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## **8.0 GLOSSARY**

**ALUS or Alternative Land Use Services Program:** Provides government assistance to landowners by a) allowing trees to be established in buffer zones b) retiring sensitive land and c) conserving land using soil conservation structures.

**Anadromous:** Fish that reproduce in fresh water and also spend a part of their life in the marine environment.

**Anchor ice:** Frazil ice that has aggregated on woody debris and substrate, often filling the stream channel and causing flooding into the riparian zone, even during low flow conditions.

**Anoxia:** An absence of oxygen in some portion of the water column.

**Aquaculture:** The farming or culturing of aquatic organisms in marine and fresh water environments.

**Atlantic salmon:** The Atlantic salmon (*Salmo salar*) is the only species of the genus *Salmo* that is native to northeastern North America. It has both landlocked and anadromous forms but only populations of the anadromous form are found on Prince Edward Island.

**Biodiversity or biological diversity:** The variety and variability within and among living organisms and the ecological complexes in which they occur, the diversity they encompass at the ecosystem, community, species, and genetic levels, and the interaction of these components.

**Barrier beach pond:** A natural pond formed inside sand dunes that may have varying degrees of salinity throughout the year.

**Base flow:** The contribution of ground water discharge (springs and seeps) to total stream flow, excluding contributions of surface runoff.

**Black salmon:** A spent or spawned-out adult salmon, also referred to as a “kelt”.

**Brush mat:** brush material anchored on point bars to catch and stabilize sediment.

**Clay road:** A country road surfaced with clay or shale, without benefit of gravel or asphalt.

**Cobble:** Substrate material, sometimes referred to as rubble, that is roughly the size of a human head.

**Conservation:** Planned management of a natural resource to prevent its loss or degradation. For Atlantic salmon, success in achieving conservation refers to the number of adult spawners or fertilized eggs deposited in the substrate in relation to that required to achieve maximum sustained yield.

**Drainage basin:** All land and water surface area inside a watershed boundary. On Prince Edward Island, the terms “watershed” and “drainage basin” are sometimes used interchangeably.

**Drowned river valleys:** Deep channels that formed from glacial melt water which were submerged with rising seawater, a process which created many large estuaries around Prince Edward Island.

**Electrofishing:** Use of an electric current to temporarily stun fish so that they can be netted.

**Ephemeral streams:** Streams which flow for part of the year, particularly in spring, and are dry at other times of the year.

**Estuary:** A semi-enclosed body of water, connected to the ocean, where salt water is measurably diluted with fresh water from surface or ground water inputs.

**First order stream:** Stream that originates from a point source, such as a spring, before joining other first order streams to then become known as a second order stream.

**Frazil ice:** Ice crystals that form and grow in super-cooled water. Frazil ice is sometimes obvious downstream from riffles in very cold weather.

**Grilse:** A term used to refer to an adult salmon less than 63 cm in fork length and which generally has spent only one winter at sea.

**Habitat Suitability Index:** The manner in which habitat features, such as water temperature, water velocity or substrate roughness, affect particular life stages of fish species.

**Hardpan:** Smooth stream bottom composed of sandstone with little cover for fish.

**Head of tide:** The furthest region upstream where tidal push raises water height in the stream.

**Head of water:** Water which was stored behind dams to run various types of mills.

**Habitat Unit:** 100m<sup>2</sup> of stream surface area.

**High graded forests:** Harvest of the best quality trees while leaving the poor quality ones to produce future forests.

**Hymac:** A large capacity excavator

**Index population:** Those populations of salmon or other fish that are biologically monitored and assumed to reflect the general health and stock status of their neighboring populations

that are generally similar in terms of life history characteristics and the habitat type of the rivers in which they are produced.

**Hypoxia:** Low oxygen levels.

**Impoundment:** A pond or lake created by a dam.

**Instream sediment trap:** A deep hole excavated in a slow water section of a watercourse to trap fine sediment.

**Kelt:** A spent or spawned-out adult salmon, also referred to as a “black salmon”.

**Land stewardship:** The act of caring for the land through sustainable management practices.

**Large woody debris:** Trunks of trees or large branches that stabilize stream substrate material, provide cover for innumerable stream organisms and generally are very valuable components of stream habitat.

