COMMITTEE ON THE
STATUS OF ENDANGERED
WILDLIFE IN CANADA

OTTAWA, ONT. K1A 0H3
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COMITÉ SUR LE STATUT
DES ESPÈCES MENACÉES
DE DISPARITION AU
CANADA

OTTAWA (ONT.) K1A 0H3
(819) 997-4991

STATUS REPORT ON THE NOOKSACK DACE *RHINICTHYS* SP.

IN CANADA

BY

J.D. MCPHAIL

STATUS ASSIGNED IN 1996
ENDANGERED

REASON: SPECIES WITH A RESTRICTED RANGE NOW IN SIGNIFICANT DECLINE DUE TO HABITAT LOSS AND DEGRADATION.

OCCURRENCE: BRITISH COLUMBIA

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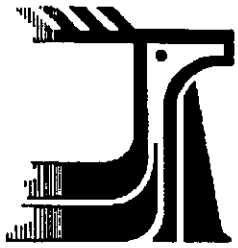

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STATUS REPORT ON THE NOOKSACK DACE *RHINICTHYS* SP.

IN CANADA

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STATUS ASSIGNED IN 1996
ENDANGERED

Status of the Nooksack dace, *Rhinichthys sp.*, in Canada.

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McPhail, J.D. 1996. Status of the Nooksack Dace, *Rhinichthys* sp., in Canada. Report to the Committee on the Status of Endangered Wildife in Canada (COSEWIC). Canadian Wildlife Service, Ottawa, Ontario

The Nooksack Dace (*Rhinichthys*sp.) is a morphologically distinctive form derived from the common, widely distributed Longnose Dace, *Rhinichthys cataractae*. Like the Salish Sucker (*Catostomus* sp.), it is a component of the Chehalis fauna. This fauna survived the last glaciation in the ice-free area west of the Cascade Mountains and north of the Columbia drainage system. In Canada, the Nooksack Dace is confined to four small streams tributary to the Nooksack River in the Abbotsford, Aldergrove and Clearbrook areas of the lower Fraser Valley, southwestern BC. The adult habitat is riffles, typically with water velocities close to 0.25 m-sec and a loose, coarse gravel substrate. Young-of-the-year inhabit shallow margins at the tail-ends of pools with mud/sand substrates, and typically recruit to the adult habitat after one year. Although the Nooksack Dace is still moderately common, suitable habitat is deteriorating rapidly through explosive urbanization and gravel extraction in the headwaters of the streams. In western Washington state, the Nooksack Dace is widespread and in no immediate danger but, in Canada, given its restricted distribution and deteriorating habitat it is endangered.

Le naseux de la Nooksack (*Rhinichthy* sp.) est une forme morphologiquement distincte dérivée d'un poisson commun, largement réparti, le naseux des rapides (*Rhinichthys cataractae)*. Comme le meunier de Salish (*Catostomus* sp), il fait partie de la faune du Chehalis, faune qui à survécu à la dernière glaciation dans des espaces libres de glace, à l'ouest des Cascade Mountains et au nord du bassin hydrographique du Columbia. Au Canada, le naseux de la Nooksack est confiné à quatre ruisseaux tributaires de la rivière Nooksack, dans les secteurs d'Abbotsford, d'Aldergrove et de Clearbrook de la partie inférieure de la vallée du Fraser, dans le sud-ouest de la C.-B. Comme habitat, les adultes adoptent les rapides, particulièrement ceux qui ont une vélocité de près de 0,25 m/s avec des substrats de gros gravier meuble. Les petits de l'année habitent les recoins peu profonds, aux substrats de boue sablonneuse, en marge des étangs, et se retrouvent naturellement dans l'habitat des adultes après une année. Même si le naseux de la Nooksack est relativement commun, son habitat de prédilection se détériore rapidement à cause d'une urbanisation frénétique et de l'extraction de gravier à la source des cours d'eau. Dans l'ouest de l'état de Washington, le naseux de la Nooksack est très répandu et ne court aucun danger immédiat, mais au Canada, vu sa faible distribution et le déclin de son habitat, il est en danger de disparition.

