

Guidelines for the Capture, Handling, Scientific Study, and Salvage of
the Nooksack Dace (*Rhinichthys cataractae*)



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Disclaimer

An earlier version of this document was prepared in cooperation with members of the Recovery Team for Non-Game Freshwater Fish Species (BC)¹ in 2008. Individual members of the team at that time were:

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This document was intended to guide capture, handling, scientific study, and salvage activities likely to impact Nooksack Dace. It does not necessarily represent the views of all individual members of the recovery team, or the official positions of the organizations with which the individual team members were associated.

Dr. Mike Pearson updated these guidelines in 2013, and again in 2015. They are based on the best available knowledge and are subject to modifications resulting from new findings and revised objectives.

¹This recovery team is no longer in existence.

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1 Introduction

Section 32 of Canada's *Species at Risk Act (SARA)* prohibits² (among others) the killing, harming, harassing, capturing, taking, collecting, or possessing of the Nooksack Dace (*Rhinichthys cataractae* ssp.), a species listed on Schedule 1 of SARA as Endangered. If your activity may impact the Nooksack Dace in one of the ways mentioned above, a permit under SARA may be required to comply with the Act. The onus is on you to ensure your activities comply with SARA.

This document provides advice for the capture, handling, scientific study, and salvage of the Nooksack Dace. The guidelines herein are intended to minimize harm to the Nooksack Dace, and are considered the best practices for capture, handling, scientific study, and salvage of the Nooksack Dace. By following these guidelines, acute mortality of Nooksack Dace as a result of trapping should be <1%.

Please refer to <http://www.dfo-mpo.gc.ca/species-especies/permits-permis/permits-eng.htm> for further information on SARA permitting for aquatic species at risk.

2 Background

The Nooksack Dace is a small freshwater fish. It is a subspecies of the widespread and common Longnose Dace, *Rhinichthys cataractae*, and is known from just four watersheds in Canada, all in British Columbia's Fraser Valley (Figure 1). Its global distribution includes approximately 20 additional streams in north-west Washington State.

The Nooksack Dace is strongly associated with riffle habitats. Young-of-the-year fish (fry) are found in shallow marginal pools in close proximity to riffles inhabited by adults. Adults primarily eat aquatic invertebrates and fry consume zooplankton.

Nooksack Dace populations are sampled regularly for scientific study and monitoring of habitat restoration. At existing low levels of intensity, such activities are unlikely to impact populations. The Nooksack Dace is also regularly captured and relocated during fish salvage operations for in-stream works. The impact of activities is likely proportional to the area of riffle habitat affected, and may be significant if fish are translocated out of an area supporting high densities, and into less favourable habitats supporting lower Nooksack Dace densities.

For additional background information on the Nooksack Dace, please refer to the *Recovery Strategy for the Nooksack Dace (Rhinichthys cataractae) in Canada*³ (Pearson et al. 2008).

² SARA also prohibits the damage or destruction Critical Habitat (Section 58).

³ http://www.sararegistry.gc.ca/document/default_e.cfm?documentID=1120.



Figure 1. Watersheds in British Columbia known to support the Nooksack Dace: 1. Brunette River; 2. Bertrand Creek; 3. Pepin Creek; 4. Fishtrap Creek.

3 Nooksack Dace Identification

3.1 *Species Description*

Nooksack Dace are small (<15 cm), torpedo-shaped freshwater fish in the minnow family. They have a long snout, large pectoral fins and barbels at the corners of the mouth (Figure 2). Fry and juveniles (to 100 mm) have a dark, mid-lateral stripe passing through the eye ending in a dark tail-spot (Figure 2). During the spawning season (early April to early July) females' underbellies may appear swollen due to developing eggs.

A *Field key to the Freshwater Fishes of British Columbia* can be downloaded at: <http://www.zoology.ubc.ca/~etaylor/nfrg/fresh.pdf>. For additional information on the description of Nooksack Dace, please refer to the *Recovery Strategy for the Nooksack Dace (Rhinichthys cataractae) in Canada*⁴ (Pearson et al. 2008).