**Lentic:** Standing water, as in ponds and lakes.

**Lotic:** Running water, as in streams.

**Mitigation:** Actions taken during the planning, design, construction and operation of works and undertakings to alleviate potential adverse effects on the productive capacity of fish habitats.

**Multi-Sea-Winter (MSW) or Salmon:** A salmon for which two or more winters have elapsed since migrating from the river as a smolt and which is generally more than 63 cm in fork length.

**Nursery habitat:** Sections of stream habitat used by young-of-the-year and yearling (1+) parr.

**Nutrient enrichment:** A process which increases nutrient inputs into ground water or surface water, often resulting in excessive production of organic matter in the aquatic system.

**Pool:** A deep, slow moving section of stream often with cover such as boulders, large woody debris, overhanging bank vegetation or undercut banks.

**Post-smolt:** A juvenile salmon from the time that it departs the river as a smolt until it completes its first winter at sea, when it becomes a one-sea-winter salmon.

**Precocial parr:** Young salmon in fresh water that can mature prematurely and fertilize eggs from returning female salmon.

**Protocol:** Rules of any procedure, such as electrofishing.

**Riffle:** Shallow, fast flowing broken surface water (over 20 cm/sec velocity; 10-40 cm depth).

**Riparian Zone:** The ecologically sensitive, vegetated zone along the borders of any watercourse from upland springs to the ocean.

**River reach:** A term used to describe a section of stream which has similar physical characteristics, such as gradient and substrate.

**Row crop:** Any farm crop that is spaced to allow cultivation between rows such as potatoes, carrots, cole crops and corn.

**Run:** Deep, fast flowing unbroken surface water (over 60 cm/sec velocity; over 40 cm depth).

**Run-around bypass pond:** Water diversion around a pond site which carries a portion of outflowing water from the impoundment.

**Salmon parr:** A term used to identify young salmon in fresh water after their first year of life and before their transformation to smolts.

**Salmon berth (stand):** Commercial netting site in salt water for capture of salmon.

**Second order stream:** A term used to describe a stream formed from the joining of two first order streams. When two second order streams unite, the result is a third order stream.

**Self-sustainability:** Used to refer to a population that is able to maintain itself over an extended period of time.

**Semi-natural rearing:** Refers to an enhancement technique in which salmon parr are kept for their second year in a natural pond before being released as smolts. The return rate of these smolts from sea exceeds that of smolts stocked directly from a hatchery.

**Shade-intolerant trees:** Refers to trees that grow well in open sunlight, for example aspen and pincherry.

**Smolt:** Fully silvered juvenile salmon during its seaward migration and with physiological capability to survive transition from fresh water to salt water.

**Soil conservation structures:** Physical structures in fields that reduce soil losses, such as diversion terraces and grassed waterways.

**Spawning:** The reproductive ritual involving egg fertilization and in the case of salmon in natural streams and rivers, the deposition of those eggs in the gravel riverbed.

**Stock (or biological stock):** Any group of interbreeding organisms that is reproductively isolated from other groups of the same species.

**Two-Sea-Winter (2SW) Salmon:** A salmon for which two winters have elapsed since migrating from the river as a smolt and which is generally equal to or more than 63 cm in fork length.

**Watershed:** The land base bounded peripherally by the water draining into a particular watercourse, which in this instance includes a river system and all its tributaries or the collection of river systems and all their tributaries. In Prince Edward Island, the term “drainage basin” is often used interchangeably with the term “watershed”.

**Watershed management:** The sustainable management of forests, fields, watercourses, natural areas, sensitive habitat and the wildlife that depend upon them.

**Wild salmon:** The progeny of salmon that have spawned naturally.

**Winter ice roads:** Ice roads used for winter transport across frozen water bodies; often flagged with small conifer trees as a guide during inclement weather.