Key Words: Cyprinids, Dace, NookSack Dace, *Rhyinichthys*, *naseaux de la Nooksack*, endangered species, British Columbia.

The Nooksack Dace *(Rhinichthys* sp.) is a small (up to about 105 mm in standard length) cyprinid fish widely distributed in the clear, relatively rapid rivers and streams of western Washington (McPhail 1967). In Canada, it is restricted to a few small tributaries of the Nooksack River in the lower Fraser Valley, southwestern British Columbia (McPhail and Lindsey 1986). It is a slim fish with a snout that clearly overhangs the mouth, a streamlined back and a flattened underside (Figure 1). In life, adults are grey-green above with a dull brassy stripe just above the lateral line. The sides below the lateral line are dirty white grading into silver-white on the underparts. Often there are scattered dusky speckles on the sides below the lateral line and a black stripe on the head in front of the eyes. Viewed from above, there is a distinct pale mark at the anterior and posterior base of the dorsal fin. There is no striking sexual dimorphism in colour, but males have conspicuously longer, and darker, pectoral fins than females. In juveniles there is a conspicuous black mid-lateral stripe that extends from the snout back to a diffuse dark spot at the base of the tail.

Distribution

This distributional account is based on collections in the fish museums of the Department of Zoology, University of British Columbia and the School of Fisheries, University of Washington. The geographic distribution of the Nooksack Dace forms a rough fish-hook around Puget Sound (Figure 2) although, curiously, it is absent from rivers on the west side of the Sound. On the west side of the Olympic Peninsula it occurs from the Queets system in the north to the Willipa River in the south. On the east side of Puget Sound it extends from the Pyuallup River in the south to the Nooksack River in the north. The species is widespread in the Chehalis system, but so far is unrecorded from the Deschutes and Nisqually rivers near Olympia, Washington. In Canada, the Nooksack Dace is restricted to Nooksack tributaries in the lower Fraser Valley, of British Columbia (B.C.) [Bertrand, Cave, Fishtrap and Pepin creeks, inset Figure 2].

Protection

No special protection is in place for the Nooksack Dace; however, its Canadian distribution lies entirely within the range of the Salish Sucker (*Catostomus* sp.), a species assigned "Endanagered" status in April of 1986 by COSEWIC and in B.C., allocated to the Ministry of Environment's critically imperiled category. Consequently, measures taken by the B.C. Ministry of Environment, Lands and Parks to protect the Salish Sucker also protect the Nooksack Dace.

Population Sizes and Trends

Although the geographic distribution of the Nooksack Dace in Canada is limited, museum records from the 1960s suggest that the species once was abundant within this restricted range. Unfortunately, no formal estimates of past, or present, numbers are available for the Nooksack Dace; however, an October 1993 survey of five riffles in Bertrand Creek revealed an average density of 1.4 (SE $\pm$ 0.24) adults m^2. Furthermore, the populations in Bertrand, Cave, Fishtrap and Pepin creeks appear healthy: a range of year classes is present in each of the creeks, including substantial numbers of young-of- the-year, although in 1993 the 1+ year class was under represented both in our survey and in a summer survey supported by the Habitat Conservation Fund (S. Inglis, B.C. Ministry of Environment, Lands and Parks, Victoria, B.C.; personal communication). Even

