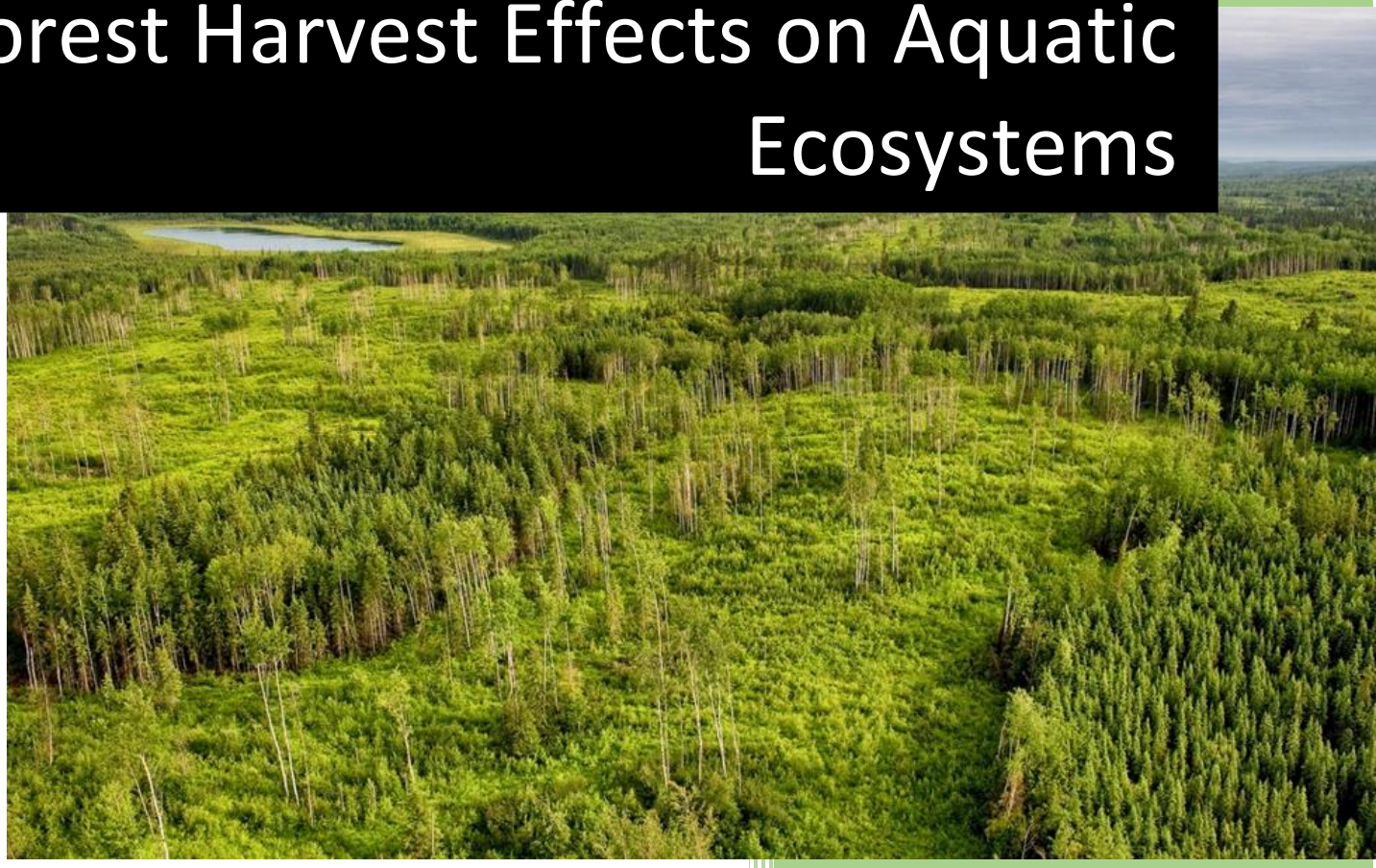
Monitoring Report: Preventing Forest Harvest Effects on Aquatic Ecosystems



Alberta-Pacific Forest Industries Inc.

