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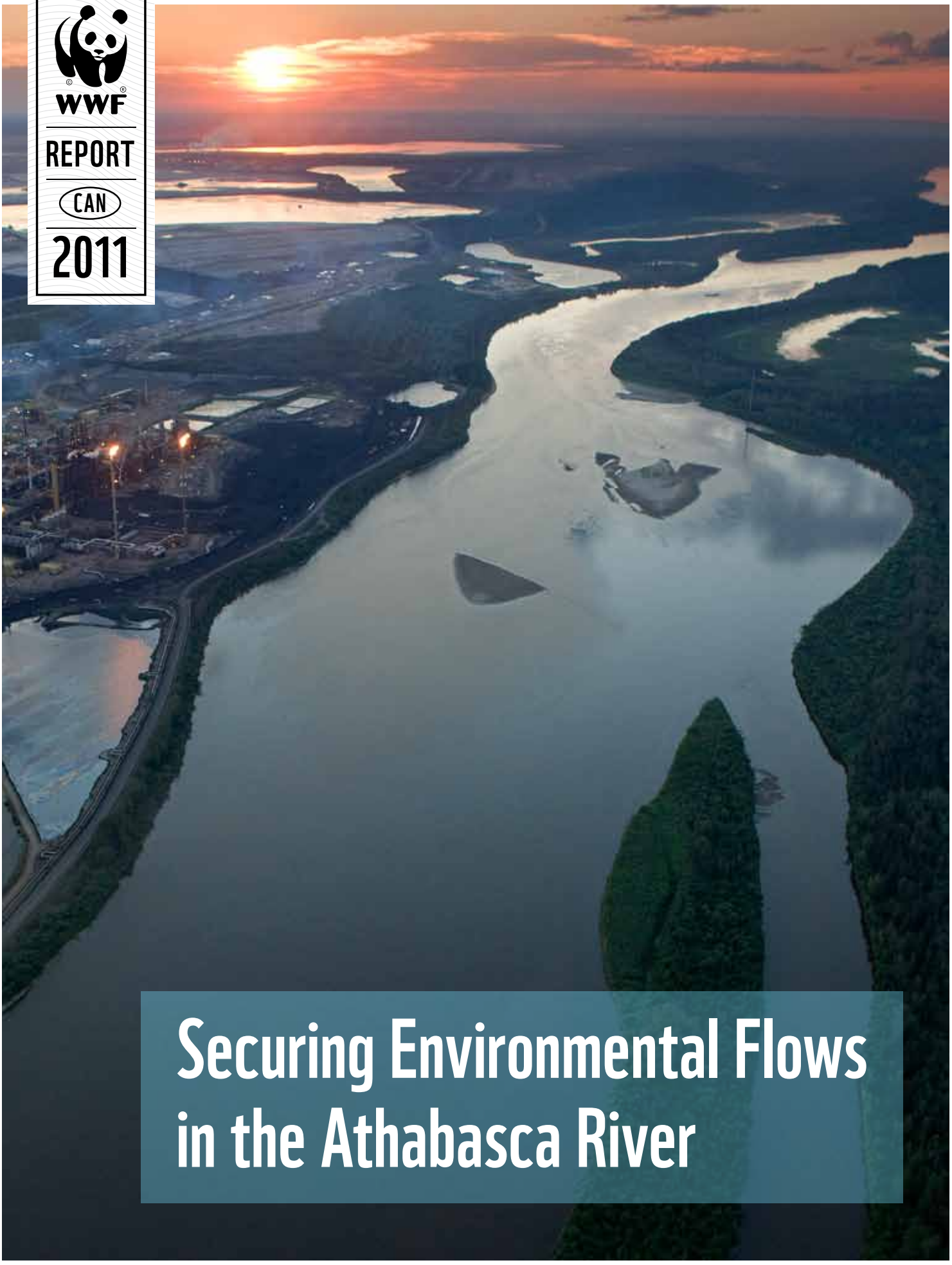

Securing Environmental Flows in the Athabasca River

Front cover: Suncor Upgrader Facility and Millennium Mine Site along the Athabasca River, north of Fort McMurray, Alberta, Canada. © Peter Essick / Aurora Photos

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Authors: Mathieu Lebel, Tony Maas, and Robert Powell

WWF is one of the world's most experienced independent conservation organizations, with over 5 million supporters and a global Network active in more than 100 countries. WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by: conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

CONTENTS

INTRODUCTION

The Athabasca River flows unimpeded across Alberta from the Columbia Icefields in the Rocky Mountains to Lake Athabasca, providing habitat for more than 30 species of fish. The river supplies the largest direct inflow of water to the Peace-Athabasca Delta – one of the world's largest freshwater deltas, a wetland of international significance, and among the most important waterfowl nesting and staging areas in North America.[1]

The Athabasca is Alberta's and one of North America's longest remaining free-flowing rivers

The Athabasca River is also the primary source of water for oil sands mining in Alberta. Oil sands mines consume a net average of just under two and a half barrels of fresh water, almost all of it taken from the river, to produce every barrel of oil.[2] More than 95 per cent of the water withdrawn for this industrial use is ultimately too polluted to be returned to the river and so must be stored in tailings ponds.[3] This means that water withdrawals by the oil sands mines reduce downstream flows in the lower Athabasca River,[4] affecting the physical and biological functions – and thus the overall health – of the river ecosystem.

All four North American flyways (Pacific, Central, Mississippi, and Atlantic) cross the Peace-Athabasca Delta, and endangered species such as the whooping crane are delta migrants.

