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# Pacific Giant Salamander

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*British Columbia's  
largest salamander is  
probably declining  
due to expanding towns,  
intensive agriculture,  
and the effects  
of logging.*





## Why are Pacific Giant Salamanders at risk?

Although the Pacific Giant Salamander is found along the west coast of North America from northern California to southern British Columbia, it has an extremely limited range in this province. Its range extends into British Columbia only in the Chilliwack River watershed and immediately adjacent areas, about 100 kilometres east of Vancouver. Its total range in British Columbia is about 250 square kilometres, a meagre 0.03 percent of the area of the province. The species has been observed at only a few dozen locations within that range over the past 65 years and does not occur elsewhere in Canada.

The distribution range of Pacific Giant Salamanders in British Columbia is limited by barriers that include the Fraser River and adjacent farmlands to the north and west, and by the colder and drier inland climate to the east. Their upper elevational limit, about 1050 metres, is probably also set by winter climate. Within their general range in the Chilliwack watershed and vicinity, their distribution and abundance is limited by the availability of suitable stream habitats. Experts feel that the species is probably declining in abundance due to the effects of development and industry on streams and on riparian (streamside) habitats, which are critical for its survival. However, the actual

population size is not known, and would be very difficult to determine.

Human activities, such as the drainage of Sumas Lake and land development for farming and settlement along Vedder Mountain and in the Cultus Lake area, may have reduced the British Columbia distribution range of the Pacific Giant Salamander. Other activities, such as logging, have probably had detrimental effects in some areas, particularly where all streamside forest has been removed and small creeks are choked with debris. Poor logging practices can result in more variable streamflows, erosion and siltation of stream habitats, removal of streamside cover, and increased water temperature. These effects are all detrimental for salamanders and for many of the species they depend on for food.

A major cause of mortality of Pacific Giant Salamanders is probably predation. Reported predators in the United States include garter snakes, River Otters, weasels and Water Shrews, species that also occur here. Other likely predators include Mink, trout, and Dolly Varden Char. The natural reproductive rate is normally high enough to overcome such losses. In good habitat, enough salamanders survive to breeding age to maintain the population, despite some losses caused by predation.

Extreme climate events, such as summer drought and resulting desiccation, severe winters, or debris torrents down streams during record rainfall, can adversely affect salamander habitat. However, to persist in this area, the salamanders have obviously been able to recover from these periodic natural events.

*This salamander has the most restricted distribution of any of British Columbia's 18 amphibian species.*

What is their status?

Like most other wildlife in the province, the Pacific Giant Salamander is protected from killing or collecting under the Wildlife Act. Using criteria such as the limited extent of its distribution, its low reproductive rate, and the rate of habitat loss, it has been classified by BC Environment as a “species at risk” and placed on the Red List – the category of greatest concern. Red-listed species are those being considered for legal designation as “Threatened” or “Endangered.” It is designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as “Vulnerable.”

