



Tailed Frog

Uniquely adapted for life in mountain streams, this species is at risk due to degradation of its habitat.





Why are Tailed Frogs at risk?

The Tailed Frog is at risk because it has very specialised habitat requirements, and because human activities, particularly timber harvesting, are altering or disturbing many of the places where it lives.

Tailed Frogs live in and beside cool, clear mountain streams with year-round flow. All stages, from egg to adult, are able to tolerate only a narrow range of water temperatures. The eggs are most sensitive and can only survive in streams with highly oxygenated waters and temperatures of 5 to 18.5°C.

The streams that Tailed Frogs inhabit often experience extreme flooding due to intense rainfall. The annual precipitation along the windward coast of British Columbia, for example, can be in the range of 3000 millimetres, with much of it falling in autumn and early winter. Quiet side pools and backwaters are therefore crucial for the survival of hatchlings, until they develop the ability to cope with swift currents. Steep mountain creeks are also subject to periodic debris flows, which scour the stream bed. Eggs and tadpoles can only survive these events if large, anchored boulders and cobbles are present in the channel, to act as refuge sites. Tadpoles are especially vulnerable because they are confined to the stream environment until they metamorphose, several years after hatching.

Once they leave the tadpole stage, Tailed Frogs face a new set of challenges associated with living part of the time on land and part in the water. As an adaptation to stream life, their lungs are greatly reduced in size so they will be less buoyant; respiration

takes place across the surface of the skin, but only when the skin is moist. Tailed Frogs cannot always stay in the water, however, because they feed primarily on terrestrial prey. This need to spend time on land makes them very sensitive to the microclimatic conditions of the forests surrounding the streams where they live.

The habitat quality of mountain streams in British Columbia is compromised in a number of ways by land-clearing activities such as forestry operations, particularly clearcut logging and road building. These activities compound the physical threats to Tailed Frog larval populations by increasing the potential for debris flows and by adding slash and fine

Removal of forests bordering streams increases the exposure of juveniles and adults to the drying powers of wind and sun.

sediments to the creeks. Sand and pebbles clog the spaces between cobbles and boulders that the tadpoles rely on for escaping predators and for seeking refuge during floods and debris flows. Logging and roads can also alter the run-off regime, increasing the intensity of floods and decreasing summer flows along headwater creeks. Clear-cutting along streams eliminates shade, which can cause water temperatures to rise to detrimental levels, especially on slow flowing, low-gradient water courses. Removal of trees and other vegetation bordering streams also increases the exposure of juveniles and adults to the drying powers of wind and sun. This can severely limit their ability to forage on land and their overland dispersal.

