or foraging, excluding introduced species not found historically in this state.

2.9 "Significant portion of its range" means that portion of a species' range likely to be essential to the long term survival of the population in Washington.

LISTING CRITERIA

3.1 The commission shall list a wildlife species as endangered, threatened, or sensitive solely on the basis of the biological status of the species being considered, based on the preponderance of scientific data available, except as noted in section 3.4.

3.2 If a species is listed as endangered or threatened under the federal Endangered Species Act, the agency will recommend to the commission that it be listed as endangered or threatened as specified in section 9.1. If listed, the agency will proceed with development of a recovery plan pursuant to section 11.1.

3.3 Species may be listed as endangered, threatened, or sensitive only when populations are in danger of failing, declining, or are vulnerable, due to factors including but not restricted to limited numbers, disease, predation, exploitation, or habitat loss or change, pursuant to section 7.1.

3.4 Where a species of the class Insecta, based on substantial evidence, is determined to present an unreasonable risk to public health, the commission may make the determination that the species need not be listed as endangered, threatened, or sensitive.

DELISTING CRITERIA

4.1 The commission shall delist a wildlife species from endangered, threatened, or sensitive solely on the basis of the biological status of the species being considered, based on the preponderance of scientific data available.

4.2 A species may be delisted from endangered, threatened, or sensitive only when populations are no longer in danger of failing, declining, are no longer vulnerable, pursuant to section 3.3, or meet recovery plan goals, and when it no longer meets the definitions in sections 2.4, 2.5, or 2.6.

INITIATION OF LISTING PROCESS

5.1 Any one of the following events may initiate the listing process.

5.1.1 The agency determines that a species population may be in danger of failing, declining, or vulnerable, pursuant to section 3.3.

5.1.2 A petition is received at the agency from an interested person. The petition should be addressed to the director. It should set forth specific evidence and scientific data which shows that the species may be failing, declining, or vulnerable, pursuant to section 3.3. Within 60 days, the agency shall either deny the petition, stating the reasons, or initiate the classification process.

5.1.3 An emergency, as defined by the Administrative Procedure Act, chapter 34.05 RCW. The listing of any species previously classified under emergency rule shall be governed by the provisions of this section.

5.1.4 The commission requests the agency review a species of concern.

5.2 Upon initiation of the listing process the agency shall publish a public notice in the Washington Register, and notify those parties who have expressed their interest to the department, announcing the initiation of the classification process and calling for scientific information relevant to the species status report under consideration pursuant to section 7.1.

INITIATION OF DELISTING PROCESS

6.1 Any one of the following events may initiate the delisting process:

6.1.1 The agency determines that a species population may no longer be in danger of failing, declining, or vulnerable, pursuant to section 3.3.

6.1.2 The agency receives a petition from an interested person. The petition should be addressed to the director. It should set forth specific evidence and scientific data which shows that the species may no longer be failing, declining, or vulnerable, pursuant to section 3.3. Within 60 days, the agency shall either deny the petition, stating the reasons, or initiate the delisting process.

6.1.3 The commission requests the agency review a species of concern.

6.2 Upon initiation of the delisting process the agency shall publish a public notice in the Washington Register, and notify those parties who have expressed their interest to the department, announcing the initiation of the delisting process and calling for scientific information relevant to the species status report under consideration pursuant to section 7.1.

SPECIES STATUS REVIEW AND AGENCY RECOMMENDATIONS

7.1 Except in an emergency under 5.1.3 above, prior to making a classification recommendation to the commission, the agency shall prepare a preliminary species status report. The report will include a review of information relevant to the species' status in Washington and address factors affecting its status, including those given under section 3.3. The status report shall be reviewed by the public and scientific community. The status report will include, but not be limited to an analysis of:

7.1.1 Historic, current, and future species population trends.

7.1.2 Natural history, including ecological relationships (e.g., food habits, home range, habitat selection patterns).

7.1.3 Historic and current habitat trends.

7.1.4 Population demographics (e.g., survival and mortality rates, reproductive success) and their relationship to long term sustainability.

7.1.5 Historic and current species management activities.

7.2 Except in an emergency under 5.1.3 above, the agency shall prepare recommendations for species classification, based upon scientific data contained in the status report. Documents shall be prepared to determine the environmental consequences of adopting the recommendations pursuant to requirements of the State Environmental Policy Act (SEPA).

7.3 For the purpose of delisting, the status report will include a review of recovery plan goals.

PUBLIC REVIEW

8.1 Except in an emergency under 5.1.3 above, prior to making a recommendation to the commission, the agency shall provide an opportunity for interested parties to submit new scientific data relevant to the status report, classification recommendation, and any SEPA findings.

