



Pacific Water Shrew

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Why are Pacific Water Shrews at risk?

Pacific Water Shrews, also known as Marsh Shrews, are threatened in British Columbia by habitat destruction within their very restricted distribution range. These relatively large shrews occur along the Pacific Coast from northern California to southern British Columbia, where they are found only in the lower Fraser Valley. Within that range, about 0.5 percent of the area of the province, they are one of the rarest small mammals and have probably always been uncommon. Limited distribution range, natural rarity within that range, and accelerating development of wildland habitats for human use combine to place these mammals in great peril.

The natural range of Pacific Water Shrews unfortunately coincides with the major urban area in British Columbia – the Lower Mainland. Much of their preferred habitat – valley bottom forestland along streams and wetlands – has been converted to farmland, subdivisions and industrial sites. Ditching and drainage schemes and stream pollution have had harmful effects on many riparian habitats. Around the fringes of the settled lands, logging has removed much forest cover and streamside strips left to protect fisheries values are mostly too narrow to benefit these shrews. Many sites where Pacific Water Shrews once occurred have now been lost. Of 24 Lower Mainland sites where the species has been recorded since 1894, 11 are now in isolated patches within urban areas, 8 are in rapidly developing lands between urban and forested zones, and only 5 are inside

large tracts of forest. Little suitable habitat occurs within protected areas.

Even more troubling are trends that suggest that this habitat loss will continue, and even accelerate. In Greater Vancouver, the human population has doubled in the past 30 years and is projected to exceed 2 million by 2011. This population growth has been accompa-

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Shrew and other wildlife species having a similar distribution.

What is their status?

The total number of Pacific Water Shrews living in British Columbia is not known, and would be almost impossible to determine. These shrews are known to be quite rare throughout their range, even at the centre of their distribution in Washington and Oregon. Field surveys in several areas have shown Pacific Water Shrews to always make up under 1 percent of all small mammals (mice and shrews) detected. In 1992, BC Environment sponsored extensive surveys in the Lower Mainland to try to locate Pacific Water Shrews and other rare small mammals. Sampling at

55 sites in a variety of forest types produced 999 individuals of 15 species of small mammals, some rare and some abundant. Only three Pacific Water Shrews were found (0.3 percent of the total); one in each of three widely scattered locations, in Coquitlam, White Rock, and near Stave Lake. In 1995, Pacific Water Shrews were found at two other locations where they had been historically reported, near Sumas Mountain and Abbotsford.

Few Pacific Water Shrews from British Columbia occur in museum collections. Of these, over 80 percent were obtained before 1950. Most of these were collected before 1900 at Sumas, near Chilliwack, a location where little suitable habitat is now present. These records, together with more recent surveys, suggest that Pacific Water Shrews have declined in abundance in British Columbia over the past century. The best lowland habitats have probably been destroyed and the remaining Pacific Water Shrew populations are confined to marginal habitats around the fringes of the Fraser Valley.

Recognizing this perilous status, BC Environment assigned the Pacific Water Shrew to its Red List in 1993. Red-listed wildlife species are candidates for legal designation as Endangered or Threatened under the British Columbia Wildlife Act. Even without such designation, however, the Pacific Water Shrew, like most wildlife in the province, is

The Pacific Water Shrew was designated as Threatened in Canada in 1994.

protected from killing or collecting by provisions of the Wildlife Act. In a national context, the Pacific Water Shrew was given Threatened status by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 1994. This was in-



based on its rarity and restricted range in Canada, its dependence on special riparian habitats, and the rate of habitat loss within its range.

What do they look like?

Shrews are diminutive, hyperactive mammals, most species being smaller than an average mouse. Shrews differ from mice in having a long pointed snout, short velvet-like fur, tiny eyes, and sharp teeth that are designed for shearing their insect prey. Their relatives, the moles, also have pointed snouts and velvety fur, but unlike shrews have broad paddle-like feet for digging, and no external ears.

