Draft Meeting Summary

Athabasca River Basin (ARB) Initiative

Working Group meeting #5

Date May 10, 2017

Time 9:00am to 4:00pm

Location Executive Royal Hotel West, Edmonton

Attendees

Alexandra Sorckoff, Fisheries & Oceans Canada
Andrew Wilson, AEP
Brian Yee, AEP
Cameron Knutson, Heart Lake First Nation
Carolyn Campbell, AWA
Dan Cardinal, Region 1, Métis Nation of Alberta
Dan Moore, AFPA/ ANC
Diane Scoville, Region 1, Métis Nation of Alberta
Ellyn Davidson, CPAWS
Harry Cheecham, Fort McMurray #418 First Nation
Janice Linehan, Suncor
Jaquelyn Negraiff, Alberta Pacific Forest Industries
Jason Ponto, Athabasca Watershed Council
Jessica Watson, West Central Forage Association
Jim Sellers, Athabasca University
JoAnne Volk, Repsol Oil and Gas
Lauren Makowecki, AEP
Linda Jefferson, ATCO
Martin Van Olst, Environment and Climate Change Canada
Murray Tenove, Alberta Agriculture and Forestry
Nazila Sedaei, University of Alberta
Patrick Marriott, Alberta Energy Regulator
Sarah Grass, University of Waterloo
Stephanie Martens, Fisheries & Oceans Canada
Steve Schafer, Aspen Regional Water Services Commission/Town of Athabasca
Xinzhong Du, Athabasca University
Zahidul Islam, AEP

Claire Jackson, Alberta WaterSMART
Danielle Marcotte, Alberta WaterSMART
Denise Di Santo, Alberta WaterSMART
Matt Chernos, Alberta WaterSMART
Megan Van Ham, Alberta WaterSMART
Mike Nemeth, Alberta WaterSMART
Ryan MacDonald, Alberta WaterSMART
Kim Sanderson

Meeting objectives

1. Systematically review and assess each water management opportunity (potential strategy) identified by the Working Group so far, including those that can and cannot be modelled in AIRM
2. Begin to assess and sort which are the most and/least promising strategies

Current action items

Actions 1-5 and 9-10 pertain to the Central Region. Actions 6-8 and 11-12 pertain to the Upper Region.

Action		Responsible	Due	Status
1	Look at the differences based on the assumption of 50% of allocation being used and if there is a large difference from existing, this might be useful as a new base case. This might be helpful in determining if TDLs should be on or off.	Modellers	End of May	
2	Look at weeks 24-43 identified as possible low flows in late season and ensure results are	Modellers	End of May	

Action		Responsible	Due	Status
	compatible with Lower Athabasca Surface Water Quantity Management Framework section 9.3.5.			
3	Consult with Meghan Payne to get more context and confirm the purpose of the weir, and modellers will look at flows pre- and post-weir to examine the impact.	Mike Nemeth	End of May	
4	Follow up with Zahid to develop and refine appropriate rules for providing water to reduce shortages and meet downstream needs (e.g., development and ecosystem) for minimum flow.	Ryan MacDonald	End of May	
5	Follow up with Lauren to get the rules for the Modified Desktop Method to do a pilot / test run on a selected tributary.	Ryan MacDonald	End of May	
6	Look at how industrial or municipal conservation alone can be done in the model.	WaterSMART	End of June	
7	Follow up with AEP to determine if there is an opportunity to change the dam operations (it may be important to consider the walleye fishery in the reservoir or the recreation on the reservoir) and to increase the storage.	Ryan MacDonald	End of May	
8	Clarify what the ANI means.	WaterSMART	End of May	
9	Follow up with Lauren to explore linkage of R1 with SD2 and SD4.	WaterSMART	End of May	
10	Use the model to quantify the hydrological value and other values for one or both options using CPAWS data and shape files provided.	WaterSMART	End of June	
11	Look at the CPAWS 25% and the CPAWS 50% conservation areas; do not reclaim towns, highways or campsites.	WaterSMART	End of June	
12	Get the CPAWS NPV model.	WaterSMART	End of June	
13	Develop an approach for stress tests and provide to the group by email.	WaterSMART	End of June	
14	Review all suggested model and PM changes contained in these notes and respond as appropriate.	Modellers	End of July	

Discussion points

1 Opening remarks

Mike Nemeth convened the meeting at 9:15 a.m. Those present introduced themselves. Mike reviewed the agenda for the day, noting that the presentation on Treaty Water Rights will be made at the September meeting along with more details on the LARP review process. Most of today will be spent in breakout groups. Mike reminded the group about the Chatham House Rule, which is intended to let people feel comfortable speaking without attribution. A lot of information is being presented and will be

documented and shared with the group, including today's slides.

Mike reviewed the scope of the project with reference to a series of slides that covered a number of areas, noted briefly below. More details can be found in the slides that accompany these notes.

- Discussions with the Government of Alberta (GoA) confirm that Alberta Environment and Parks (AEP) is committed to the Athabasca River Basin (ARB) initiative and its success. Although there is potential for confusion and overlap with the Lower Athabasca Regional Plan (LARP) review, this is manageable. The intent is still to launch work in the Peace/Slave but that will come later.
- There have been some challenges regarding Indigenous engagement and many external factors won't allow us to get the clarity the Indigenous communities have asked for. Nevertheless, we hope they will continue to participate to the extent they are interested and able.
- With respect to prior concerns raised by some First Nations and Métis groups, WaterSMART does not consider this collaborative process to be consultation. The GoA supports this work and is prepared to receive and review project deliverables as they become available. These deliverables will be considered as one input among many; if and where appropriate, they may help inform development of future GoA products, including policy, regulation, or decisions. It is GoA products upon which Government would directly engage and consult, as it may find appropriate. WaterSMART will be offering in-community sharing sessions. Sharing of the Roadmap will be done with whoever is interested in discussing its potential benefit to their community (e.g., information base, internal planning and decision making).

Mike reviewed the overall collaborative water management process, indicating where we are in the process and reminding the group about the overall tool being used to develop the Roadmap—the Athabasca Integrated River Model (AIRM). He briefly described the components of the model, including the role of performance measures (PMs). He recapped the last meeting where the concept of landscape change was introduced and summarized the top five land uses in each region of the basin. The dominant driver for the whole basin is forest disturbance—both fires and harvesting—although fires have about double the impact of harvest. He revisited the scale at which we are working, the opportunities identified at the last meeting for the three basin segments, and the challenges that participants indicated they wanted to focus on. He presented examples of potential strategies that could be part of the Roadmap and the opportunity provided by the model to explore trade-offs.

2 Breakout Session 1 (morning): Review and assess opportunities for each region

Participants split into three breakout groups by basin segment (Lower, Central and Upper) to systematically review and assess the modelled opportunities in each segment. Handouts were provided that presented opportunities for each segment, sorted into three categories: Supply and Demand, Regulatory, and Lands and Ecosystems. Opportunities previously proposed as "basin-wide" were inserted into each basin segment. If participants had comments on more than one basin segment, they could move to a different table, provide written comments to the WaterSMART project team, or the project team could send them the document into which comments could be inserted.

The groups examined each opportunity for their segment. If modelled, they looked at how the opportunity was modelled and the results and suggested revisions to the model run. If not modelled, the groups considered if and how it should be modelled. For all opportunities, the groups determined whether it should be looked at further, whether it provided more of an observation about the river

system, or whether it should be set aside. Below is a summary that reflects discussion at the tables.

Table 1: Lower Athabasca (Megan and Danielle)
Megan and Danielle first provided a brief refresher on the Opportunities document and on the river system component of the AIRM (water quantity in the Athabasca River on a daily basis over the past 45 years with today's operations and demands).

SD1: Potential hydropower sites. Example modelled: Grand Rapids site
This potential site was identified in an earlier Hatch report on potential hydro sites in the ARB. It was modelled as reservoir #346, upstream of Fort McMurray with capacity of 400,000 cubic decameters (cdm), based on the estimate provided in the Hatch report. There are a number of options for how a facility could be built in this location including run of reservoir, low head and high head. The 407,000 cdm capacity would likely require a 25-30 meter high dam.

Operationally, this facility could serve a range of functions. Based on prior working group discussion, these might include:

- Supplementation to meet minimum flows downstream
- Water supply for licensed demands
- Hydropower generation.

The rule curve for the facility was drafted to fill during spring high flow, stay full over summer and release flows through fall and winter.

Based on the initial model run, the impact on flow in the mainstem immediately downstream of the potential site was:

- Up to 50 cms reduction in spring while the reservoir is filling
- Up to 30 cms increase in fall as the reservoir supplements flow
- Up to 10 cms in the winter as the reservoir supplements flow.

The PMs showed the following results:

- Shortages were reduced by a small amount, recognizing that upstream shortages could not be resolved by this facility.
- There was no change in the dissolved oxygen (DO) PM (this is measured at Fort McKay based on a daily metric correlating flow to DO).
- The streamflow as a percentage of natural flow increased in the winter (as flow is augmented) and decreased in the summer (as the reservoir is filling).
- The Aboriginal Navigation Index (ANI) showed a slight improvement in some years.

The group raised a number of concerns with an on-stream facility:

- What impact would the change in flows have on the Peace-Athabasca Delta?
- What impact would it have on sediment transport; both the trapping of sediment in the dam and the impact on downstream sediment from the change in flow?
- What impact would the reduction in spring and summer peak flows (due to reservoir filling) have on riparian health?
- What impact would the dam have on fish migration; both as a result of the dam barrier and as a result of the change in DO and temperature from the flow change?

- Specific to the Grand Rapids site, what would the impact be of building a dam in a reach of the river that currently oxygenates the river (through the rapids)?
- What impact would hourly peaking (typically seen below a hydropower site) have on aquatic health and habitat, recognizing that diurnal peaking is already seen in the natural flow of the river?
- What impact would hourly peaking have on ice build-up and jamming, again, recognizing that diurnal peaking is already seen in the natural flow of the river?

These questions and many more would be addressed in the extensive scenario analysis and study of potential operations and mitigative actions as well as the Environmental Impact Assessment (EIA) process.

The group suggested revising the model run as follows:

1) Run a second, smaller version of the reservoir (estimate a run of reservoir size with 2-3 days storage).
2) Revise the operations to use reservoir releases to meet downstream navigation and ecosystem minimum flows. It was also suggested to fine tune the upper and lower rules to reflect daily operations on the reservoir, rather than a coarse monthly pattern.
3) Run a version of the reservoir operating only for hydropower generation, for comparison purposes. It was also suggested to fine tune the upper and lower rules to reflect daily operations on the reservoir, rather than a coarse monthly pattern.
4) Prepare a run using the Pelican site instead of the Grand Rapids site.

SD2: Re-evaluate water storage options off stream. Example modelled: McMillan Lake.
This potential site was modelled at 100,000 cdm at the current McMillan Lake site. Operationally, it releases flows to meet downstream licensed demand needs. In the initial run, it was used (only ~5,000 cdm) once (in March) in the 45 year record. Note: the model follows the Surface Water Quantity Management Framework flow triggers and cumulative withdrawal limits, but does not reflect the water shortage agreement that is negotiated between companies to meet the withdrawal limit.

This facility would have little to no benefit for DO (as noted in the commentary) and the brine level in the lake may create unwanted fisheries impacts.

The group suggested adding the following to the model run:

1) Keep the initial run that focuses on meeting licensed demands.
2) Revise the operations to focus on meeting the downstream AXF.
3) Revise the operations to focus on supplementing flows to ensure the flow is not reaching the 87cms licence cut-off bracket. This is how the current run is set up – maybe focus on not reaching the next cut-off bracket in the framework.

SD3. Remove freshwater SAGD licences
There are five SAGD licences for fresh water. These licences pull from an unnamed non-isolated lake, not from the river. The model run looked at the impact if these licensed demands were removed (for simplicity, the model had the licences pulling directly from a tributary).

There was no detectable difference in flow in the mainstem below the tributary confluence once the demands were removed.

Provincial policy is in place for alternate sources to be fully explored before freshwater use is approved.

This run was viewed as an observation rather than a potential opportunity.

SD4: Reuse of industrial or municipal effluent
This was previously a basin wide opportunity. The group considered whether there is a specific opportunity in this region related to water reuse that should be explored.

The regional water line from Fort McMurray to Anzac is for water supply, not waste water and not purple pipes, as noted in the commentary. Through the Oil Sands Leadership Initiative, the predecessor to COSIA (Canadian Oil Sands Innovation Alliance), a number of companies looked at opportunities for reusing water regionally.

The Regional Municipality of Wood Buffalo continues to look at a purple pipe opportunity to send treated waste water to industrial users. At one point, they explored the option of supplying the Nexen Long Lake upgrader. Distance has so far proven to be a limiting factor in finding suitable customers.

The group agreed there was no specific opportunity in this part of the basin and it should not be looked at further for this part of the basin.

