

Draft Meeting Summary

Athabasca River Basin (ARB) Initiative



Working Group meeting #4

Date March 14, 2017
Time 9:00am to 4:00pm
Location Executive Royal Hotel West, Edmonton

Attendees

- | | |
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| Adi Adiele, Fort McKay Métis | Kelly Scott, ATCO |
| Ahmad Asnaashari, AEP- Upper Athabasca | Martin Van Olst, Environment and Climate Change Canada (ECCC) |
| Allé-Ando Yapo, Teck Resources Ltd. | Meghan Payne, Lesser Slave Watershed Council (LSWC) |
| Al Richard, Ducks Unlimited Canada | Murray Tenove, Alberta Agriculture and Forestry |
| Axel Anderson, fRI Research/Alberta Agriculture and Forestry (AAF) | Nazida Sedaei, University of Alberta |
| Brian Yee, AEP – Transboundary Waters | Patrick Marriott, Alberta Energy Regulator (AER) |
| Candice Maglione, Driftpile First Nation-Treaty 8 | Steve Schafer, Aspen Regional Water Services Commission/Town of Athabasca |
| Cathy Maniego, AEP-Watershed Adaptation and Resilience | Tracy McKim, Repsol Oil and Gas Canada |
| Carolyn Campbell, AWA | Xinzhong Du, Athabasca University |
| Dallas Johnson, Alberta Innovates | Zahidul Islam, AEP- Policy |
| Dan Moore, AFPA/ANC | Claire Jackson, Alberta WaterSMART |
| German Rojas, AEP- Lower Athabasca | Danielle Marcotte, Alberta WaterSMART |
| Janice Linehan, Suncor | Denise Di Santo, Alberta WaterSMART |
| Jaquelyn Negraiff, Al-Pac | Justin Straker, ALCES/WaterSMART |
| Jason Ponto, Athabasca Watershed Council (AWC) | Megan Van Ham, Alberta WaterSMART |
| Jessica Watson, West Central Forage Association | Mike Nemeth, Alberta WaterSMART |
| Jim Sellers, Athabasca University | Ryan MacDonald, Alberta WaterSMART |

Meeting objectives

1. Review and refine the process being followed to develop the ARB Roadmap
2. Review a very preliminary draft of the basin story: current state, issues and opportunities
3. Systematically refine the list of opportunities identified so far
4. Introduce and explore the effects of landscape changes on water in the ARB
5. Determine as a group what the ARB Roadmap will focus on

Current action items

Action	Responsible	Due	Status
1 Change wording from “implementable” to “practical” when talking about the Roadmap	WaterSMART	March 31	Complete

Action	Responsible	Due	Status	
2	Add examples to each of the scales mentioned on slide 79 to provide clarity on the focus of scale for this work.	WaterSMART	March 31	Complete
3	Confirm meeting with GoA and include how this work may touch on treaty rights.	Mike	March 24	New
4	Provide clear definitions for data sets of what is and is not included in ALCES land use parameters. Example: what is included in “oil and gas” vs. “oil sands mining”?	WaterSMART	April 14	New
5	Check AWC State of Watershed work and LARP for indicator(s) to use to reflect linear fragmentation pressure.	WaterSMART	April 14	New
6	Send out September meeting invite	Mike	April 30	New
7	Send out meeting summary and slides	Mike	March 22	Complete

Discussion points

1 Opening remarks

Mike Nemeth convened the meeting at 9:05 a.m., welcomed everyone. Participants introduced themselves, noting their name and affiliation. Mike reviewed the objectives of today and the agenda. He reviewed the Chatham House Rule, which is designed to increase openness of discussion and will be used throughout this process to ensure participants feel they can speak openly. The Chatham House Rule reads: “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.”

