

VEGETATION OF CARNATION CREEK  
STREAMBED

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by

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### INTRODUCTION

Carnation Creek Watershed was selected by the Fisheries Service of Environment Canada for an intensive investigation into the effects of forest harvesting operations on salmonid fish populations. The creek, located north of Sarita River, empties into Trevor Channel of Barkley Sound, on the west coast of Vancouver Island. The Canadian Forestry Service undertook the classification and mapping of vegetation and soils of the watershed.

A survey of vegetation and soils of the lower or western portion of the watershed was initiated and completed in 1972 (Oswald, 1973), and was extended to the upper portion of the watershed during 1973 (Oswald, 1974). Because of the importance of vegetation along the stream channel for supplying food and cover for fish, a more intensive survey of the stream-side vegetation was undertaken than that conducted on the upland areas. Results of this investigation are hereby presented as a preliminary report.

### METHODS

Detailed analysis and survey of tree distribution and ground vegetation was conducted from low-level 70-mm color aerial photography (scale approximately 1:2400) by the B.C. Forest Service, using a helicopter equipped with two Hasselblad cameras mounted on a floating boom suspended beneath the aircraft. Conventional panchromatic aerial photographs, at a scale of 1:15,840, were used for broader coverage. Plant species distribution along the banks and the canopy coverage over the stream channel were estimated by traverses up the stream channel and along the

stream banks. The soils were examined along the cut banks of the stream and, in a few locations, in the floodplain. However, because of the intricate heterogeneity of the soils, typical of streams undergoing continual change promoted principally by log jams, no attempt was made to map the soils.

#### RESULTS

The stream consisted of a gently inclined lower reach of about 3100 meters with a floodplain of variable width, a steeply inclined central reach of about 1000 meters containing falls impassible to anadromous fish and possessing virtually no floodplain, followed by another reach of gentle incline. The primary concern of vegetation mapping was in the lower reach (Figure 1); however, some data were also collected for the upper reaches.

The tree cover on the lower reach consisted primarily of western hemlock (Tsuga heterophylla) and western red cedar (Thuja plicata), with some red alder (Alnus rubra), amabilis fir (Abies amabilis) and Sitka spruce (Picea sitchensis). The distribution of conifer species appeared to be at random because no correlation between species occurrence and physical site parameters could be established. Alder required an opening for establishment but, once established, persisted for an indefinite period. Conifers succeeded the alder in most areas, but the rate of succession depended on site conditions; succession is usually slower on wet than on moist sites. Currently, alder forms a narrow discontinuous fringe along the banks of the lower reach and a few clusters occur primarily where alterations in the stream channel have formed suitable conditions (Fig. 1). Alder, rather than conifers, is believed to contribute

more food to fish populations through direct insect drop or by insect eggs and casts deposited in the water during leaf fall.

Along the steep banks of the middle reach, the tree cover consisted of western hemlock, amabilis fir and red cedar. Few alder saplings occurred along this reach because their survival is jeopardized by periodic high flood levels. On the upper reach, the tree cover was essentially the same as on the lower reach.

The understory vegetation on the lower reach was more closely attuned to the physical site characteristics than the tree cover. Salal (Gaultheria shallon) occurred on elevated sites, such as rocky knolls, stumps or logs. Huckleberries (Vaccinium parvifolium and V. ovalifolium) were often present on moist sites and swordfern (Polysticum munitum) on somewhat wetter sites under a forest canopy. Salmonberry (Rubus spectabilis), stink current (Ribes bracteosum), red-berry elder (Sambucus callicarpa) and false azalea (Menziesia ferruginea) occurred on these sites in forest openings and along the stream banks not covered by forest canopy. On dry and moist sites, the predominant forbs included foam flower (Tiarella trifoliata), wild lily-of-the-valley (Maianthemum dilatatum), western trillium (Trillium ovatum) and oak-fern (Gymnocarpum dropteris). The vegetation of the bog and fen sites included skunk cabbage (Lysichitum americanum), Indian hellebore (Veratrum viride), silver-green (Adenocaulon bicolor), maidenhair fern (Adiantum pedatum), bulrushes (Scirpus spp.) sedges (Carex spp.) and sphagnum (Sphagnum spp.). Devils club (Oplopanax horridum) occurred only in one location in the lower reach, where it was represented by very few individuals.

The understory vegetation along the middle reach consisted primarily of deerfern. Swordfern occurred in drainage channels and in

depressions. Salmonberry was present along the stream banks but was represented only by a few scattered individuals. The understory vegetation of the upper reach was similar to the lower reach, except that devil's club was much more prevalent.

Tentative vegetation units were delineated on a map (Figure 1) and named after the most prevalent or characteristic understory species. They could not be seen on the conventional aerial photographs (scale 1:15,840) and only partially on the low-level photographs. Further, orientation was impossible to maintain between the low-level photographs and the stream channel because of inadequate control of overlap between successive stereo-pairs, and because the camera platform skewed in respect to the ground during photography. Therefore, the exact distribution and extent of the communities could not be portrayed from the photographs.