Table 2: Central Athabasca (Mike and Ryan)

Spring shortages (March) were noted under the current base in two areas of the basin (with TDLs). About 85% of water licences report use and for those licences only 50% of allocated volume is used. Upstream of Fort McMurray, if 80/100 licences report, we know their allocation and use actual use in the model so we could assume the non-reported licences use a similar percentage.

ACTION 1: Modellers will look at the differences based on the assumption of 50% of allocation being used and if there is a large difference from existing, this might be useful as a new base case. This might be helpful in determining if TDLs should be on or off.

SD1: Irrigation agriculture

- There could be a future increase in irrigation agriculture in response to changing climate (warmer air temperatures and longer growing season), assuming suitable soil conditions. Increased demand would be small as current demands are small, so even with doubling of those demands shortages aren't expected to increase. Landscape changes could occur, resulting in changes to the runoff regime, and potentially affect water quality through increased sediment and nutrient loading. This could potentially be mitigated with Best Management Practices (BMPs). With more water for irrigation, current flows do not drop below 400 cms downstream of Ft. McMurray during the summer.
- A PM that looks at late season flows (summer) should be further examined as part of a climate change flow scenario to see if increased water use in that time period would have any impact on flows downstream of Ft.McMurray.
- Overall, need to watch for potential changes in water quality and potential for reduced flows and effects on the Lower Athabasca Water Management Framework.

ACTION 2: Modellers will look at weeks 24-43 identified as possible low flows in late season and ensure results are compatible with Lower Athabasca Surface Water Quantity Management Framework

section 9.3.5.

SD 2: Weir at Lesser Slave Lake to manage lake levels

- The weir was installed in 1983 to reduce overall fluctuation of lake water levels. This opportunity could be less about managing lake levels and more about restoring natural flow variability downstream and seeing what impact the weir is having on downstreamflow regimes with respect to fish habitat, navigation on Lesser Slave River, channel maintenance, sediment transport, and overall ecosystem health.
- What flows are needed to serve a wide range of functions? Lesser Slave River can contribute large amounts of streamflow to the Athabasca River.

ACTION 3: Mike will consult with Meghan Payne to get more context and confirm the purpose of the weir and modellers will look at flows pre- and post-weir to examine the impact.

SD 3: Potential hydropower and water storage sites

- A dam at the Mirror site could potentially provide 1.9 million dam^3 of storage upstream of the Town of Athabasca on the mainstem of the Athabasca River. This could be a multi-purpose structure.
- The PM for walleye recruitment shows that the dam increases reduction in walleye recruitment. High volume demands for water in this area are unlikely but suitable fish passage through a dam would be necessary to avoid reducing habitat and range. One option is to store water in summer then use it to maintain minimum flows during the winter, which may address issues with DO.
- The group did a live modelling scenario with an arbitrary 200 cms minimum flow downstream of Ft. McMurray on the mainstem of the Athabasca River. They determined that there was enough storage in the 1.9 million dam^3 Mirror Reservoir to meet a 200 cms minimum flow year round.

SD 4: Re-evaluate water storage options off stream

- One option is to retrofit the Lesser Slave Lake weir and raise it by 30 cm, which would create 100 Mm^3 storage for use by downstream oil sands operations; e.g., McMillan Lake receives water for use. Potential impacts: spawning, inundation, and riparian health.
- All six seasonal thresholds in the Lower Athabasca Water Management Framework are built into the model; if any of these are hit, the model forces the demands to not ask for water.
- The model could be forced to meet minimum required flows in the Lower Athabasca River with an additional specified volume to meet downstream industrial needs. If the lake level is raised, mitigation will be required to reduce impacts.

ACTION 4: Ryan will follow up with Zahid to develop and refine appropriate rules for providing water to reduce shortages and meet downstream needs (e.g., development and ecosystem) for minimum flow.

SD 5: Explore setting precautionary water withdrawal limits

- Current winter withdrawal limits are less protective of ecosystem needs than the IFNs determined using the Alberta Desktop Method. The Surface Water Allocation Directive for lakes and rivers is a new policy being developed to manage allocations in watersheds where no water management plan is in place.

ACTION 5: Ryan will follow up with Lauren to get the rules for the Modified Desktop Method to do a

pilot / test run on a selected tributary.

SD 6: Reuse of industrial or municipal effluent, and
SD 7: Water conservation and water efficiency improvements

- The Water Reuse policy is still in development. Industrial demand and use drive this opportunity. The question was asked "How much does this part of the basin need return flows?" All return flows in the central basin could be turned off and then assess outcomes in the model run. Then if industry came in and said they needed effluent, the impact could be assessed.

Table 3: Upper Athabasca (Claire and Matt)

SD 1: Reuse of industrial or municipal effluent

This opportunity was modelled using the Alberta Newsprint Company (ANC) licence, considering the licensed use and licensed return flows. Two different versions of this opportunity were modelled. Version 1 was modelled where ANC still too the same amount of water as in the base case, but did not return any flow to the river. Version 2 was modelled where ANC reuses its return flow instead of returning it to the river, therefore there was no return and the demand was smaller.

The group looked at the flows in the river downstream of the ANC demand. Because the flow in the mainstem of the Athabasca River is so much larger than ANC's demands this opportunity did not show any visible change in the hydrograph on the mainstem of the river. The group wondered what this opportunity would look like if all users in the upper portion of the basin recycled their return flows; is there an opportunity to look at this from a regional perspective? It was decided that this opportunity would be more valuable if it was modelled as if all users or all big users recycled their water.

- How much water would not be returned to the river?
- Would it be possible to model this opportunity such that all return flows are sent to offline storage and used later? It could be used by industrial users.
- This scenario may also have positive water quality impacts.

SD5: Water conservation and water efficiency improvements

Conservation, education, and understanding should also be considered; this led the group to discuss SD5: water conservation and water efficiency improvements.

- Reviewed 10% decrease in industrial, commercial, and municipal licences.
- Is it possible to look at industrial or municipal conservation alone; e.g., drop municipal use by 10 or 20%? This could be done in the model with a switch.

ACTION 6: Look at how industrial or municipal conservation alone can be done in the model.

- It would be necessary to incentivize industrial or municipal users to conserve more water; they could get breaks such as decreased water bills or decreased taxes.
- It may be beneficial to put in legislation that encourages grey water use.
- The group looked at the hydrograph in two areas, both below Whitecourt and below where the Firebag enters the Athabasca; there was no change in either hydrograph.
- The PM shows that this opportunity allows the Athabasca to contribute more to the PAD, it also decreases the ANI.

New Opportunity

Change operation of the Paddle River dam and/or increase storage of the Paddle River dam and impacts on Pembina River? This may be beneficial in drought conditions.

ACTION 7: Ryan or Matt to follow up with AEP to determine if there is an opportunity to change the dam operations (it may be important to consider the walleye fishery in the reservoir or the recreation on the reservoir) and to increase the dam storage.

SD3: Explore new and existing on stream and off stream hydropower sites for both hydropower and water storage

The Oldman Reservoir was modelled as a starting point, it was modelled as a 2.3M dam^3 reservoir. The group looked at the hydrograph below the reservoir, the reservoir rule curve, and the reservoir storage and how flow and the ANI would be changed in the Lower ARB. There was a slight improvement in the ANI (0.1%) but it was not clear what this meant. There was some discussion about looking in reverse to see how big the dam would have to be to allow 100% navigation or to maintain minimum flows downstream. It was noted that the reservoir did not have an impact on shortages because there are so few demands in this portion of the basin.

ACTION 8: Clarify what the ANI means.

SD2 Limit TDLs in tributaries that have habitat at risk and
SD4: Explore setting precautionary water withdrawal limits

These opportunities both deal with developing instream flow needs and shorting demands to keep a certain amount of water in the river. These opportunities were calculated in three portions of the Upper Region: the Upper Athabasca on the mainstem, the McLeod, and the Pembina. The minimum flow was calculated using the larger of either the Alberta Desktop Method or the 80^{th} quartile; it was also calculated using a 10% buffer above the larger of these two flows. This opportunity showed the most change to the hydrograph in the Pembina River. Could we try cutting off use from first to third order streams altogether?

Storage in the Paddle River Dam shows that the dam is supplementing downstream flows on the Paddle River. Is this how the Paddle River Dam is actually run? The dam, which has storage of 60,000 dam^3, empties to about 10,000 dam^3 to meet downstream minimum flows. The group had interest in looking at increased system demands; e.g., 20% increase in population, 20% increase in oil and gas activity.

3 Breakout Session 2 (afternoon): Continue to review and assess opportunities for each region

Table 1: Lower Athabasca (Megan and Danielle)

SD5: Water conservation and efficiency improvements

This was previously a basin wide opportunity. The group considered whether there is a specific opportunity in this region related to water reuse that should be explored.

Related to industrial use:

- COSIA has developed water intensity targets for its oil sands producer members. This is being driven by many factors including wanting to reduce fresh water use, the economics of water use, chemistry differences between freshwater and recycled water, and environmental net effects. Reduced water intensity should result in reduced fresh water diversions.

Related to municipal use:

- Many municipalities have already implemented water conservation and efficiency programs, in part due to the Water for Life Conservation, Efficiency and Productivity (CEP) Plan requirements.

- Other projects have taken a simple look at municipal conservation potential by having the model show the impact of a 10% reduction in consumptive demand. This 10% might be informed by literature examples of what other conservation programs have been able to achieve.
- Would there be an opportunity in the post-fire rebuilding in Fort McMurray to incentivize low impact development and practices?
- Municipal use typically sees a relatively high return rate; therefore reductions in municipal water use, while beneficial, have less of a net effect on river flow.

The group agreed there was no specific opportunity in this part of the basin and it should not be looked at further for the lower region. Educational tools could be helpful to address consumptive uses.

R1: Implement an Aboriginal Base Flow (ABF) or Aboriginal Extreme Flow (AXF)
This opportunity was discussed in prior working group meetings. The model run that was prepared based on those discussions implemented a 400 cms AXF during the open water season in the mainstem of the Athabasca River downstream of the confluence with the Firebag River. Upstream licence demands are shorted to try to meet the AXF when needed.

The results showed that the AXF was not met in some years, typically in the spring and fall, and while shorting upstream licences created more flow in the river, it was not sufficient to reach the AXF target. Alternative means to enable navigation on the mainstem and tributary mouths was discussed at earlier meetings and mentioned again here. These included:

- Using alternative water vessels that could operate in shallower depths, for example, some air boats are used in Fort Chipewyan.
- Dredging channels to create boat passage. Dredging was done in the past on the Athabasca River for the barges. This was stopped once the winter road was built. Since then, sand bars have developed that impede boat passage.

The group suggested adding to the model run with the following:

- Prepare a second version of the run that draws from upstream on or off stream storage to meet the AXF.

R2: Explore an Ecosystem Base Flow (EBF)
The group noted that an EBF has already been implemented in the lower Athabasca River through the Surface Water Quantity Management Framework (SWQMF). The 87 cms “floor” was put in place to guard against extremely low flow in the river. The framework was developed through an extensive collaborative effort that factored in aggressive projected development scenarios, climate change scenarios, and considerations of 1:200 low flows. Consequently, the framework’s EBF is quite conservative. Furthermore, the SWQMF has review cycles built in to allow for review and adaptive management as conditions change.

It was agreed that the development of an EBF over and above what is in the SWQMF requires a more detailed and lengthy process than this project is intended for and should be done on a reach specific basis.

A model run had been prepared that implemented a draft IFN (calculated using the Alberta Desktop Method) at the mouth of the Athabasca River, just above the PAD. It was noted that the Alberta Desktop Method is the default tool used for licence application decisions.

The group briefly reviewed the run and noted that for much of the year, the IFN overplots the observed flow in the river. The exception is some winter months where the IFN would demand higher flows than observed. By shorting licences upstream, the model showed the IFN at the mouth being met up for to 20 more days in a year than without having the IFN in place. This raised the question of whether an IFN at the mouth might drive higher flows in the river either through demand shortages or supplementation from storage.

The group did not suggest further revisions to this model run.

R3: Explore the creation of a policy or directive to enable oil sands to treat and release water.
A government and industry working group is working on this question. Through COSIA, detailed modelling is being done to support the discussion.

In earlier meetings, this group proposed using a simple set of assumptions to explore the potential for the water releases to be timed to be beneficial to flow in the ARB. The group recognized that water quality concerns and the assimilative capacity of the receiving body are key considerations that this work cannot address. To look at the flow related opportunities, we would need to assume that these considerations would be addressed fully by the dedicated working group. It was noted that these releases may be "on/off" for a while but ultimately the intent is to fully reconnect these water bodies.

The group suggested preparing a model run using simple water quantity volume and timing assumptions drawn from the COSIA modelling. Janice Linehan agreed to help coordinate accessing these assumptions from COSIA.