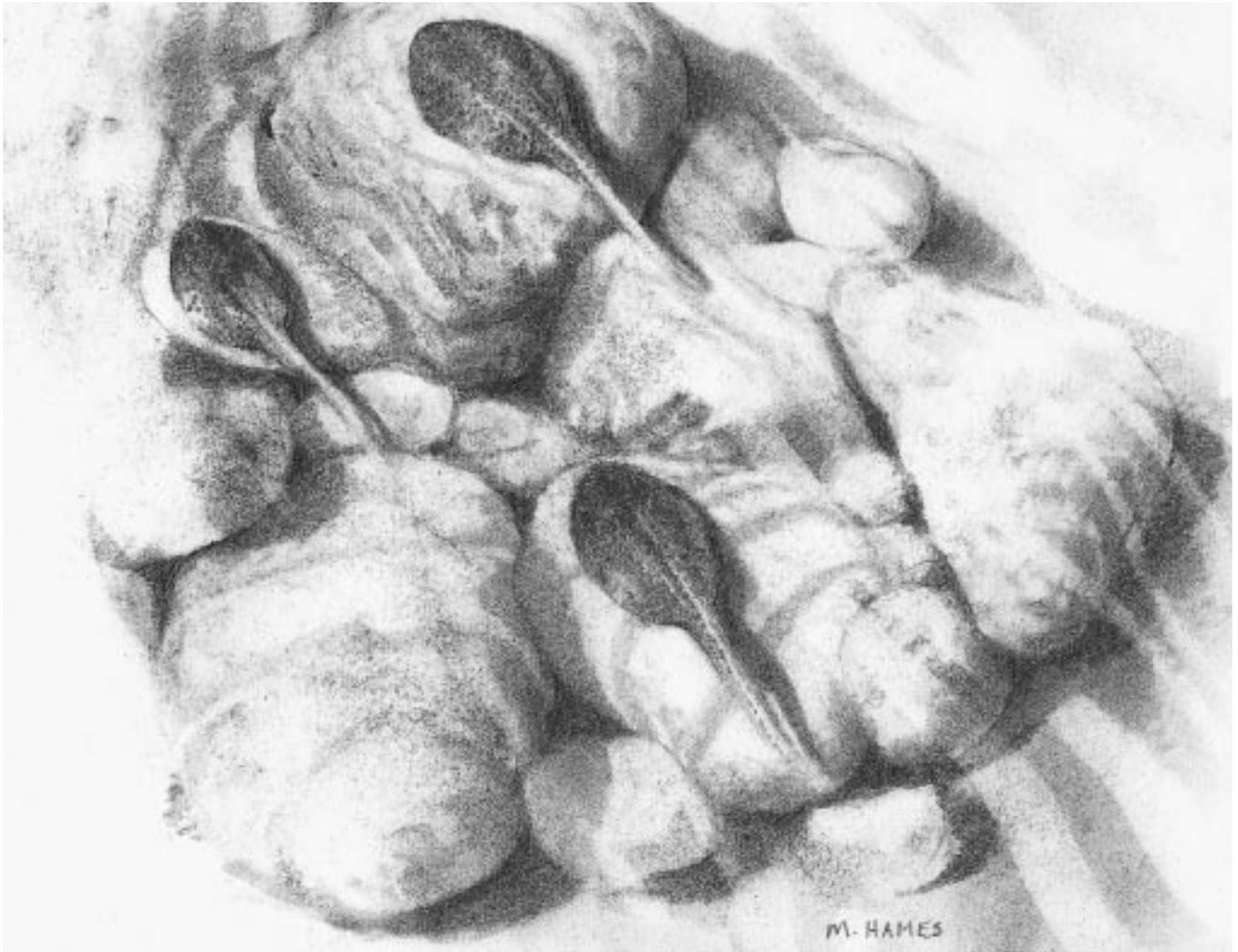
Roughly 75 percent of the water-

sheds in British Columbia have been subject to some level of timber harvesting. Small headwater streams usually contain no fish, so they and their forested borders receive little or no protection from resource agencies and industry, unless they are unstable or have an impact on fish or their downstream spawning grounds and nurseries. The result can be extensive disturbance to Tailed Frog habitat, making this species vulnerable to population declines and local extirpation.

What is their status?

The Tailed Frog is exclusively a North American species. In British Columbia – the only Canadian province where it occurs – the Tailed Frog is found along the Coast Mountains, from the Lower Mainland to Portland Canal, north of Prince Rupert. An isolated Kootenay population also lives in a handful of small watersheds in the Rocky and Purcell mountains in the extreme southeastern corner of the province. In the United States, the Tailed Frog occurs along the Coast and Cascade ranges of Washington and Oregon, and in northern California. The Kootenay Tailed Frogs are linked to others found in some of the watersheds between the Bitterroot Ranges and the Rocky Mountains of western Montana.

Although its range in British Columbia is quite extensive, there are concerns about the status of the Tailed Frog due to its low reproductive rate, its highly specialised habitat requirements, the nature of human activities within its range and our lack of knowledge about minimum viable population size, particularly in fragmented landscapes. The coastal populations are Blue-listed in British Columbia, which means they are considered to be vulnerable. The Kootenay population has been placed on the Red List, meaning it is a candidate for legal designation as Threatened or Endangered. Preliminary studies have



shown genetic differences between the coast and interior populations; more detailed studies are being carried out to determine how different these two populations really are.

Like most native wildlife species, the Tailed Frog is protected under the British Columbia Wildlife Act against being killed or collected. In California and Oregon, the Tailed Frog is recognised as a species of concern because of its high degree of specialisation and its sensitivity to forestry practices.

What do they look like?

The Tailed Frog (*Ascaphus truei*) is slender, with a large head and long legs. Adults may reach a length of 5 centimetres. Adults and juveniles are usually chocolate brown or tan in colour, but can also be olive green, peach or red-

dish brown, with indistinct dark blotches. Their skin is often grainy, unlike the smooth skin of pond-breeding frogs and the warty skin of toads. The two most striking features of this species are the copper-coloured bar or triangle commonly found between the eyes, and the vertical orientation of the pupils. Male Tailed Frogs can be identified by the presence of a short, conical “tail,” which is actually a copulatory organ used to inseminate females during mating.

In order to clamber up streambanks and move efficiently along channel rocks, the Tailed Frog’s finger tips are hardened like claws and the outer toes on the hind feet are flat and wide. Unlike other frogs, Tailed Frogs

do not have external ear membranes and do not vocalise, presumably because they could not be heard over the sound of rushing water which dominates their environment.

Tailed Frog tadpoles are amazingly adept at moving in swiftly flowing water without being carried away.

Its large, sucker-like mouth is situated on the underside of the head and

The Tailed Frog tadpole is black or mottled brown, usually with a conspicuous white spot on the tip of its long fin-like tail. It has a flat, streamlined body and grows to 50 millimetres in length.

equipped with 10 to 16 rows of teeth. The oral suction disc and teeth are used for adhering to rocks. They are able to hold on so tightly that one researcher lifted a 35-gram stone out of the water by inadvertently grabbing a tadpole by the tail and having the stone it was attached to come with it!