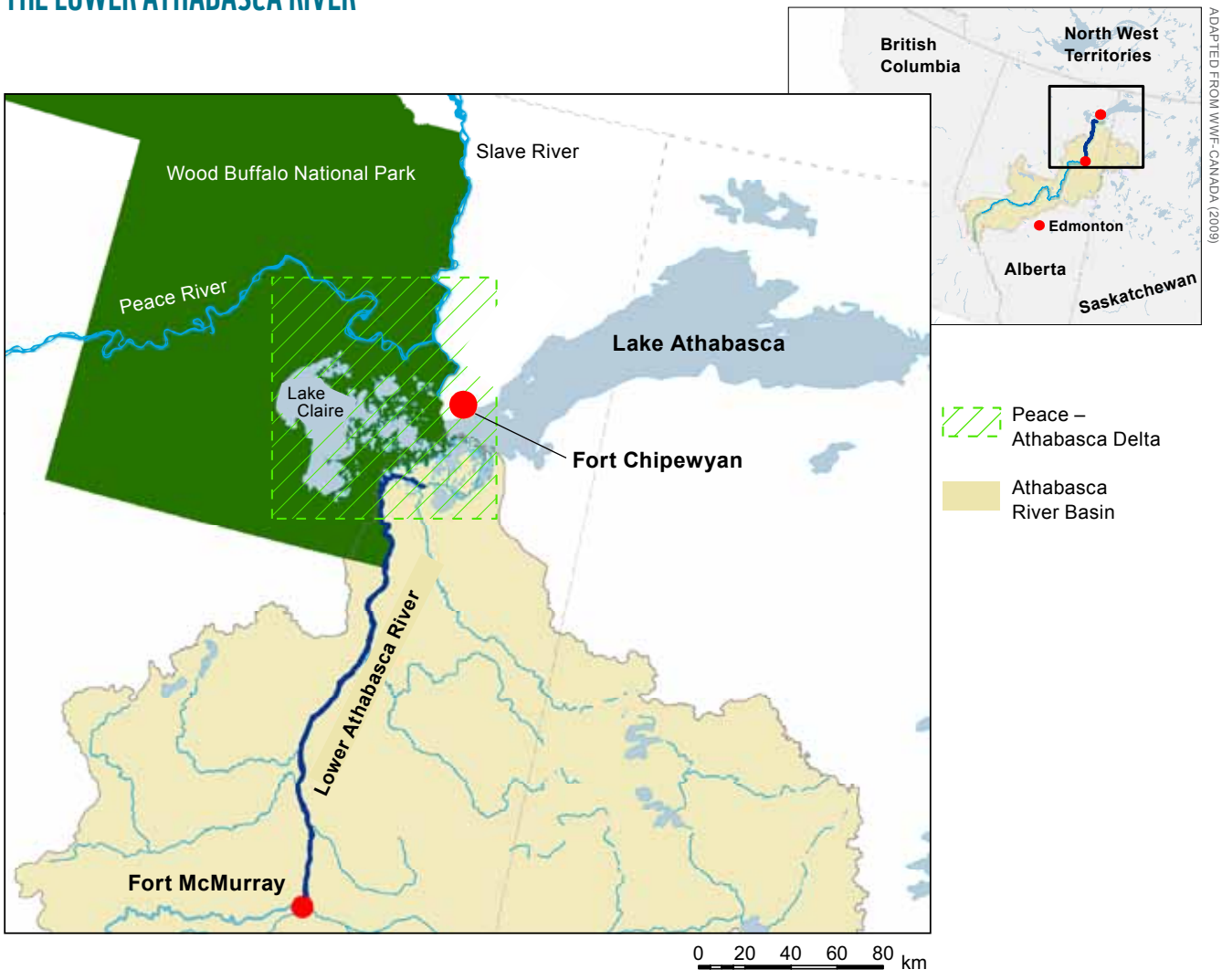
The challenge for water managers – in particular federal and provincial regulatory agencies – is to reconcile industry's growing demand for water with nature's water needs. Industry benefits from taking water from the river, but other societal benefits – such as fishing, trapping, and navigation – depend on maintaining flows in the lower Athabasca River as close as possible to natural conditions. Therefore, a range of interests must be considered when deciding how much water can be taken from the river at different times of the year. After almost a decade of deliberations, dialogue, studies, and committees, involving governments, industry, First Nations and Métis groups, and environmental organizations (ENGOs), there is no consensus on a water management plan for the lower Athabasca River to effectively address the needs of both nature and society.

The purpose of this report is to outline the importance of establishing an Ecosystem Base Flow (EBF) for the lower Athabasca River, and to urge the responsible government agencies – Alberta Environment and Fisheries and Oceans Canada (DFO)– to ensure that the final water management plan includes an EBF in order to protect one of Canada's most important and iconic rivers.[5]

An EBF establishes a flow level at which aquatic life requires all of the available water flowing in a river

An EBF is a low-flow threshold below which all water withdrawals should cease. Below this threshold aquatic life requires all of the available water in a river. Further withdrawals would result in unacceptable risk to the health of the aquatic ecosystem. The EBF concept is now becoming widely adopted in water management plans in other river basins in Canada and around the world (e.g., British Columbia, United States, New Zealand).[6] EBFs are recognized as a critical element of the broader science of environmental flows. Establishing an EBF is vital to ensuring that the lower Athabasca River is protected over the long term, and represents a fundamental component of any water management plan designed to meet social, economic, and environmental interests.