**Young-of-the-year (YOY) salmon:** Juveniles, sometimes referred to as 0+, during their first summer after hatching.

**APPENDIX I – Outline for a simple watershed management strategy**

### **Project Management Strategies for Salmon Rivers Where Watershed Groups are Involved<sup>1</sup>**

1. Obtain community and landowner support.
2. Develop a simple, long term work plan with appropriate timing for each activity.
3. Obtain required permits in a timely fashion.
4. Secure training for at least one project leader and develop close ties with knowledgeable regional coordinators and others for expert advice. Coordinators must be appropriately trained and should be given more responsibility. This may require additional personnel.
5. Obtain landowner permission for all access, explain projects to landowners and keep them updated.
6. Develop a walking trail and remove (with permission) all old barbed wire along the stream.
7. Identify all fish blockages and develop a beaver management program (if applicable). This will include the removal of all inactive and/or active dams and in some cases, beavers, in identified areas.
8. Identify all sources of sediment input to the system (e.g. agricultural fields, roads, culverts, development, instream). Walk all tributaries during the month of April for best information. Begin work with landowners and appropriate government agencies as soon as possible.
9. Construct sediment traps (instream or bypass ponds and brush mats) before other work is undertaken (with exception of beaver dam removal).
10. With the help of government agencies, expand buffers and work to change land use in sites that cause regular input of sediment into the watercourse.
11. Only after the above steps are taken should instream work begin (other than fish passage and sediment work already undertaken). This requires careful prescriptions from knowledgeable field personnel.
12. Monitor progress and quality of work completed. Do not continue to fund “huff and puff” projects.

<sup>1</sup>Not all rivers with salmon runs have active watershed groups. Where effective watershed groups do not exist, some government agency should be mandated to manage the river for anadromous fish.

**APPENDIX II – Habitat Suitability Indices for Atlantic salmon and other anadromous fish**

Source: Department of Fisheries and Oceans

Rating and Score for Habitat Variables

| Rating    | Score |
|-----------|-------|
| no use    | 0     |
| some use  | 1     |
| good      | 2     |
| very good | 3     |

Habitat Suitability Index for Rainbow Smelt.

| Habitat Variable               | Criteria | Ratings for Life Stages |        |                |
|--------------------------------|----------|-------------------------|--------|----------------|
|                                |          | Egg                     | Larval | Juvenile/Adult |
| Average Water Temperature (°C) | 0-2      | 0                       | 0      | 0              |
|                                | 2-4      | 0                       | 0      | 0              |
|                                | 4-6      | 1.5                     | 1      | 1              |
|                                | 6-8      | 3                       | 2.5    | 2.5            |
|                                | 8-10     | 3                       | 3      | 3              |
|                                | 10-12    | 1                       | 3      | 3              |
|                                | 12-14    | 0                       | 2.5    | 2.5            |
|                                | 14-16    | 0                       | 1.5    | 1.5            |
|                                | 16-18    | 0                       | 0.5    | 0.5            |

**Other Habitat Characteristics and their Suitability for Rainbow Smelt**

Alewife spawn at water temperatures between 4-18 °C; the peak is 6-9 °C  
 Pelagic fish dwell in midwaters of lakes, onshore coastal waters, and rivers. Water depth is used for overhead cover  
 Slow moving water is generally acceptable. Swift current is good for spawning  
 Optimum level of dissolved oxygen is > 5 mg/l; less than 3.5 mg/l may be lethal  
 High total dissolved solids affect spawning; < 1.5 ppt preferred

Habitat Suitability Index for Alewife.