The Pacific Water Shrew (*Sorex bendirii*) is the largest shrew in British Columbia, averaging 15 cm in total length, of which the tail makes up nearly half. The fur is blackish brown to black in colour. The belly may be a slightly lighter, dark-grey hue. The tail is also dark. Its feet are brownish and fringed with short stiff hairs that aid in swimming. Like other shrews, this species has short legs, five clawed toes on each foot, short ears that are partly hidden by fur,

prominent whiskers on the snout, and side glands that produce a musky odour.

Of nine kinds or species of shrews in the province, five may occur within the range of the Pacific Water Shrew in the Lower Mainland. Four of these species, the Common, Dusky, Vagrant and Trowbridge's Shrews, are all smaller than the Pacific Water Shrew, and usually average 10 to 12 cm in total length, including the tail. The fifth species is the closely related Water Shrew, a similar-sized species found across Canada and in the northern United States. The Water Shrew is found in mountains north of Burrard Inlet and the Fraser Valley and could be confused with the Pacific Water Shrew if not examined closely. However, the Water Shrew has white or grey underparts, and the underside of its tail is also white. In the small area where their ranges overlap, the Water Shrew usually lives at higher elevations. Any dark-bodied shrew over 14 cm long encountered below 500 m elevation in the Fraser Valley

and immediately adjacent areas is probably a Pacific Water Shrew. Because so little is known about Pacific Water Shrews in this area, anyone making a positive sighting or finding a dead specimen should report it to the Ministry of Environment, Lands and Parks office in Surrey.

What makes them unique?

Shrews are ancient mammals, and have evolved their distinctive characteristics over several million years. Pacific Water Shrews probably became differentiated from their close relatives the Water Shrews during the ice age when these shrews were isolated south of the ice sheet, the Pacific Water Shrew along the Pacific Coast of California and Oregon, the Water Shrew further east. As the glaciers melted back, the Pacific Water Shrew, and other mammals like the Coast and Townsend's Moles, Shrew-Mole, Creeping Vole and Townsend's Vole, moved northward into the Puget Sound and Fraser Lowlands. As a result, the northern edge of the Fraser Lowland is one of the most distinctive

A Pacific Water Shrew can run on top of the water for periods of several seconds.

zoogeographic boundaries in North America. The Pacific Water Shrew is an important component of this unique faunal assemblage, and further studies of it could aid in unravelling the mysteries of post-glacial evolution and landscape change in southwestern British Columbia.

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Pacific Water Shrews are unique among lower Fraser Valley shrews in terms of their large size, habitat selection, and food habits. More than any other shrew within their range, Pacific

Water Shrews are specialized for an aquatic mode of life. They are seldom found more than 50 m from sluggish streams and wetlands, and swim and dive readily in search of underwater prey. They also have the most specialized food habits, feeding on a narrower range of food items, a higher proportion of insects, and more foods of aquatic origin than is the case for other shrews in the same area.

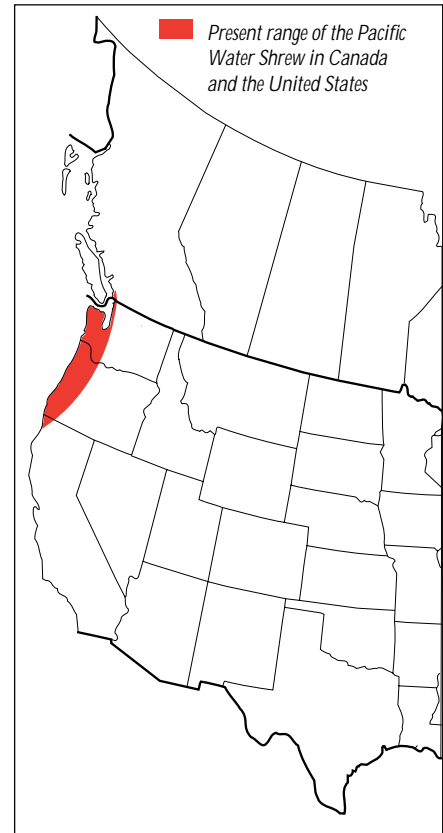
How do they reproduce?