The percentage of coverage over the stream channel provided by the vegetation is indicated in Figure 2. The samples are from designated points measured along the middle of the stream. The species of plants forming the cover was not recorded at each point. Trees consisted primarily of amabilis fir, Sitka spruce, western hemlock and red alder, but occasionally red cedar and rarely Douglas-fir were present. The understory species, providing coverage over the stream, was primarily salmonberry, but occasionally huckleberries, stink current, red-berry elder and ferns contributed a small proportion of coverage.

#### DISCUSSION

Removal of the existing forest canopy along the stream floodplain will, in most cases, allow alder to become more prevalent, as indicated in disturbed areas. Without some means of control, it will retard reforestation

with coniferous species, even if they are planted. Natural regeneration by coniferous species, primarily western hemlock, would be very slow, as indicated by similar situations in surrounding creek channels.

Salmonberry will also become more prevalent when the forest canopy is removed and will contribute to retarding reforestation. Currently it invades almost any area receiving direct sunlight, and is dense along most of the stream bank on the lower reach and in openings on the floodplain not perennially saturated with water. On elevated knolls which become dry during part of the year, salal will be dominant but salmonberry and huckleberries will also be prevalent.

The stream channel will be altered to some extent by logging, if the trees are removed to the stream. Any disturbance of the bank will result in channel alterations because the soil is loose, coarse-textured alluvial material, held in place primarily by plant roots. Log jams in the stream channel caused by logging debris will contribute to alterations and siltation. The extent of alterations will depend on the magnitude and frequency of freshets between disturbance and restabilization by vegetation.

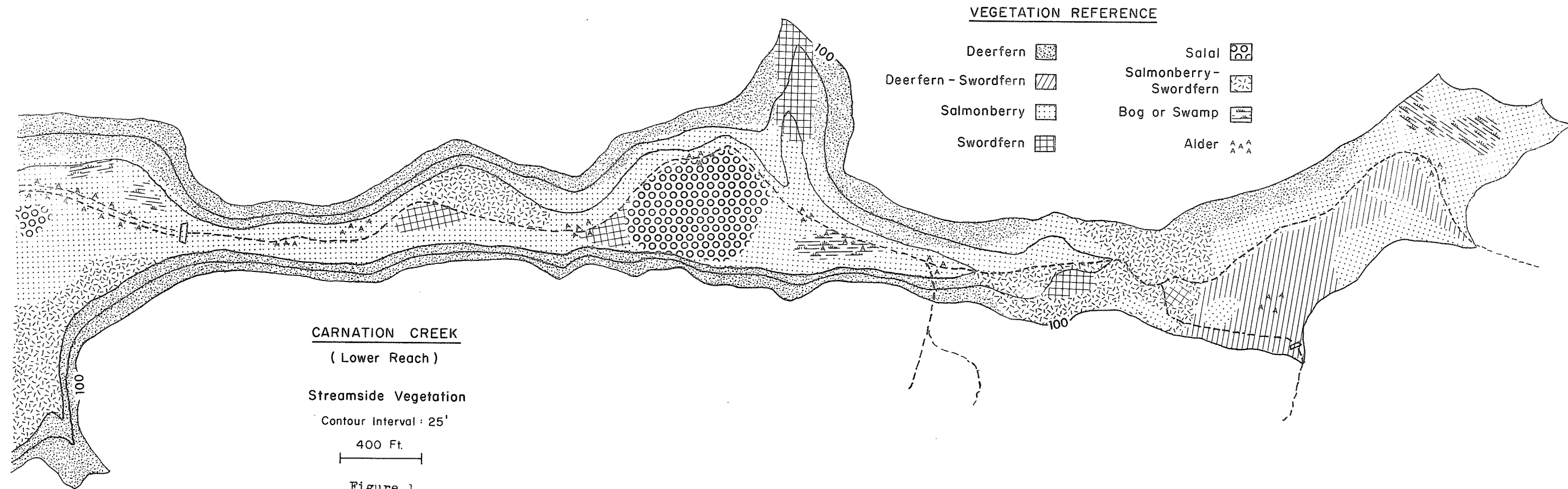
Low-level color photography should be conducted as a monitoring system for effects of logging on the stream and reforestation. However, a contact scale of about 1:5000 should be conducted in conjunction with the 1:2400 scale photography so that the entire floodplain, or most of it, is covered in one rather than two adjacent flight-lines. The smaller scale should also allow for more, or better, control of overlap between successive stereo-pairs. The overlap in the initial photography varied from zero to about 30% because of poor synchronization between ground speed and shutter timing. Lack of overlap prevented ascertaining location when analyzing

the photos. Also, the stereo viewing would be facilitated if successive stereo-pairs had overlap in a vertical plane (Y axis) rather than a horizontal plane (X axis), as in previously conducted low-level photography. This could presumably be achieved by rotating the cameras 90° in the boom mounting.

A future report, bringing together all soils and vegetation survey data collected in the watershed, is planned.