THE LOWER ATHABASCA RIVER



The lower Athabasca River provides habitat for 31 species of fish

The Athabasca River: Supporting a Diverse, Productive, and Globally Significant Ecosystem

The Athabasca is Alberta's longest and only major free-flowing river. At 1,538 kilometres (km), it is also among the longest of North America's remaining free-flowing rivers. The river's final 300 km, known as the lower Athabasca River, provide habitat for 31 of Alberta's 59 species of fish, including walleye, lake whitefish, northern pike, and burbot. The Athabasca converges with the Peace and Birch Rivers at the western end of Lake Athabasca to form the Peace-Athabasca Delta, a 6,000-square-kilometre (km^2) wetland complex of global significance.

The Peace-Athabasca Delta provides vital habitat for waterfowl during spring and fall migration, when up to one million birds pass through the area

The Peace-Athabasca Delta provides vital habitat for waterfowl during spring and fall migration, when up to one million birds pass through the area. All four North American flyways (Pacific, Central, Mississippi, and Atlantic) cross the delta, and species such as the endangered whooping crane and rare Ross's goose are delta migrants. The delta's mosaic of habitats attracts a rich diversity of birds, including ducks such as northern pintail and common goldeneye, other wetland birds such as the eared grebe, and other avian species, among them the peregrine falcon and sandhill crane. The delta also provides habitat for 42 species of mammals, including muskrats, moose, lynx, and wolves, as well as the world's largest population of free-roaming bison. The Peace-Athabasca Delta is maintained by natural fluctuations in water levels and flows. Approximately 80 per cent of the delta is protected within Wood Buffalo National Park, a UNESCO World Heritage Site, and the delta has also been designated a Ramsar wetland site.

Source: DFO (2008); Peters et al. (2006); Nelson and Paetz (1992); CWS (1985)

ENVIRONMENTAL FLOWS IN THE ATHABASCA:

MANAGING WATER FOR NATURE AND SOCIETY

Water is a valuable and renewable natural resource that humans use for many purposes, including agriculture, urban use, and industry. Protecting water for nature is the foundation of sustainable water management.

Both the amount of water flowing through rivers and the timing of these flows are fundamental to the overall health of aquatic ecosystems and species. A strong scientific consensus now exists that securing a healthy river ecosystem requires maintaining or re-establishing some or all aspects of a river's natural flow regime.[7] The science of **environmental flows** provides a framework for better understanding flow regimes and the tools needed for protecting and restoring river health.

The Brisbane Declaration

The Brisbane Declaration, a widely endorsed global call to action to protect the world's rivers, provides the most common definition of environmental flows:

> *Environmental flows describe the quantity, timing and quality of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems.*

Various terms are used to describe environmental flows. In Alberta – as in many parts of western North America – the common term is currently "instream flow needs." The term "environmental flows" is used throughout this report.

Source: Brisbane Declaration (2007)

The natural flow regime of the Athabasca River is highly variable; spring and summer peak flows are commonly 10 times greater than winter flows

The natural flow regime of the Athabasca River is highly variable; spring and summer peak flows are commonly 10 times greater than winter low flows (figure 1). Preserving the high flows that occur in spring and summer is critical to replenishing and revitalizing the Peace-Athabasca Delta. To provide habitat for fish and other species in the aquatic ecosystem when it is most sensitive, as much water as possible must be kept in the river during low-flow periods.[8]

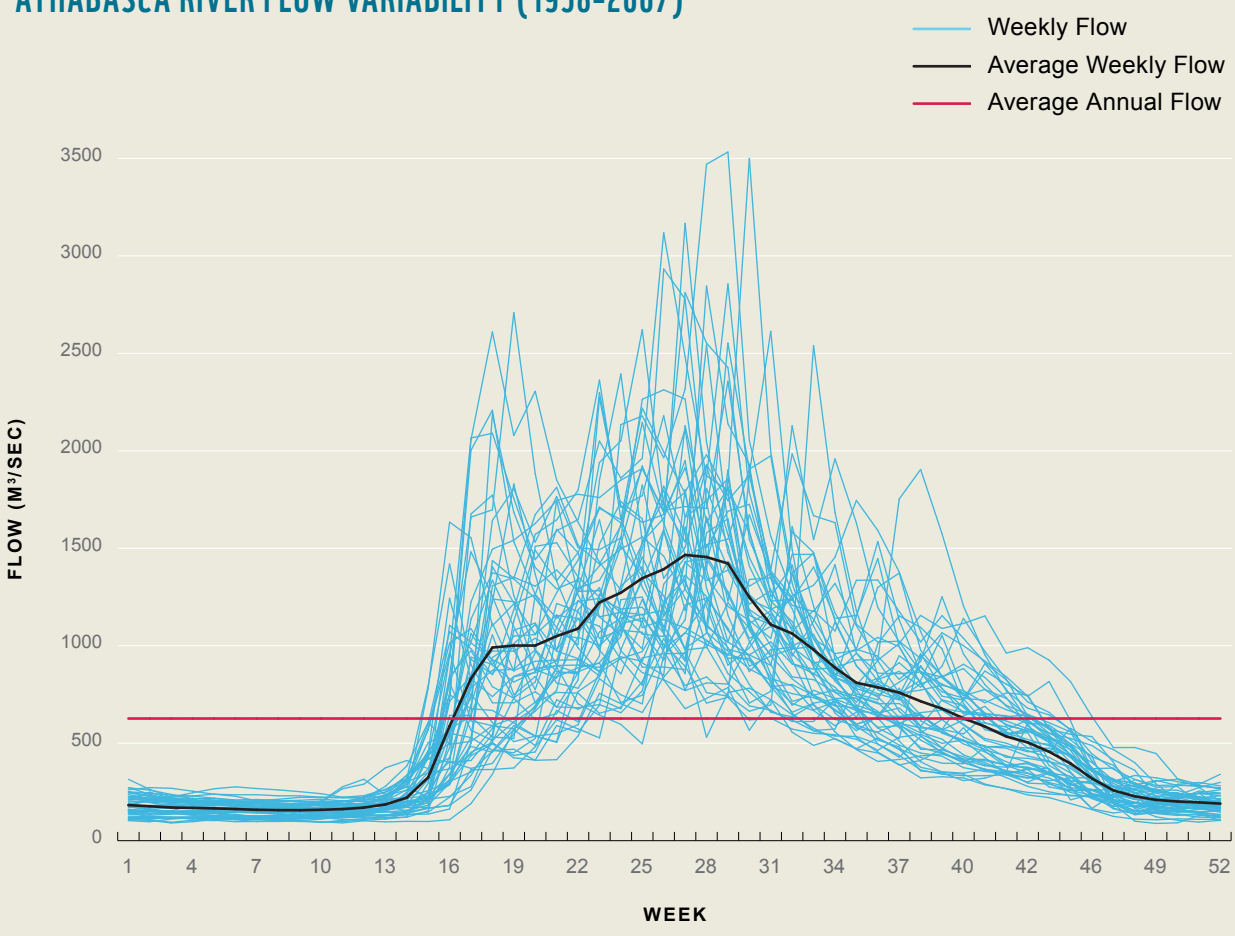
The discussion around the impact on flows of water use by oil sands mining operations in the lower Athabasca River is frequently confusing. Industry often