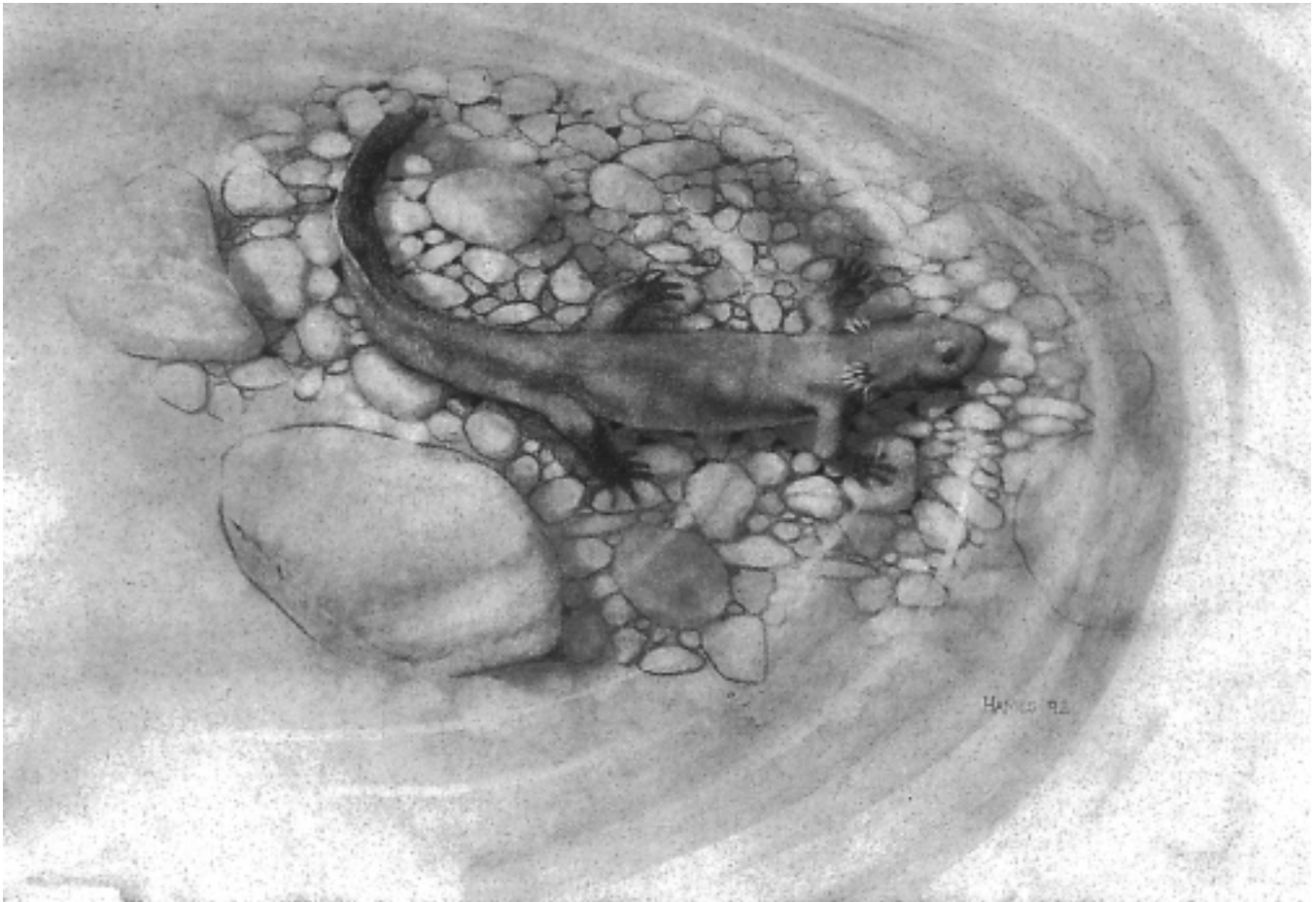
The Pacific Giant Salamander has the most restricted distribution range of any of the 18 species of amphibians that are native to British Columbia. It is a good example of a “peripheral” species – one that is relatively widespread outside of this province but only barely extends into it. For genetic reasons, peripheral species are considered by BC

*Poor logging practices can result in variable streamflows, increased erosion and siltation, and the removal of streamside cover.*

Environment to be of provincial management concern, and conservation efforts for them emphasize habitat preservation.

In British Columbia, this unique large amphibian has been recorded along streams of the Chilliwack River drainage from Vedder Crossing to the United

States border and in nearby areas such as Bridal Veil Creek, and small streams along the west side of Vedder Mountain. All British Columbia records are from below 1050 m elevation. Searches have so far failed to find the species in



adjacent areas south of the Fraser River, such as the Silverhope and Skagit valleys or Sumas Mountain. The Fraser River is a major barrier to northward dispersal.

This salamander is more widely distributed in Washington, Oregon, and northern California, occurring in suitable habitats from the coast inland to the crest of the Cascade Range. Closely related species, which were until recently considered to be varieties of the Pacific Giant Salamander, occur along the central coast of California, on the Olympic Peninsula, and in Idaho.