| Habitat Variable                | Criteria    | Ratings for Life Stages |                |
|---------------------------------|-------------|-------------------------|----------------|
|                                 |             | Egg                     | Juvenile/Adult |
| Average Water Temperature (°C)  | 8           | 0                       | 0              |
|                                 | 8-10        | 0                       | 1              |
|                                 | 10-12       | 1                       | 1.5            |
|                                 | 12-14       | 2.5                     | 2              |
|                                 | 14-16       | 3                       | 3              |
|                                 | 16-18       | 2                       | 3              |
|                                 | 18-20       | 1                       | 3              |
|                                 | 20-22       | 0                       | 2.5            |
|                                 | 22-24       | 0                       | 1              |
| 24                              | 0           | 0                       |                |
| Average Water Velocity (cm/sec) | 0-4         | 1.5                     | 1.5            |
|                                 | 4-6         | 3                       | 3              |
|                                 | 6-20        | 3                       | 2              |
|                                 | 20-25       | 2                       | 1.5            |
|                                 | 25-30       | 2                       | 1              |
|                                 | 30-45       | 1                       | 1              |
|                                 | 45          | 0                       | 0              |
| Substrate (Dominant)            | silt        | 1                       | 1              |
|                                 | sand        | 3                       | 3              |
|                                 | gravel      | 3                       | 3              |
|                                 | rubble/rock | 2                       | 2              |
|                                 | boulder     | 1                       | 1              |
|                                 | bedrock     | 1                       | 1              |
|                                 | mud         | 0                       | 0              |

**Other Habitat Characteristics and their Suitability for Alewife**

Depth is not important  
 Eggs are most common at shallow depths of 15-30 cm  
 Juveniles and adults move from shallow to moderately deep water depending on the time of day and weather conditions e.g. found in shallow waters during overcast days or at night, and in deeper waters during the daylight hours  
 Sea-run alewife spawn in slow moving waters of streams <sup>or ponds</sup> above the head of tide

often far up river

Habitat Suitability Index for Brook Trout and Rainbow Trout.

| Habitat Variable   | Criteria          | Ratings for Life Stages |          |       |
|--|-------------------|-------------------------|----------|-------|
|  |                   | Egg                     | Juvenile | Adult |
| Average Water Temperature (°C)   | 0                 | 0                       | 0        | 0     |
|  | 0-3               | 1                       | 0.5      | 0.5   |
|  | 3-6               | 2                       | 1        | 1     |
|  | 6-9               | 3                       | 1.5      | 1.5   |
|  | 9-12              | 3                       | 2.5      | 2.5   |
|  | 12-15             | 2.5                     | 3        | 3     |
|  | 15-18             | 1.5                     | 2        | 2     |
|  | 18-21             | 1                       | 1        | 1     |
|  | 21-24             | -                       | 0.5      | 0.5   |
| 24   | 0                 | 0                       | 0        |       |
| Average Water Depth (cm)   | 10                | -                       | -        | 0     |
|  | 10-15             | -                       | -        | 1     |
|  | 15-30             | -                       | -        | 2     |
|  | 30-60             | -                       | -        | 3     |
|  | 60                | -                       | -        | 2     |
| * juvenile and adult readings during the warmest part of the year  |                   |                         |          |       |
| * egg readings during time of incubation   |                   |                         |          |       |
| Average Water Velocity (cm/sec)  | 0-15              | 1                       | -        | -     |
|  | 15-30             | 2                       | -        | -     |
|  | 30-60             | 3                       | -        | -     |
|  | 60-75             | 2                       | -        | -     |
|  | 75-90             | 1                       | -        | -     |
|  | 90                | 0                       | -        | -     |
|  | upwelling         | 3                       | -        | -     |
| Substrate (dominant type)  | clay              | 0                       | 1        | 1     |
|  | silt              | 0                       | 1        | 1     |
|  | sand              | 1                       | 1        | 1     |
|  | gravel            | 3                       | 2        | 2     |
|  | rubble/rock       | 2                       | 3        | 3     |
|  | boulder           | 1                       | 2        | 2     |
|  | fractured bedrock | 0                       | 1        | 1     |
|  | solid bedrock     | 0                       | 0.5      | 0.5   |
|  | mud, detritus     | 0                       | 1        | 1     |
| * silt and vegetation will lower values - estimate 10% silt equals a zero value for spawning                             |                   |                         |          |       |
| * for spawning to receive a value of 3, up to 20% cobble and up to 15% sand are allowed, if there is at least 40% gravel |                   |                         |          |       |
| Percentage of Instream Cover   | 0-6               | -                       | 1        | 1     |
|  | 6-12              | -                       | 2        | 1     |
|  | 12-14             | -                       | 2        | 2     |
|  | 14-22             | -                       | 3        | 2     |
|  | 22                | -                       | 3        | 3     |