What makes them unique?

The Tailed Frog retains more primitive characteristics than any other living frog and is the only member of the family Ascaphidae; its closest relatives reside in New Zealand. With a life span of 15 to 20 years, the Tailed Frog is one of the world's longest lived frogs. It also has the longest larval (tadpole) phase and takes longer to reach sexual maturity than any other North American frog. The age at which it begins breeding – 8 or 9 years – is roughly twice that of other species.

The Tailed Frog is the only frog in Canada that lives in cold, fast-flowing mountain creeks. Several unique physical, physiological and behavioural traits enable it to live in this formidable environment. For example, without the male's tail, which permits internal fertilisation, the sperm would be washed away by the current during mating. Except for the Tailed Frog and one species of African toad, all other members of the frog family practice external fertilisation.

Tailed Frog tadpoles are amazingly adept at moving in swiftly flowing water without being carried away. Mostly they clamber about, clinging to smooth rocks with their

oral sucker; occasionally they swim for short bursts. Their ability to thrive in icy water is also remarkable. One researcher, working at high elevations in the Chilliwack and Skagit basins, found two-year-old tadpoles in areas where there had been only solid ice a month or so earlier. How these tadpoles survived being frozen is not fully understood.

How do they reproduce?

Mating takes place in the water, in September or early October. After a courtship ritual, the male clasps the female, locking his arms tightly around her pelvis. He inserts his "tail" into her cloaca and the pair remain in this position for 24 to 30 hours. The female stores the sperm inside her body until she is ready to produce eggs, many months later. In early July, she attaches a gelatinous string of 35 to 70 colourless, pea-sized eggs to the base of a large, underwater stone or boulder. The embryos emerge roughly six weeks later, equipped with a yolk sac that will nourish them until they are old enough to feed. Hatchlings overwinter in the quiet waters of the nest area, not venturing out until the following spring. By this time they have developed the oral sucker that will enable them to cling to rocks.

In southern parts of their range, such as Oregon and California, tadpoles may metamorphose after one or two years of larval development.

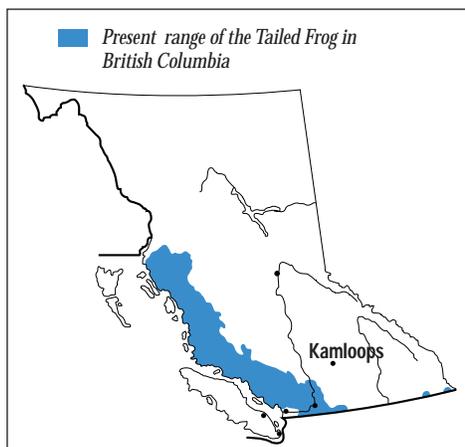
In montane regions and in northern British Columbia, however, the larval growth period may last up to four years. The juvenile froglets do not



reach sexual maturity and begin breeding until they are eight years old, if they are male, or nine, if they are female. In populations living at high elevations in Washington's Cascade Mountains, females only breed every second year. The same may be true for most populations in British Columbia, as the climate here is harsher than in most of the more southerly parts of the Tailed Frog's range.

What do they eat?

Tadpoles use their many rows of tiny teeth to scrape microscopic algae off submerged rocks. In the process of grazing on algae, they sometimes also ingest small insects and pollen. Usually they feed during daylight hours, but where they coexist with Pacific Giant Salamanders, such as in the Chilliwack watershed and its vicinity, Tailed Frog tadpoles feed nocturnally and remain hidden during the day to avoid detection by their main predator, the Pacific Giant Salamander larva.



Adult Tailed Frogs retreat under large objects in or beside streams during the day and come out to feed at night. They are opportunistic feeders, eating whatever invertebrates come their way. Since they are inefficient underwater foragers, aquatic invertebrates are not a large part of their diet. They do, however, eat a wide variety of terrestrial creatures, including snails, ticks, mites, spiders, collembolans, dipterans, moths, ants, may-flies, crickets and lacewings. Most frogs and toads have their tongue attached at the front of the mouth and can flip it out to catch prey sitting a short distance away or flying past. The Tailed Frog lacks this ability, because its tongue is attached at the back of the mouth.

Where do they live?

In British Columbia, the coastal population of Tailed Frogs may be found at all elevations in the Coastal Western Hemlock and Mountain Hemlock zones, and in the alpine meadows above them. They live on steep slopes in the Lower Mainland and the Fraser Valley, as well as in more remote coastal locations. The southern interior population inhabits high-elevation forests in the Engelmann Spruce–Subalpine Fir zone.