Mike explained there is lots of information being presented and the slides will be distributed with the meeting summary. Some of the material will be reviewed in future meetings and this process is designed to be iterative. The Athabasca River Basin (ARB) Initiative will be developing a Roadmap for sustainable water management throughout the ARB—the 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 path toward sustainable water management in a basin
- intended to inform future planning and management efforts as they relate to water

The integrated model was named the AIRM (Athabasca Integrated River Model) and it is based on the best publicly available data. The bulk of the modelling work is done to this point, but refinements can still be made. Remember that the model is meant to show direction and magnitude of change under “what-if” scenarios, not explicit numbers or predictions. He re-emphasized to the group that the current spatial scope of this project is the whole Athabasca Basin from top to bottom. The Peace-Slave is to come later were the whole Slave River Basin will be looked at together.

Question (Q): Are there updated timelines of the Peace-Slave project? Last meeting you said you

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were hopeful to kick it off in April.

Response (R): Yes, we were hopeful to kick it off in April as that would be ideal timing to line up well with the work in the ARB Initiative. We are still working on funding, project structure, and some clarifications with Alberta Environment and Parks (AEP). An April start at this point likely won't happen.

This Initiative brings people together to use AIRM collaboratively to inform a dialogue around water in the basin. Today specifically, we want to discuss land use and landscape changes and then bring it all together with AIRM at the next meeting May 10th. AIRM has four components (climate, land, hydrology, management system). The inputs that we can put into AIRM are the opportunities while the outputs are the magnitude and direction of change shown in the Performance Measures (PMs). Questions that you could ask the model include things like: what if climate changes, what if glaciers melt, what if fire increases, what if water use doubles, etc... The Roadmap is as a recommended path forward, which recognizes the potential trade-offs of decisions and supports future planning in the basin.

Mike went on to discuss how this Initiative has been perceived by some as consultation and provide clarity around that. At the last meeting concerns from some of the First Nations and Métis were brought to the WG, one being that they view this as consultation. We took these concerns back to the Government of Alberta (GoA), and the GoA has provided the same messaging they have in the past on these issues:

Perception that the ARB Initiative and engagement process is “Consultation” and this role belongs to government.

- The GoA has taken part in this Initiative as an interested stakeholder, who is likely to derive benefit from the outputs. The ARB Initiative is not a GoA Initiative.
- GoA is one of many participants in the Initiative and does not lead the process. As such, engagement activities taking place through the Initiative are not on behalf of government.
- Tools and recommendations delivered through the initiative may help inform development of future GoA products, including policy, regulation, or decisions. It is these products upon which GoA would directly engage and consult, as it may find appropriate.

There is no guarantee that recommendations identified through this process will be used.

- It is the hope and expectation of all that are involved, including the GoA, that the outcomes from this work will serve to further the development and ongoing improvement of regional plans, sub-regional plans, and environmental management frameworks for the ARB.

Need to understand how this Initiative fits into overall water management processes and planning.

- There is high expectation that the findings and outcomes of this Initiative will be implemented and/or used in decision making around future development and planning with respect to water. This could include things like the Tailing Management Framework, Water Reuse Policy, development plans, land use plans, conservation planning, etc.

There is no forum for dialogue with GoA on these matters of water management and underlying issues of infringements on treaty rights.

- For further concerns, please contact a GoA representative to discuss those specific concerns.

Q: I'm concerned that there is a fundamental jurisdictional issue here in regards to water. I came today because I was curious to what's going on in these meetings and in regards to the planning process. We had questions about how many First Nations are actually participating and I don't see one right now. We also had concerns about the model and about what has been discussed to date so far. I don't see anything in here in regards to the jurisdictional issue surrounding treaty rights. The key elements of our way of life (our traditional use of water, our traditional ceremonies, etc...) is not being modelled or planned for. My traditional knowledge keepers, have all said that there was a time when we could drink clean water anywhere, and now we can't do that. We agreed to share this land, not to give up jurisdiction. All of the commercial activity that takes the water and the revenues is not shared with First Nations. In a time when the government says that it will implement the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), this is not being brought to the table today. I was hoping there would be more First Nations people here. Treaty rights are more than just about the right to hunt, trap and fish. They are about our right to be able to continue our way of life, including our traditional ceremonies and our spiritual connection with the water. I whole heartedly disagree with some of these statements here, I don't see 25 First Nations participating. Thank you for inviting us, but I feel uneasy about this whole process, a water planning process by third parties that have no jurisdiction to do so.