LE1-4 Reduction in linear fragmentation, this discussion included:

LE1: Reclamation requirements, practices and implementation for hydrology, and priority reclamation
LE2: Restoration requirements; e.g., for cut lines
LE3: Surface disturbance limits
LE4: Road and seismic line BMPs and monitoring their effectiveness

Each of these land use opportunities related to the extent and impact of linear features on the landscape. To begin the exploration, a model run was prepared that reduced the linear features in the whole basin by 40%. This included reduction in minor roads, trails, seismic lines and pipelines. The model replaced the linear feature with the natural feature surrounding it; e.g., forest cover, wetland.

The expected hydrologic impact would result from increased interception and shade of the vegetated canopy and from the conversion of impervious to permeable surfaces. This would most likely result in a decrease in runoff from the affected area. That said, due to the narrow nature of the linear features, a 40% reduction in those features only changed 0.6% of the area of the basin. There was some discussion of a possible increase in base flow due to higher infiltration and connectivity; however, it was suggested that higher transpiration by vegetation would be greater thus causing a net decrease in base flow.

The water balance results (interception, snow melt, snow water equivalent, soil moisture) for the Boreal region did not show a detectable difference between the model run and base case. The large scale of study is one contributor to this as well as the relatively small percent of the basin that was changed in this run.

To narrow the scale, the group looked at the flow in the Clearwater River. There was a small reduction in flow in the river as expected because of the increased interception and infiltration. That reduction could be seen to a lesser extent in the mainstem after the confluence with the Clearwater.

The group felt that this examination may be more relevant at the sub-basin rather than ARB scale. They suggested that the model run be redone with 40% reduction in linear features in each of the following sub-basins separately:

- Christina River
- Hangingstone River
- MacKay
- Muskeg River

The Pembina River may see an impact, but the reality of removing linear features may be limited as many of them are roads that serve agriculture.

It was also noted that many of the linear features in the basin are not "hard surfaces." They range in degree of permeability due to differences in cover (asphalt, gravel, earthen) and in compaction (high use to low use).

Overall, the discussion around reduction in linear features from a water management perspective might promote:

- Extracting resources with minimal disturbance
- Reclamation beneficial to hydrological processes:
    - This may inform prioritization of reclamation
    - This may contribute to the need for enforcement of reclamation requirements
    - This may inform the current reclamation requirements that allow for a range of end states compared to the initial state of the landscape – this range presents both a risk (initial hydrological processes are lost) and an opportunity (further hydrological processes can be created)
- BMPs related to conserving or restoring hydrological processes
    - Many are available now but may not be being followed

LE 5&7: Wetlands

This discussion included:

LE5: Provide more information on which wetland areas are "more sensitive" (or more significant) from a hydrological perspective and an isolated/local/regional scale

LE7: Maintain the wetland network in the region to offer key functions associated with fires

This group discussed wetlands at the last meeting. More specific direction is needed as to what might be further investigated or modelled. The last discussion suggested identifying wetlands that are "more sensitive" hydrologically. While classification is done/being done through AEP, Ducks Unlimited, and at specific sites, it is difficult to define "hydrologically more sensitive" across a large basin. It was noted that Traditional Ecological Knowledge (TEK) could be very informative in trying to do this.

It was recognized that wetlands perform a number of functions:

- Water storage and base flow
- High flow buffering and mitigation

- Water quality filtration

BMPs are available that maintain many of these functions; for example, culverts required in road building. Consideration could be given to replacing perched culverts but there would be hundreds of them and many agencies have associated responsibilities. Peat harvesting (e.g., around McMillan Lake) is impacting wetlands in that region.

It was not clear at this point which of these the group felt should be modelled or explored further. However, it was suggested that, similar to linear fragmentation, this change in landscape should be looked at by sub-basin rather than at the scale of the ARB.

Table 2: Central Athabasca (Mike and Ryan)

R1: Water management for lakes

- The intent is to create lake water balances related to allocation limits, maintaining lake level variability and limiting rates on water withdrawal to maintain natural functions. AEP has looked at the watershed area of a lake to determine surface inflow, and then produced a lake water balance. This is part of the draft Surface Water Allocation Directive (SWAD).
- Downstream channels must also be considered. If a lake normally outflows, then downstream impacts are considered and the rule is set for the lake.
- Under-ice flows must also be taken into account.
- Whatever water is not needed downstream can be allocated. The water renewal rate and chemical make-up are not changed in the draft SWAD.
- A pilot study could be done on a lake in the central region with data and recorded downstream flows to see changes. R1 could be combined with SD2 and SD4.

ACTION 9: WaterSMART will follow up with Lauren to explore linkage of R1 with SD2 and SD4.

LE1: Ensure adequate reforestation and buffer requirements for logging activities

- This opportunity was not simulated as this is a local issue and generally out of scope. Buffers are already implemented in the operational ground rules and some material provided by the forest sector could potentially be shared with more details. We should assume regulations and BMPs are being followed and can encourage and evaluate buffer adequacy on case by case basis. This opportunity will be kept due to its riparian significance and the fact that adequate buffers are needed for both public and private lands.

LE2: Understand the opportunity around natural water storage and how it has changed

- The model simulated 15% wetland loss in the Lac La Biche area; this number was used as a starting point and was not based on projected losses in that region.
- It was discussed that wetland loss of 15% would be likely too high. If wetland storage is lost, runoff could increase. It is important to note that wetland function varies with type —these are interconnected issues that the model has not resolved at the spatial scale of the ARB.
- This scenario is intended to provide context for the recognition of wetland values rather than an opportunity. BMPs should be implemented, and the Wetland Policy adhered to in terms of avoidance of wetland loss; landscape connectivity is important, but not in scope of the modelling at this time.
- Work is onging to include these hydrologic functions in our modelling.

LE3: Identify, conserve and restore areas for source water protection

- An example conservation area was suggested in the North Lesser Slave Lake area. There are two theoretical options that could be examined to determine impact on flows: 1) If we had conserved an area 50 years ago, what would it look like today assuming it didn't burn and knowing the climate in that time period; and 2) if we conserve an area now (plant trees, take out roads, no fires, assume future climate same as today), what will it look like 50 years in the future compared to now?
- It is difficult to set assumptions because natural disturbance such as fire would affect water flows more than conservation. The analysis also needs to recognize other ecosystem values that result from conservation in addition to the hydrological ones.

ACTION 10: WaterSMART will use the model to quantify the hydrological value and other values for one or both options using CPAWS data and shape files provided.

LE4: Reclaim roads that are no longer needed

- As a starting point, 40% of all linear features across the whole basin were reduced (reclaimed), making the impact greater in areas where road density is current higher (e.g., around Drayton Valley and Swan Hills). Water level of Lesser Slave Lake declined as a result of less runoff and the decrease in impervious surfaces.
- The model run shows that Swan River hydrograph peaks during spring freshet were slightly reduced.
- This opportunity was intended to see if changing linear features can improve drainage but this is difficult to determine at a large scale. Changing surface area from roads to natural does affect speed of drainage but this model run does not reflect drainage course or conveyance. Overall, reclamation has a benefit but needs to be targeted within a watershed (e.g., locally or a sub-basin) to make sure it attains specific goals (e.g., reduction in hydrologic impact and sedimentation).

LE5: Opportunity to make any future new farmland

- In the central area, agricultural expansion would likely mean converting forested land to farmland for crops or livestock, and if expansion does happen that it does so with no net increase in sediment or nutrient loading from runoff.
- Agriculture is not expected to require a lot of water but there are other impacts (e.g., runoff). The model simulation increased the current cropland and grazing land use by 30%, assuming that farmland would expand adjacent to existing farmed areas (e.g., Lesser Slave, Pembina watersheds) as connectivity between agricultural lands is important. The PM of flow at the Pembina outlet showed no real change; there were slight changes in the water balance, with more water getting into the soil.
- With higher rainfall, we do see a slight increase in peak flows with the 30% change to cropland but BMPs could potentially manage this. This is not being looked at as an opportunity to convert forests to cropland, but if agriculture were to expand in terms of land or water use, the main consideration is the impact of runoff into river systems.
- There is no detrimental impact on quantity or flow at the scales assessed in this modelling.

LE6: Prioritize reclamation through strong reclamation modelling

- Target local impacts, do on an appropriate scale and focus reclamation locally (e.g., target culverts) in areas where is can be done successfully. Combine with LE4.

SUMMARY REVIEW

The group reviewed all the opportunities. WaterSMART will remove the ones that fall more into the category of observation and will bring back simulations of others to the next meeting where they can be refined and put through a variety of stress tests.

SD1	An observation rather than an opportunity. If irrigation agriculture expands, the issues would be water quality related to sediment and nutrient runoff rather than water quantity.
SD2	To be combined with SD4 and R1. The opportunity is to target flow for downstream oil sands use and to meet instream flow needs.
SD3	Keep as an opportunity. Don't model only for hydropower but consider size for water storage, potential other uses, and the value of contributing to a more natural hydrograph.
SD4	Combine with SD2 and R1 as above.
SD5	Pilot on a tributary and bring back to next meeting.
SD6	Simulate and use to inform SD7
SD7	As above
R1	Combine with SD2 and SD4 as above
LE1	Out of scope, assume BMPs
LE2	Not an opportunity; assume follow Wetland Policy (no wetland loss) and standard practices
LE3	Quantify hydrological value of suggested conservation areas. Using forward or backward simulations to quantify value to be determined.
LE4	Combine with LE6 to develop a statement focused on the benefits of targeted reclamation
LE5	Keep as an opportunity noting that there would not be a big impact on surface water management but need to limit impacts and not make the situation any worse.
LE6	Combine with LE4 as above

Table 3: Upper Athabasca (Claire and Matt)

LE2: Alter forest harvest regimes

This was modelled as 30% forest disturbance to illustrate the impacts of forest disturbance on surface water quantity. It was not possible to achieve 30% forest disturbance through forest harvesting alone, so 30% forest disturbance was reached through both harvest and fires.

- There was an increase in spring flow.
- There were higher peak flows (10%).
- There was increased water in the system which led to more flooding and better ecosystem flows. Saw 10-20% increase in flooding.

POTENTIAL ACTION to add to the opportunity: Identify hydrologically sensitive areas and limit forestry in these areas.

- This scenario should be modelled with forestry and forest harvest separated; they would like to see the run with forest harvest alone.
- Is it possible to look at the effects of climate change on vegetation; e.g., the boreal forest moving

north?
- Would it be beneficial to look at controlled burns to control forest fires?

LE3: Increase in agricultural land
Cropland was increased by 30% in the areas that currently have agriculture. The main growth in agriculture in the Upper Region was seen in the Paddle River and Pembina regions.

- The hydrographs showed that there was more water in the system and also higher peaks flows. There is less streamflow during low flow periods.
- Potential issues with water quality; may need to implement agricultural buffer zones
- Would there be less impact if agricultural BMPs were implemented?
    - BMPs are more relevant for water quality impacts than water quantity impacts.
- In this scenario it would decrease the impacts if there is no drainage and wetlands are protected.

The group decided that increasing agricultural use is not a strategy, but more of a stressor.

LE4: Reclaiming linear features
The group discussed the opportunity to decrease linear disturbances; this was modelled as a 40% decrease in linear features over the entire basin. The hydrographs show there is slightly less streamflow. There was not a great deal of change overall in this opportunity. It should be reworded to "decrease or minimize expansion of linear features." Culverts and bridges should be accounted for as they interfere with flow in the rivers and streams.

LE5: Prioritize reclamation through strong reclamation modelling
This opportunity was not modelled as more clarity is needed from the group. The group noted that more clarity was needed from the opportunity, what would be reclaimed and what would the value be for water quantity as seen in the model?

It may be worth identifying more hydrologically sensitive areas both for reclamation and protection. This could be combined with LE1.

LE1: Establish parks or conservation areas
This opportunity was not modelled; there was some uncertainty regarding how to look at this opportunity in the model. Typically we model changes to the system and compare them to the current system. Would we model conservation areas as having no additional changes, as being reclaimed, or would we backcast the land use model to show what these areas would have looked like before they were disturbed?

The conservation areas we have are from CPAWS; we could use these areas as conservation areas and also identify areas that are hydrologically sensitive. The ALCES model can also be examined re: now vs. the future or now vs. the past to get the change and see the hydrological value. DUC also has some data that could possibly be used to fill in gaps.

For modelling purposes we could use the current basin as the baseline and reclaim the areas over time to look at the hydrological impact or we could focus reclamation of linear features in these areas.

ACTION 11: Look at the CPAWS 25% and the CPAWS 50% conservation areas; do not reclaim towns, highways or campsites.

The CPAWS 50% shape file would have the model reclaiming large sections of land that have industrial development; how would this be dealt with? CPAWS also did a model that accounts for net present value of industry in the area; it avoids conserving areas that are of high economic value so this model is likely more realistic and plausible.

ACTION 12: Get the CPAWS NPV model.

Future suggestion for a stressor: what if a new heavy water use industry comes into the ARB? This should be a stress test. Throughout the breakout sessions the group discussed examining increases in water demand and how to adapt to this in the future. This can be done in the model; demands can be scaled and examined. This will be done in future Working Group meetings.

