Environment and Climate Change Canada
Environnement et Changement climatique Canada

Development of an Environmental Flows Framework for the Peace-Athabasca Delta

Workshop 1: Knowledge gathering, ecosystem components, and broad habitat types

Executive Summary Report

In support of the:

Environmental Flows and Hydrology Theme *of the* Wood Buffalo National Park Action Plan

August 2019

Canada

What we heard:

- There is significant research and information available on the Peace-Athabasca Delta (PAD) system and wider watershed.
- Participants reaffirmed the highly complex nature of water management for the PAD; ecological, environmental, economic, and socio-cultural aspects are highly interconnected.
- First Nations and Métis representatives emphasized the importance of water to all aspects of life, including animal and plant resources and waterway navigability.
- A strong braiding of traditional knowledge and western science is needed.

About this Executive Summary Report

This report summarizes the first workshop convened under the Environmental Flows and Hydrology recommendations for the Wood Buffalo National Park Heritage Site Action Plan. A more detailed and technical summary report of the outcome of the workshop is also available.

The successes of this initial workshop are due to all those who attended in order to share their time, knowledge, opinions and thoughts, and the collaborative effort of the entire group. Thank you all for your support and contributions to this work. We look forward to continued collaboration as we progress with this important work.

Background: Wood Buffalo National Park World Heritage Site Action Plan

The PAD in northeastern Alberta is an important part of the Outstanding Universal Value (OUV) of the Wood Buffalo National Park (WBNP) World Heritage Site. In 2017, the UNESCO Reactive Monitoring Mission report provided Canada with several recommendations to protect the OUV of the site, including to “conduct environmental flows assessments to the highest international standards for the Peace, Athabasca and Slave Rivers as they pertain to the health of the PAD” to inform decision making (Recommendation 3).

In 2019, Canada finalized the Wood Buffalo National Park World Heritage Site Action Plan (2019), available online at:

https://www.pc.gc.ca/en/pn-np/nt/woodbuffalo/info/action

In support of implementation of the EFH actions described in the Action Plan, Environment and Climate Change Canada and Parks Canada are supporting a series of expert knowledge workshops and sessions. The overall goal is to contribute to the development of an environmental flows[1] framework for the PAD System. The framework will be a roadmap for making informed decisions about managing water in the PAD – how we do it, who is involved, and what information is needed.

A Holistic Water Management Framework

The proposed environmental flows framework follows a modified Ecological Limits of Hydrologic Alteration (ELOHA) framework to balance the water needs of both aquatic, riparian and terrestrial ecosystems and human cultures and economies. The initial part of the framework seeks to identify ecosystem components, such as water levels and sustainable harvesting, and how these components influence and relate to one another. The nature of these relationships will be tested and assessed using publicly available information and both Indigenous and scientific knowledge gathered from multiple workshops and sources.

Approach for Workshop 1

The first workshop's objectives were to identify:

1. Additional potential knowledge sources to support the development of the framework;
2. Broad habitat types within the watershed; and
3. Ecosystem components within the watershed.

The workshop was held in Edmonton, Alberta on March 13-14, 2019. The 59 participants included Elders and representatives from First Nation and Métis communities in and around WBNP, academics, watershed associations, environmental non-governmental organizations, provincial, territorial and federal governments, and industry. Attendees participated together and in smaller group discussion to provide thoughts for the proposed framework.

While the discussions focused on the PAD system, participants were encouraged to consider the wider watershed including the Peace, Athabasca, Lake Athabasca and Slave River Delta watersheds.

[1] Environmental Flows describes the quality, quality and timing of freshwater flows and levels required to sustain aquatic ecosystems and by extension human livelihoods, cultures, economies and well-being (Arthington et al., Front. Environ. Sci., 02 July 2018 | https://doi.org/10.3389/fenvs.2018.00045)

Figure 1: Images taken during Workshop 1 discussions and group activities.

Workshop Outcomes

Knowledge Gathering

Workshop preparation involved gathering publicly available information linked to the PAD system and wider watershed, including data, scientific articles, and published reports:

- Longer-term data is available from four main sources: the Water Survey of Canada, the Alberta Biodiversity Monitoring Institute, Canada-Alberta oil sands monitoring program, and the Mackenzie DataStream;
- Over 500 relevant scientific articles and reports were identified; and
- Online searches for Indigenous knowledge were relatively limited, but available reports (e.g., Cumulative Environmental Management Association) provided knowledge related to water quality, flow regime changes, ice processes, and concerns expressed by Indigenous communities.