Habitat Suitability Index for Brook Trout and Rainbow Trout...Continued

| Habitat Variable   | Criteria                        | Ratings for Life Stages |          |       |
|--|---------------------------------|-------------------------|----------|-------|
|  |                                 | Egg                     | Juvenile | Adult |
| Percentage of Pools  | 0-15                            | 0                       | 1        | 1     |
|  | 15-35                           | -                       | 2        | 2     |
|  | 35-65                           | -                       | 3        | 3     |
|  | 65-85                           | -                       | 2        | 2     |
|  | 85-100                          | -                       | 1        | 1     |
| * during late summer or low water conditions   |                                 |                         |          |       |
| Percentage Bank Stabilization  | 0-50                            | 1                       | 1        | 1     |
|  | 50-75                           | 2                       | 2        | 2     |
|  | 75-100                          | 3                       | 3        | 3     |
| * by rooted vegetation and up to 30% boulder   |                                 |                         |          |       |
| Percentage of Pool Type (estimate as a percentage of total wetted area of stream)  | 10% 1st class and 50% 2nd class | -                       | 1        | 1     |
| 1st Class Pool - large and deep (1.5 m), more than 30% pool bottom obscured by depth, surface turbulence or structure, can hold several adult trout  | 10-30% 1st class                | -                       | 2        | 2     |
| 2nd Class Pool - moderate size and depth, between 5-30% bottom obscured by depth, surface turbulence or structure, can hold several adult trout  | > 50% 2nd class                 | -                       | 3        | 2     |
|  | > 30% 1st class                 | -                       | 2        | 3     |
| 3rd Class Pool - small, shallow, or both. Cover if present, is surface turbulence or very limited. Structure, e.g. wide, shallow pool areas of streams, small eddies behind rocks. Holding area for 1 or 2 adult trout | > 65% 1st class                 | -                       | 1.5      | 2     |
|  | > 85% 1st class                 | -                       | 1        | 1.5   |
| <b>Other Habitat Characteristics and their Suitability for Trout</b>   |                                 |                         |          |       |
| <u>Brook Trout</u>   |                                 |                         |          |       |
| Redds found in areas of ground water upwelling in streams and ponds  |                                 |                         |          |       |
| Temperature range for incubation is 0-20 °C, optimum of 4-14 °C  |                                 |                         |          |       |
| Temperature range for adults is 0-24 °C, optimum at 9-16 °C  |                                 |                         |          |       |
| Velocity range of 0-90 cm/sec, optimum is 30-60 cm/sec   |                                 |                         |          |       |
| Dissolved oxygen required >5 mg/l  |                                 |                         |          |       |
| pH tolerance of 4.0-9.5  |                                 |                         |          |       |
| Minimum water depth of 15 cm   |                                 |                         |          |       |
| <u>Rainbow Trout</u>   |                                 |                         |          |       |
| Spawn exclusively in streams   |                                 |                         |          |       |
| Redds located at head of a riffle or downstream edge of a pool   |                                 |                         |          |       |
| Temperature range for incubation is 0-20 °C, optimum 7-10 °C   |                                 |                         |          |       |
| Temperature range for adult is 5.5-20 °C, optimum 11-14 °C   |                                 |                         |          |       |
| Velocity range of 10-90 cm/sec, optimum 30-70 cm/sec   |                                 |                         |          |       |
| Dissolved oxygen required >3 mg/l  |                                 |                         |          |       |
| pH tolerance range 5.5-9.0   |                                 |                         |          |       |
| Maximum water depth 15 cm  |                                 |                         |          |       |