5	**Watershed Stressors**

Megan Van Ham reviewed the role of stress tests and their use is testing strategies under potential basin conditions. As we develop stress tests, we want them to reflect more challenging but plausible future scenarios so we can determine which strategies would be most useful under those circumstances. Megan described potential stress tests under consideration to see how our strategies respond:

- Changes in climate – changes in air temperature and precipitation. Scenarios could look at drier or wetter conditions in the ARB.
- Increased demand – increase in consumptive water use could be modelled by licence type (municipal, agriculture, hydraulic fracturing, etc.)
- Large event-based landscape change, such as a big fire in the headwaters or changes in glaciers. The 2016 fire could be the basis for modelling the impact on basin hydrology if such a fire occurred around Jasper.

Participants were asked for comments on the potential stress tests.

Climate change: There was agreement that the proposed climate change stress tests should be done (wetter and drier conditions).

Increased demand:

- This could be done for one sector or across the board.
- We already looked at increasing agricultural land by 30% and doubling irrigation, and there was very little impact on flows. However, conversion of forested land to agriculture changed moisture content of soil and increased runoff.
- What about increasing environmental demand? We could meet environmental demand through increased attention to IFN and ecosystem-based flow. Otherwise how would environmental demand grow? TDLs are a way to manage fracking demand, which should perhaps be part of industry demand. Is there a shift away from issuing a lot of TDLs?
- TDLs are issued for many purposes, including dust control, and by definition are only for a year or so. If there is ongoing demand for the same site, a multi-year licence would be more appropriate. Environmental demand might be misleading and TDL is also misleading. There could be unpredictable shifts in TDLs and water is not necessarily going to come from the mainstem; it could come from a sub-basin.
- Environmental demand is way too low. Guidelines from the Department of Fisheries and Oceans say to leave 90% of water in the river for ecosystem protection. We need to think about this with

respect to inter-jurisdictional agreements between Alberta and NWT. The master agreement for the Mackenzie system says Alberta has the right to use and manage water as long as it causes no unreasonable negative impact downstream and includes traditional use. We might find a potential stressor in downstream demand as the UNESCO report on PAD and Wood Buffalo National Park could lead to recommendations to restrict development activity. We need to consider this as well as activity and impacts in the ARB.

An asterisk will be put on environmental demand and the term clearly defined. WaterSMART will review the work done from an agricultural perspective and look at building in increased municipal demands and possibly increased industry demands for the next meeting. We also will take a closer look at the downstream impacts.

Large event-based landscape change: The group agreed that fire and glacier change should be examined.

- It seems that impacts from a large forest fire in the headwaters would be more short term so we may want to look at it that way.
- It would be useful to look at glacier recession and impact on streamflow in response to future climate change. With glacier melting, there will clearly be more water for awhile, then none.

In previous basin projects, stress tests have also been done in combination to test the strategies under worst-case conditions and this is an option for the ARB. When asked if they would prefer to look at stress test scenarios individually or in combination, the group was about evenly split, noting that glacier change and climate change are already coupled.

ACTION 13: The project team will develop an approach for stress tests and provide to the group by email.

ACTION 14: The modellers will review all suggested model changes contained in these notes and respond as appropriate.

6 Next Steps and Close

Mike Nemeth noted that the next meeting will continue the assessment and sorting process, but we will also try to screen out the most and least promising strategies.

Potential dates for the next two meetings are:
September 26, 27 or 28
November 21, 23, or 30.

The Alberta Lake Management Society may be holding its meeting near the end of September and that could be a conflict for some people so the ALMS schedule should be checked before a date is confirmed. No other concerns were raised regarding these dates so WaterSMART will select a date and issue meeting invitations to the working group.

The meeting adjourned at 3:47 p.m.

ALBERTA
waterSMART
Water Management Solutions

Sustainable Water Management in the Athabasca River Basin Initiative (ARB Initiative)

Working Group meeting #5
May 10, 2017

Welcome and introductions

Previous Agenda		
9:00	**Welcome, introductions, and opening remarks**	**Mike**
9:45	Breakout groups: review and assess the list of opportunities per region	All
11:15	Readouts to plenary	Group Reps
11:30	Presentation: Treaty rights with regards to water	TBD
12:10	Lunch	-
1:00	Breakout groups: Continue to review and assess opportunities per region	All
2:45	Readouts to plenary	Group Reps
3:00	Break	-
3:15	Discussion: Watershed 'stress tests' – examples and how they help refine strategies	Megan
3:45	Next steps, and close	Mike

Today's Agenda		
9:00	**Welcome, introductions, and opening remarks**	**Mike**
9:45	Breakout groups: review and assess the list of opportunities per region	All
11:45	Readouts to plenary	Group Reps
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Chatham House Rule

"When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed."

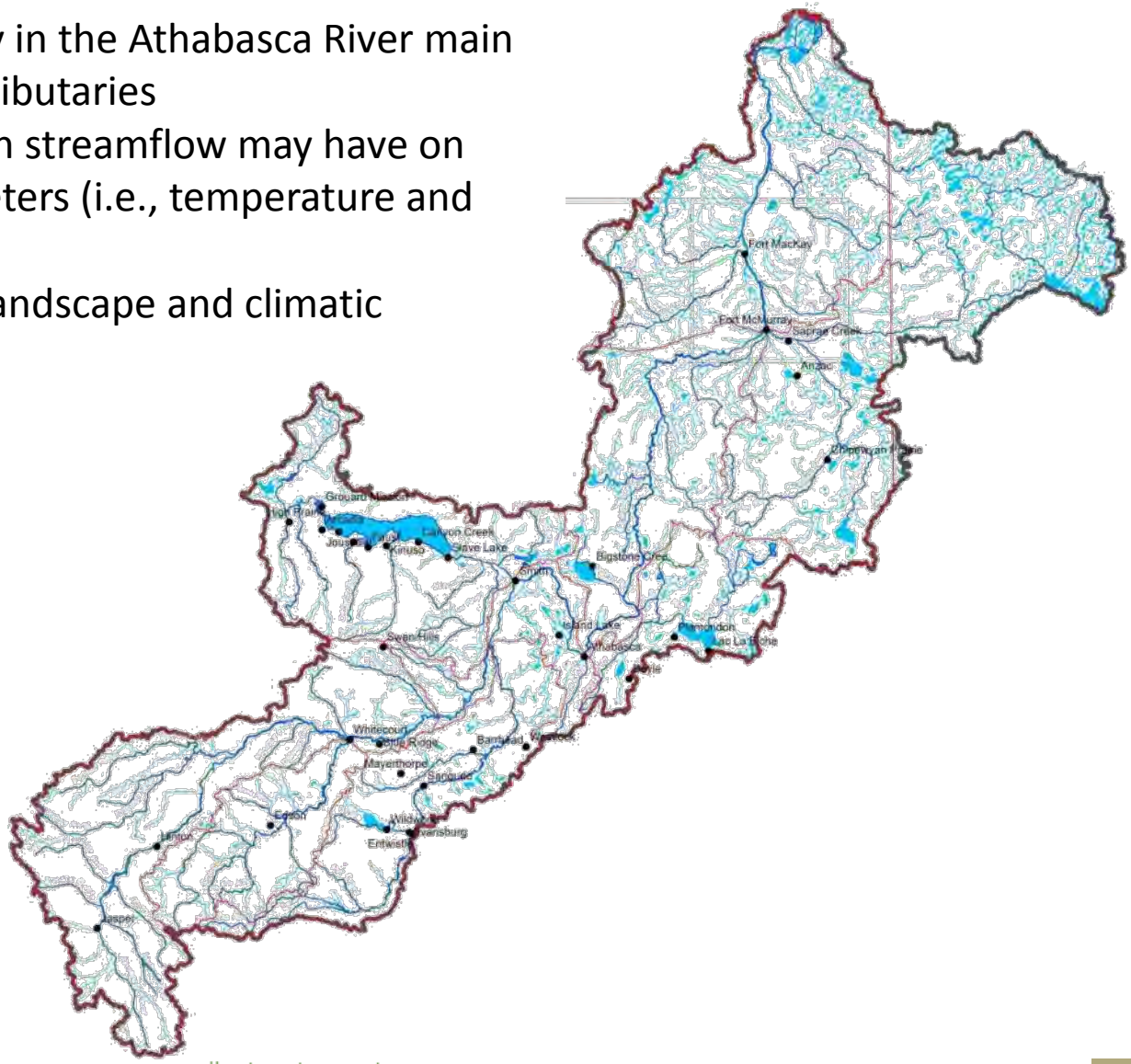
Be bold, be innovative, speak openly……focus on addressing the challenge, not the blame

Keep in mind…

- Slides and meeting summary will be sent out after today's meeting.
- Materials and information presented can be shared publically- all meeting material available on the project website (visit www.albertawatersmart.com or Google "ARB Initiative")
- Please ask questions as we go through the slides and during the working sessions.
- Some of the material will be reviewed again in future meetings.
- This process is iterative - it is on-going work.

Current scope

- Surface water quantity in the Athabasca River main stem, and the major tributaries
- Implications changes in streamflow may have on certain quality parameters (i.e., temperature and dissolved oxygen)
- Implications of basin landscape and climatic change on streamflow



Updates on the ARB Initiative after discussions with GoA (I)

AEP is committed to the ARB Initiative and its success. AEP has committed to formally “receiving and reviewing” the ARB Roadmap deliverable.

- Focus for the remainder of the ARB will be to produce the most useful Roadmap and communicate it to those in the ARB community.

AEP feels that there may be potential for confusion with the upcoming LARP (Sept 2017) review but this is manageable.

There are many external factors that don’t enable us to get the clarity that Indigenous communities seek within our timelines and context of the work.

- It is our continued hope that Indigenous communities do chose to participate if they are interested and have the capacity to do so.

Updates on the ARB Initiative after discussions with GoA (II)

There is limited support for launching the Peace/Slave pieces of this work due to Land Use Framework timing in the Lower Peace, the implementation of UNDRIP, the upcoming LARP review, and other factors.

- Work planned for year 3 of the ARB Initiative will focus on completing and disseminating the Roadmap. Timelines will likely be ~3 months instead of ~8 months. Originally there was a large focus on getting the Peace/Slave work launched.

There is growing interest in the water aspect of climate change adaptation.

- Climate scenarios in the ARB can be used to stress the system and help inform responses.

Update on concerns raised by some First Nations and Métis

Based on ongoing and recent discussions the following is the path forward for the ARB Initiative:

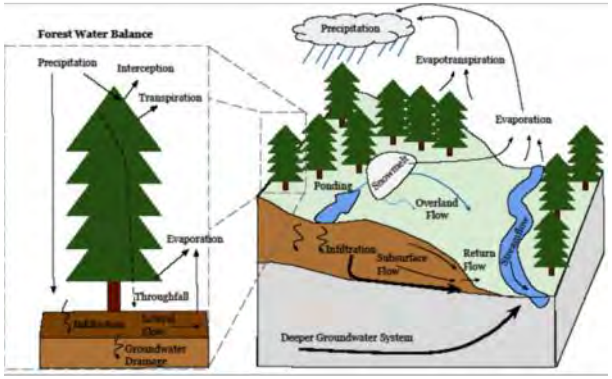
- The ARB Initiative is a WaterSMART driven project, and as part of this project, WaterSMART is engaging First Nations and Métis communities. **WaterSMART does not consider this collaborative process to be Consultation**. The Government of Alberta (GoA) is supportive of this work, and is **prepared to receive and review project deliverables**, as they become available. These deliverables will be considered as one input amongst many; if and where appropriate, they **may help inform development of future GoA products, including policy, regulation, or decisions**. **It is these products upon which government would directly engage and consult, as it may find appropriate.**
- **WaterSMART has not been able to secure funding for travel reimbursement for Aboriginal communities.**
- **WaterSMART is offering in-community sharing sessions.** Sharing of the Roadmap will be done with whomever is interested in discussing its potential benefit to their community (e.g., information base, internal planning and decision-making).
- We recognize that without full participation in the ARB Initiative, conversations and outcomes will not reflect the full voice of the basin. However, based on experience of similar efforts, **the Roadmap will be a tool/set of information that, once published, is expected to be of value to the water community in the basin whether they participated directly or not**.