states that its water allocation is only a tiny fraction of the flow of the lower Athabasca River, and indeed the allocation amounts to about 2.2 per cent of the **average** annual flow.[9]

However, **average** supply and demand numbers do not reveal much about the potential environmental impact of water withdrawals. In reality, the situation is more complex. In terms of protecting environmental flows, **when** water is withdrawn is as important a consideration as **how much** is withdrawn. The

FIGURE 1.
ATHABASCA RIVER FLOW VARIABILITY (1958-2007)

ADAPTED FROM OKYERE (2009)



Each blue line corresponds to one year of the Athabasca's flow record below Fort McMurray[10] in weekly averages (Week 1 is January 1–7, Week 2 is January 8–14, etc.) based on Okyere (2009), the black line corresponds to the average weekly flow over the period of record (1958–2007), and the red line corresponds to the river's average annual flow over the period of record. It is evident from this graph that expressing oil sands mining water demand as a percentage of average annual flow (approximately 627 cubic metres per second [m^3/sec]) masks the river's significant inter- and intra-annual flow variability and that the same scale of water withdrawals during low-flow winter months, compared with during average- or high-flow periods, places much greater pressure on river ecosystems and species.

In terms of protecting environmental flows, when water is withdrawn is as important a consideration as how much is withdrawn

oil sands mining industry's existing and anticipated water demand is small compared with the volume of water in the river during periods of high flow, or even compared with the river's average annual flow; in winter, however, the industry's demand accounts for a much greater proportion of the natural water supply. For example, in January 2010, flow in the river declined to 106 m^3/sec, and industry was allowed to withdraw 10 m^3/sec, which equates to 9.4 per cent of the river's flow.[11]

Low flows are stressful for fish and other aquatic life, as habitat availability is reduced, water quality may change, and food sources may decrease.[12] Low flows during the winter period may be of particular concern, because they tend to aggravate the combination of factors that already presents substantial challenges to the survival of fish and other aquatic species, such as reduced habitat, low temperatures, and variable ice dynamics.[13] Water withdrawls have a direct influence on flow. Altered flows reduce the available habitat, and therefore scientists believe that withdrawing water during low-flow winter periods jeopardizes the overwintering survival of many fish and other aquatic species.[14]

When flows in the lower Athabasca River reach their lowest levels in midwinter, the amount of aquatic habitat and the oxygenation of water under ice are likely to become limiting factors in the overwintering survival of aquatic life, including fish

The Peace-Athabasca Delta. The lower Athabasca River supplies the largest direct inflow of water to the Peace-Athabasca Delta, a wetland of international significance.

An EBF is a fundamental component of an environmental flows policy

An EBF is designed to ensure that there are no increases in the frequency and duration of very low flows due to human activities

and invertebrates.[15] Securing the health of the river and its aquatic life will require that water withdrawals be severely restricted under such circumstances; an EBF is the means through which to implement such a restriction.

Ecosystem Base Flow

An Ecosystem Base Flow (EBF) establishes a flow threshold in a river system below which no withdrawals are permitted. An EBF is a fundamental component of an environmental flows policy and is designed to ensure that there are no increases in the frequency and duration of very low flows, which can reduce habitat availability, food production, and water quality. EBFs have been developed in Alberta (e.g., Pipestone River, South Saskatchewan River Basin) other provinces and states (e.g., British Columbia, California), and elsewhere (e.g., Australia, United Kingdom). They are increasingly implemented as part of water management regimes in many jurisdictions (e.g., Alberta's Pipestone River, British Columbia, California, Australia, United Kingdom). EBFs have also been established using a number of different methods and have been described in other jurisdictions as "subsistence flows," "base flows," and "low-flow cutoffs," among other terms. Because EBFs are designed to protect the aquatic ecosystem when it is most sensitive, they are an essential component of any water management plan designed to address social, economic, and environmental objectives.