8.1.1 The agency shall allow at least 90 days for public comment.

8.1.2 The agency will hold at least one public meeting in each of its administrative regions during the public review period.

FINAL RECOMMENDATIONS AND COMMISSION ACTION

9.1 After the close of the public comment period, the agency shall complete a final status report and classification recommendation. SEPA documents will be prepared, as necessary, for the final agency recommendation for classification. The classification recommendation will be presented to the commission for action. The final species status report, agency classification recommendation, and SEPA documents will be made available to the public at least 30 days prior to the commission meeting.

9.2 Notice of the proposed commission action will be published at least 30 days prior to the commission meeting.

PERIODIC SPECIES STATUS REVIEW

10.1 The agency shall conduct a review of each endangered, threatened, or sensitive wildlife species at least every five years after the date of its listing. This review shall include an update of the species status report to determine whether the status of the species warrants its current listing status or deserves reclassification.

10.1.1 The agency shall notify any parties who have expressed their interest to the department of the periodic status review. This notice shall occur at least one year prior to end of the five year period required by section 10.1.

10.2 The status of all delisted species shall be reviewed at least once, five years following the date of delisting.

10.3 The department shall evaluate the necessity of changing the classification of the species being reviewed. The agency shall report its findings to the commission at a commission meeting. The agency shall notify the public of its findings at least 30 days prior to presenting the findings to the commission.

10.3.1 If the agency determines that new information suggests that classification of a species should be changed from its present state, the agency shall initiate classification procedures provided for in these rules starting with section 5.1.

10.3.2 If the agency determines that conditions have not changed significantly and that the classification of the species should remain unchanged, the agency shall recommend to the commission that the species being reviewed shall retain its present classification status.

10.4 Nothing in these rules shall be construed to automatically delist a species without formal commission action.

RECOVERY AND MANAGEMENT OF LISTED SPECIES

11.1 The agency shall write a recovery plan for species listed as endangered or threatened. The agency will write a management plan for species listed as sensitive. Recovery and management plans shall address the listing criteria described in sections 3.1 and 3.3, and shall include, but are not limited to:

11.1.1 Target population objectives.

11.1.2 Criteria for reclassification.

11.1.3 An implementation plan for reaching population objectives which will promote cooperative management and be sensitive to landowner needs and

property rights. The plan will specify resources needed from and impacts to the department, other agencies (including federal, state, and local), tribes, landowners, and other interest groups. The plan shall consider various approaches to meeting recovery objectives including, but not limited to regulation, mitigation, acquisition, incentive, and compensation mechanisms.

11.1.4 Public education needs.

11.1.5 A species monitoring plan, which requires periodic review to allow the incorporation of new information into the status report.

11.2 Preparation of recovery and management plans will be initiated by the agency within one year after the date of listing.

11.2.1 Recovery and management plans for species listed prior to 1990 or during the five years following the adoption of these rules shall be completed within five years after the date of listing or adoption of these rules, whichever comes later. Development of recovery plans for endangered species will receive higher priority than threatened or sensitive species.

11.2.2 Recovery and management plans for species listed after five years following the adoption of these rules shall be completed within three years after the date of listing.

11.2.3 The agency will publish a notice in the Washington Register and notify any parties who have expressed interest to the department interested parties of the initiation of recovery plan development.

11.2.4 If the deadlines defined in sections 11.2.1 and 11.2.2 are not met the department shall notify the public and report the reasons for missing the deadline and the strategy for completing the plan at a commission meeting. The intent of this section is to recognize current department personnel resources are limiting and that development of recovery plans for some of the species may require significant involvement by interests outside of the department, and therefore take longer to complete.

11.3 The agency shall provide an opportunity for interested public to comment on the recovery plan and any SEPA documents.

CLASSIFICATION PROCEDURES REVIEW

12.1 The agency and an ad hoc public group with members representing a broad spectrum of interests, shall meet as needed to accomplish the following:

12.1.1 Monitor the progress of the development of recovery and management plans and status reviews, highlight problems, and make recommendations to the department and other interested parties to improve the effectiveness of these processes.

12.1.2 Review these classification procedures six years after the adoption of these rules and report its findings to the commission.

AUTHORITY

13.1 The commission has the authority to classify wildlife as endangered under RCW 77.12.020. Species classified as endangered are listed under WAC 232-12-014, as amended.

13.2 Threatened and sensitive species shall be classified as subcategories of protected wildlife. The commission has the authority to classify wildlife as protected under RCW 77.12.020. Species classified as protected are listed under WAC 232-12-011, as amended. [Statutory Authority: RCW 77.12.020. 90-11-066 (Order 442), § 232-12-297, filed 5/15/90, effective 6/15/90.]