3.2 *Hybrids*

Hybridized dace are known from the Coquitlam River, Alouette River and Kanaka Creek watersheds. Note that hybrids are neither listed under SARA, nor considered to be Nooksack Dace.

⁴ Ibid.



Figure 2. Adult Nooksack Dace (top) are very streamlined, with relatively long snouts, a bottom-facing mouth, and (often) brassy colouration. Fry and juveniles (bottom) have a dark lateral strip extending the full length of the body.

4 General Guidelines for all Activities

4.1 *Equipment Sterilization*

To prevent the spread of invasive species and disease organisms, sterilize all gear and equipment with a 1% bleach solution prior to moving gear from one waterbody to another. This includes but is not limited to: waders, traps, nets, holding containers and measuring equipment.

4.2 *Riffle Disturbance*

Always take care not to disturb riffles, as they provide habitat for Nooksack Dace and eggs during incubation. This may be achieved by avoiding reaches that contain riffle habitat altogether, navigating alongside banks of riffle habitat, or avoiding electrofishing within 10 m of riffle habitat.

4.3 *Coordination*

If activities are planned to occur within the same area and timeframe by multiple permit holders, DFO may request coordination of activities. This is intended to minimize potential repeated harm to the species.

4.4 Timing

Work windows are one of many measures used to protect fish and fish habitat, and are considered when issuing permits under SARA. The work windows for activities in various habitat types for the Nooksack Dace⁵ (to determine the habitat type for a given stream reach, refer to Appendix 1) are as follows:

Table 1. Work windows and special conditions for activities in different categories of Nooksack Dace habitat.

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Least risk window for projects near water in spawning reaches. ⁶								
Least risk window for projects near water in critical habitat and potential/confirmed presence reaches.								
Least risk window for capturing the Nooksack Dace. ⁷								
During this period handle gravid females in such a way that minimizes damage to, or expulsion of, eggs.								

5 Capturing the Nooksack Dace

The Nooksack Dace is very difficult to capture. Baited commercial Gee minnow traps, and seining are the preferred methods; however, electroshocking is often the only feasible method.

5.1 Gee Trapping - General

- Gee trapping is the only method suitable for riffles during the spawning period
- Gee trapping is not suitable for population estimates (due to low catch rates).
- Gee trapping is not effective at water temperatures below 11 °C.
- Catches are highest in overnight sets.
- Bait traps with roe and/or dried cat food.
- If daytime dissolved oxygen concentration (DO) is below 4 mg/L suspend traps to provide fish with access to the water's surface.
- Place traps in pools⁸ adjacent to riffles, or dug into riffles, so that funnel entrances are underwater.
- Account for traps at all times; forgotten traps may continue to capture and kill fish even when not baited.
- Lift traps within six to 24 hours; or, if daytime dissolved oxygen concentration is below 4 mg/L limit sets to 2-6 hours during daylight hours.

⁵Other species such as salmonids might be present in proposed work areas during sensitive life stages. It is your responsibility to ensure you avoid causing serious harm to fish in compliance with the *Fisheries Act*. For more information, please refer to DFO's Projects Near Water website <http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>.

⁶ Prior to August 15 newly hatched fish may not yet be free swimming. After October 15, water temperatures typically fall below 10° C. Nooksack Dace then become less active and are likely to burrow into the substrate.

⁷ Outside this period the Nooksack Dace may be burrowed deeply in coarse substrate (typically cobble or boulders), and their capture would require considerable habitat disturbance at a vulnerable point in their life history.

⁸ Under low flow conditions the Nooksack Dace may move into pools.

5.2 *Gee Trapping - Adults and Yearlings*

- Target the fastest available current.
- During spawning, set traps in riffles by working from the margins of the riffle and taking care not to disturb potential nest sites (under cobble or boulders).

