Fish Habitat Restoration Methods Concept Specification

Digger Logs

Purpose:

- To support a riffle upstream and create a pool downstream to enhance trout and salmon habitats and develop aquatic habitat diversity.

Conditions Where Applicable:

- Instream location and sizing must be approved by an Adopt-A-Stream Biologist.
- In a stream with low to moderate grade (up to 3%), with gravel-cobble substrate, and where natural flows and currents can be allowed to shape the streambed.
- The log acts as a gradient control holding the riffle/run substrate from washing into the pool. They are not intended to create a significant head difference or plunge pool.

Habitats Created:

- Pool habitats are ideally 45 cm deep or more in low flow but this is dependent on stream size
- Instream cover under the log.
- Sorted substrates removing sands and silt to point bars and flood plain.
- Sorted substrate and pools capture leaf litter and organics, supports larger insect populations for food, provides better spawning gravels and juvenile escape cover, and over-wintering habitats.
- Encourages the development of the thalweg between pools.
- Imitates natural digger log processes in streams.

Advantages:

- If positioned correctly, a digger log will create a pool that will not fill in.
- Creates overhead instream cover and helps develop a proper riffle/pool ratio and sorted gravels in disturbed streams.
- Can be built with on-site materials in remote or poorly accessible forested areas.

Disadvantages:

- If not positioned/anchored correctly, digger logs will wash away, do nothing or further disturb habitat.
- Can be labour intensive to install.
- Structure must be checked regularly to make sure it is still functioning correctly.

Design Criteria:

- The digger log should be placed at the head of a natural pool or at the location the restoration design determines a pool should be developed. These pools are very close to six channel widths apart based on the channel width of a 1:2 year mean daily flow channel and are on alternating sides of the stream.
- Proper placement is critical to their success in creating habitat diversity. They must be placed at locations where the existing flow is establishing a pool. Proper siting in this pattern is critical and must be determined or checked by AaS staff. .
- Logs are most effective in streams under 6 m (20 ft) wide.
- Log diameter is typically 15 cm (6 in.) to 25cm (8 in.) on the small end with a minimum of taper from one end to the other. The log diameter for a particular site will be specified by the AaS staff as the diameter changes based on the stream width and bank heights.
- The digger log must be firmly anchored to the substrate.
- It should be placed on a 30^{o} angle from straight across the stream and, when looking downstream, turned toward the side the pool is on.
- The upstream end of the log should be set 15cm or more lower than the rest of the log to concentrate low flows on the pool side of the stream.
- The ends of the log must fit tightly to the banks and be well rocked in place to prevent erosion of the banks. Some fact sheets call for the ends of the log to be set up to 1 m into the bank. This is not necessary in most Maritime streams unless the log is in a gravel bar or other soft bank material.
- A rock ramp should be built, sloping the streambed up to the log. Typically, this means a 1 - 3 m (3 - 10 ft) long ramp on the upstream side.
- Cobble and large rocks armouring the surface should be removed from the pool area to assist the scour by the flows.
- The thalweg location for digger logs is the low end of the log.
- Digger logs can be used in combination with deflectors in over widened watercourses. The digger log is an extension of the downstream end of a deflector.
- Logs work with the stream flows to sort gravel and shape pools, riffle and thalweg. This typically takes two to three years to fully form.
- Logs and ramps need periodic maintenance until the stream has achieved its new form and vegetation has stabilized the new banks.
- The logs work with the flows to create the habitats. The substrate that is scoured from the pool area is needed to build the point bar and shape the channel.
- When the pool has formed, the cobble and large rocks that were removed initially may be replaced to provide juvenile instream cover as needed.

Digger Log with Deflector:

- The deflector is typically installed on the downstream end of the digger log. In some cases deflectors may be placed on both ends of the log.
- Its tip is at the edge of the channel design and all dimensions, angles and form are the same as described on the deflector fact sheet.
- The deflector will help dig a longer pool and speed the narrowing of the over-widened stream.
- This combination gives the benefits of both structures.

Implementation Steps:

- Follow the design for location and layout provided or approved by the AaS staff.
- Preferably use hardwood logs of appropriate size because they withstand scour with fine gravels and sand bedload better than softwoods.
- Place digger log into stream, firmly anchoring it to the substrate with re-bar.
- Build a good rock ramp on the upstream side. Remember that the log will undercut so the rock against the log must be large enough not to fall through. If large rock is not available, lay another log along the top side of the digger log making the structure two logs wide to provide a wider area for the undercut and then smaller rock can be used for the ramp. It is not acceptable to use fencing or geotextiles in stream for this purpose as they plug with sand and silt preventing the ramp from being used as a spawning area.