Although their range is quite large, Tailed Frogs do not occupy every waterway within this range. Only cool, swift, permanently-flowing streams meet their needs. Stream bed characteristics are also important. Cobble and anchored boulders derived from hard rock, such as gran-

ite, are stable and provide plenty of spaces for tadpoles and adults to retreat. Streams that flow over the small stones and gravel produced by softer rock, such as argillite, are avoid-



TAILED FROGS HAVE GRAINY-LOOKING SKIN AND VERTICALLY-ORIENTED PUPILS. Rick O'Neill photo

ed, as these finer substrates are more prone to displacement during floods and debris flows. Tadpoles are rare or absent in streams with high rates of bedload movement and large proportions of fine sediment. Tadpoles also shun moss-covered rocks because they are unable to adhere to them.

Adult Tailed Frogs retreat under large objects in or beside streams during the day and come out to feed at night.

few hundred metres from their chosen section of stream.

What can we do?

Protection of this species under the Wildlife Act and placement on the Blue and Red lists is not enough to guarantee its survival. Within British Columbia, its habitat is only protected in a few areas, such as provincial parks. The majority of Tailed Frog streams are on Crown land and are managed by the forest industry and those government agencies responsible for managing British Columbia's natural resources.

Under the Forest Practices Code, the Tailed Frog is considered a species of concern and is therefore eligible for management of critical habitats, including designation of special management areas. Stable creeks with very low potential for debris flows

should be specially managed for this species by maintaining a forested buffer on either side.

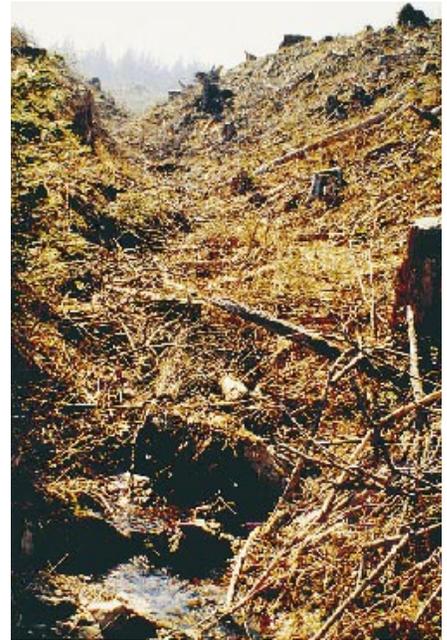
Biologists are studying the Tailed Frog to learn what habitat features are essential for its long-term viability. They are particularly interested in the habitat requirements of adult frogs and how to allow for movement between streams through habitat linkages. They also want to determine which stream characteristics are most important to this species. The results of these studies are helping in the development of recommendations for forestry activities in Tailed Frog habitat. Proposed recommendations include: leaving forest buffers to maintain the structure of stream channels and provide a source of shade to keep water temperatures cool; installing sediment traps where ditches or culverts meet creeks; deactivating secondary roads to minimise the input of sediment from road surfaces into streams; keeping



STREAMS THAT FLOW OVER COARSE GRANITE, LIKE THIS ONE, PROVIDE IDEAL TAILED FROG HABITAT. *Linda Dupuis photo*



BECAUSE SHALE IS READILY BROKEN DOWN AND IS PRONE TO DISPLACEMENT DURING FLOODS, THIS STREAM IS NOT SUITABLE FOR TAILED FROGS. *Linda Dupuis photo*



REMOVAL OF BORDERING VEGETATION HAS LEFT THIS STREAM CLOGGED WITH LOGGING SLASH AND EXPOSED TO THE SUN'S HEAT. *Linda Dupuis photo*



LARGE, STABLE COBBLES AND BOULDERS ARE IMPORTANT REFUGE SITES FOR TAILED FROG TADPOLES. *Rick O'Neill photo*

heavy equipment out of stream channels to prevent on-site damage and downstream silting; and felling and yarding of trees away from permanent creeks to maintain slash-free watercourses. Similar recommendations can also be applied to Tailed Frog habitat in more urban settings, such as

along Vancouver's North Shore.

Protection of streamside habitat will benefit a multitude of other wildlife species in addition to the Tailed Frog and should ensure that these unusual little amphibians remain an important part of our British Columbia fauna. 



THESE PEA-SIZED TAILED FROG EGGS ARE ALMOST READY TO HATCH. THE LARGE YOLK SAC ATTACHED TO EACH TINY TADPOLE WILL NOURISH IT THROUGH THE WINTER. *Pierre Friele photo*

FOR MORE INFORMATION ON TAILED FROGS, CONTACT:

Wildlife Branch
Ministry of Environment, Lands and Parks
PO Box 9374, Stn Prov Govt
Victoria, British Columbia V8W 9M4

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