Collaborative water management creates informed discussions that can move toward action

1. Bring together an inclusive basin-wide working group

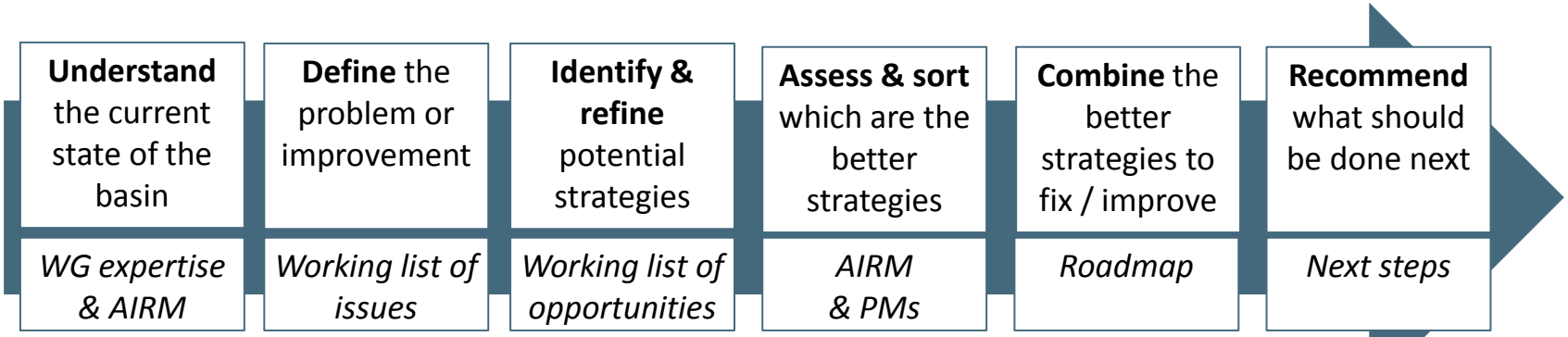
First Nations, Métis Regions, Métis Locals, and Métis Settlements

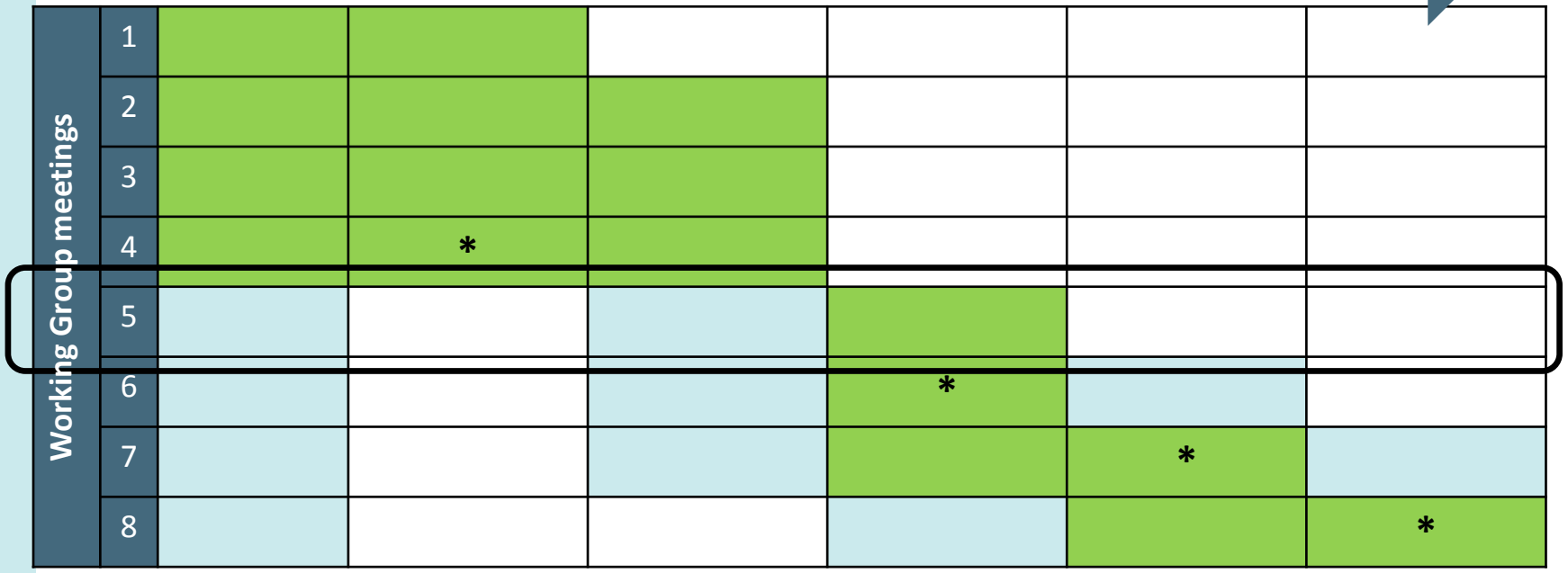
2. Provide a strong base of data and tools



3. Work collaboratively to identify challenges and opportunities

Collaborative process to develop the ARB Roadmap





Collaborative approach to “Assess & sort”

Assess & sort which are the better strategies

Long list of strategies identified and refined by WG

↓

Review results & refine in breakout sessions with plenary

↓

Filter down least promising strategies – confirm with WG

↓

Shorter list of strategies

↓

Review results & refine in breakout sessions with plenary

↓

Filter up most promising strategies – confirm with WG

↓

Short list of strategies put in combinations in the Roadmap

↓

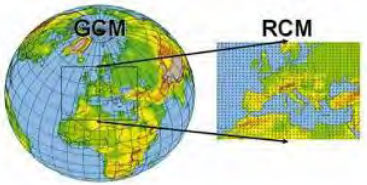
Full list provided in Roadmap report:
Most promising; Some promise; Least promising

Reminders about the Athabasca Integrated River Model (AIRM)

- AIRM represents the basin today, based on available data and information to date.
- "All models are wrong, some are useful."
    - We believe the integrated model is a useful representation of the ARB watershed.
- AIRM and the PMs show direction and amount of hydrologic change within the basin.
- Expect small refinements in the model as we work with it; however, AIRM is built and ready for use.

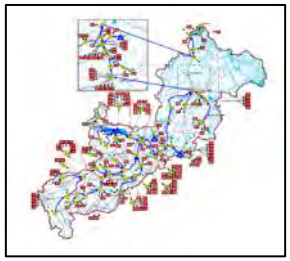
Athabasca Integrated River Model (AIRM)

Input: opportunities (e.g., changes in demand/water use, flow targets, infrastructure changes, land use and landscape change, changes in climate, etc.) and expertise.



Output: future daily precipitation and air temperature

Outputs: changes to streamflow based on changes to climate and landscape, changes in snowpack, soil moisture, etc.



ALCES

Outputs: changes in landscape composition from various scenarios

Outputs: Changes to streamflow and PMs that show effects of strategies on the system

Examples of 'What if…' questions

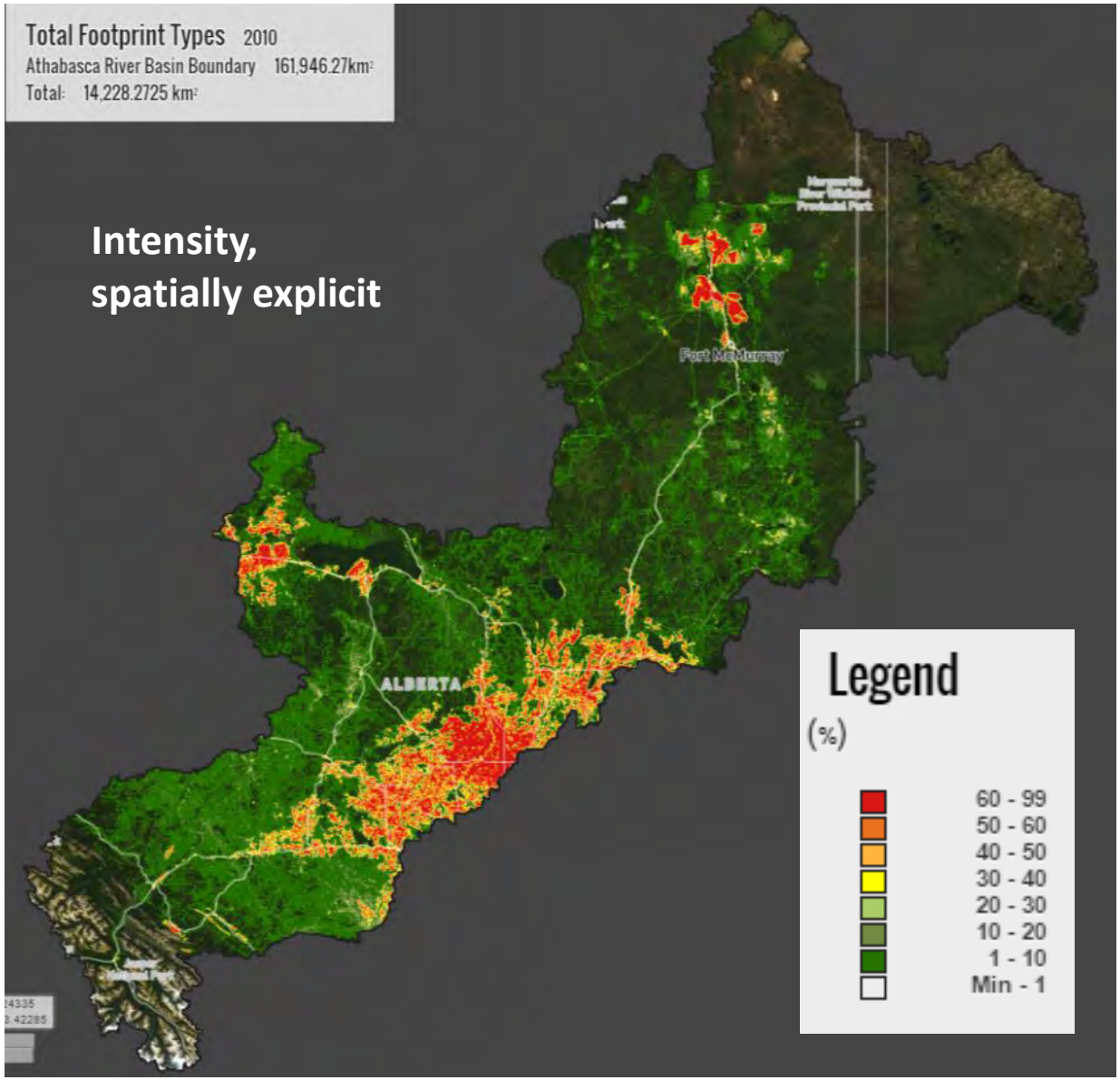
Working group participants decide on the issues and opportunities they would like to explore using the modelling tool

- How would a large forest fire in the headwater affect streamflow?
- What if large areas of land are conserved (no additional human disturbance)?
- What if IFNs were put in place on tributaries?
- What if current population centers were to double or triple in size?
- What if water intensive industries move to the ARB because of licence availability?
- What if precipitation occurs as rain in the spring rather than snow?
- What if we experience the drought of the century?
- What opportunities might potential hydropower facilities provide for water management?
- What actions will improve water navigability?

→ As a community or organization, what are my water concerns?

Last meeting- introduction to land uses and landscape change in the ARB

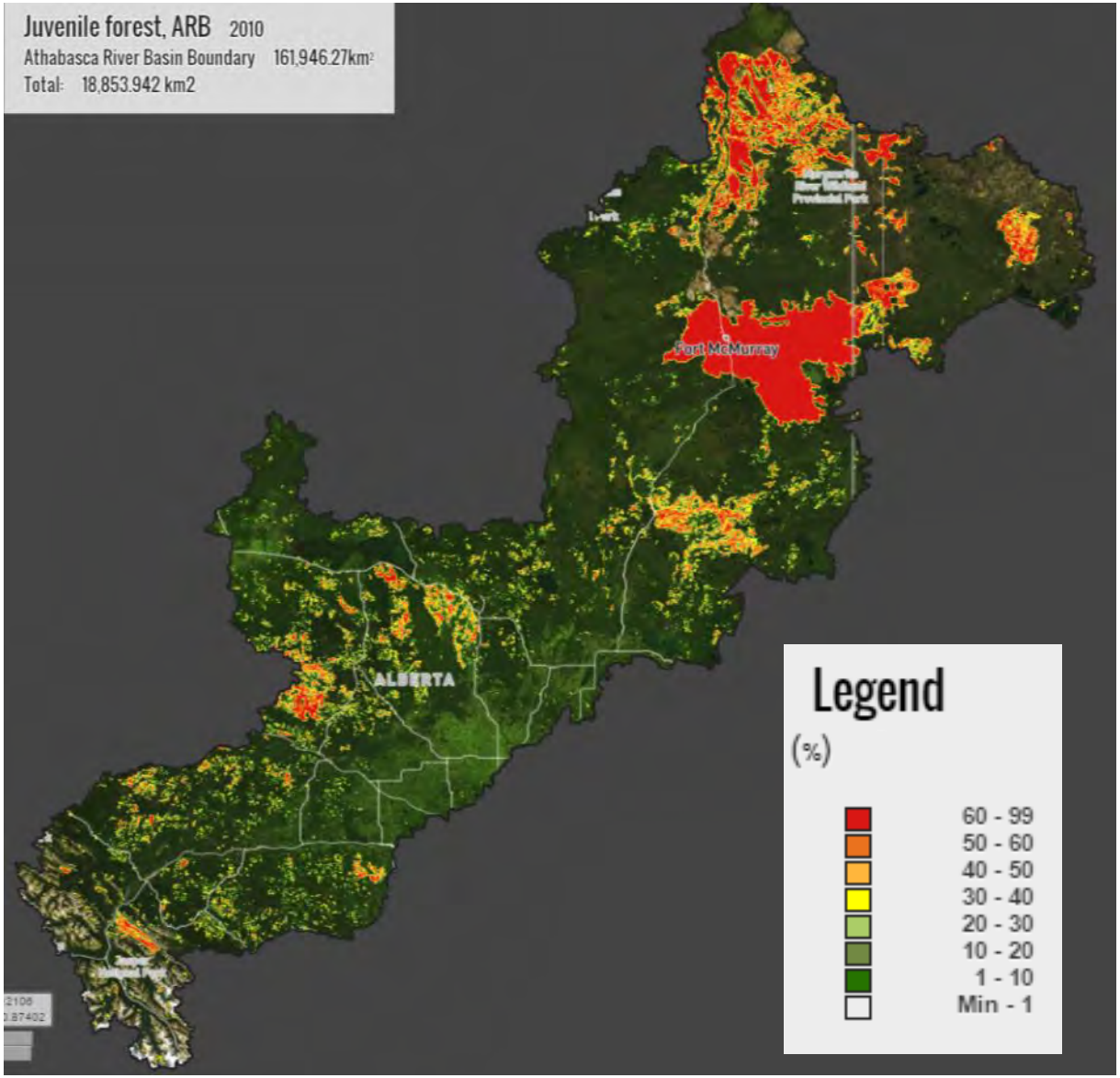
All human land uses in the ARB, ~2015 (based on total footprint)