Source: DFO (2008); Acreman et al. (2006); DFO (2006); Hardy et al. (2006); Acreman (2005); NRC (2005); Clipperton et al. (2003); Brizga (2001); IRIS Environmental Systems (1999); Jackson and Blecic (1996)

Walleye (*Sander vitreus*) is one of 31 species of fish found in the lower Athabasca River.

SEEKING BALANCE IN WATER MANAGEMENT

Alberta Environment and DFO have undertaken a phased approach to managing freshwater resources and ecosystems in the lower Athabasca River.

The Phase 1 Water Management Framework for the lower Athabasca River was implemented in March 2007 and established as a short-term plan for protecting the aquatic ecosystem, taking into account current water demand, water management options, and environmental flows. While an important first step, the Phase 1 framework is viewed as inadequate in terms of environmental protection, as it is unenforceable,[16] neglects to consider the potential impacts of climate change on future river flows,[17] and fails to establish and implement an EBF.[18] Given the absence of an EBF, the Phase 1 Water Management Framework gives precedence to maintaining water withdrawals for the oil sands industry over protecting the aquatic ecosystem when it is most sensitive, that is, during winter low-flow periods.[19]

Given the absence of an EBF, the Phase 1 Water Management Framework gives precedence to maintaining water withdrawals over protecting the aquatic ecosystem when it is most sensitive

The objective of the Phase 2 Water Management Framework for the lower Athabasca River, which Alberta Environment and DFO have together committed to implement by January 2011, is to meet social, economic, and environmental goals over the long term by improving on the Phase 1 framework.[20] The Phase 2 Framework Committee (P2FC) for the lower Athabasca River, a multi-stakeholder group with representation from provincial and federal governments, a First Nation, a Métis association, industry, and ENGOs, including WWF-Canada, was tasked with developing recommendations to Alberta Environment and DFO regarding these improvements.

The P2FC primarily sought to recommend a plan prescribing how much water could be withdrawn from the lower Athabasca River and when it could be withdrawn, but also made recommendations on implementation requirements, such as incorporation of the plan into law and guidance for a monitoring and adaptive management program for the river. The P2FC reached agreement in many areas, succeeded in furthering shared understanding of the management problem, and framed the parameters for addressing social, economic, and environmental interests. After more than two years of effort, however, participants could not reach consensus on a set of rules to govern water withdrawals from the Athabasca River. **The Phase 2 Framework Committee** Report was published online in January 2010.

Phase 2 Framework Committee Participants

Government
Alberta Environment
Alberta Sustainable Resource Development
Energy Resources Conservation Board
Fisheries and Oceans Canada
Parks Canada – Wood Buffalo National Park

Environmental Organizations
Alberta Wilderness Association
South Peace Environmental Association
WWF-Canada

Industry
Canadian Natural Resources Ltd.
Imperial Oil Resources Ltd.
Petro-Canada (merged with
Suncor Energy Inc. in 2009)
Shell Canada Ltd.
Suncor Energy Inc.
Syncrude Canada Ltd.
Total E&P Canada Ltd.

First Nations and Métis Groups
Fort Chipewyan Métis
Fort McKay First Nation

Reconciliation of legacy water rights with the need to protect environmental flows is necessary if the Phase 2 framework is to effectively address social, economic, and environmental interests

The P2FC agreed on an EBF in principle but reached an impasse over how to implement it in an effective and meaningful way. The impasse stems primarily from two concerns. The first was the scientific uncertainty in establishing an EBF threshold. The second was the fact that two major industrial users of water in the lower Athabasca River, Suncor Energy Inc. and Syncrude Canada Ltd., were issued water rights before water managers understood or concerned themselves with protection of environmental flows.[21] The committee was divided on making recommendations requiring reconciliation of these "legacy" water rights with the need to protect environmental flows. Specifically, some P2FC stakeholders were not prepared to implement a flow threshold at which water withdrawals would cease for all oil sands mining operators. They wanted to exempt legacy water rights holders Suncor Energy Inc. and Syncrude Canada Ltd.[22] However, reconciliation of these legacy water rights with the need to protect environmental flows is necessary if the Phase 2 framework is to effectively address social, economic, and environmental interests.

It is clear that the P2FC had no authority to alter existing water licences – that authority rests solely with Alberta Environment. At the same time, the federal government, through DFO, has the authority to limit water withdrawals in order to deliver on its mandate under the *Fisheries Act*[23] to protect fish and fish habitat.[24] Some P2FC members maintained that the committee should not make recommendations that they thought would alter existing water rights. Other P2FC members, including WWF-Canada, asserted that recommending an EBF was essential, while recognizing that the decision would rest with the regulators:

Implementing an EBF is vital to ensuring that the lower Athabasca River is protected over the long term

Alberta Environment and DFO. The latter group of members observed that existing water licences contain specific provisions to allow Alberta Environment to stipulate such a cutoff of withdrawals which the Government of Alberta has not applied to date. This disagreement is in part what thwarted attempts to reach common ground on an EBF and achieve a consensus recommendation on a new water management plan for the lower Athabasca River.

Drying whitefish. Traditional livelihoods rely on the lower Athabasca River.