5.3 *Gee Trapping - Young-of-the-year (Fry)*

- Do not target fry, except in a fish salvage (refer to Section 8).

5.4 *Kick Seining*

- Kick seining is suitable for riffles or glides with significant current.
- Flush fish into a small pole seine by manually disturbing the substrate immediately upstream of the net.

5.5 *Beach Seining*

- Beach seining is suitable for pools or slow glides with few obstructions (logs, boulders etc.), and for capturing young-of-the-year (for fish salvages only; refer to Section 8).
- Pull the seine net (with floats on top and weights on the bottom) together from each end to encircle fish.

5.6 *Electrofishing*

- Electrofishing is suitable for sampling in riffles or glides with substrate too large for kick-seining.
- Electrofishing is suitable for presence/absence sampling after no Nooksack Dace have been captured using other sampling methods.
- Always use the minimum effective voltage of straight DC current or gated bursts of current.
- Restrict electrofishing to a single pass per season, except in fish salvages (refer to Section 8).
- Electrofish stream reaches to sweep Nooksack Dace with the current into a downstream net.⁹

6 **Handling the Nooksack Dace**

- Minimize handling time to the extent possible.
- Handle the Nooksack Dace with wet hands free of sunscreen, insect repellent or other potential irritants.
- Handle fry as little as possible. Do not attempt to measure or weigh them as they are extremely delicate and may perish from handling.

⁹ Unlike salmonids, Nooksack Dace rarely roll belly up when shocked; they usually freeze and sink to the bottom, where they are difficult to see. They also frequently become trapped in crevasses between rocks.

- Lightly anaesthetize the Nooksack Dace to be measured or marked in a solution¹⁰ of MS222 (tricaine methanesulfonate; typically 70 mg/L).¹¹
- After handling, allow the Nooksack Dace to recover in a holding container with fresh stream water, changed frequently to maintain temperature and oxygen close to ambient levels.
- Keep any holding containers a minimum of 10 m away from any electrofishing.
- Check condition of held Nooksack Dace (including normal respiration) at least once every 15 minutes; or, if air or water temperature exceeds 20 °C, check condition at least once every 5 minutes.
- Following recovery, release the Nooksack Dace at the original point of capture (except in salvages; refer to Section 8).

7 Scientific Study of the Nooksack Dace

7.1 Mark-Recapture¹² with Elastomer Injections

- Elastomer injections are recommended for short term mark-recapture studies, but not for long term studies as marks are difficult to detect after one field season.
- Subcutaneous injections of elastomer (Northwest Marine Technologies, Shaw Island, WA) are simple to use, inexpensive, and relatively non-invasive.
- Insert the needle approximately 1 cm anterior to the fin insertion and slide it, just under the skin, posteriorly to the mark site (Figure 2).
- The best mark locations are at the base of the paired fins, where the skin is translucent over bone.



Figure 2. Nooksack Dace marked with subcutaneous injections of elastomer at the base of both pelvic fins. The needle entry point for the right (red) mark is visible as a red dot approximately 1 cm below the fin base.

7.2 Lethal Sampling

- At this time, intentional lethal sampling is only appropriate for the collection of voucher specimens to document newly discovered populations.¹³

¹⁰ Soft waters may require buffering with sodium bicarbonate.

¹¹ Dosage may vary as efficacy is affected by body size, density of fish, and water quality. Anaesthesia is achieved once equilibrium, muscle tone, and spinal reflexes are lost, while regular opercular movements are maintained.

¹²Passive Integrated Transponder (PIT) tags have not been used to date for the Nooksack Dace. Should this be contemplated, a preliminary laboratory study should be conducted on Longnose Dace to ensure that the method does not harm the fish and to develop guidelines for minimum fish size.

¹³*R. cataractae* from all locations in the Fraser Valley are of scientific interest.