though the existing populations appear healthy, there is evidence that suggests the B.C. distribution is shrinking. For example, Nooksack Dace are now absent from some of the smaller tributaries (e.g., Howes Creek) and headwaters of both Bertrand and Fishtrap creeks where they occurred in the 1960s. In these creeks, rapid urbanization in the Aldergrove, Clearbrook and Abbotsford regions has increased siltation, pollution and fluctuations in discharge. The result is deteriorating water quality and a loss of habitat that is spreading downstream. Near the U.S. border, the streams are in better condition. Here, they flow through a rural landscape, but even in this area land clearing and gravel extraction generate silt and decrease summer flows. By late August most small tributaries are dry and, in drought years, even the main creeks (Bertrand and Fishtrap) are reduced to trickles. Since adult Nooksack Dace depend on riffles with loose gravel substrate for foraging and breeding (see sections on Habitat and General Biology), silt and low summer flows are especially harmful to this species. Low summer flows restrict adult habitat at the most productive time of the year by reducing the riffle areas, and silt tends to fill the interstices between rocks and cement them into the substrate. This reduces both the cover available to adults and their foraging opportunities. Under low water conditions, adults will shift into pools but they probably do not grow or survive as well in this marginal habitat as they do in riffles. Consequently, given that the demand for both housing and gravel in the lower Fraser Valley will continue to increase, habitat suitable for adult Nooksack Dace will continue to decrease and the species probably will go extinct in Canada in the next one or two decades.

Habitat

Adult Nooksack Dace are demersal and typically occur in riffles with water velocities greater than 0.25 $m\text{-}^{sec}$ and a substrate of loose gravel (4-10 cm in diameter), cobbles, or boulders. In Canada, the species is associated with small to moderate sized streams (1 to 4 m in width); however, this association probably simply reflects the absence of large Nooksack tributaries in Canada; whereas in Washington, the species regularly occur in large rivers. In contrast to adults, young-of-the-year are associated with slow water ($0.14 \pm 0.022 m^{-S}$ near the downstream ends of pools (Table 1). Here, the young occur in shallow water (about 10 to 20 cm deep) but swim above the sand or mud substrate. Thus, the species occupies two basic stream habitats: adults in fast water over loose rock substrates, and juveniles in quiet waters over sand or mud substrates.

General Biology

In .B.C, Nooksack Dace spawn in the spring (April through May). Spawning apparently occurs at night and the eggs are usually found near the top ends of riffles. There is no evidence of the spawning colours reported for Longnose Dace (*Rhinichthys cataractae)* in Manitoba (Bartnik 1972). Both males and females mature at the end of their second summer (1^{+}) and breed in their third spring (2^{+}). To date, the oldest recorded individual (a female 105 mm in standard length) was in her sixth year (5^{+}). As in most fish, egg number is a function of female size, and in the Nooksack Dace fecundity ranges from about 200 to over 2000 eggs. In summer, adults feed primarily on riffle dwelling insects *(e.g.* nymphs of caddisflies and mayflies, dytiscid beetle larvae and adult riffle beetles). In pools the young feed primarily on chironomid pupae and ostracods. Adults collected at mid-morning have empty stomachs but packed hind guts. This suggests nocturnal feeding. In the lower Fraser Valley, adults appear to inhabit

riffles throughout the year, but in less benign climates they may shift to slower, deeper water in the winter.

Limiting Factors

Habitat loss through human disturbance is the greatest threat facing the Nooksack Dace in British Columbia. Around Aldergrove, Clearbrook and Abbotsford, housing developments, shopping malls and industrial parks are replacing fields and wooded areas at a dizzying pace. This accelerating urbanization brings with it all the usual environmental problems, compounded in this case by the development being in the headwaters of the streams. Thus, both Bertrand and Fishtrap creeks and their tributaries are vulnerable to the usual fate of urban streams (e.g., straightening, siltation, industrial and domestic chemical spills, and clandestine garbage disposal), as well as attempts to "aesthetically improve" the streams by creating parks and ponds that please the human eye but destroy critical fish habitat. In the past, accidental fish kills in the Canadian portion of the Nooksack system would have been followed by natural recolonization from the main river. This is no longer the case. The U.S. portions of Bertrand and Fishtrap creeks are ditched and silted. They no longer contain either Nooksack Dace or habitat suitable for Nooksack Dace. Thus, the shrinking Canadian populations are sandwiched between a deteriorating environment upstream and unsuitable habitat downstream.

