

Feature



Figure 5. Rock riffle from culvert outlet that formerly had a 0.54 m drop.

Over the long term, the weir riffle structures may be less stable and the relative elevations will drop slightly. However, the large angular material prescribed and used in construction is expected to keep the structures functional.

Bed material in the weir riffle structures will, at least partially, wash out of the inside of the culverts at the downstream ends, while the one riffle structure will maintain all substrate within the culvert due to key

riffle boulders at the outlet holding material in place.

Recommendations:

Based on observations of this limited test site, we recommend installing a riffle from the lip of a culvert, instead of a backflow weir, whenever feasible. This may not be possible in some situations where culvert capacity is inadequate or the outlet pool is considered an essential habitat feature to be maintained. The benefits of this type of application is that construction is closer to the road surface, so bed material in the culvert is more stable, and riffle slope is less than a downstream weir. It is anticipated that the long-term stability of this technique is better than a downstream weir. The work at the four sites described included hauling 192 cubic yards of angular rock some 50 km, and yet the cost per site was just over \$2,300; thus, it is an economical alternative to culvert replacement, if the existing structure is in good condition and is adequately sized.

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Technical Tip

Watersheds BC: Strategic Information About BC's Watersheds

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Introduction

Geographic Data BC's objective for the Watersheds BC project is to provide decision-makers with comprehensive and easy-to-use information about the land and water resources of British Columbia. These summaries of province-wide GIS databases, containing many measurements that pertain to the cumulative effects of forest practices, are available in highly accessible formats.

We produce two standard products: *Environmental Statistics*, a database that contains 435 relevant statistics for each of the 18,481 watersheds identified in the BC Ministry of Fisheries' Watershed Atlas; and *Map*

Folios, a composite map derived from those input maps most important to the summarization process.

These products can be updated readily when new data become available, as the process for creating them is highly streamlined. The products are also compatible with such office software as Word, Excel, Access, and by map viewing packages including Arc/View.

Product Description

The *Watersheds BC - Environmental Statistics* provides extensive summary information on many relevant land and resource indicators. This information is summarized in a number of categories for each of the province's

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watersheds. For example, statistics on roads in a given watershed include the total length of roads in the specific area (Figure 1). The database is available in the common and widely used "dbf" format. All statistics are reported as a direct measurement of area, length, or count, and also as a percentage or density. This allows a meaningful comparison between watersheds of different sizes. Information is available in the following categories:

- **Roads:** length, density, on forest land, by 3 elevation ranges, on steep slopes, within 100 m of a stream, road-stream crossings.
- **Rivers** (both 1:20 000 and 1:50 000 scale): length, on forest land, mainstem, headwaters, by gradient, length logged.
- **Fish:** known salmon, sport and other fish distributions, 6 salmon species and bull trout, distribution on forest land, urban land, agricultural land.
- **Riparian:** area summaries for land use and land cover for all land within 30 metres of a stream.
- **Forest Land Use:** area summaries for forest land use, also characterized by slope classes.
- **Non-forest Land Use:** area summaries of 15 land use classes.
- **Ecology:** summaries of biogeoclimatic and ecoregion classifications.
- **Terrain:** elevation - min, max, mean, standard deviation:
 - slope - summary by 8 categories
 - aspect - summary by 9 categories.

Product Description

The *Watersheds BC - Map Folios* composite maps indicate some of the most important input map features based on the data used to calculate the Environmental

Statistics. These 1:100 000 scale maps are available in the widely used "JPEG" image format. Spiral bound 11" x 17" books of maps covering 12 regions of B.C. are also available. A portion of an individual map for the Howe Sound area is shown in Figure 2.

Input GIS Databases

Data from the input maps were summarized to produce the *Environmental Statistics* and the composite maps in the *Map Folios*.

• Watershed Atlas

The atlas contains the basic units (18,481 watersheds) used for summarizing and presenting the information. It also allows for aggregation from small to medium to major watersheds based on the watershed code. The size of the basic watershed units varies from 50 to 35,000 hectares (5,000 ha. average), with 1600 watersheds covering Vancouver Island, for example.

• 1:20 000 Base Mapping (TRIM)

Standard base mapping including detailed information on roads, streams and topography (slope, aspect, elevation).

• 1:250 000 Land Use Mapping (BTM)

Land use and land cover information down to units 15 hectare in size. It identifies 20 broad classes, including such features as Old Growth forest, logging (approx. the last 20 years), urban and agricultural areas, and wetlands.

• FISS (Fish Information Summary System)

Fish distribution and fish habitat information.

• Community Watersheds

The location of all community watersheds as defined under the Forest Practices Code.

• Biogeoclimatic / Ecoregion

Ecological classification information.

• MinFile

Information on producing mines and other activities related to mining.

• Crown Land

An overview-level determination of Crown versus private land.