- To lethally sample the Nooksack Dace, overdose the fish in anaesthetic (approximately 70 mg/L MS 222 solution or greater)¹⁴ and preserve it in 95% ethanol.
- Retain a minimum of one and a maximum of two individuals for deposit with the Beaty Biodiversity Museum¹⁵ and/or the Royal British Columbia Museum.¹⁶

8 Salvage of the Nooksack Dace

Conduct a fish salvage and re-location if the Nooksack Dace is at risk of harm from proposed works (this includes most instances of machinery work in waters where the species may be present) using the following sequential steps. Refer to Section 4.4 to ensure you comply with the appropriate work window. The following steps of the salvage protocol are intended to be carried out sequentially.

- A.** Attempt to clear Nooksack Dace from the area (without capture).
 - i.** Install a stop net (0.25 in mesh or finer) at one end of the section to be isolated.
 - ii.** Starting from the installed stop net and working outwards, sweep the channel with a beach or pole seine¹⁷ (refer to Sections 5.4 and 5.5) to clear it of fish.
- B.** Isolate the site.
 - i.** Install a second stop-net¹⁸ not more than 100 metres from the first stop-net.
- C.** Capture remaining Nooksack Dace.
 - i.** Set at least one Gee trap (refer to Sections 5.1 through 5.3) per five metres of channel length within the isolated area.
 - ii.** Conduct one overnight trapping set; or, if daytime DO is less than 4 mg/L, set traps for a minimum¹⁹ of six daylight hours on at least two consecutive days.
 - iii.** Repeat trapping until no Nooksack Dace are captured (this may take several days; using more traps may shorten the time required).
 - iv.** Seine (refer to Sections 5.4 and 5.5) shallow pools.²⁰
 - v.** If the enclosed area can be waded, use a maximum of three backpack electrofisher passes (refer to Section 5.6); or, if the habitat is to be destroyed, continue until no Nooksack Dace are captured in two consecutive passes.
- D.** Handle the Nooksack Dace gently (refer to Section 6).
- E.** Release²¹ the Nooksack Dace.
 - i.** As they have very small home ranges, following recovery release the Nooksack Dace into the closest suitable habitat (within 50 m when feasible) where they are unlikely to be re-captured.

¹⁴ Dosage may vary as efficacy is affected by body size, density of fish, and water quality. Euthanasia is achieved once opercular movements have ceased, and opercular colouration becomes pink.

¹⁵ <http://www.beatymuseum.ubc.ca/fish-collection>.

¹⁶ <http://royalbcmuseum.bc.ca/nh-collections/ichthyology/>.

¹⁷ If seining is infeasible, use splashing, physical disturbance and/or short bursts of low-voltage electrofishing.

¹⁸ If a seine was used to clear fish, it can serve as the second stop-net; simply secure the seines' ends to shore at the end of the sweep to form the enclosure.

¹⁹ A minimum soak time for trapping (as opposed to a maximum) is described for the salvage protocol because the intention is to remove as many Nooksack Dace as possible before a project near water is initiated.

²⁰ Fry school in backwater pools and immediately upstream of riffles in depths of less than 30 cm between July and October. Adults and older juveniles may also be found in pools under very low flow conditions.

²¹ Additional legislation may apply to translocations.

APPENDIX 1: HABITAT TYPE MAPS FOR NOOKSACK DACE STREAM REACHES

The following maps are intended for concurrent use with Table 1, to determine any associated work windows for a given stream reach. Species presence and habitat types identified on the maps are based on best available information and are subject to change. Uncategorized stream reaches may also support Nooksack Dace.