Summary of top five land-uses in each region

Upper	Central	Lower
Agriculture - 11.5%	Agriculture – 7.7%	Forestry (<20 years old) – 1.5%
Forestry (<20 years old) – 5.5%	Forestry (<20 years old) – 5.3%	Oil & gas – 1.2%
Oil & gas – 2.3%	Oil & gas – 1.9%	Oil-sands mining – 1.1%
Roads – 0.5%	Roads – 0.3%	General industrial – 0.2%
Human settlement – 0.5%	Human settlement – 0.3%	Roads - < 0.1%
Total – 20.3%	**Total – 15.5%**	**Total – 4%**

Young forest, current – substantial area from the 2011 Richardson fire and 2016 Horse River (FM) fire



Suggest we focus on sub-basin and regional scale

This project and its tools are targeted at “sub-basin and regional”

Reach	Sub-basin	Region	ARB
~10 km^2	~1,000 km^2	~10,000 km^2	~100,000 km^2
NO	**YES**	**YES**	**NO**
Do not fit this project	Need to focus working group and modelling effort	Likely the most effective scale to work at for this project	Difficult to generalize changes at the ARB scale
e.g., streambed restoration project	e.g., proposed conservation area	e.g., forest disturbance (fire, harvest)	e.g., basin-wide well pad reclamation

Discussions from the breakout groups last meeting…

Breakout group objective: Explore and have informed discussions on issues and opportunities related to changes in landscape in the ARB; review changes in.

Lower Basin opportunities

- Reducing linear fragmentation causing interruptions in hydrological connectivity.
- Impose requirements on mining operations to maintain watershed functions target ranges (Muskeg watershed reclamation).

Central Basin opportunities

- Identify and conserve and restoration areas for source water protection.
- Reclaim roads that are no longer needed.

Upper Basin opportunities

- Establish parks or conservation areas.
- Increase to agricultural land (forest conversion).

Reminder – challenges, focus of investigation

ARB water related challenges:

- Maintaining or improving water quality
- Providing water supply certainty for development
- Maintaining or improving ecosystem health
- Minimizing the effect of development footprint on basin hydrology
- Accessing data and knowledge in the basin around water

- Maintaining or improving the health of the Peace-Athabasca Delta (PAD)
- Understanding the renewable energy potential of the basin
- Limiting damage from floods or extreme events
- Addressing the concerns around treaty rights
- Ensuring sufficient flow for navigation

Roadmap: Potential types of strategies

Operational changes to existing infrastructure

Investment in new water infrastructure

Investment in natural infrastructure

Demand management

Planning and preparedness

Policy and practices

Goal for this work is an ARB Roadmap

A Roadmap is:

- a set of strategies and practical actions
- developed by an inclusive basin-wide working group using collaborative modelling and dialogue
- a recommended or potential path toward sustainable water management in a basin
- intended to inform future planning and management efforts as they relate to water

- **Screens** and **sorts** strategies; does not prioritize projects
- Identifies **gaps** and **recommends next steps**; does not layout an Implementation Plan
- Reflective of **collaborative findings**; not Consultation or a decision making body
- A **guiding** document; not a basin Plan

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3:45	Next steps, and close	Mike

Breakout Groups

Systematically review and assess current list of opportunities per region

Discussion focus:

- For each modelled opportunity:
  1. Review how each opportunity is modelled
  2. Review results as shown in the model
  3. Assess the potential of each opportunity (does it 'move the needle' on the PMs?)
     - Does the model show a change? (magnitude and direction)
     - Is the change meaningful for ARB sustainable water management?
     - Does the opportunity give clues as to where there may be benefits?
  4. Determine any revisions to be made to the opportunity
- Discuss opportunities not simulated in AIRM
- Add additional opportunities as they are identified

Table 1: Megan and Danielle
Lower Athabasca

Table 2: Mike and Ryan
Central Athabasca

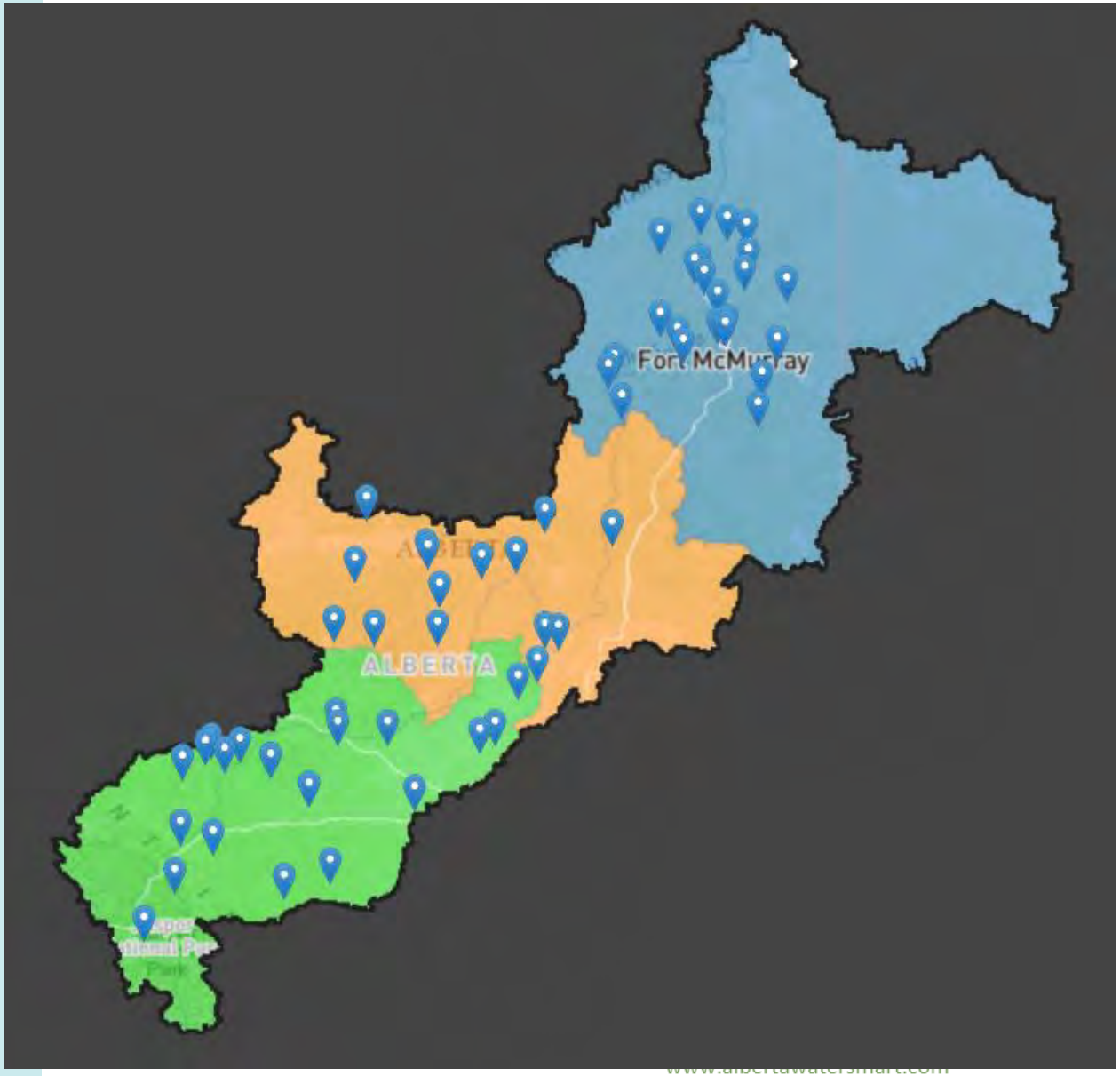
Table 3: Claire and Matt
Upper Athabasca

A volunteer from each table to provide a brief readout ☺.

Readouts

# or Name	Key results	Suggested revisions

Interest was expressed in refining many opportunities



Opportunities are broken down into:

- Upper
- Central
- Lower

Grouped into 3 buckets:

- Supply and Demand
- Regulatory
- Lands and Ecosystems

Breakout Groups

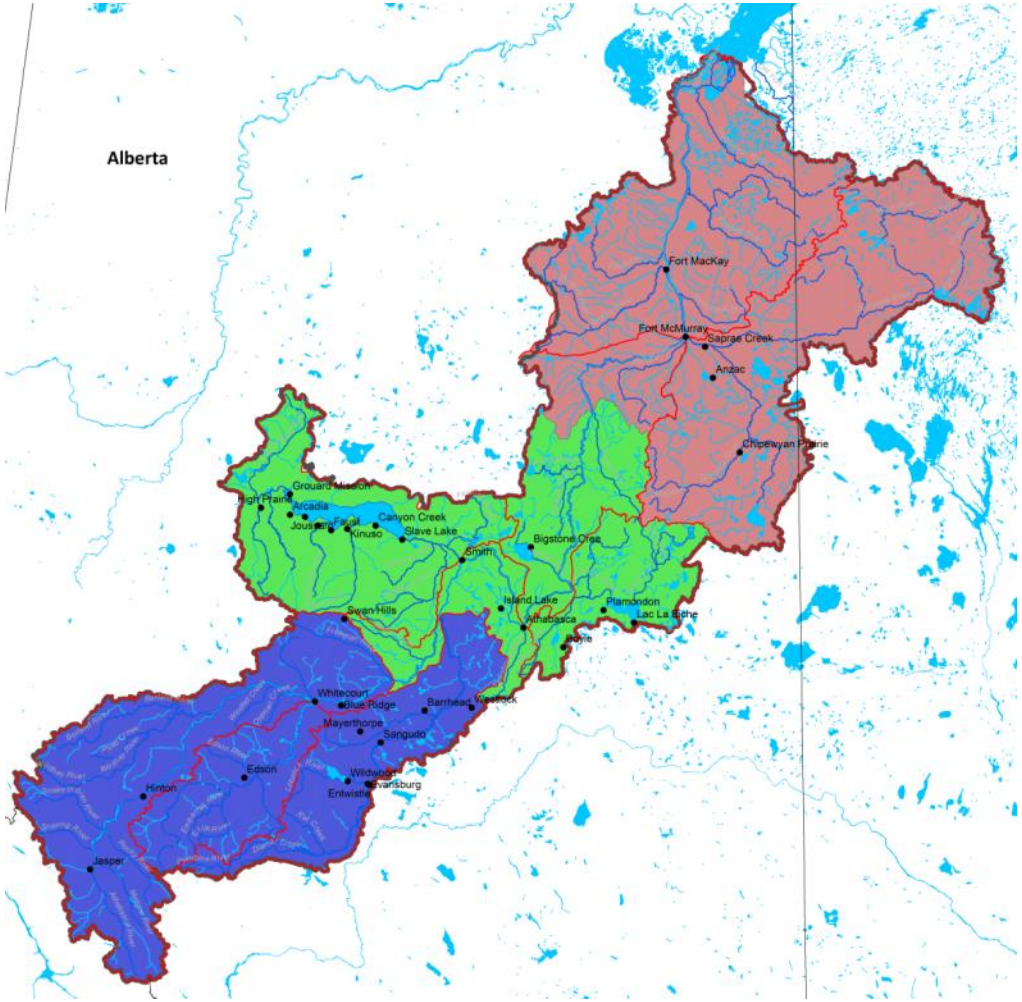


Table 1: Megan and Danielle
Lower Athabasca

Table 2: Mike and Ryan
Central Athabasca

Table 3: Claire and Matt
Upper Athabasca

Today's Agenda		
9:00	Welcome, introductions, and opening remarks	Mike
9:45	Breakout groups: review and assess the list of opportunities per region	All
11:45	**Readouts to plenary**	**Group Reps**
12:00	Lunch	-
1:00	Breakout groups: Continue to review and assess opportunities per region	All
2:45	Readouts to plenary	Group Reps
3:00	Break	-
3:15	Discussion: Watershed 'stress tests' – examples and how they help refine strategies	Megan
3:45	Next steps, and close	Mike