Habitat Suitability Index for Atlantic Salmon.

| Habitat Variable                | Criteria          | Ratings for Life Stages |     |      |
|---------------------------------|-------------------|-------------------------|-----|------|
|                                 |                   | Egg                     | Fry | Parr |
| Average Water Temperature (°C)  | 0                 | 0                       | 0   | 0    |
|                                 | 0-3               | 1                       | 0.5 | 0.5  |
|                                 | 3-6               | 2                       | 1   | 1    |
|                                 | 6-9               | 3                       | 1.5 | 1.5  |
|                                 | 9-12              | 3                       | 2.5 | 2.5  |
|                                 | 12-15             | 2.5                     | 3   | 3    |
|                                 | 15-18             | 1.5                     | 2   | 2    |
|                                 | 18-21             | 1                       | 1   | 1    |
|                                 | 21-24             | 0                       | 0.5 | 0.5  |
|                                 | 24                | 0                       | 0   | 0    |
| Average Water Depth (cm)        | 5                 | 0                       | 0   | 0    |
|                                 | 5-10              | 0                       | 1   | 0    |
|                                 | 10-15             | 0                       | 1   | 1    |
|                                 | 15-20             | 0                       | 2   | 1    |
|                                 | 20-25             | 0                       | 2   | 2    |
|                                 | 25-30             | 0                       | 3   | 2    |
|                                 | 30-35             | 0                       | 3   | 3    |
|                                 | 35-40             | 0                       | 2   | 3    |
|                                 | 40-50             | 0                       | 2   | 3    |
|                                 | 50-60             | 0                       | 2   | 3    |
|                                 | 60-65             | 0                       | 1   | 2    |
|                                 | 65-80             | 0                       | 0   | 2    |
|                                 | 80-115            | 0                       | 0   | 1    |
| 115                             | 0                 | 0                       | 0   |      |
| Average Water Velocity (cm/sec) | 0-20              | 0                       | -   | -    |
|                                 | 20-50             | 1                       | -   | -    |
|                                 | 50-60             | 3                       | -   | -    |
|                                 | 60-70             | 2                       | -   | -    |
|                                 | 70-80             | 1                       | -   | -    |
|                                 | 80                | 0                       | -   | -    |
| Substrate (dominant type)       | sand              | 0                       | 1   | 0    |
|                                 | sand/gravel       | 0                       | 2   | 0    |
|                                 | gravel/sand       | 1                       | 2.5 | 1.5  |
|                                 | gravel            | 2                       | 3   | 3    |
|                                 | rubble            | 3                       | 3   | 3    |
|                                 | rock/boulder      | 1                       | 2   | 3    |
|                                 | boulder           | 0                       | 1.5 | 3    |
|                                 | fractured bedrock | 0                       | 1   | 2    |
|                                 | solid bedrock     | 0                       | 0.5 | 1    |

Habitat Suitability Index for Atlantic Salmon... Continued

| Habitat Variable        | Criteria          | Ratings for Life Stages |     |      |
|-------------------------|-------------------|-------------------------|-----|------|
|                         |                   | Egg                     | Fry | Parr |
| Overwintering Substrate | silt              | -                       | 0   | 0    |
|                         | sand (no silt)    | -                       | 1   | 0    |
|                         | sand/gravel       | -                       | 1.5 | 0.5  |
|                         | gravel            | -                       | 2   | 1    |
|                         | gravel/rubble     | -                       | 2.5 | 1.5  |
|                         | rubble/gravel     | -                       | 3   | 2    |
|                         | rubble/rock       | -                       | 2.5 | 2.5  |
|                         | rock/boulder      | -                       | 2   | 3    |
|                         | boulder/rock      | -                       | 1   | 2.5  |
|                         | boulder           | -                       | 1   | 2    |
|                         | fractured bedrock | -                       | 0.5 | 1    |
|                         | solid bedrock     | -                       | 0   | 0.5  |