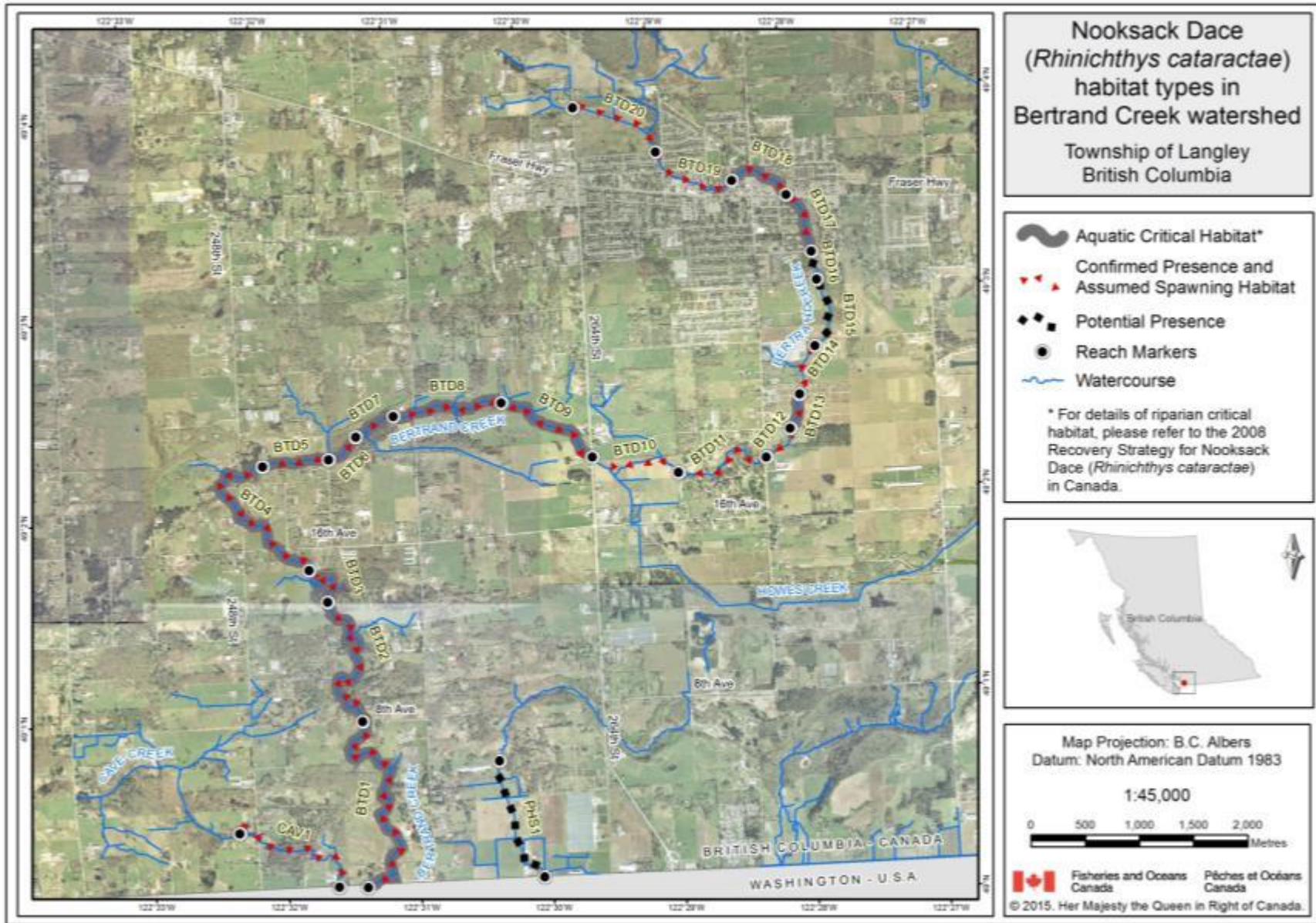


Figure A1. Habitat types for Nooksack Dace stream reaches in the Bertrand Creek watershed.