Readouts

# or Name	Key results	Suggested revisions

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Breakout Groups

Systematically review and assess current list of opportunities per region

Discussion focus:

- For each modelled opportunity:
  1. Review how each opportunity is modelled
  2. Review results as shown in the model
  3. Assess the potential of each opportunity (does it 'move the needle' on the PMs?)
     - Does the model show a change? (magnitude and direction)
     - Is the change meaningful for ARB sustainable water management?
     - Does the opportunity give clues as to where there may be benefits?
  4. Determine any revisions to be made to the opportunity
- Discuss opportunities not simulated in AIRM
- Add additional opportunities as they are identified
- Which opportunities have fallen to the bottom of the list as the least promising?
- If time review additional changes in cheat sheet

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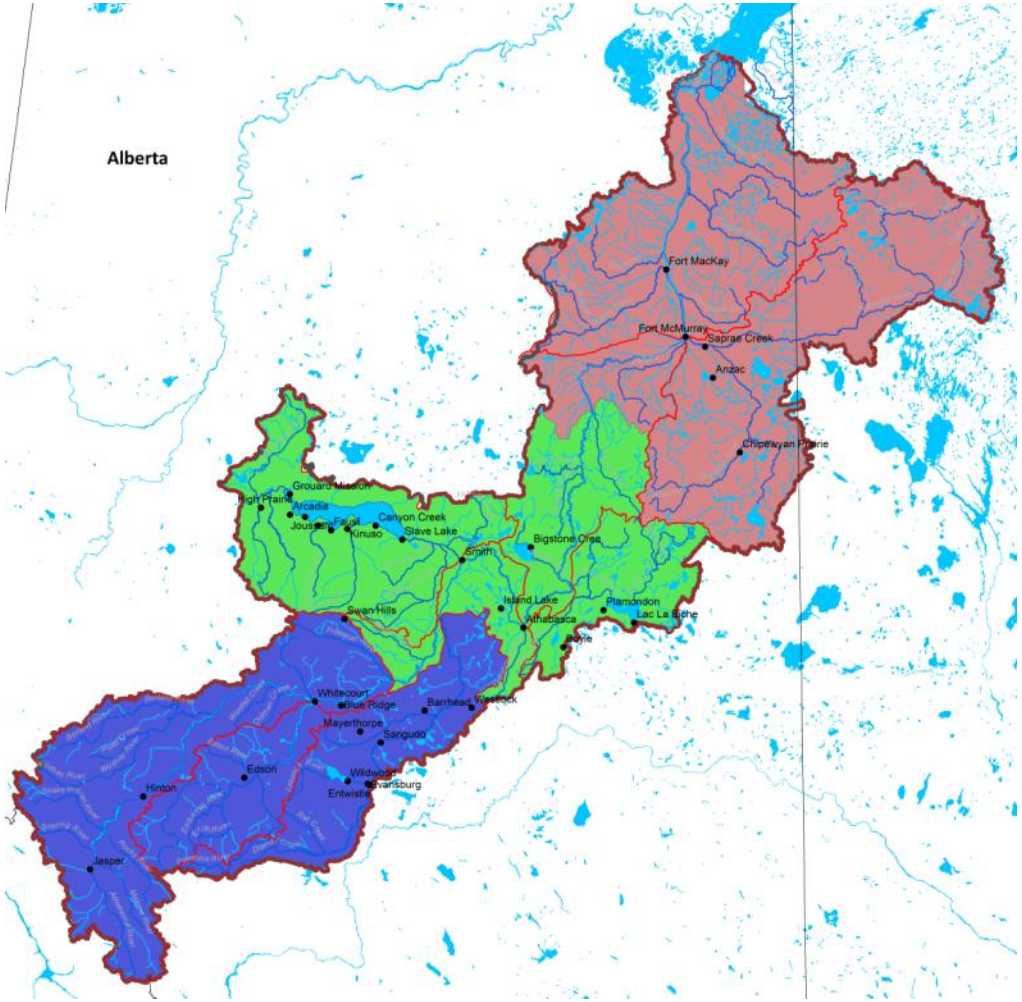
A volunteer from each table to provide a brief readout ☺.

Readouts

# or Name	Key results	Suggested revisions	Least promising ?

Breakout Groups



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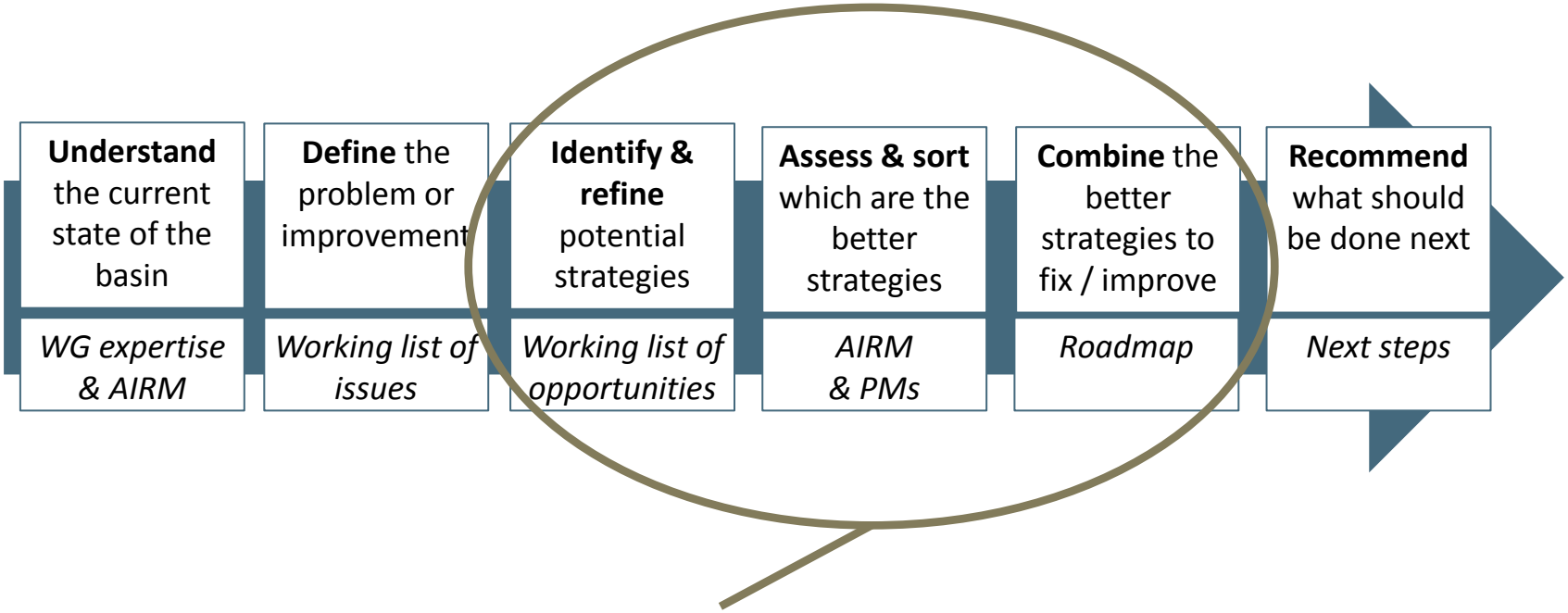
Collaborative process to develop the ARB Roadmap



Identify, refine, assess and sort strategies:

Under current basin conditions

+

Under potential basin conditions ("stress tests")

- More challenging conditions than today
- Based on plausible science and/or projections
- Useful for assessing performance of strategies

Potential “stress tests” for this project

Changes in climate

- e.g., multi-year drought

Increase in demand

- e.g., increase in consumptive water use (municipal, irrigation)

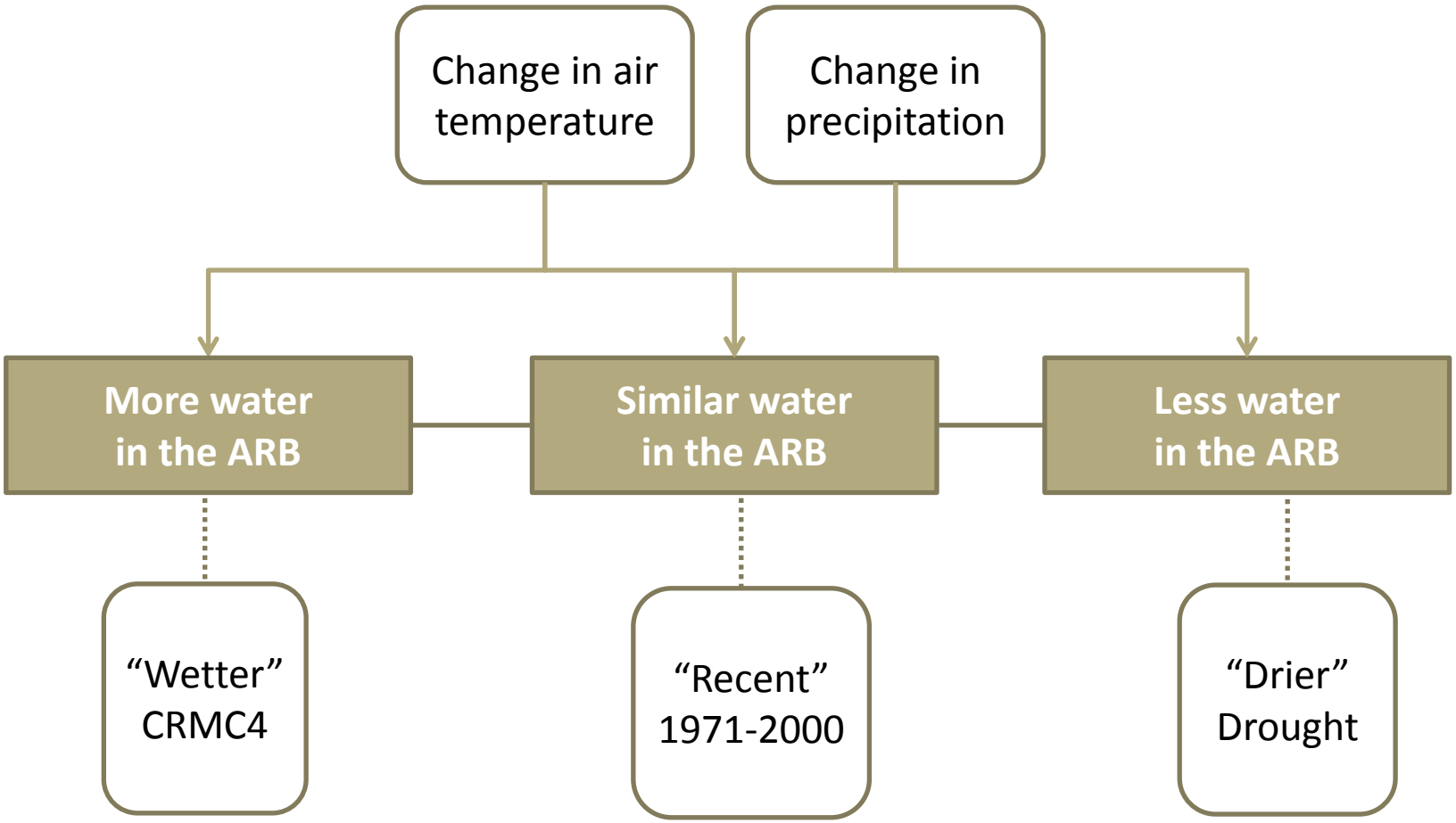
Large event-based landscape change

- e.g., large forest fire in the headwaters

Others?