Very little is known about the reproductive life of the Pacific Water Shrew. Shrews in general live less than 18 months and this probably also applies to Pacific Water Shrews. Pacific Water Shrews are not believed to reach sexual maturity in their first summer, so they have only one spring-summer breeding season in their lifetime. This short lifetime is to some extent compensated for by production of two or three litters of three to six young. The gestation period of related shrews, about 18 to 21 days, is probably similar in Pacific Water Shrews. Young Pacific Water Shrews are born and nursed in a nest, typically made of shredded bark and hidden under the loose bark of a fallen tree or similar hiding place. When born the young are poorly developed and hairless. Newborn young huddle together in a ball to preserve body heat. Their eyes are visible as black spots through red skin and they have rudi-

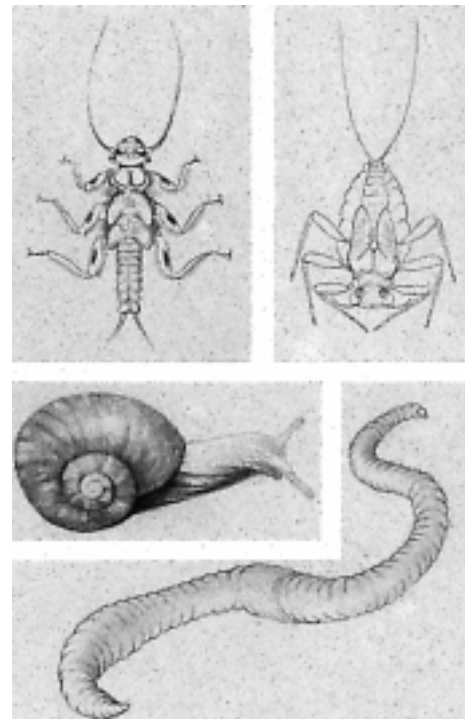
mentary, unopened ears. The growth of young is believed to be rapid but the length of time spent in the nest remains unknown. After they leave the nest, juvenile Pacific Water Shrews tend to disperse. Males have side glands that produce a strong musky odour believed to be important in finding mates.

What do they eat?

Larval stages of freshwater insects, including mayflies, stoneflies and other species, are among the most important foods of Pacific Water Shrews. Other favoured prey are snails, slugs, earthworms, and spiders. This shrew obtains much of its food from the streams and ponds along which it lives, and is remarkably adapted for this aquatic existence. A Pacific Water Shrew can actually run on top of the water for periods of three to five seconds, with its belly above or just touching the water! More frequently it swims frantically on the water surface, sculling and whirling like a giant beetle, then submerges to hunt. Underwater propulsion is by alternating strokes of the large, fringed hind feet. Bubbles trapped in the fur give a silvery appearance when the shrew is submerged, and aid in insulation against the cold water. Bouts of swimming in search of food are usually under



two minutes, but may be longer if prey items are found. While underwater, the shrew uses its flexible snout and sensitive whiskers to probe crevices in search of food; normal swimming activity



THE PACIFIC WATER SHREW'S DIET CONSISTS OF INVERTEBRATES SUCH AS INSECT LARVAE, MOLLUSCS, AND EARTHWORMS.

creases frantically when prey animals are detected. In captivity, Pacific Water Shrews make frequent trips to the water each day for foraging, and probably do so in the wild as well.

Captured food is taken out of the water before it is devoured. Only the soft parts of hard-bodied prey like snails and beetles are eaten. Large earthworms are subdued by lightning-like bites along their length before being consumed.

Shrews are among the smallest warm-blooded animals, and therefore have a high rate of heat loss in proportion to body size. They compensate with a high metabolic rate, which also means they must consume a lot of food. It has been estimated that mammals the size of the Pacific Water Shrew need to eat at least their own body weight in food each day if they are to survive. How these non-hibernators manage to do this in winter remains a mystery. At any rate, food-finding is the major life-long, day and night preoccupation of these hyperactive little mammals.

Where do they live?

Pacific Water Shrews are found only from northern California to extreme southern British Columbia, west of the summit of the Cascade Range. This area is characterized by moist, temperate coniferous forest, its lower elevations being dominated by Douglas-fir. In British Columbia, Pacific Water Shrews have been recorded south of the Fraser River from White Rock to Cultus Lake and Chilliwack, and north of the river from Point Grey and North Vancouver to the vicinity of Stave Lake and Agassiz. They have been found up to the 1300 m elevation in the southern part of their range, but not above the 850 m level in British Columbia.