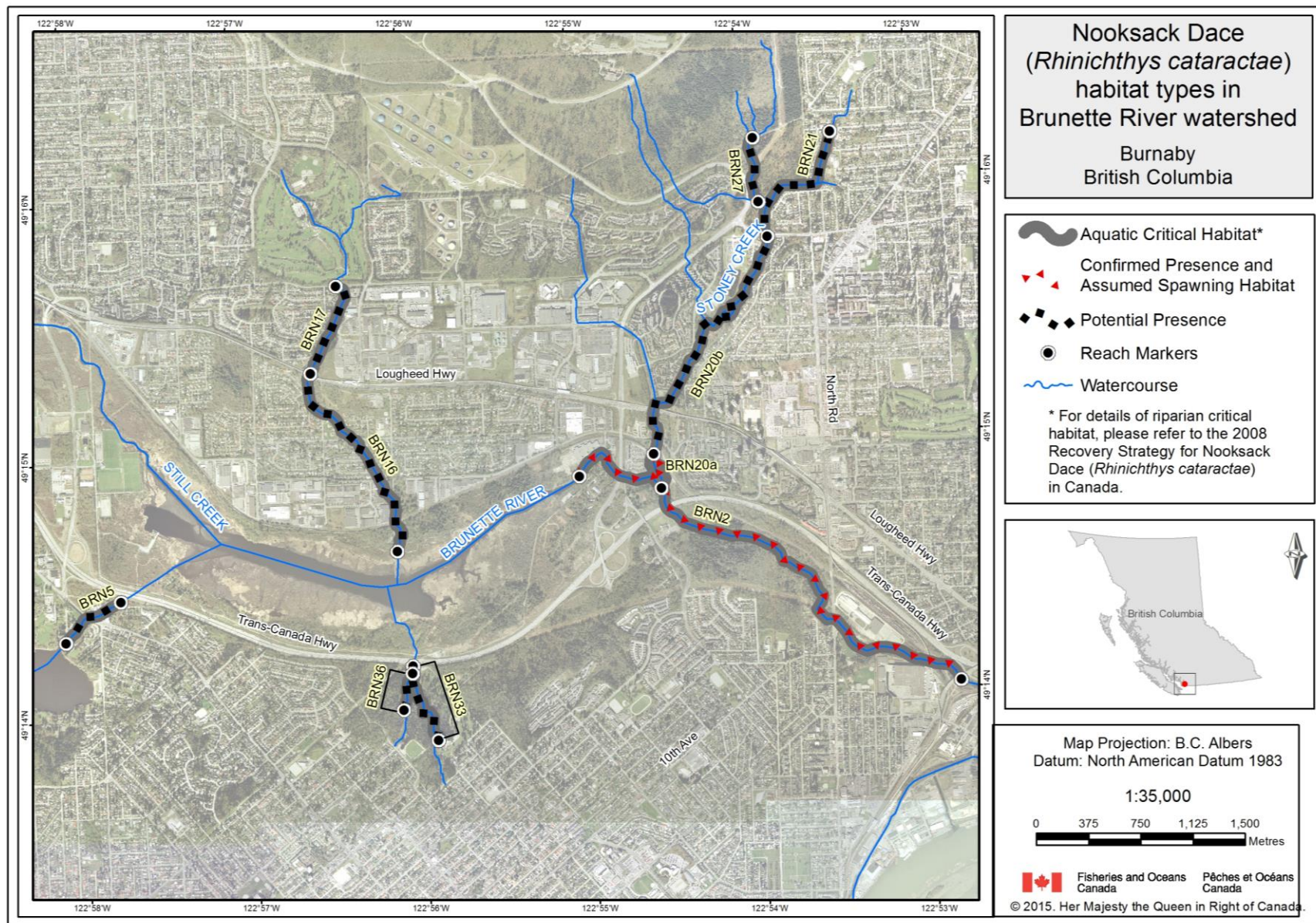


Figure A2. Habitat types for Nooksack Dace stream reaches in the Brunette River watershed.