R: Thank you for your comment. There are roughly 25 Nations that have been invited and that we hope attend these meetings. Some of the same concerns you have voiced have prevented others from participating as well. We definitely want and need your voice in this process, we don't want just government, or industry or any one single voice. This is about more than just enabling more development or changing the landscape. It's about what we as residents and people of the basin want for the basin. Again this isn't meant to create a plan, it's meant to create dialogue about what the opportunities are and what the challenges are in the basin. We have struggled to get First Nations at the tables, but we've also made, and continue to make great efforts to try and have them meaningfully participate, including offers to go out to each community and do a sharing session with them so they can have input and understanding of this work.

Q: These same concerns were brought up at the Fort McMurray meeting. What has been done so far to address these?

R: We plan to have a meeting with the government to address these concerns. We will then inform the working group of the outcomes of this meeting. That meeting is planned for early April.

Q: Parallel to the difficulties with First Nations participation, it is also difficult for grassroots groups to participate. Personally, I'm afraid not to be here participating because of the way this could influence government decisions. It will be helpful to know how these concerns will be addressed for local grassroots groups and for First Nations. We've decided to participate to raise our issues, but it would help to know how these outstanding issues about participation will affect the outcomes of this process.

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R: We are diligently working to bring this back to the government. There is the ability to take this to a more detailed regional view, and we are working with government to address these comments. However, the tool that we are developing here will be able to zoom in to certain regions, and grassroots organisations can use it at the local scale. This is a starting point for this work, and the platform can be flexible to accommodate different levels of interest at different scales for future use. Something to keep in mind is the scale of the process – you can zoom in and work with communities in the model once the platform has been built and can be used. We are trying to work on this right now at the basin scale, while ensuring that the thinking about the more detailed regional view is there for the future. These are good comments thank you.

Mike then went through and briefly reviewed what the group did at the last meeting’s morning breakout session. Table 1 discussed meeting an Aboriginal Extreme Flow (AXF), with and without storage; Table 2 discussed the Mirror hydro site and increases in irrigation; and Table 3 looked at cutting the water available to TDs by half and alternate sources of water (storage, treated effluent returns, etc.). Mike also reminded the group of the idea of future changes in climate and how that played into last meeting’s afternoon breakout session, specifically recalling the “Wetter”, “Drier”, and “Recent” climate scenarios and how those can and will be used to test the opportunities discussed and make them more robust.

Q: One of the major impacts of climate is about shifting the hydrograph, not necessarily about just the changes in quantity. Are you also simulating those impacts?

R: Yes. Through the hydrologic model you will also see the shift in timing due to changes in snowpack and seasonal shifts in precipitation. All of this will be dynamically simulated.

Q: Will the model consider water going into temporary storage as ice?

R: Yes, the model will simulate water in the winter as it becomes ice/snow and then melts in the spring.

Q: Is there a repository of materials that is related to the Athabasca basin?

R: The Athabasca University houses the BARB, a large database of information and data related to previous work in the ARB. Discussions are ongoing with the university about possibly hosting the information/data from the ARB Initiative.

2 ARB Initiative Process: Steps to develop a water management roadmap for the ARB

Megan outlined the steps of this process that will develop a water management Roadmap for the ARB. She explained that we, as a project team, want to update the working group on the process, and check in to see how the plan on completing this work resonates with the WG. To go through this process, we first need to understand the current state of the basin in order to understand the issues, we then need to define which issues we want to work on together while we identify opportunities that would be worked into potential strategies for the Roadmap. This has been a big focus on these over the last three meetings. We can then start to refine specific strategies that will address these issues. Collectively, we will sort through the strategies by using the model and asking if we are moving the needle on the challenges that are of interest for this work to focus on. We can then combine different strategies to develop the Roadmap.