#### REFERENCES CITED

- Oswald, E. T. 1973. Vegetation and soils of Carnation Creek Watershed:  
A progress report. Dept. of Environ. Canadian Forestry Service.  
Int. Rept. BC-43. 38 pp.
- Oswald, E. T. 1974. Vegetation and soils of Carnation Creek Watershed:  
Upper section. Dept. of Environ. Canadian Forestry Service.  
Rept. BC-P-11-74. 15 pp.



VEGETATION REFERENCE

- |                      |  |                         |  |
|----------------------|--|-------------------------|--|
| Deerfern             |  | Salal                   |  |
| Deerfern - Swordfern |  | Salmonberry - Swordfern |  |
| Salmonberry          |  | Bog or Swamp            |  |
| Swordfern            |  | Alder                   |  |

CARNATION CREEK  
( Lower Reach )

Streamside Vegetation

Contour Interval : 25'

400 Ft.  
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Figure 1.

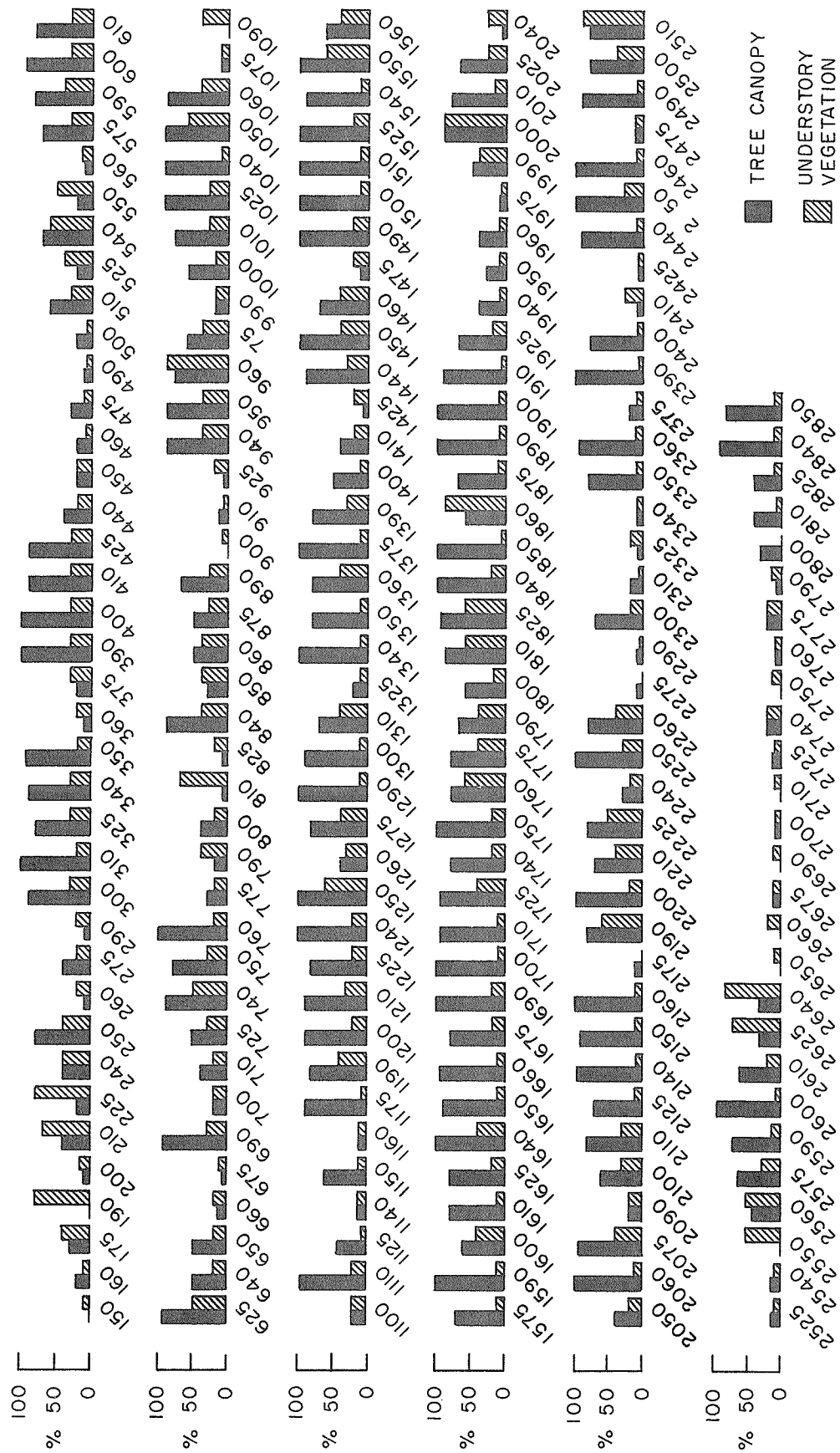


Figure 2. Percentage of closure over the stream channel along the lower reach of Carnation Creek at designated points.