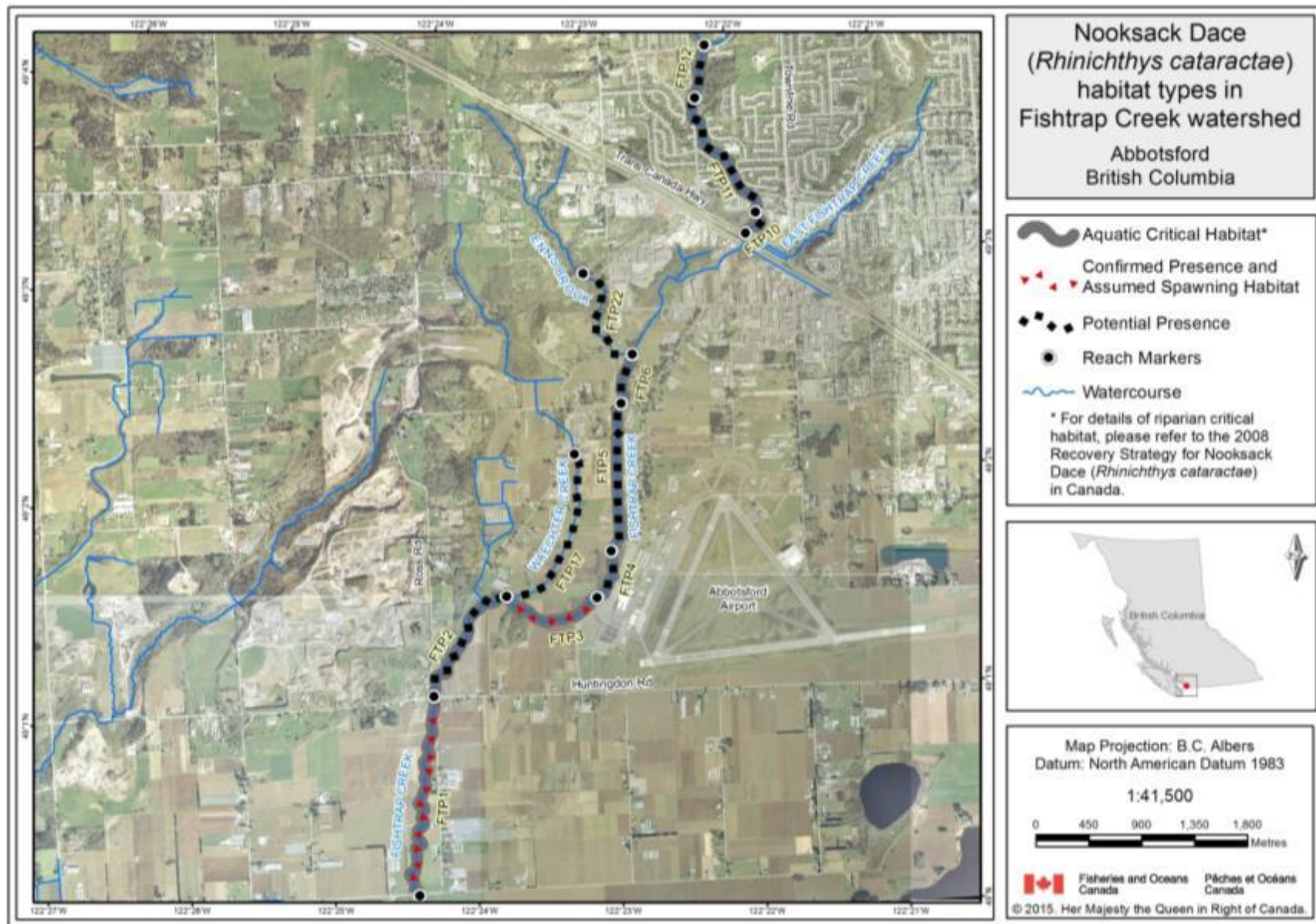


Figure A3. Habitat types for Nooksack Dace stream reaches in the Fishtrap Creek watershed.