MOVING BEYOND THE IMPASSE:

ECOSYSTEM BASE FLOW FROM PRINCIPLE TO PRACTICE

The impasse the P2FC reached related to management of water withdrawals at very low flows. Resolving this issue will be critical to securing enough water in the Athabasca River to meet its environmental flow requirements. However, the impasse also obscured an important point: that a water management plan is a prescription for allowable withdrawals at all flows and in all seasons, not just during low flows or winter months.

For example, high flows during the spring and summer are required to sustain the productivity of the Peace-Athabasca Delta, while sufficient flows from early spring through late fall are relied upon for transportation and subsistence.[25] It is important to recognize that disagreement over implementation of an EBF means that no consensus was reached on an overall management plan; without agreement on implementation of an EBF, there is no agreed upon recommendation from the P2FC for water withdrawal rules for the lower Athabasca River.

The lower Athabasca River is most sensitive to water withdrawals during winter low-flow periods.

The need to establish an EBF to protect environmental flows and the health of the lower Athabasca River has long been recognized

The Long Road to an EBF for the Lower Athabasca River

The need to establish an EBF to protect environmental flows and the health of the lower Athabasca River has long been recognized. In 2006, DFO recognized the need to establish an EBF to protect the aquatic ecosystem of the lower Athabasca River from the cumulative water withdrawals of the oil sands mining industry. The following year, the Alberta Energy and Utilities Board / Canadian Environmental Assessment Agency Joint Review Panel (JRP) report on Imperial Oil Resources Ventures Limited's Kearl Oil Sands Project also recognized this need. The JRP indicated that an EBF was a critical component of any water management framework for the Athabasca River and, if implemented, could mitigate significant adverse environmental impacts. The JRP strongly recommended that Alberta Environment and DFO incorporate an EBF in the final water management framework for the Athabasca River. The Government of Canada, through DFO, accepted the JRP's EBF recommendation.

Despite these recommendations, the current Phase 1 Water Management Framework, which Alberta Environment and DFO prepared jointly, did not include an EBF, which is one of the main reasons that the framework has been widely viewed as inadequate in terms of environmental protection. Alberta Environment and DFO recognized that some level of low flow (an EBF) could occur in the Athabasca River such that water withdrawals for industry should stop, and agreed that research would be directed toward defining an EBF in the Phase 2 or a final water management framework.

Source: AENV/DFO (2007); AEUB/CEAA (2007); DFO (2007); DFO (2006)

The P2FC expressed its understanding of an EBF in the form of three principles:[26]

1. There is a low flow at which continued minimum water withdrawals could pose an unacceptable risk to the aquatic ecosystem.
2. At such a flow it may be appropriate for all water withdrawals to cease.
3. This would require the investigation of the legal, administrative, and policy options for doing this in a manner consistent with water rights granted to licensees under the *Water Resources Act*[27] and preserved in the *Water Act*.[28]

As noted above, this agreement in principle has yet to translate into agreement in practice, which is the ultimate outcome required to achieve protection of environmental flows in the lower Athabasca River. Two specific issues impeded the translation of an EBF from principle into practice:

1. uncertainty in establishing the EBF threshold
2. legal authority to implement an EBF

Uncertainty in establishing the EBF threshold

Although the EBF concept is widely accepted by river ecologists and applied by water managers, defining this threshold for any particular river system remains a challenge. Evidence of a clear threshold, or "ecological edge," above which the impact of water withdrawals would be minimal and below which the impact would be major remains to be determined and used to define an EBF in any environmental flows policy.[29] This is due in part to the considerable uncertainty in predicting the response of aquatic life to a given change in flow.[30]

In the absence of information, the presumption cannot be made that water withdrawals have no environmental impact

Understanding of the biological impacts of changes in the flow regime may improve over time, but uncertainty will remain, and there is therefore a need to accept and integrate uncertainty into environmental flows recommendations.[31] The Instream Flow Council, an organization that represents the interests of state and provincial fish and wildlife management agencies in the United States and Canada, recognizes that in the absence of information, the presumption cannot be made that water withdrawals and other water use projects have no environmental impact. In other words, absence of proof is not proof of absence of effect, and the greater the level of uncertainty, the more precautionary the flow prescription should be.[32] The Government of Canada recognizes the application of precaution as a legitimate and distinctive decision-making approach within science-based risk management.[33]

The need to address uncertainty is central to implementing an EBF for the lower Athabasca River. Due in part to their design and to the absence of data, the models the P2FC used could not assess with a high degree of precision the potential impacts of water withdrawals at very low flows.[34] The absence of data was an inevitable consequence of considering flows for the EBF threshold without any historic precedent.[35] Because of this uncertainty, the P2FC and regulators were advised to use the results of the models and professional judgment to determine an EBF.[36]

Following the release of the the P2FC report, DFO undertook a scientific evaluation of environmental flows for the lower Athabasca River and concluded that specifying an evidence-based EBF for it was not possible, given the uncertainties related to limited availability of data. DFO found, however, that

although scientific uncertainty exists about the exact flow threshold for an EBF, "there was concurrence that a flow should be established for the lower Athabasca River below which there would be no withdrawal of water," and that "this flow should be established using a precautionary approach."[37] The approach is consistent with the EBF concept and recognizes that an EBF threshold in the river may need to be adjusted as ecological knowledge improves over time. Furthermore, DFO indicates that the establishment of an appropriate precautionary cutoff flow below which water withdrawals would cease would also address concerns regarding the potential effect of climate change on future flows in the lower Athabasca River.[38]

Uncertainty will always exist in the establishment of an EBF for any river system. Precaution is therefore needed to establish and implement an EBF to protect aquatic life in the lower Athabasca River.