2024

Introduction

The Canadian boreal forest is a mosaic of land cover from forested upland to riparian areas to watercourses and waterbodies[1]. Riparian areas, watercourses, and waterbodies contribute to the boreal ecosystem through water supply, climate regulation, and forest productivity and are also rich in biodiversity, providing habitat for hundreds of species of plants and animals.

Alberta-Pacific Forest Industries Inc.'s (Al-Pac's) current Forest Management Agreement (FMA) with the Government of Alberta grants the company timber harvesting rights on over 6.3 million hectares of northern Alberta boreal forest. Within that area, Northland Forest Products Ltd. (NFLP) has a volume-based tenure providing the company access to conifer timber. Both Al-Pac and NFPL are dedicated to understanding the environmental effects of their forestry activities within the FMA area. As organizations certified by the Forest Stewardship Council® (FSC®) under a FSC Forest Management group certificate (FSC®-C022642), they monitor various aspect of forest ecosystem health.

In 2005, Al-Pac explored the potential effects of harvest activities at a catchment scale. It found that Al-Pac's forest operations has a limited effect at the watershed level. However, use of site-specific mitigative measures during harvest activities are necessary to protect riparian areas, waterbodies, and watercourses as these are the important source areas for boreal watersheds.[2]

Throughout all stages of Al-Pac's and NFPL's planning and harvest operations, measures must be taken to mitigate for these potential effects to riparian areas, waterbodies, and watercourses (herein referred to as aquatic ecosystems in this report). This document will provide some insight into Al-Pac and NFPL's aquatic ecosystem monitoring programs and activities for:

- operational planning to protect aquatic ecosystems;
- responsible harvest operations near aquatic ecosystems; and
- continuous learning through inspections in the FMA area during harvest operations.

Operational Planning

Alberta Timber Harvest Planning and Operating Ground Rules

The Alberta Timber Harvest Planning and Operating Ground Rules (OGRs) are the regulations developed that set out how planning and timber harvesting operations will be conducted to achieve objectives outlined in the Forest Management Plan (FMP). The OGRs establish practices that minimize the chance of negative impacts from forest management operations and activities, including road development and timber harvesting.

[1] See Appendix A for Alberta Timber Harvest Planning and Operating Ground Rules definitions.

[2] See Appendix B for a synopsis of the Alberta-Pacific Catchment Experiment that explored harvesting effects at the watershed level.

During the 2023 update to the OGRs, significant changes were made to the requirements for aquatic resources (e.g., wetland identification, classification, and protective buffers). The OGRs require that where possible, avoiding aquatic ecosystems should be a first step. However, if avoidance is not possible there are rules and best management practices that set specific objectives to:

- Maintain surface and subsurface water flow;
- Avoid soil compaction or soil layer disturbance;
- Maintain structure and function of riparian and wetland vegetation;
- Avoid site level run-off and erosion;
- Prevent sediment and pollutants from entering wetlands; and
- Plan roads to minimize the number, length, and sensitivity of crossings.

Al-Pac's Layout Manual

Al-Pac's layout manual was created to provide guidance in developing operational forest harvest and road plans to members of both Al-Pac and NLFP teams, particularly to members of layout crews. Layout is a field assessment of the harvest area and roads on the ground; it includes the delineation and marking of both harvest area boundaries, roads, important features to manage for (e.g., pipeline crossings) as well as any environmentally sensitive features to be avoided or that have specific management requirements (e.g., avoiding stick nests, or watercourse setbacks).

The Layout Manual describes the standards and procedures for the layout of blocks, roads, and other features to meet the requirements of the OGRs and FSC Standard. The Layout Manual is reviewed on an ongoing basis and updated as needed to support continuous improvement in meeting forest management objectives.

Occasionally, the standard procedures in the Layout Manual may include mitigation and requirements that go beyond those that are required within the OGRs. For example, the Manual applies slightly larger protective buffers on aquatic ecosystem features than required in the OGRs. It also identifies conditions for Machine-Free Zones such as within:

- Ephemeral and intermittent watercourses
- Non-frozen harvest blocks areas with wet ground conditions that contain merchantable timber (e.g., swamps). Wet soils are not stable for logging equipment during non-frozen conditions and the risk of rutting is very high.