In terms of today’s meeting a key milestone will be to define the challenge(s) we collectively want to

work on in the basin. Today we are also going to work through the list of opportunities and we want to focus on and continue to refine into strategies. Does this seem reasonable, or are there questions?

Q: Concerns in regards to the PM's ability to accurately reflect fish habitat impacts of on-stream reservoirs. There was some interest in working with the modelling team and some of the fish folks in the room to look at the aquatic ecosystem impacts of on-stream reservoirs.

R: As we move through this process we will continue to come back to the PM to decide if we have the right PMs or if we need to change the current PMs or augment them with new PMs.

Reminder about the Roadmap: The Roadmap is simply a way to screen and sort strategies, not prioritize (or score them). For the issues that we cannot speak to, we will identify them as gaps and document them in the report. The Roadmap is reflective of collaborate findings, not intended as consultation, nor as a decision-making process. Nor will it develop a formal plan. It will just be a useful guiding document.

Q: A major red flag that still remains for me is the lack of capacity and participation by grassroots, NGOs, and First Nations.

R: Yes, that is a valid concern. We will need to continue to encourage engagement, but we must also recognize that not the full perspective of all will be included due to the lack of participation.

Q: Can we get more clarification on the word "implementable". No economic analysis or analysis for policy conflicts have been done for any of these actions, so I'm not sure I'm okay with the word "implementable".

R: Other basins have liked the word "practical". We could also use "plausible" or "realistic". Whatever word we use should reflect the fact that this action might be possible.

Action Item: Change wording from "implementable" to "practical" when talking about the Roadmap

3 Very preliminary draft of the basin story: current state, issues and opportunities

Megan reviewed that over the last three meetings we've been developing this common understanding of the basin from what we have heard from the WG and learned by going through the data and tools together thus far. The ARB is massive, it's complex, but we're going to take a first cut at sharing this story. And then we want you to give us your input. We need this story today so that it will equip us to collectively decide where we should focus our efforts, and which basin challenges we should focus our discussions and findings on. The ARB has three distinct regions – mountains, foothills, plains, - but the basin is connected by the water that moves through it. The mainstem, tributaries and wetlands, are connected from the headwaters (top) to the delta (bottom). There is development; heaviest development in terms of footprint is agriculture, forestry, and oil and gas. The basin has many challenges, and based on what we have hear from the WG we think ten of these challenges include:

***Note: these only numbered for reference purposes, they are not ranked or ordered in any particular order.**

1. Maintaining or improving water quality
2. Providing water supply certainty for development
3. Ensuring sufficient flow for navigation
4. Limiting damage from floods or extreme events
5. Maintaining or improving ecosystem health

6. Minimizing the effect of development footprint on basin hydrology
7. Maintaining or improving the health of the Peace-Athabasca Delta (PAD)
8. Realizing the renewable energy potential of the basin
9. Accessing data and knowledge in the basin around water
10. Addressing the concerns around treaty rights

Some examples of opportunities include water reuse, minimum flows, enabling withdrawals to support development, off/on stream storage, managing landscape footprint, or basin water management plans. When the basin story is put together we'd like to have an idea of what the challenges and opportunities are.