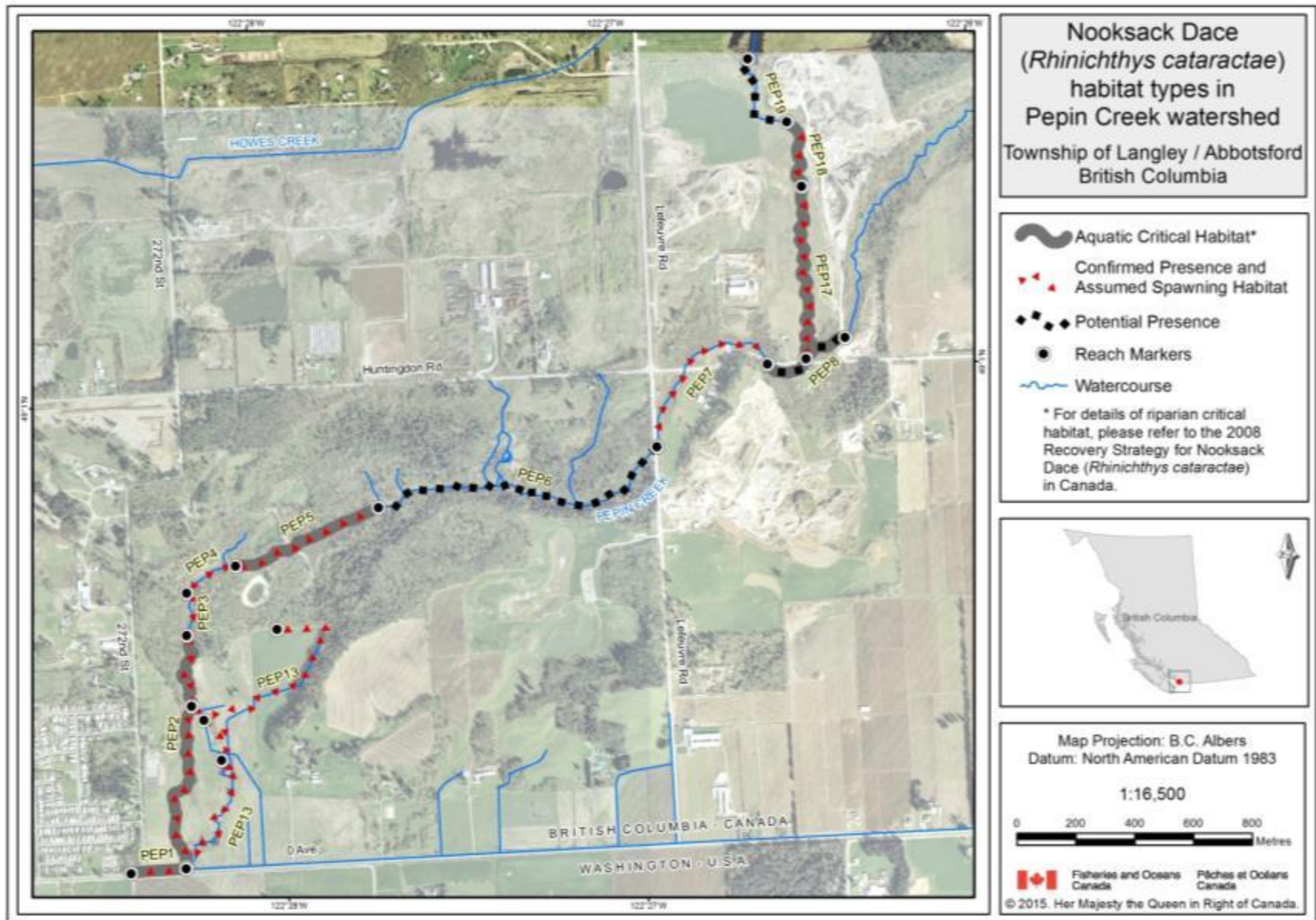


Figure A4. Habitat types for Nooksack Dace stream reaches in the Pepin Creek watershed.