Special Significance of the Species

The Nooksack Dace is a member of the Chehalis fauna (McPhail 1967, 1987; McPhail and Lindsey 1986). This isolated fauna is derived from the Columbia fauna and, with the exception of the endemic Olympic Mudminnow *(Novumbra hubbsi)*, all the species are closely related to Columbia species. These Chehalis isolates diverged from their Columbia counterparts sometime before the last (Fraser or Vashon) glaciation, and survived the ice-sheets south of Puget Sound but north of the Columbia River. Consequently, their geographic distributions include the Chehalis River, the rivers on the west side of the Olympic Peninsula and some rivers on the east side of Puget Sound. In two cases, the Salish Sucker and Nooksack Dace, Chehalis isolates have dispersed postglacially as far north as the lower Fraser Valley (Figure 2).

The Nooksack Dace is a typical Chehalis isolate: it is related to, and presumably derived from, the western North American form of a widely distributed species, the Longnose Dace *(Rhinichthys cataractae)*. It differs from this species in scale counts (McPhail 1967; Bisson and Reimers 1977), body shape and in consistent sequence differences in both mitochondrial and nuclear genes. For example, the mitochondrial sequence differences between Nooksack and Longnose Dace are comparable to the sequence differences between such well established species as Largescale Sucker (*Catostomus macrocheilus*) and Longnose Suckers (*Catostomus catostomus*) [McPhail and Taylor, in preparation). The Nooksack Dace also shows the characteristic distribution pattern of a Chehalis isolate: scattered populations in the Chehalis River and populations in rivers draining the west side of the Olympic Peninsula and the east side of Puget Sound (Figure 2).

Typically, the genetic separation between Chehalis isolates and their Columbia relatives, as measured by allozyme frequencies or gene sequences, is greater than their morphological separation (McPhail and Lindsey 1986; McPhail and Taylor, in preparation. Still, Chehalis isolates usually can be separated from their Columbia counterparts by a combination of morphological traits.

Because the geographic distributions of most Chehalis isolates do not overlap with theirclosest relatives, any decisions regarding their taxonomic status (e.g., species or subspecies) are necessarily arbitrary; however their status is independant, divergent linages are not debatable, and for conservation purposes they should be regarded as species. Certainly, their distinctive morphologies, gene sequences and characteristic geographic distributions argue that athe Nooksack Dace has not exchanged genes with the Longnose Dace for a long time (i.e., since well before the beginning of the last galciation and, perhaps, since before the Pleistocene).

Evaluation

The Canadian distribution of the Nooksack Dace probably will continue to shrink as long as the Vancouver megalopolis continues to expand. To stop the decline will require a concerted effort by all levels of government to protect the remaining free-flowing streams occupied by this species...an unlikely event. Even if the political will is there, accidents are inevitable in urban streams, especially with a drinking-water supply that for public health reasons will require chloramination in less than a decade. Once this happens, it will be a minor miracle if, in Canada, the Nooksack Dace survives into the next century.

Acknowledgments

The illustration of the Nooksack Dace was drawn in "Freehand" on a Macintosh computer by Diana McPhail. Marvin Rosenau, Juanita Ptolemy and Susan Inglis (B.C. Ministry of Environment, Lands and Parks) helped in many ways. Over the years, Ron Jones, Dave Greenfield, Clyde Murray and Gordon Haas helped me outline the nature and distribution of the Chehalis fauna. I am grateful for their support and enthusiasm. More recently, Mike Folkes assisted in the field, Ruth Withler did an allozyme survey, and Claire Thompson and Ric Taylor did DNA analyses. The Fisheries Branch, B.C. Ministry of Environment, Lands and Parks, commissioned and funded this report.