Applications

These new information products will be useful for a wide range of applications, particularly at the strategic and planning levels. The relevance of these products for a range of diverse applications combines with their comprehensive, easy-to-use format to produce a powerful

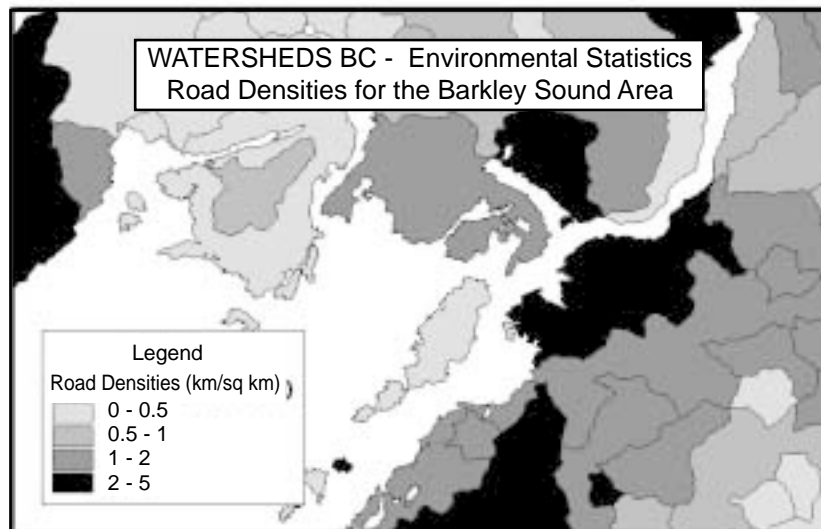


Figure 1. An example of road density information.

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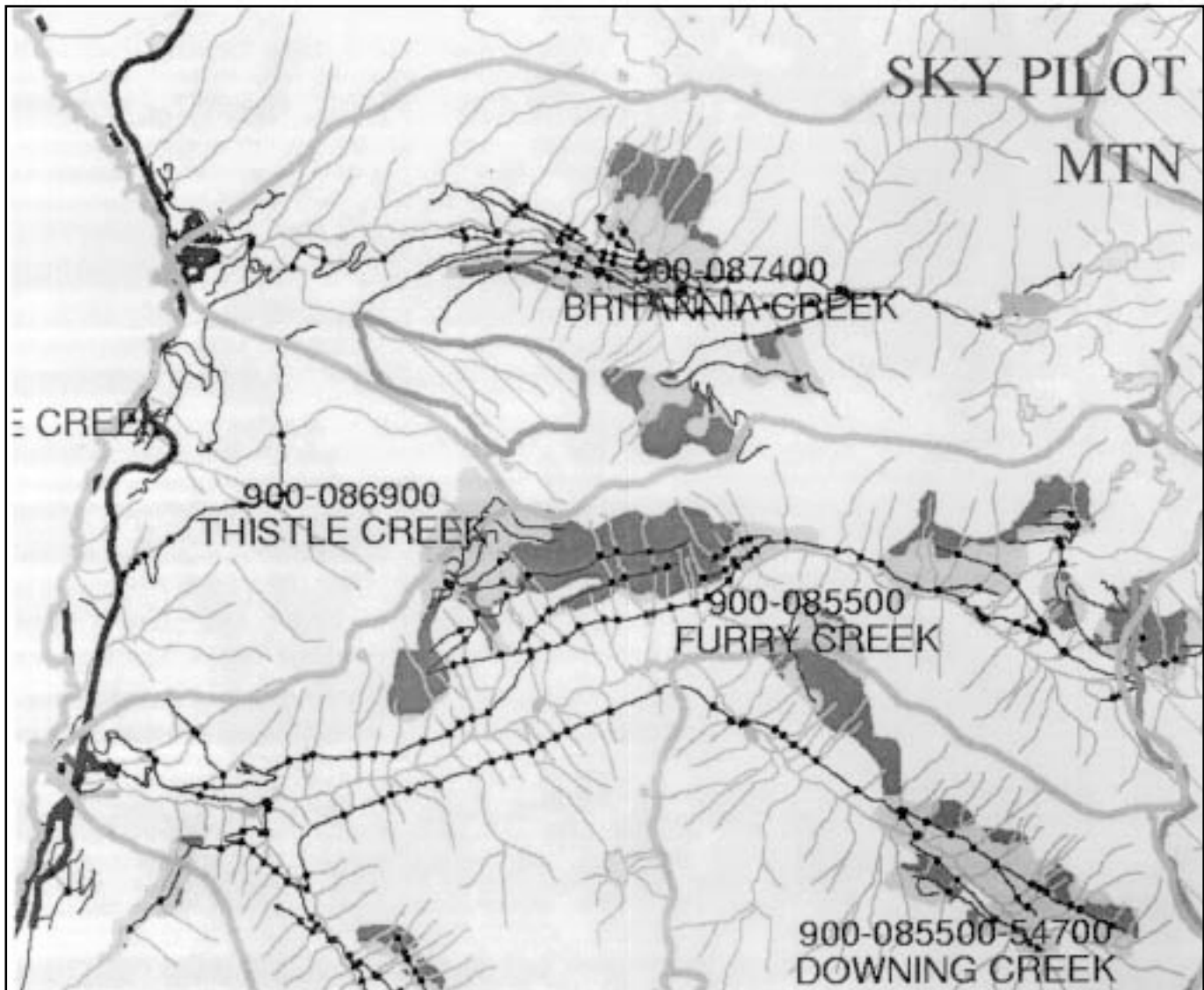


Figure 2. Enlarged view of a portion of the Watersheds BC map of Howe Sound (original in colour).

information tool. Applications include:

- strategic overviews of areas ranging in size from Forest Districts to all of BC,
- comparative analyses of watersheds,
- ranking and prioritizing watersheds based on a wide range of parameters,
- provision of a quantitative basis for expert opinion,
- creation of an extensive (and repeatable) environmental baseline, and
- monitoring, when the input data sets are updated.

The Watersheds BC product will be complete for all of B.C. by November 1999. For further information, please visit the WATERSHEDS BC web site: www.env.gov.bc.ca/gdbc/Watersheds_BC

Please check the website first. Then, if you require further information, contact:

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