What do they look like?

Like most salamanders, the Pacific Giant Salamander (*Dicamptodon tenebrosus*) has gill-breathing *larvae* that live entirely in water, and terrestrial (land-dwelling) *adults*. In British Columbia, transformation from

larva to adult occurs at about five to six years of age, when the larvae have reached a size of 15-20 centimetres. However, some larvae continue to grow to adult size and become sexually mature without losing their gills. This process is called *neoteny*, and these individuals are referred to as *neotenes*. Neoteny is common in this species in British Columbia.

As its name implies, this is a large salamander; in fact, it is the largest salamander in British Columbia. Adults and neotenes are stout-bodied and may reach 30 cm or more in total length. Like all salamanders, this one has four toes on the front feet, five toes on the hind feet, and a tail. The tail, about 40 percent of the total length, is laterally compressed (from side to side, like an eel) as an aid for swimming.

Although secretive and seldom seen, adults are readily identified by their colouring. The head, back, and sides have a distinctive marbled or reticulate pattern of dark blotches on a light brown or brassy-coloured background. The belly is a uniform slate or tan colour. The

*The Pacific Giant Salamander can reach 30 centimetres or more in length.*

broad head has a shovel-like snout, and a fold of skin (the gular fold) across the throat. The eyes are medium-sized and have a brass-flecked iris and large black pupil. Adult-sized neotenes have a uniform brown colouring on their heads, backs and sides in contrast to the marbled pattern of transformed adults, and they retain their

external gills. Colour varies considerably throughout the range of this salamander.

Larvae of the Pacific Giant Salamander are streamlined and adapted for life in flowing water. They have small, fuzzy gills behind their heads and a fin around the top and bottom of their tails. Young larvae have tiny, scattered dark brown or black patches on their backs, sides and upper surface of their tails.

The Pacific Giant Salamander is the only salamander in British Columbia that normally occurs in fast-flowing mountain streams. Salamander larvae, adults, or neotenes observed in clear mountain streams in the Chilliwack River area are almost certain to be of this species.

What makes them unique?

**T**he Pacific Giant Salamander is particularly elusive, moving about and feeding mostly at night, and hiding by day. It tends to be least active and most hidden in winter, a response to cold weather. Consequently, little is known about the behaviour of this salamander in the wild, particularly in British Columbia. Almost all research on the Pacific Giant Salamander has been carried out in the United States.

Larvae and neotenes live entirely in the water. Transformed adults visit streams to breed but, because they have lungs, can live out of the water and hence are called "terrestrial." During the day, adults are usually hidden in crevices along streams, or under rotten logs, rocks, or other cover in adjacent forests. Adults are capable diggers and climbers, and

have cornified (hardened) toes for this purpose. They frequently dig into surface material to find food or protective cover. They avoid brightly lit areas and direct sunlight, and prefer damp surroundings where their skin will not dry out.

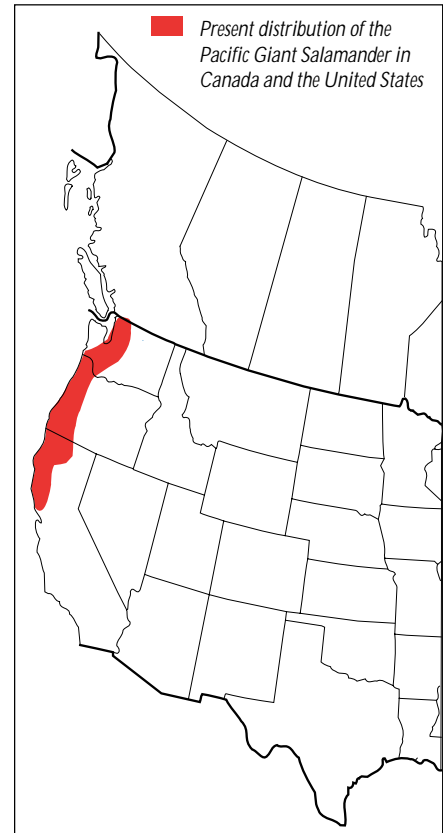
Adults often display aggressive behaviour toward others of their kind or potential predators. They will defend small caverns against subordinate individuals, an indication of territoriality. If threatened or attacked, adults engage in biting and tail-thrashing, and generally try to look as formidable as possible. Foul-tasting secretions from glands on the top of the tail also aid in defence. This species is said to produce sounds described as "rattles," "barks," or "growls," but researchers in British Columbia have not observed this here. The tendency to vocalize and to use defensive postures varies from place to place, and little study has been done in British Columbia.