Literature Cited

Bartnik, V. 1972. Comparison of the breeding habits of the two subspecies of Longnose dace, *Rhinichthys cataractae*. Canadian Journal of Zoology 50 (1): 83-86.

Bisson, P.A., and P.E. Reimers. 1977. Geographic variation among Pacific Northwest populations of longnose dace, *Rhinichthys cataractae*. Copeia 1977 (3): 518-522. McPhail, J.D. 1967. Distribution of freshwater fishes in western Washington. Northwest Science 41: 1-11.

McPhail, J.D., and C.C. Lindsey. 1986. Zoogeography of the freshwater fishes of ascadia (the Columbia system and rivers north to the Stikine). Pages 615-637, in The Zoogeography of North American Freshwater Fishes. *Edited by* C.H. Hocutt and E.O. Wiley. John Wiley and Sons, New York. 866 pp.

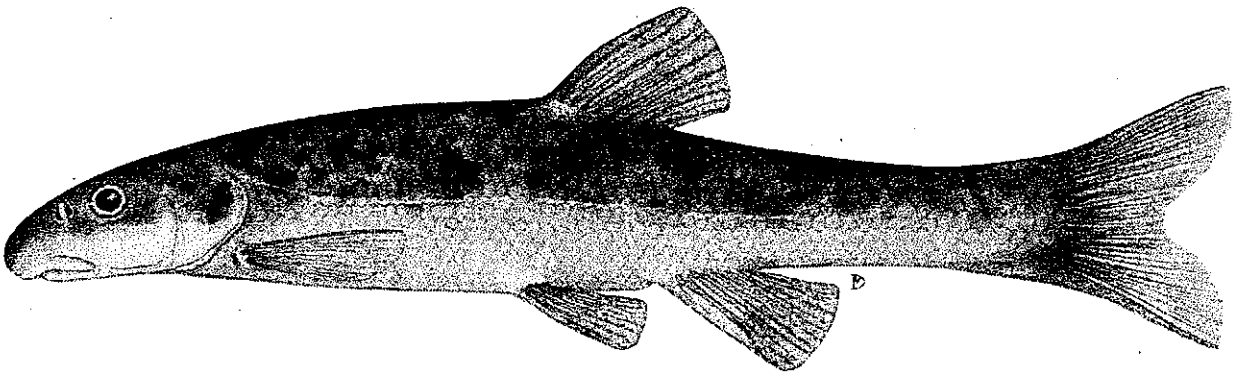
Table 1. Habitat differences between adult and young-of-year Nooksack dace, *Rhinichthys sp.*, Bertand Creek, October 1, 1993.

	Adults	Young-of-year
Average Water Veocities	0.34 ± 0.039 m^{-sec}	014 ± 0.022 m^{-sec}
Substrate	fist-sized gravel, cobbles and boulders	mud, sand, leaflitter