Throughout their range, Pacific Water Shrews are usually found near sluggish low-elevation streams, marshes

and other wetlands. Although occasionally found up to 350 m from streams, detailed studies in Washington and Oregon have found most to be within 50 m of water. Being adapted to a semi-aquatic existence and heavily dependent



RIPARIAN AREAS AROUND STREAMS AND MARSHES ARE IDEAL PACIFIC WATER SHREW HABITAT. Bruce Runciman photo

on freshwater organisms for food, Pacific Water Shrews need riparian habitats to survive. This shrew is more strongly associated with riparian situations than any other shrew or mouse within its range. Pacific Water Shrews are generally more abundant in mature and old-growth forests than in younger stands, and are seldom found in clearcuts or farmlands. Their forest habitats may be dominated by coniferous trees like Douglas-fir or mixed stands of conifers, red alder, and other deciduous trees and shrubs. They seem to prefer sites where the forest floor has abundant fallen and rotting logs, as well as a good cover of fine litter. Characteristics of the understory and forest floor may be as important, or more important, than the kind and density of the forest canopy.

Pacific Water Shrews are usually found in relatively extensive tracts of forest. Many forest fragments isolated in settled areas of the Fraser Valley are too small to support shrew populations, although the minimum size needed for their survival isn't known. Pacific Water Shrews are expected to have long narrow home ranges parallel to streams, therefore lengthy tracks of riparian habitat are probably needed to support a population.

What can we do?

The Environment is focusing more attention on the plight of the Pacific Water Shrew by assigning it to the provincial Red List, distributing status information, and sponsoring field surveys. The B.C. Conservation Data Centre maintains a database, available to researchers and the public, on this and other rare species.

A major and pressing need is for preservation of remaining habitats occupied by Pacific Water Shrews. Unfortunately, the species is so rare in British Columbia that reliable information on its regional abundance and most important habitats will take much time and effort to collect. Greater attention must be given to preserving

Support riparian stewardship forestland initiatives and within the the establishment Pacific Water Shrew. The riparian zone is a key habitat type for many mammals, birds, amphibians and reserves along streams and reptiles, around wetlands.

some of which are as rare as the Pacific Water Shrew. This is particularly important on suburban and forest-fringe lands where development for



MUCH REMAINING PACIFIC WATER SHREW HABITAT IS AT RISK OF BEING LOST TO URBAN DEVELOPMENT.
David Nagorsen photo



HABITAT IN THE FRASER VALLEY IS BECOMING INCREASINGLY FRAGMENTED.
Paul vanPeenen photo

housing, agriculture or other uses is imminent.


Lands devoted to forestry, whether Crown or private, also need attention. Streamside strips of mature or old-growth forest should be permanently maintained, and need to be wide enough to support shrew populations. Narrow leave strips that have traditionally been saved to protect fishery resources are not wide enough for most riparian wildlife. Hopefully, 30 to 50 m wide riparian management areas along streams and around wetlands and lakes, as now prescribed by the Forest Practices Code, will be an improvement. However, some researchers have suggested that buffer strips of 60 to 100 m may be needed for Pacific Water Shrews.

Additional attention should also be given to restoring the quality of urban and rural streams that have been damaged by pollution, erosion, channelization, and other activities. In some cases it may be possible to reconnect short segments of riparian woodland partitioned by human land uses in past years.

Further field surveys of this intriguing mammal are needed to identify critical habitats. These surveys should be directed at promising habitats that have not been surveyed before, and use techniques that specifically

target the Pacific Water Shrew.

Members of the public are urged to become more familiar with this poorly known shrew. Sightings, specimens, or observations of activities threatening its habitat should be reported to the nearest BC Environment office. People can also aid the survival of Pacific Water

Shrews by supporting stewardship initiatives and the establishment of parks and reserves along streams and around wetlands in the Fraser Valley area. Habitat protection is urgently needed. With your help, this remarkable mammal and other rare species found with it will continue to enrich our fauna. 

FOR MORE INFORMATION ON THE PACIFIC WATER SHREW, CONTACT:

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