Q: This seems contradictory in terms of what Mike said earlier - one of the ten challenges presented here is addressing concerns around treaty rights. Alberta narrows it's view around what treaty rights actually are. Prior to the treaty we had everything, our own governance, land, language, being, ways of life, water, etc... When the treaty rights were brought in, those rights were added on top of what we already had. Viewing treaty rights under a narrow scope of just hunting, fishing, and trapping, is not accurate. This treaty rights issue is under a narrow scope of what they deem it to be. After 150 year of oppression (Canada's 150th birthday) we must all understand the treaty is not understood by all. Looking at these top ten challenges, there has been no real education at any level around what treaty rights means from an indigenous lens. For so long non-indigenous Canadians have interacted with indigenous peoples but there's still no understanding of the oppression we experience or why it's occurring. This fundamental understanding and education needs to happen – I don't know at what venue but we all need to challenge ourselves to get to that greater understanding. We can't just box in "concerns about treaty rights" because that's too narrow of a scope. I'm not bringing this up to create a division, but to challenge people for fostering a better understanding.

R: Thank you for your comments. We will, as a working group and project team, work to ensure the wording of the challenge is right. This project, I don't believe, is the proper venue to address issues around treaty rights and First Nations rights; however we heard it as a challenge in the basin related to water, so that is why it was listed. But we would like to educate ourselves and inform the readers of the Roadmap that this is indeed a challenge in the basin, just not one that we can directly address in this project.

Q: I was influenced last week by reading the UNESCO report on Wood Buffalo National Park. In that report, there are strong findings that there should be state of the art assessments not just on the tributaries but for the mainstem. There was a lot of comment of added rigour to assess cumulative impacts of hydrologic reservoir projects on the Peace. Reading that report just made me think about how important it is to consider environmental flows in the basin, not only on tributaries, but also on the mainstem.

R: Thank you for that comment.

Megan then went ahead and introduced the concept of a ‘dot-mocracy’ and how we wanted to use it in this meeting: We will give every participant 9 stickers. Throughout the day please place the stickers on the challenge(s) where you would like to focus our discussion. Bear in mind who is participating, the tools we have, and the project scope and timeline. We want to use this to get an indication of where the group interest lies in order to focus our work.

4 Breakout groups: Systematically refine current list of opportunities per region and basin wide

Participants were asked to break into three groups to systematically refine current list of opportunities per region and basin wide that should be explored further for a Roadmap for Sustainable Water Management in the ARB.

Vet each opportunity of the working list: Is it still relevant? Provide more information? Addresses what issue? What do preliminary model results show? Also to add additional opportunities as they are identified.

Participants broke into three groups representing three regions of the basin:

Table 1 (Megan and Danielle): Lower Basin

Table 2 (Mike and Ryan): Central Basin

Table 3 (Claire and Justin): Upper Basin.

The groups were asked to review and refine the Working List of Opportunities identified so far for their specific region of the basin (Upper, Central, or Lower), as well as some of the basin-wide opportunities that have been identified to date. In particular, the groups were asked to identify which should be further explored within this project and which should be set aside and not pursued further in this Initiative.

Below is a summary reflecting discussions at the tables in the readouts as well as points from the flip charts.

Table 1- Lower Athabasca (Megan and Danielle)

SD1. Potential hydropower sites (list of 4) - - FURTHER EXPLORE.

SD2. Potential hydropower site: Grand Rapids - FURTHER EXPLORE – combine with SD1.

Basin-Wide SD2. Re-evaluate water storage options on and off stream - FURTHER EXPLORE.

SD3. Potential actions to help mitigate the drying of the PAD - DO NOT PURSUE

- The PAD itself is not within the geographical scope of this project therefore weirs etc. in the PAD are out of scope.
- Instead, this project should maintain a Performance Measure that reflects the flows delivered from the Athabasca River to the PAD and as strategies are explored upstream, this PM should be checked to ensure flows to the PAD are not unintentionally impacted.

- In addition, augmenting flows for the PAD could be a driver of operations for upstream infrastructure therefore should be added to the list of potential objectives for upstream reservoirs.

SD4. Install weirs to raise the lake levels for ecological and traditional uses - DO NOT PURSUE

SD5. Mitigate ice-jam flooding in Fort McMurray – DO NOT PURSUE

- Instead, this project should maintain a PM that reflects the flows through Fort McMurray and indicates whether any changes in those flows from upstream strategies may increase the conditions conducive to ice jamming.