Figure Captions

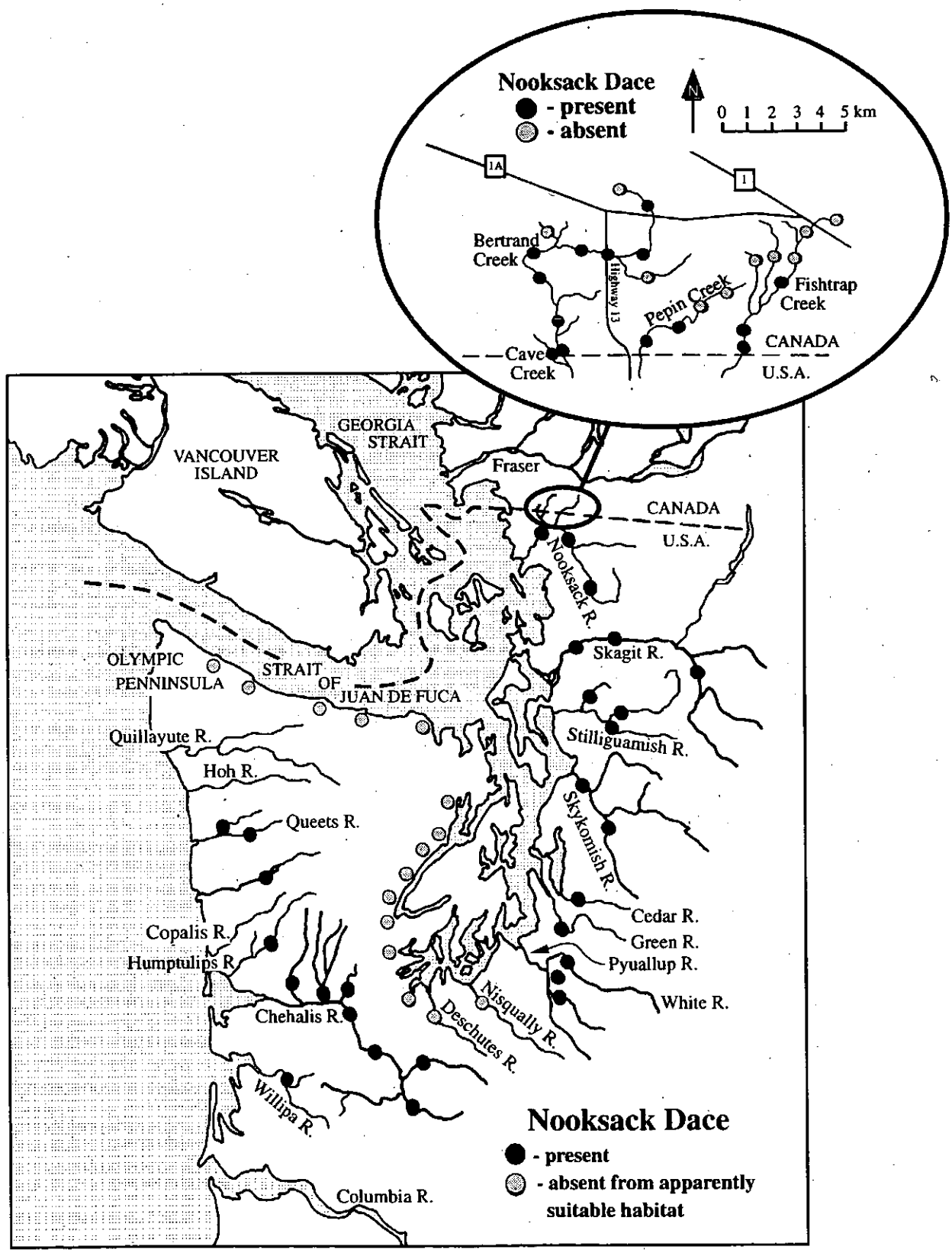
Figure 1. Nooksack Dace, *Rhinichthys* sp., 81 mm standard length.

Figure 2. Geographic range of the Nooksack Dace, *Rhinichthys* sp., (inset Canadian distribution).



Nooksack dace
Rhinichthys sp.

1 cm


Nooksack Dace
- present
- absent
N
0 1 2 3 4 5 km
1A
1
Bertrand Creek
Highway 13
Pepin Creek
Fishtrap Creek
CANADA
U.S.A.
Cave Creek
GEORGIA STRAIT
VANCOUVER ISLAND
Fraser
CANADA
U.S.A.
Nooksack R.
Skagit R.
OLYMPIC PENNINSULA
STRAIT OF JUAN DE FUCA
Quillayute R.
Hoh R.
Queets R.
Stilliguamish R.
Skykomish R.
Cedar R.
Green R.
Pyuallup R.
White R.
Copalis R.
Humptulips R.
Chehalis R.
Nisqually R.
Deschutes R.
Willipa R.
Columbia R.
Nooksack Dace
- present
- absent from apparently suitable habitat