"A flow should be established for the lower Athabasca River below which there would be no withdrawal of water"

DFO (2010)

EBFs across Alberta

The issue of reconciling existing water rights with environmental flows protection is not limited to the Athabasca River. A recent report to the Alberta Minister of Environment recommended that Alberta establish "Protected Water" – "a quantity of water or rate of flow not available for allocation to other uses" – on all its major rivers. The implementation of an EBF is a critical element of Protected Water, but effectively addressing river health will require the protection of other components of a river's flow regime, including high and peak flows. The report also recommended that the government actively address any incompatibilities between existing water rights and the objective of establishing Protected Water:

> *There is an urgent need to establish levels of Protected Water for the purpose of protecting the environment and aquatic ecosystems in all major river basins in the Province. The government should not allocate water for consumptive uses where allocations would reduce Protected Water below the stipulated levels.*
>
> *Where existing licences prevent the stipulated levels of Protected Water from being met, the government should establish and implement a plan to achieve legal protection for the stipulated levels within a reasonable period.*

Source: Minister's Advisory Group on Water Management and Allocation (2009)

Legal authority to implement an EBF

It is up to Alberta Environment and DFO to decide how to implement an EBF

The second issue preventing the P2FC from reaching agreement on implementation of an EBF was the legal authority to address legacy water rights held by the senior companies (Suncor Energy Inc. and Syncrude Canada Ltd.) under their long-standing water licences. The third EBF principle the P2FC agreed on acknowledges that implementing an EBF on the Athabasca River may require an investigation of the rights of long-standing water licensees (Suncor Energy Inc. and Syncrude Canada Ltd.) and the licensing authority, Alberta Environment. Notwithstanding agreement on this principle, the senior companies were not prepared to relinquish voluntarily what they perceived to be their established right to withdraw water even at very low flows.

The Suncor Energy Inc. and Syncrude Canada Ltd. water licences contain the following specific provision, designed explicitly to enable withdrawal restrictions:

> *The Controller of Water Resources may designate a minimum residual flow rate immediately downstream of the point of diversion and the licensee shall be required to cease or reduce any further diversion during periods when the residual flow falls below the rate designated.*[39]

These provisions have not been applied, although they have been in place for more than twenty years.

Provisions in the *Fisheries Act* also give DFO the legal authority to implement an EBF. In its response to the JPR on the Kearl Oil Sands Project, DFO committed to incorporating an EBF in the final water management plan for the lower Athabasca River.[40]

It is up to Alberta Environment and DFO to decide how to implement an EBF.

THERE IS A WAY ... IS THERE THE WILL?

There is a way through the impasse that the P2FC reached – one that secures water for nature while providing sufficient water for development.

The P2FC recognized the need to protect the aquatic ecosystem during low-flow periods, and some P2FC members promoted the implementation of an EBF. Implementation of an EBF for the lower Athabasca River has been reinforced from a science perspective by DFO's Canadian Science Advisory Secretariat review and from a water management policy perspective by the (Alberta Environment) Minister's Advisory Group on Water Management and Allocation.

The impact on industry would likely be negligible - operations would be affected by an EBF at this level on average once in a century

Moreover, the impact on industry would likely be negligible at the EBF threshold the P2FC explored (87 m^3/sec), which corresponds to the one-in-a-hundred-year weekly average low flow for the winter period in the lower Athabasca River. Statistically, Suncor Energy Inc. and Syncrude Canada Ltd. operations would be affected by an EBF at this level on average once in a century.

An EBF is required to protect the lower Athabasca River over the long term. Fish, mammals, migratory waterfowl and other birds of the Peace-Athabasca Delta, and traditional livelihoods rely on the lower Athabasca River. All that remains now is for the regulators – Alberta Environment and DFO – to implement a new water management plan for the lower Athabasca River that includes an EBF.

A CALL TO ACTION

WWF-Canada is calling on Alberta Environment and Fisheries and Oceans Canada to take the following actions:

1. Establish and implement an Ecosystem Base Flow for the lower Athabasca River set at no less than 87 cubic metres per second (the value of river flow the Phase 2 Framework Committee explored), below which water withdrawals are required to cease, recognizing that whatever threshold is implemented may need to be adjusted as ecological knowledge improves over time
2. Establish, implement, and make resources available for a monitoring and adaptive management program for the lower Athabasca River consistent with the recommendations of the Phase 2 Framework Committee to
    a. address the scientific uncertainties identified in the Phase 2 Framework Committee process and Fisheries and Oceans Canada's Canadian Science Advisory Secretariat review
    b. provide the basis for monitoring of both effectiveness and compliance
    c. specify management triggers that may signal the need for a formal review prior to a regular 10-year review

Withdrawing water during low-flow winter months rather than during average- or high-flow periods places much greater pressure on aquatic life.

ENDNOTES

1 Wolfe et al. (2008).

2 Suncor Energy Inc. reports using 2.27 cubic metres (m^3) of water from the Athabasca River to produce 1 m^3 of oil (Suncor Energy Inc., 2010); Syncrude Canada Ltd. reports using 2.31 m^3 of river water per 1 m^3 of synthetic crude oil produced (Syncrude Canada Ltd., 2010); Shell Canada Ltd. reports an average water requirement of 2.32 barrels of fresh water per barrel of bitumen produced (Shell Canada Ltd., 2009). Synthetic crude oil is manufactured by upgrading bitumen extracted from oil sands. Bitumen is a form of petroleum consisting of a mixture of long-chained hydrocarbons.