SD6. Find alternatives to freshwater use in SAGD facilities – FURTHER EXPLORE

- Most SAGD operations use groundwater however there are a small number that have licenses to withdraw freshwater from the river. It would be informative to model these withdrawals and see the flow impact of eliminating them.
- Separately, there may be a Regulatory strategy or gap related to the outstanding for a clear and useful definition of “near fresh” or brackish groundwater vs. saline groundwater.

SD7. Explore alternate methods of transportation on the river to access traditional fishing and hunting areas. – DO NOT PURSUE

- This should be included as an option that is captured under R2. Implement an Aboriginal Base Flow (ABF) or Aboriginal Extreme Flow (AXF).
- It should be noted that minimizing disturbance to fish habitat should be a key consideration for looking at alternative transportation vessels and dredging.

SD8. Explore temporal changes for withdrawals to limit stress on the aquatic system. – DO NOT PURSUE

- At a seasonal scale, this is already in place for new offshore facilities in the region.

R1. Consider how to meet the current Water Management Framework in the Lower Athabasca. – DO NOT PURSUE.

- The current framework is already being met through the water sharing agreement between oil sands operators. There may be an opportunity to be more transparent on this agreement and how it works; however, it also uses information and data considered sensitive by the participating companies.

R2. Implement an Aboriginal Base Flow (ABF) or Aboriginal Extreme Flow (AXF). – FURTHER EXPLORE

R3. Explore an Ecosystem Baseflow (EBF) – FURTHER EXPLORE

- R2 and R3 should not be grouped together as they would likely have different needs in different

locations.

R4. Explore the creation of a policy or directive to enable oil sands to treat and release water.

- This is already being examined by a working group including government and industry.
- Water quality is a major concern with the concept of treat and release and this project cannot speak to that therefore perhaps this strategy should not be further explored.
- However, it would be informative for this project to look at the potential augmentation offered from controlled releases from a flow volume perspective. We would need to assume that water quality guidelines are met.

LE1 and LE2 were tabled for discussion in the afternoon (Cariboo and additional compensation mechanisms besides compensation lakes).

Table 2- Central Athabasca (Mike and Ryan)

The Group started with the Central Basin specific opportunities, and then moved on to the basin-wide regulatory.

Central Basin

SD1. Account for water collection at local sites in rural areas - - DO NOT PURSUE

- It was decided not to pursue this one as the information isn't there to really speak to it, and the scale at which this concern might be happening and where it is happening would not be well represented in the model.

SD2. Irrigation agriculture - FURTHER EXPLORE

- This potential future need should to be addressed. Add a demand node. Pembina sub-basin has been included here with demand node. Check on model results within the growing season timeframe identified, rather than assessing for the entire year, since the irrigation water demand would not apply outside of the growing season months. This should be applied to the land that is currently classed as agriculture and determine what a maximum amount of irrigation on that land would actually be.

SD3. Re-naturalize or dredge Buffalo Bay - DO NOT PURSUE

- It was decided not to pursue this opportunity as it was outside the scope of this work; however it was noted that actions upstream to limit or reduce sediment loading would help with this opportunity.

SD4. Use the weir at Lesser Slave Lake to manage lake levels.- FURTHER EXPLORE

SD5. Potential hydropower sites (Mirror and Moose Portage sites) – FURTHER EXPLORE

- Mirror site was examined and more is needed, and Moose Portage site is yet to be discussed by the group. Clarify if these are run of the river and how much power they would generate. There are fisheries concerns about these.

SD6. Address access management and linear disturbances – FURTHER EXPLORE

- Other “linear disturbances” include channelized and straightened channels for water conveyance designed to get water off the land efficiently; this is an opportunity to re-naturalize

the channels and the river system. Get impacting companies to synergize their efforts to remedy the impacts.