How do they reproduce?

**S**exually mature individuals of the Pacific Giant Salamander migrate to suitable streams or springs for breeding, which is believed to occur from spring to autumn. The female deposits from 85 to 200 eggs, singly or in clumps, in a hidden subterranean or underwater nestsite. The eggs are white,

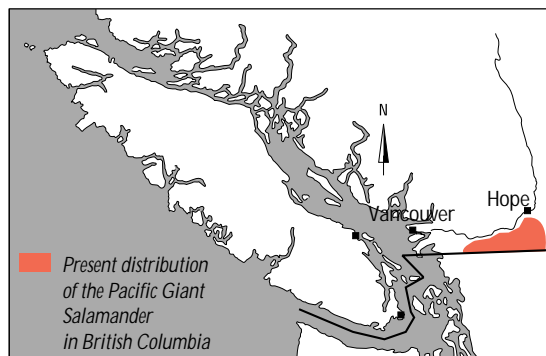
15 to 20 millimetres in diameter, and each is attached to the roof of the underwater nest cavern by a short stalk. The female

broods and protects these eggs for up to seven months. During this period she aggressively protects them from being



cannibalized by males or eaten by other predators, and eats little or nothing herself. At hatching, the larvae are about 3 cm long, including the tail, and have a large yolk sac. The larvae stay in the nest area and live off their yolk for a further two to four months, finally beginning to hunt for small prey when about 4 cm in length. Growth is slow in the cold mountain streams preferred by this salamander, particularly in British Columbia where larvae may not be sexually mature for five or six years.

Several characteristics of the Pacific Giant Salamander result in a low reproductive rate compared to many other amphibians. These characteristics include the relatively small number of eggs produced, a long egg-brooding period that allows females to breed only about every second year, and a period of several years required to reach sexual maturity.



What do they eat?

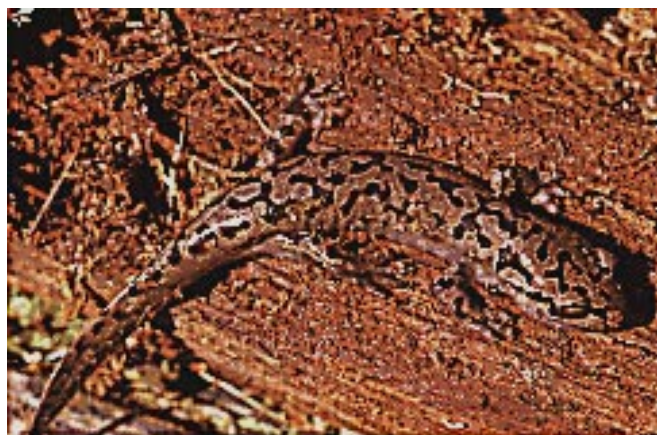
**F**oods of the Pacific Giant Salamander have not been determined in British Columbia, but are likely to be similar to those eaten by this species in the United States. Larvae and adults are all predatory, and may even be cannibalistic. Larvae of aquatic insects are important prey, including mayflies, stoneflies, caddisflies, and true flies such as mosquitoes and blackflies. Other aquatic food items include worms, snails, small fish, and tadpoles of the Tailed Frog, which also occur in mountain streams. Adult salamanders occasionally eat land insects, such as beetles, aphids, ants, and grasshoppers, as well as spiders and slugs. Large individuals can capture sizeable prey, including shrews, mice, Northwestern Salamanders, and even small garter snakes.

