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Investigations of the Hydrological Regime of the Skeena River Alluvial Floodplain - Information Report on FRDA Project 2.11

This project was initiated in response to public concern about the use of herbicides on the environmentally sensitive Skeena Islands and adjacent floodplains. The project has since expanded into a general baseline description of the hydrology of these sites. Included in this study, which began in 1985, is the monitoring and subsequent description of the annual groundwater regime and descriptions of the physical and hydrologic characteristics of the soil. The detailed annual climatic regime has also been documented, including descriptions of how it affected groundwater movement, flooding regime, and the physical characteristics of the soil. The amalgamation and synthesis of the collected data has greatly clarified the understanding of the physical, climatic and hydrological processes that characterize these sites.

Along with the acquisition of baseline information on the hydrological regime of the Skeena alluvial floodplains this study has identified:

1. application windows to minimize entry of various herbicides into the aquatic environment for selected herbicides, based on how the chemical will interact with the soil, and both surface and subsurface water; and

2. the flooding process and how to identify site specific flooding hazard with the use of 1:10 000 aerial photography.

Predictions on the fate of various herbicides, when applied to these sensitive areas, can now be based on some sound environmental information, rather than speculation. Although the fate of the various commonly used forest herbicides (i.e., Vision®, 2,4-D®, Velpar®, Garlon®1) was not actually measured, the environmental conditions that drive the different processes that determine their fate were measured or monitored. This included measurements of soil climate (temperature and moisture) which affects rate of degradation and leaching, description of the mineral and organic soil properties, which both play important roles in chemical adsorption, and description of the groundwater regime and local climate which are the driving forces of any soil movement of the chemical.

Thus, an understanding of the hydrological regime of these aquatically sensitive areas, coupled with the understanding of how the herbicide interacts with this environment will certainly help decision making in respect to determining if herbicides are appropriate on a given site, choosing a suitable window of application, and choosing the type of herbicide that will minimize impacts to aquatic environments.

In addition to the implications that this work has for herbicide applications, it is also providing some much needed insight on the flooding processes and flooding regime of large northern river systems. The islands and adjacent floodplains of the lower Skeena River are rich, productive sites, composed of young soils that are continuously being acted upon (i.e., erosion and accretion) by the regular floodwaters of the river. The successful regeneration of commercial coniferous crops, such as Sitka spruce (Picea sitchensis, Bong, Carr), is highly desirable on these sites. However, Coutts (1981) and Coutts and Philipson (1978) reported the cessation of root elongation of Sitka spruce within a few days of flooding and the subsequent death of the plant if the soil remains waterlogged for extended periods of time. Thus, it is important to be able to identify flooding potential on a site specific basis so that the conversion of these presently NSR brushfields can be achieved with species adapted to site specific moisture conditions.

The two years of monitoring the groundwater and climatic regime of the lower Skeena has helped our understanding of flooding process. In addition to elevation of the site, several other site characteristics determine the frequency and duration of flooding, such as distance of a site to the main channel or a back channel of the river. The monitoring and understanding of the flooding process has led to the development of a flow chart classification scheme that permits the user to identify site specific flooding potential on a flood-frequency/duration classification of I to V. This system is still under development, with several additional ground checks needed to confirm initial findings. This classification scheme can then be used for creating a flood hazard map of any specified area along the river. Because the system is process based, it could be used on several large north-western fluvial systems, such as the Skeena, the Nass and possibly the Kitimat rivers.

1 Mention of a trademark name or proprietary product does not imply its approval by the B.C. Forest Service to the exclusion of other products that may also be available.
This work will generate several reports with the first two expected by the spring of 1989. The first report will focus on the physical description of the floodplains with an in-depth technical explanation of the hydrological processes that characterize these sites. The second report will be focussed more towards the interpretation of the processes, how the knowledge applies to the forest management of fluvial sites, and the answering of specific hydrology related questions that may be encountered when managing these sites for their multiple aquatic and terrestrial resources.

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