R1. Water management for lakes. – FURTHER EXPLORE

- This is related to allocation limits. Applying the same rules as rivers (similar to IFN). Basin size, precipitation, etc., to create lake water balances.

LE1. Ensure adequate reforestation and buffer requirements for logging activities. – FURTHER EXPLORE.

- See linear disturbances (SD6) and benefits to identifying logging roads to be restored. Need to have better enforcement and the timing of reforestation.

LE2. Understand the opportunity around natural water storage and how this has changed relative to pre-industrial landscape. – FURTHER EXPLORE

DK1. Share data sets – DO NOT PURSUE

- It was decided not to pursue this opportunity as it was discussed that this is outside the scope of this work; however it was noted that this work encourages and supports the sharing of data sets, and that over the course of the Initiative data gaps or access to data issues will be flagged.

Basin-wide

R1. Revisit policy around sand and gravel extraction in flood plains. – DO NOT PURSUE

- It was decided not to pursue this opportunity as it was outside the scope of this work.

R2. Sub-basin planning for water management – FURTHER EXPLORE

- This would include holistic water management planning and regulation that recognizes water connectivity through small tributaries and wetlands. Water management is needed for lakes as well as rivers. Create implementation plans for holistic water management. This may include managing flow and lake levels (e.g., restrict flows into and out of lakes/reservoirs for water management and instream flow requirements)

R3. Propose IFNs on tributaries as needs dictate – FURTHER EXPLORE

R4. Clarify policy around water reuse – FURTHER EXPLORE

R5. Enable transfers of old unused licences – DO NOT PURSUE

- It was decided not to pursue this opportunity as the basin is still open to new licences, and in order to transfer licences you need a water management plan.

R6. Develop a basin wide water management plan – DO NOT PURSUE

- It was decided not to pursue this opportunity as this work can't create a water management plan, but it can certainly inform a plan and can be used to help in the creation of one.

R7-R12 the group did not have time to get through.

Q: With the dam proposal for irrigation and hydro, was there discussion on the prioritisation and whether those things are compatible or not?

R: Yes, in looking at the modelling results last time it was determined that the potential irrigation demand from a reservoir in that area would be relatively small compared to water storage size, and the discussion today was that if a hydro facility would need to be used for multiple uses to have true value.

Table 3- Upper Athabasca (Claire and Justin)

Upper Region

SD1 – “Alberta Newsprint Company (ANC) treated effluent to hydraulic fracturing companies” should be combined with SD5 “Collaborative grey water collection and storage”. It should be re-worded as “Develop policy for water reuse, policy should address acceptable water quality for reuse as well as storage options”; this will likely make is a ‘regulatory opportunity’. Specific examples of the reuse projects that could take place under a reuse policy are:

- Using treated industrial effluent from ANC for use in hydraulic fracturing.
- Developing collaborative collection and storage of water available for reuse at various locations to be used by industry users that rely on TDL’s.

SD2 “Obed site: run of the river solutions” and SD3 “hydropower” to be combined into “Explore new and existing on stream and off stream hydropower sites”.

- How does the discussion surrounding hydropower relate to water management? The need for hydropower would be more dependent on the growth in the basin. If this group is going to discuss hydropower then we should do an assessment of the amount of power produced, the need for that power, and the economic impacts of the site such as jobs created.
- Knowing that this is outside of the scope of this project, and that none of the participants are aware of past work that has been done in this area perhaps we should focus the conversation more on looking at reservoirs to meet water demands.
- We should keep the Obed site on the list as a discussion point, but it is more related to power production than to water management, if necessary it can be looked at as an alternative to a hydropower site if the hydropower site is only going to be used for power production and not for water management.

SD4 “Limit TDLs in high value tributaries” should be changed to “Limit TDLs in tributaries that have habitat at risk”. Tributaries that have sensitive habitats can be identified and withdrawals can be limited from those tributaries. Seasonality must also be considered.