Where do they live?

**T**hroughout its North American range, the Pacific Giant Salamander is found in a variety of aquatic habitats, including lakes, ponds, rivers, and streams. In British Columbia, most records are from relatively small streams between 100 and 1050 m elevation in coastal coniferous forests. There are a few records from Cultus and Chilliwack Lakes and the Chilliwack River. Transformed adults also live in moist uplands beside streams or lakes.

In British Columbia, streams where this salamander breeds and rears larvae are generally small, permanent ones with moderate to fast flows, and water that is clear, cool, and well oxygenated. Some of these may almost dry up in summer, consisting then of a series of pools connected by underground flow.

Most have tall streamside vegetation that provides shade and prevents overheating in summer. Warm, murky lowland streams, swamps, or ditches, so attractive to many kinds of amphibians, are not suitable for the Pacific Giant Salamander.



THE COLOUR OF PACIFIC GIANT SALAMANDERS CAN VARY.  
*Vic Palermo photo*

Cover is very important for this species for hiding from predators, protection from the sun, brooding eggs and resting. Small larvae burrow into gravelly streambottoms to hide. Larger larvae and adults in streams find protection under overhanging banks, in crevices in the bedrock, or under submerged logs or large boulders and rubble. The best streams have numerous pools with complex bottoms composed of a mixture of boulders and sand. Terrestrial adult salamanders also need cover when away from streams. Mature and old-growth forests with plenty of shade and with considerable litter and debris, such

as rotting logs on the forest floor, are preferred habitats. These provide protection from the elements, many moist dark hiding places for the salamanders, and a variety of habitats for insects and other prey.

What can we do?

**A**ssignment of this uncommon salamander to the provincial Red List (Candidates for Threatened or Endangered status) ensures that the species will receive priority attention in government conservation programs. The Conservation Data Centre maintains a database of information on rare species in British Columbia, including this salamander.


Although the Pacific Giant Salamander is protected under the provincial Wildlife Act, only a few small areas of potential habitat are protected in parks. Most of its habitat is on Crown land managed for forestry, and the impact of logging is a serious concern. Management of this elusive amphibian is largely a matter of protecting its remaining habitat.

Pacific Giant Salamanders presently occur in streams through second-growth forests that were logged in past decades, indicating that they can persist or reestablish in logged areas. Nevertheless, streams occupied by this vulnerable species should receive protection from adverse effects of logging practices.

Routine referral of logging plans and other significant development proposals to BC Environment Habitat Protection staff allows potential impacts on salamander habitat to be identified. In such cases, recommendations are made concerning retention of streamside vegetation, road location, culvert design

or other pertinent measures, to avoid siltation into streams or blockage of salamander movement along them. Regional staff are preparing guidelines for culvert design and installation in streams supporting Pacific Giant Salamanders. Laws and guidelines for protection of fish-bearing streams afford only limited protection for this species because the salamanders often inhabit minor streams and headwaters that do not support salmonids.

Recent government-sponsored research has improved our knowledge of the local distribution and ecology of this unique amphibian, but much remains to be done. Thorough searches of many small streams are still needed. More information on habitat preferences and on impacts of logging and silvicultural practices would aid in protection and management.

The public is urged to become more familiar with this little-known member of our fauna. Any sightings of it, or observations of activities that threaten its habitat, should be reported to the nearest BC Environment office. With your support, the Pacific Giant Salamander and other rare species will continue to enrich this diverse province. 



A RECENTLY METAMORPHOSED ADULT SALAMANDER.  
*Vic Palermo photo*



THESE SALAMANDERS LIVE IN CLEAR, FAST-FLOWING, SHADED STREAMS.  
*Vic Palermo photo*

FOR MORE INFORMATION ON THE PACIFIC GIANT SALAMANDER, CONTACT:  
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