References:

DFO fact sheets (1994).

Thaumas Environmental Consultants Ltd. 2005. Personal Communication.

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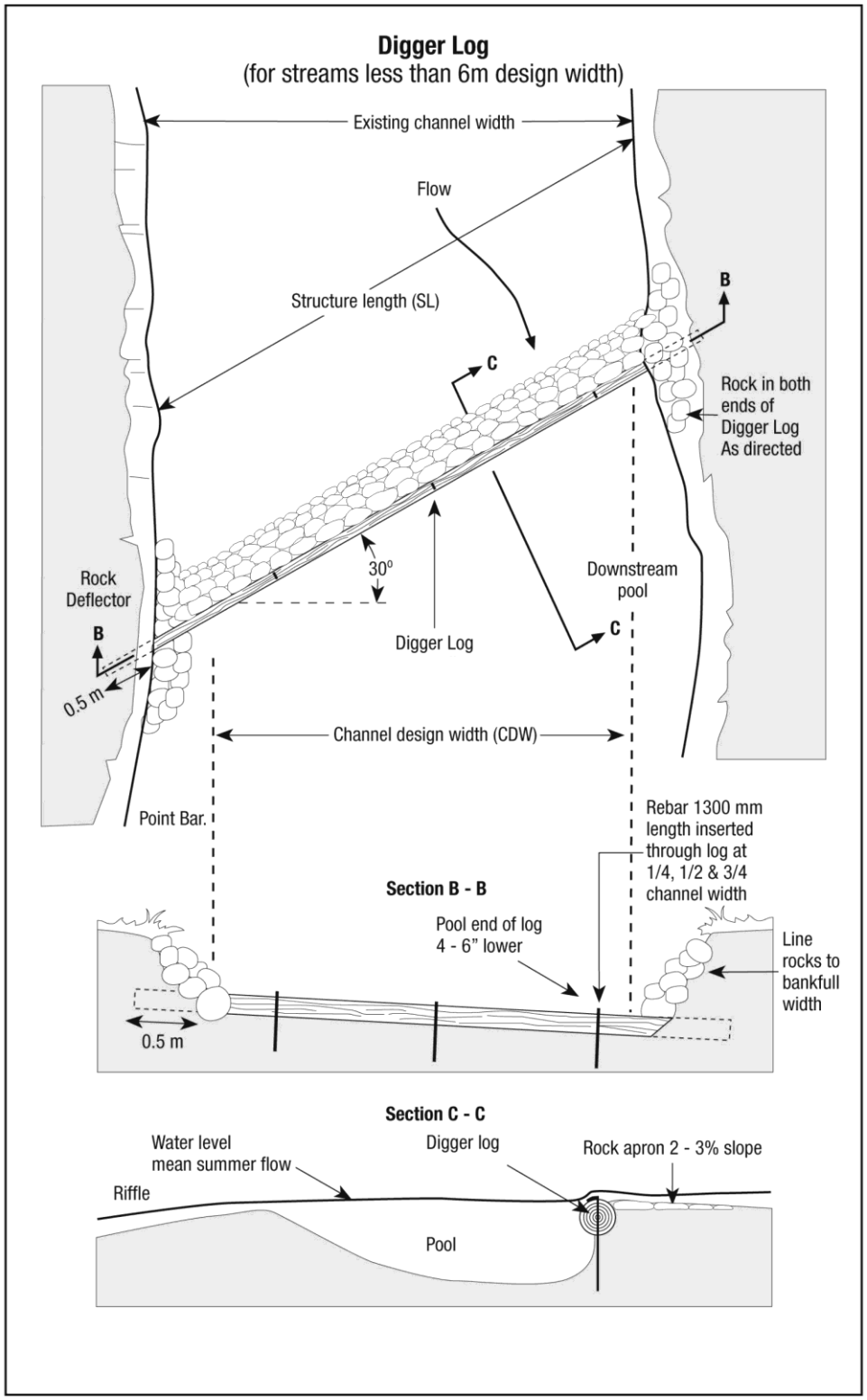

Figure 1. Conceptual drawing of a digger log (Thaumas Environmental Consultants Ltd.).