3 Oil sands companies operate under a zero-discharge policy whereby all oil sands process water must be stored on site (Giesy et al., 2010), but Suncor returns some cooling water back to the Athabasca River (Suncor Energy Inc., 2010). In 2009 oil sands mining projects withdrew 104,616,785 m^3 of water from the Athabasca River and returned 3,090,183 m^3 (AENV, 2010b).

4 The section of the Athabasca River between Fort McMurray and Lake Athabasca is considered the lower Athabasca River and is approximately 300 kilometres long (Ohlson et al., 2010). Oil sands mining operations withdraw water from the lower Athabasca River.

5 Many terms are used to describe the EBF concept. In Alberta the common term is currently “EBF,” and it is used throughout this report.

6 See, for example, Otago Regional Council (2010); Hardy et al. (2006); Jackson and Blecic (1996).

7 Poff et al. (1997).

8 DFO (2010).

9 See, for example, CAPP (2010); Shell Canada Ltd. (2009).

10 Flow record for the Athabasca River below Fort McMurray, Water Survey of Canada 07DA001.

11 AENV (2010a).

12 Bradford and Heinonen (2008).

13 Bradford and Heinonen (2008); Cunjak et al. (1998).

14 Bradford and Heinonen (2008); Cunjak (1996). Maintenance of the quantity and quality of winter habitat may be the primary factor regulating the carrying capacity of northern rivers (Power et al., 1999).

15 Ohlson et al. (2010); DFO (2008).

16 Kwasniak (2010).

17 Schindler et al. (2007).

18 Government of Alberta (2007).

19 Dyer (2009). Under the Phase 1 Water Management Framework, oil sands mining operators are always permitted to cumulatively withdraw at least 5.2 per cent of historical median flow in each week, regardless of the severity of a low-flow event (AENV/DFO, 2007).

20 AENV/DFO (2007).

21 Ferner (1992).

22 Ohlson et al. (2010). The P2FC considered a threshold flow below which some P2FC members recommended that Suncor Energy Inc. and Syncrude Canada Ltd. be permitted to withdraw their average annual allocation rates, and Shell Canada Ltd. and Canadian Natural Resources Ltd. be permitted to withdraw only enough to prevent their intakes from freezing.

23 R.S.C. 1985, c. F-14.

24 For example, DFO's authorization for the harmful alteration, disruption or destruction (HADD) of fish habitat for the Shell Albian Sands oil sands mining operation includes a restriction that the withdrawal rate at the Athabasca River intake shall not exceed 1.8 per cent of the average daily flow of the river, to provide protection of fish habitat during periods of extreme low flows (AENV/DFO, 2007).

25 Candler et al. (2010); Wolfe et al. (2008).

26 Ohlson et al. (2010).

27 In 1931 Alberta passed the *Water Resources Act*, S.A. 1931, c. 71. The final consolidation of this act was the *Water Resources Act*, R.S.A. 1980, c. W-5. The *Water Resources Act* was repealed and replaced by the *Water Act*, R.S.A. 2000. C. W-3., which came into effect in 1999 (Kwasniak, 2010).

28 R.S.A. 2000, c. W-3.

29 Ohlson et al. (2010); Hardy et al. (2006); Brizga (2001).

30 Anderson et al. (2006).

31 Bradford and Heinonen (2008).

32 Annear et al. (2004). A precautionary approach may also reverse the burden of proof to presume that water withdrawals during sensitive periods are harmful until proven otherwise (FAO, 1995).

33 PCO (2003).

34 Ohlson et al. (2010); Paul and Locke (2009). The evaluation criteria (metrics used to compare water management alternatives, such as fish habitat) used in the P2FC process, placed no special weight on the impacts of water withdrawals during extreme low-flow events. In other words, a reduction in habitat during a one-in-five-year low-flow event was treated the same as a reduction of the same percentage of habitat in a one-in-a-hundred-year low-flow event. The Instream Flow Needs Technical Task Group did not necessarily support this treatment of habitat loss during low-flow events.

35 Ohlson et al. (2010). The EBF threshold the P2FC explored, 87 m^3/sec, was calculated by averaging the weekly one-in-a-hundred-year low flows for weeks 1 through 11 in the lower Athabasca River. For reference, the lowest weekly average flow observed over the 50-year period of record (1958–2007) was 88 m^3/sec.

36 Ohlson et al. (2010); Paul and Locke (2009).

37 DFO (2010).

38 DFO (2010).

39 Suncor Energy Inc. Licence 00038538-00-00, I.L. No. 10400, Section 10, and Syncrude Canada Ltd. Licence 00035216-00-00, I.L. No. 07921, Section 5. Available from Alberta Environment's Authorization / Approval Viewer http://environment.alberta.ca/01519.html.

40 DFO (2007).

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The Athabasca River in Numbers

1,538

At a length of 1,538 kilometres, the Athabasca is Alberta's and one of North America's longest free-flowing rivers.

6,000

The Peace-Athabasca Delta is a 6,000-square-kilometre wetland complex of global significance.

1 million

Up to 1 million migratory birds pass through the Peace-Athabasca Delta.

31

The lower Athabasca River provides habitat for 31 species of fish.

WWF

Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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