Over 500 scientific articles and reports have already been identified on the PAD system and wider watershed.

Incorporating and identifying additional Indigenous knowledge is a critical step moving forward with the development of the environmental flows framework.

Broad Habitat Types

Workshop discussions identified several broad habitat types, which encompass the following:

Rivers/tributaries – divided into small, medium and large tributaries. Large tributaries include the mainstem rivers of the Peace, Athabasca, and Slave watersheds draining through the PAD System. Glacial headwaters are considered a sub-group of small tributaries.

Lakes – divided into small, medium, and large categories, with large lake habitats represented by Lake Athabasca and Lake Claire, and Mamawi Lake as an example of a medium-sized lake.

Floodplains/wetlands – represent areas adjacent to rivers that sustain intermittent flooding during the year, while wetland habitats are permanently or seasonally inundated with water

Perched basins – are isolated small lakes at a higher elevation than the nearby rivers; they are primarily replenished by overland flooding. These are given special distinction as proxies for hydraulic recharge of the PAD System

Participants highlighted the importance of each of these broad habitat types and their connectivity for different ecosystem components.

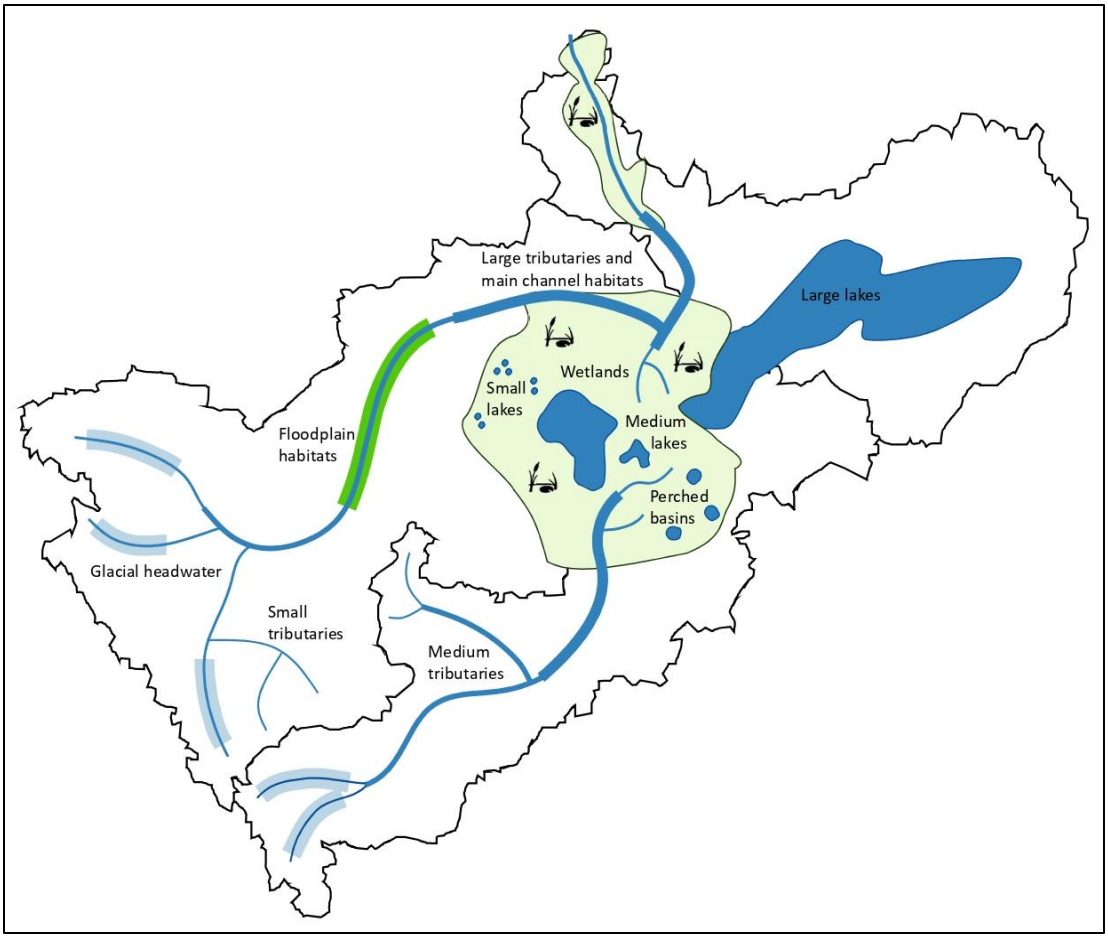
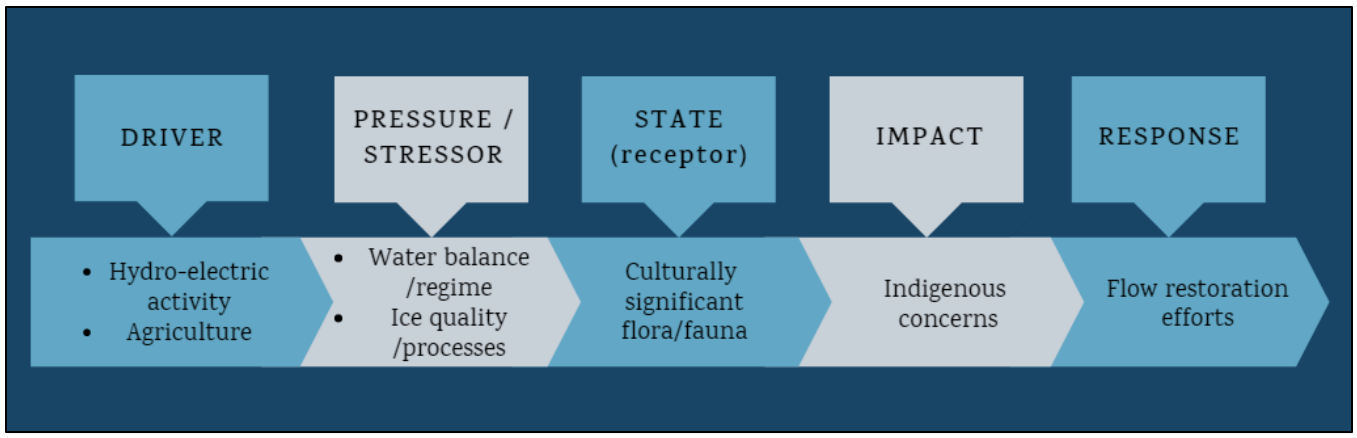