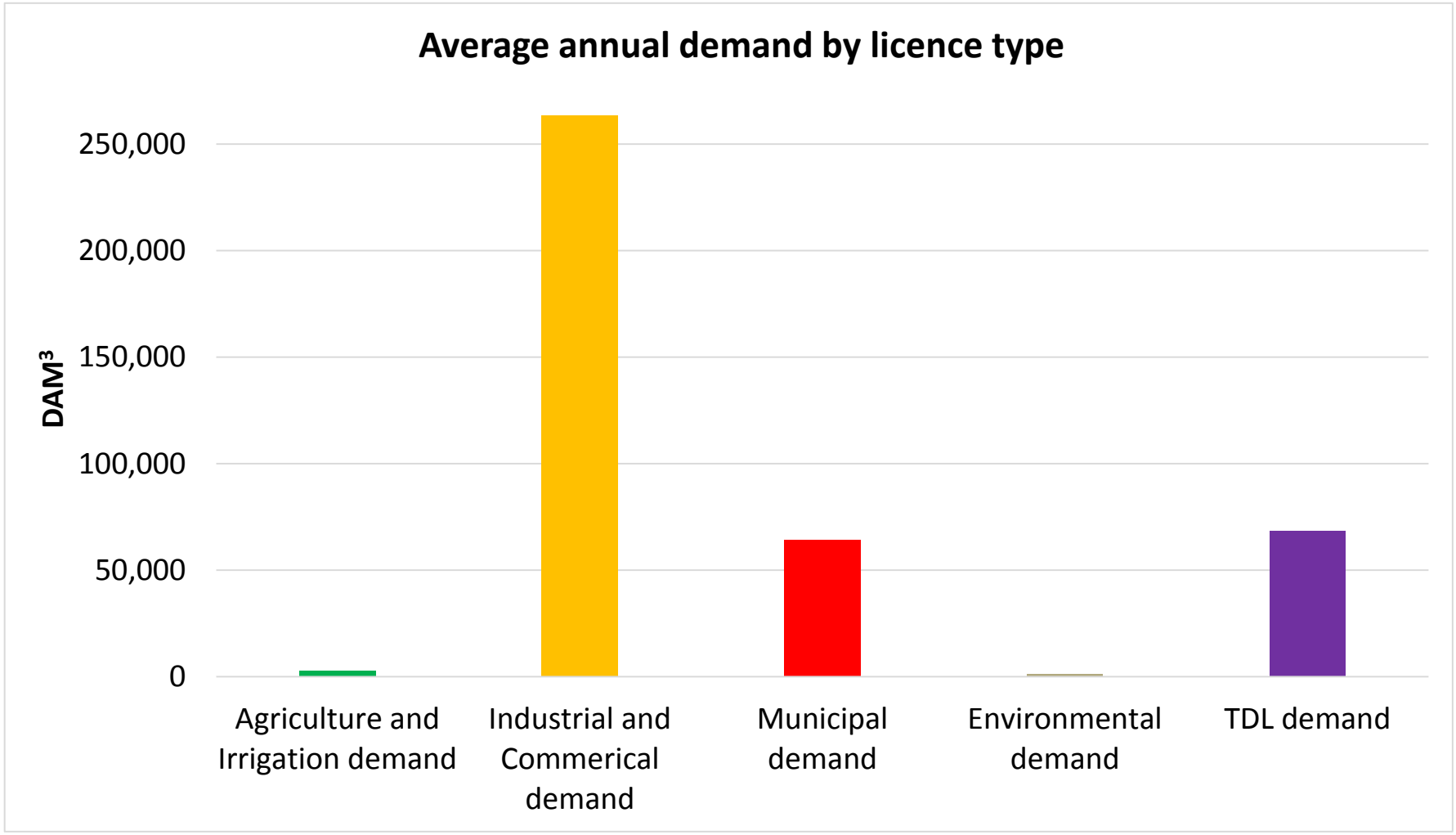
What “stress tests” do you think would be useful?

Potential stress tests: changes in climate



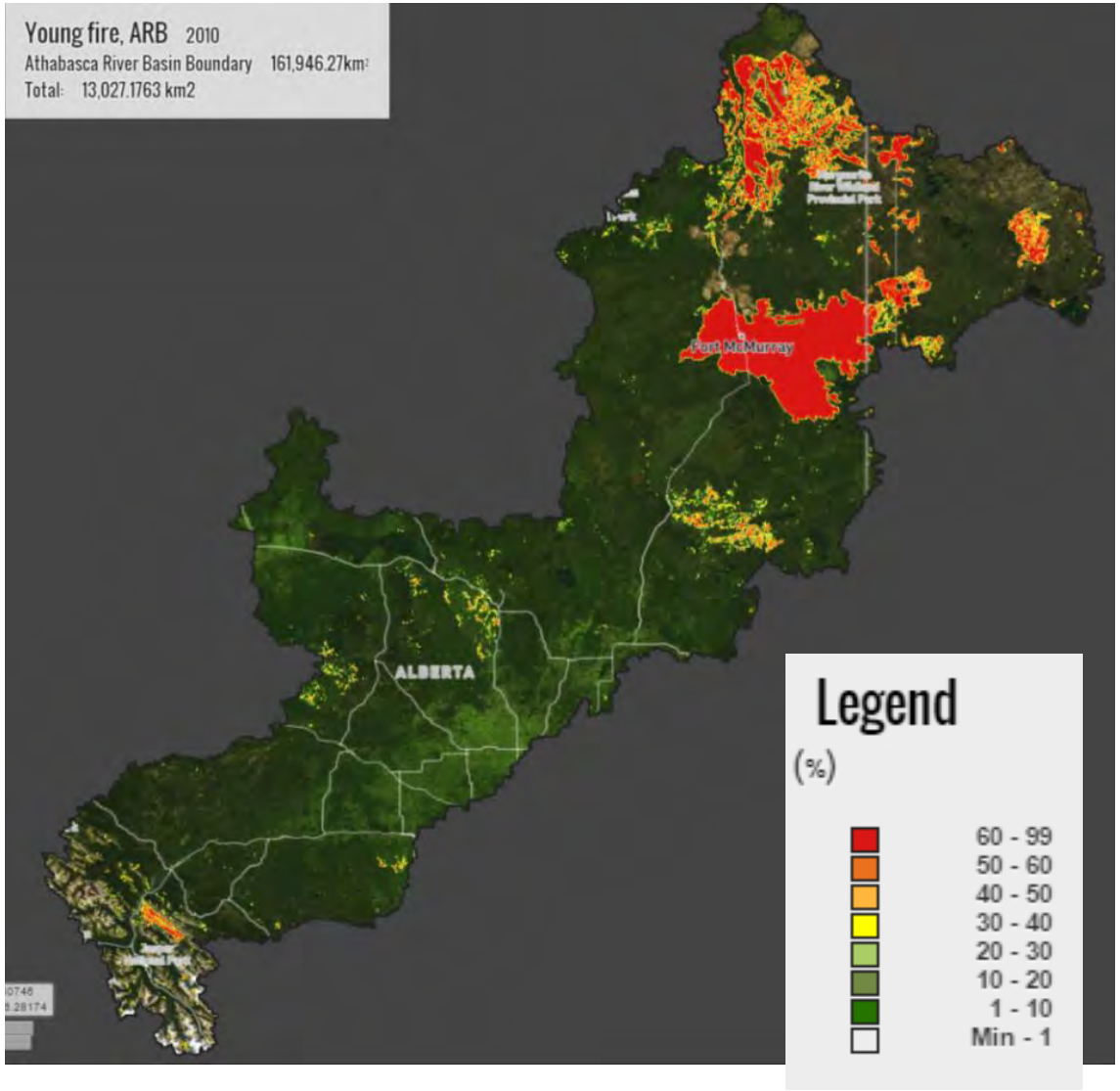
Stress tests: (1) "Wetter" and (2) "Drier"?

Potential stress tests: increase in demand



Stress test: x% increase in specific sector demands?

Potential stress tests: large event-based landscape change



Stress test: What if the 2016 fire happened in the water producing headwaters?

Confirm “stress tests” for this project

Changes in climate

- Drier scenario
- Wetter scenario

Increase in demand

- Increase in consumptive water use (e.g., municipal, irrigation, hydraulic fracturing)

Large event-based landscape change

- Large forest fire in the headwaters
- Glacier change

Others?

Combinations?

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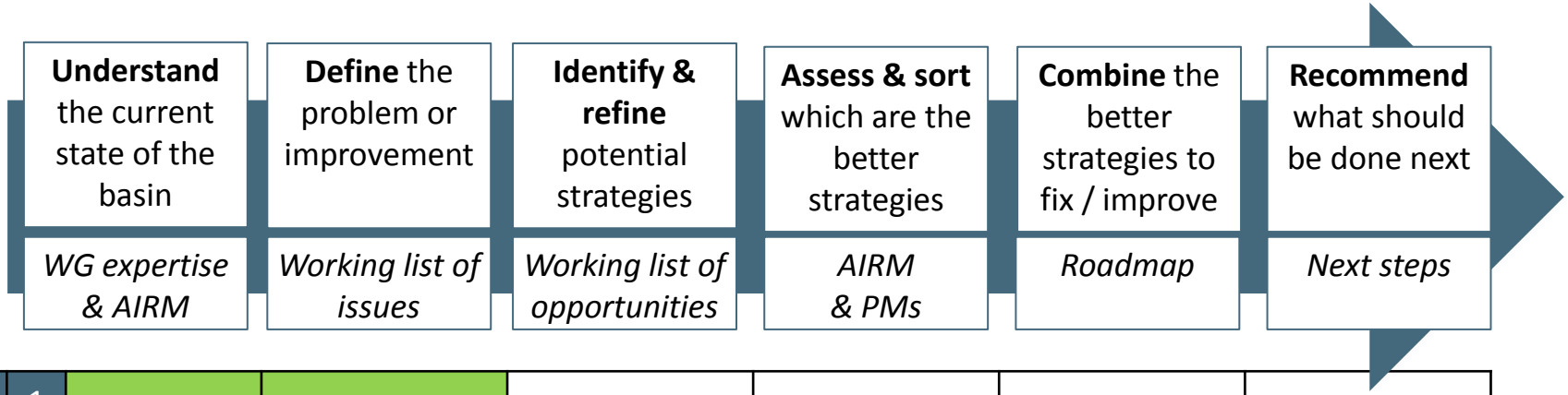

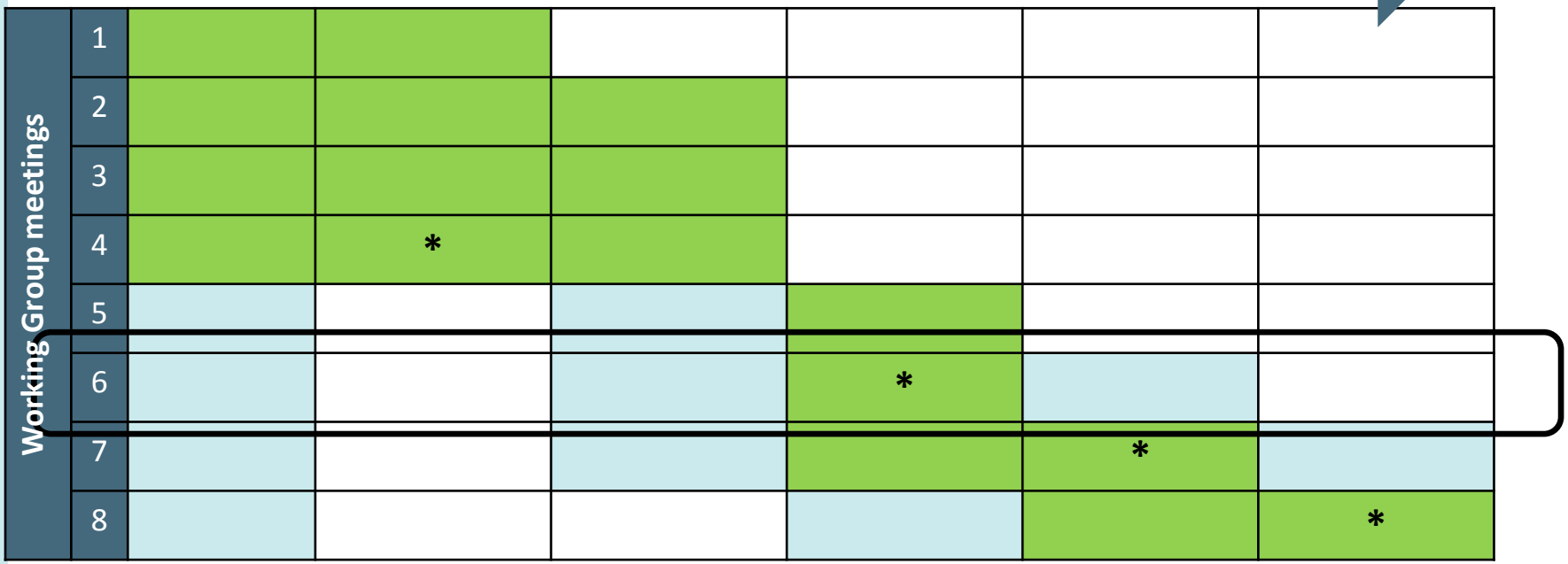

Final Reminders

- WaterSMART will draft meeting summary and distribute to Working Group members for review. Meeting materials are also posted on the ARB Initiative website.
- **Next meeting (#6): September – Edmonton, proposed dates September 27th or 28th – any potential conflicts?**
  - Filter short list of strategies for the Roadmap (i.e., most promising; some promise; least promising)
  - Explore the effects of stress tests on strategies (e.g. climate change, increased water use)
- **November meeting (#7): Proposed date are 21st, 23rd, 30th- any potential conflicts?**
  - Combine the most promising strategies to build the Roadmap
- Please contact us if you have any thoughts, questions, comments!

Thank you for all your support and participation

Thank you

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Reference slides