Additional Resources in Planning and Layout

During Operational Planning desktop methods are used to identify environmental sensitive features. The following datasets are also used to identify aquatic ecosystems at the desktop level: Wet Areas Mapping (WAM), Recreational Opportunity Mapping (ROM), Alberta Vegetation Inventory (AVI), Derived Ecosite Phase (DEP), and other Government of Alberta Hydrographic layers.

In addition to the Al-Pac Layout Manual, all planning foresters and layout staff are provided additional training and materials. This includes:

- Wetland Training Module and Key developed by a Wetland Practitioner pursuant to the Professional Responsibilities in Completion and Assurance of Wetland Science, Design and Engineering Work in Alberta (Government of Alberta 2017).
- Guiding Principles for Wetland Stewardship and Forest Management – Practitioner Guide (Ducks Unlimited Canda 2018).
- Resource Roads and Wetlands: A Guide for Planning, Construction, and Maintenance (Partingon et al. 2016).
- Wetland Best Management Practices for Forest Management Planning and Operations (Ducks Unlimited Canada 2019).

Al-Pac also employs a wetland ecologist. The wetland ecologist provides support to both companies' planning and layout with field training and field trips to classify an aquatic ecosystem due to time of year or difficult wetland characteristics.

Harvest Operations

Prior to both non-frozen and frozen harvest, a kick-off meeting is provided to all forest harvest contractors. The kick-off includes details on sensitive environmental features, such as steep slopes or aquatic ecosystems. It highlights the need to avoid aquatic ecosystems and to stop work, in the rare case that a new feature is identified that was not previously delineated. Each contractor is also provided with a Contractor Manual and several flipbook reference guides. These provide information on spill procedures, fuelling and fuel storage, road construction, corduroy and snowfill crossings, freeze down operations, culvert installations, and temporary bridge installation.

Contractors have regular watercourse crossing inspections conducted by Al-Pac staff. The details of these are provided in the next Monitoring Section.

Monitoring

Responsible forest management requires safeguarding aquatic ecosystems functions, and one way of doing so is through environmental inspections. Although aquatic ecosystems are generally avoided in the non-frozen season by Al-Pac and NFPL, some crossings are unavoidable. As a result, these crossings are regularly inspected to ensure they meet compliance and are not disturbing it with erosion, sedimentation, or over hanging culverts, and that their structural integrity is being maintained. There are two main types of stream crossings created depending on the duration of access required to reach the forests resources: temporary and permanent crossings. Temporary access roads are further broken down into the season they are created: winter and summer. A typical summer temporary access road can be seen in Figure 2. The type of stream crossings for both winter and summer crossings differ but both are inspected.

Each crossing in the FMA is inspected at least once prior to the removal of timber from the cutblock and once after the road has been reclaimed, and on an *adhoc* basis during the crossing's lifetime. Inspections are conducted more often after events such as spring break up, winter freeze/thaw, and large rainfall events as these events increase the risk of damage to the crossing (e.g., flooding).

Inspections are conducted to monitor potential impacts on crossings such as erosion, sedimentation, improperly situated or overhanging culverts, water flow (e.g., impoundment), and problems with the structural elements of the crossing (e.g., separation layer and support logs). Another consideration in the monitoring program is the level of environmental risk associated with the water crossing. Higher risk crossings include: fish bearing watercourses, proximity to a fish-bearing watercourse, erosion prone slopes, cuts and fills greater than 1 metre that are associated with the crossing, or potential third party use.

Al-Pac's Inspections are documented on a digital form that is linked to the company's Land Resource Management (LRM) system for easy access and centralized monitoring. If issues are identified, the inspector will make a note and recommend an action to correct the non-compliance to the Layout Manual and/or ORG standards. Variances, both internal and regulatory, are monitored and stored within LRM. Regulatory variances are non-compliances with the OGRs. Whereas internal variances are non-compliances with either the OGRs or the Layout Manual.