Figure 2: Schematic for the PAD System and the wider Peace, Athabasca, Lake Athabasca, and Slave Delta watersheds representing the nine dominant habitat types identified from information shared during Workshop 1 discussions. Glacial headwaters are also indicated, but were considered with a sub-group within small tributaries.

Ecosystem Components

Workshop attendees also undertook an exercise to identify ecosystem components relevant to the PAD, ranked them in importance, provided input on connections, and discussed the relationships among them. An ecosystem component can be either a driver, pressure/stressor, state (receptor), impact, or a response. The figure below provides an example of these ecosystem components and examples from the workshop. This simplified example shows how one component can influence the next, resulting in impacts and responses.



To describe the example further, a driver (e.g., hydroelectric power generation) may produce a pressure/stressor (e.g., changes to water levels), with observed changes to receptors (e.g., changes to wildlife), resulting in an impact (e.g., changes in Indigenous harvesting), resulting in a response (e.g., building a weir or measures to restore an ecosystem).

Workshop 1 results confirmed just how highly complex the ecosystem components are for the PAD system and wider watersheds. Participants identified 123 ecosystem components and 606 unique linkages between these components. Readers are encouraged to consult the technical report for more detail, given the number and complexity of ecosystem components and the relationships between them.

The PAD system and wider watershed are highly complex. Workshop participants identified:

- 123 ecosystem components
- 606 unique links between them

Through the workshop deliberations on ecosystem components, input focussed on seven themes of interest:

- ***Indigenous concerns*** – Impacts on the PAD System felt by Indigenous communities ranked highest in terms of interest, including Indigenous practice of rights, physical and spiritual well-being and waterway navigation. Indigenous practice of rights and well-being were strongly linked with hydroelectric activity and pressures relating to water levels, forest fires, and permafrost thawing. Waterway navigation was linked with flow regime, sedimentation processes, and technological innovation. Direct linkages were made between Indigenous ways-of-life and water levels within the PAD, with limited indirect connections (e.g., through culturally significant flora/fauna). Participants emphasized that community engagement will be a critical source of information moving forward.

- ***Human activities*** – Many human activities potentially drive changes to the PAD System, including industrial activities, agriculture, forestry, hydroelectric dams, commercial and Indigenous harvesting, and urbanization. These drivers are suspected of having strong links to other ecosystem components, such as water levels and sedimentation processes, and biological changes such as wetland conversion, vegetation cover, and aquatic and terrestrial species diversity leading to nutrient (agriculture) and environmental contamination (industrial

activities). The workshop preparation and discussion advanced knowledge and understanding of these components and identified current knowledge gaps.

- ***Climate change*** – The UNESCO Reactive Monitoring Mission Report highlights the need to understand interactions between the PAD ecosystem and climate change, which workshop attendees supported. Participants highlighted differences between natural climate variability and human-made changes, making links with water levels and quality, glacial retreat and snowmelt, ice processes, and air temperature. Human-made climate change was also linked to habitat (such as quality and quantity) and flooding components (such as flow variability, flood duration, and flood frequency). Data are available to assess linkages between natural and human-made climate changes and PAD ecosystem components relating to water regime, balance, and ice processes, and linkages between climate change and habitat structure.

- ***Water –*** Workshop discussions underscored the critical need to understand water in the PAD system and how it interacts with the environment: levels change, flow alters, and channels move. In addition, there are sedimentation processes, water chemistry, withdrawal, and flow restoration efforts. Many of these aspects of water in the PAD exert significant top down pressures on stressors and receptors within the system. Participants identified knowledge gaps including a lack of information about how sedimentation processes water chemistry link with other ecosystem components. Participants were concerned about localized drying within the PAD System, particularly southwest of Lake Claire and along the northern shorelines of Mamawi Lake. Shoreline recession of Mamawi Lake was associated with sedimentation and changes in channels directing water away from this area. Water navigation issues were identified within Mamawi Lake. A lack of hydrological monitoring data was identified within western portions of the PAD System, particularly west and southwest of Lake Claire, and north and northwest of Peace River where it enters the PAD.

- ***Ice processes*** – There was strong interest in the role of ice on the PAD System, reflected in the ample modelling work available for the region. Ice components included ice jam frequency and ice quality (e.g., thickness and porosity or “honeycomb ice”). Workshop attendees linked ice components with climate and water levels, and additionally linked ice with precipitation (snow and rain) and air temperature. Drivers linked with ice processes included climate change and hydroelectric activity. Workshop attendees identified under-ice flows and ice processes south of Lake Athabasca as critical knowledge gaps to the PAD System, while Alberta Environment and Parks ice observation data and ice-jam locations were suggested as sources of information.

- ***Nutrient loading and environmental contamination*** – Workshop attendees shared strong interest in the importance of water chemistry, environmental contamination, and nutrients/organic matter as stressors on the PAD System. Workshop deliberations provided insights into the links between these stressors and industrial and agricultural practices, climate change, forest fires, land/water reclamation, and saline water release. Not all linkages could be explored given time constraints, the scope of conversations, and the backgrounds of individuals in attendance. Further examination of the path between these stressors and animals and plants are needed. It was noted that substantial amounts of data are available relating to nutrients, environmental contamination, water chemistry, and atmospheric chemistry.

- ***Habitat composition and change*** – Through the analysis and discussions, habitat components were identified as various ecosystem components: pressures, stressors, and most dominantly

as receptors. Participants discussed the impacts of drivers and stressors on animals and plants in the PAD, particularly culturally sensitive animals like bison, muskrat, and moose. Water levels and weather are important factors affecting habitat composition and change. Out of all the PAD System components identified, culturally-significant flora and fauna ranked among the highest for workshop interest, second only to Indigenous practice of rights.

Path Forward

The first workshop was successful in meeting its objectives. It supported the identification of many of the components and linkages to be considered in the development of an environmental flows framework for the PAD System and wider watershed. Engagement with local Indigenous communities and additional workshops will continue this development.

Using expert knowledge and discussion, Workshop 2 will build on the outputs from Workshop 1 and will focus on further developing hypothesised pathways among nodes for the different broad habitat types under low, seasonal, high and ice-affected flow and water level conditions, in addition to identifying further analyses to support the development of flow recommendations

Workshop 3 will use expert knowledge and small group discussion to explore the refined hypothesised pathways, develop flow and water level needs, and identify potential variables for the long-term monitoring and assessment of the PAD System and wider watershed.

Communities will guide the structure of the Indigenous engagement sessions, which will aim to inform the objectives of the framework, and further explore key components and linkages.

To obtain a copy of the full report, please contact:

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