From 2019-2023 Al-Pac and NFPL conducted more than 4,500 inspections. The results of Al-Pac's inspections are provided in Figures 2 and 3. A small proportion of Al-Pac's inspections resulted in variances related to riparian areas or watercourses.

The Government of Alberta also monitors for conformance to the provincial *Forests Act.* From 2019-2023, both Al-Pac and NFPL received **no** contraventions.

Figure 1 Typical temporary non-frozen season stream crossing.

Figure 2 Number of internal watercourse crossing and riparian area inspections and found variances from 2019-2024.[3] [4]

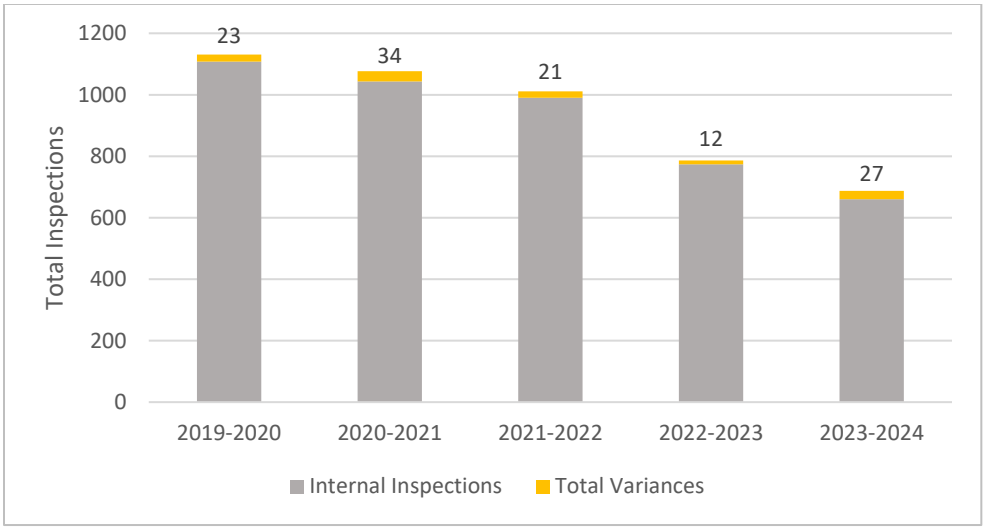
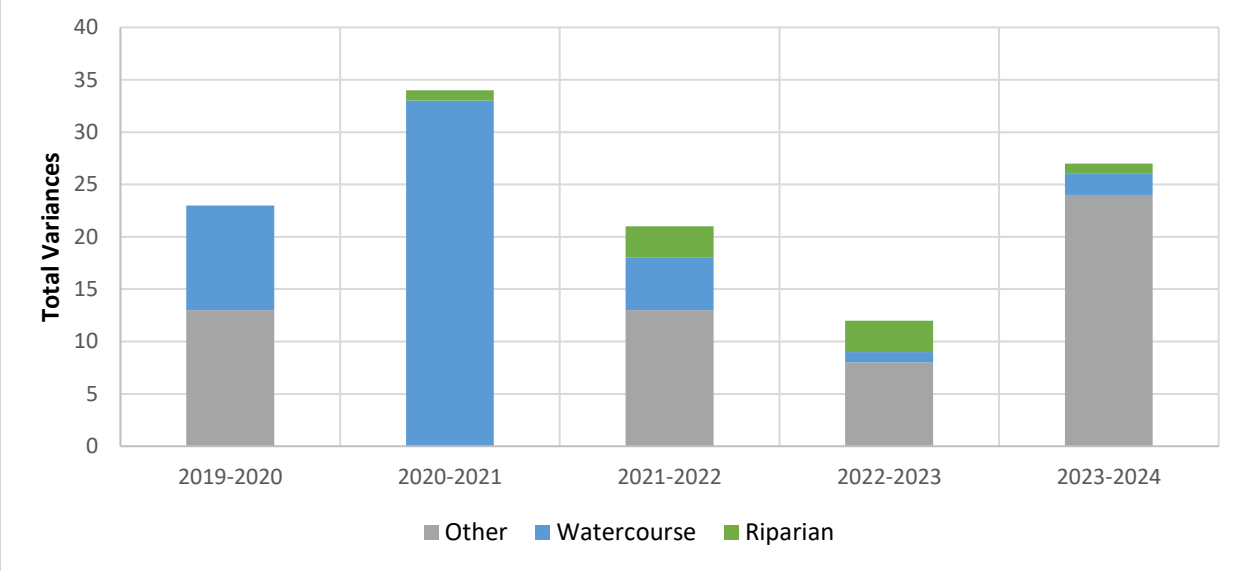


Figure 3 Number of Watercourse crossing and riparian area variances identified during 2019-2024 internal inspections[5]



Conclusion

This environmental report illustrates some of Al-Pac and NFPL's efforts to plan, harvest, and monitor the aquatic ecosystems in the FMA area. Frequent inspections keep Al-Pac and NFPL accountable and foster a work environment centered around responsible forestry and continuous improvement.

[3] Year is from May to April based on the timber harvest year.
[4] Number indicates number of variances in each year.
[5] Year is from May to April based on the timber harvest year.

Appendix A: Definitions

All definitions are directly from the OGRs.

Riparian Area or management zone: 1) riparian areas on public land are the vegetation zones next to flowing and standing water bodies (e.g., rivers, lakes sloughs). They are found in all natural regions of the province, from the prairies and foothills to the boreal mixedwood region. 2)Terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables, and soils that exhibit some wetness characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of these rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs, and wet meadows. The riparian zone is influence by and exerts an influence on, the associated aquatic ecosystems.

Waterbody: The bed, bank or shore of a lake, pond or other natural body of standing water, whether it contains or conveys water continuously or intermittently.

Watercourse: The bed, bank or shore of a river, stream, creek or other natural body of flowing water, whether it contains or conveys water continuously or intermittently.

Watershed: An area of land, which may or may not be under forest cover, which drains water, organic matter, dissolved nutrients and sediments into a lake or stream. The topographic boundary, usually a height of land, that marks the dividing line from which surface streams flow in two different directions.

Wetland: Land saturated with water long enough to promote wetland or aquatic processes as indicated by the poorly drained soils, hydrophytic vegetation, and various kinds of biological activity that are adapted to a wet environment. According to the Alberta Wetland Policy, wetlands are classified as one of marsh, bog, fen, swamp, or open water wetland.

Appendix B: Alberta-Pacific Catchment Experiment

The Al-Pac Catchment Experiment (ACE)[6] was initiated in 2005 to examine the potential effects of harvest activities in a given area for a 10-15 year period on hydrologic processes at a catchment or landscape scale in the boreal plains[7]. The ACE study design consisted of paired, pre-and post-harvest streamflow sampling in aspen-dominated stands, conducted on two mesoscale (10-20 km^2) catchments with a range of surficial geology and low relief. Comparing flow pre-harvest and post-harvest indicated no observable differences in low and high flow discharge or geochemistry concentrations between reference and harvested catchment outflows. Key findings include:

- Soil and groundwater storage buffered the impacts of harvesting on catchment stream flow and large time lags of up to four years were observed in initial response.
- Most streamflow is generated from wetland areas, and soil storage dominates in the forested areas.
- Climate signals and flow modifications by beavers dominate the runoff regime and potentially mask any difference due to harvest. These factors should also be assessed when evaluating land-use practices.

This study supported the use of site-specific mitigative measures during harvest activities to protect riparian areas, waterbodies, and watercourses as important source areas for boreal watersheds.

[6] The results of the ACE were published in the Forestry Chronicle in March 2016.

[7] The Al-Pac FMA area is located within the Boreal Plains Ecoregion, which is characterized by low slope/relief, deep soils, as well as short, warm summers and long, cold winters.