LE1 “Establish parks or conservation areas” in the description “Look at conservation areas with high biodiversity / hydrological importance” hydrological importance should be removed, most areas will not have high hydrological importance unless the areas are wetlands.

New Lands and Ecosystem Use opportunity – “Alter forest harvest regimes in some watersheds and limit forestry in hydrologically sensitive watersheds”.

Basin-wide

LE1 – “Address access management and linear disturbances”

- This will need to be looked at in the model, how much hydrological importance does this have?

LE2 – “Prioritize reclamation through strong reclamation modelling”.

- This opportunity is vague; it should be clarified, combined with another opportunity or removed.

LE3 – “Implement land use planning restrictions to limit residential development impacts on lakes and wetlands”.

- In the commentary for this opportunity Lac La Biche is highlighted, maybe this opportunity should be moved into the Lac La Biche region?
- Again, this opportunity is vague; it should be clarified, combined with another opportunity or removed.

LE4 – “Advance recreational opportunities in the basin”. This opportunity should be removed.

LE5 – “Apply Room for the River philosophies and principals in communities within the ARB”

- This opportunity should stay, specific urban areas where the Room for the River philosophy should be applied should be highlighted.

LE6 – “Apply BMPs to land use”

- The State of the Watershed report highlight areas of high disturbance, but it does not detail BMPs. What sort of BMPs should be applied?
- BMPs vary greatly depending on the land use, these should be defined.

LE7 – “Identify areas of ‘general’ restoration” should be combined with opportunity LE8 “Identify and conserve areas for source water protection”.

LE9 should be removed.

In general in the basin wide lands and ecosystem use opportunities there are many that could be either combined or clarified in order to ensure that the differences are understood.

5 Presentation: Landscape change in the ARB and implications for water management

Justin introduced himself and that he was going to be speaking to the landscape and land use side of the integrated model, and looking at landscape and change over time. The model is able to look at a range of human land uses, as well as natural landscape features. Maps show the location of different features spatially in the basin. The color reflects the intensity of the indicator within a given cell (e.g., Red represents 60-100% of some kind of human footprint within that cell). In total, there is currently ~14,000 km² of human footprint in the basin. The three biggest by total footprint area are agriculture, forestry, and oil and gas. They are important in terms of size of footprint, in other words number of km², not in

terms of their economic value or any other metric.

Q: Is agriculture really bigger than oil and gas?

R: Yes, in terms of footprint (km²).

Q: Are we factoring in duration?

R: Right now the maps are showing what today looks like currently. However, we can show simulations into the future or even back into the past. For example, since forests are able to regenerate themselves over time, we are only showing the current cut blocks, not all cut blocks that have ever been made.

Q: The area doesn't really capture linear fragmentation. Might want to do % of area 50 m away from a linear feature, or 200 m away. This might be a better indication.

R: Yes, we can look at those as well and certainly do that with buffers.

Agriculture is the largest by size - it occupies about 9,000 km². It is very concentrated, particularly in the upper and central regions. For forestry, the indicator "Young cut blocks" shows forest that is less than 20 years old due to harvest.

Q: Is it fair to say that the location of the footprint will change over time, even though we are expecting on going cutting. So yes the forest is growing older, but there will be more cutting...

R: Yes, but in this basin there will actually be less cut in future years.

Using the same legend breakpoints as agriculture and forestry, we can see that the oil and gas footprint is equally intense in the lower Athabasca only. Had we kept the legend at default bins, it would like it was equally intense in all three basins.

Q: Dark green shade means that there's 1%?

R: Yes, and 0% is transparent so it will show the satellite imagery in the background. In the breakout groups, you can change the legend and try different colour or different background basemaps.

Q: What does the 2010 date mean, are there updates since 2010?

R: These simulations actually draw from 2015 data, but since we show simulations in a decadal time step the date is appearing as 2010.

Q: Are seismic lines included?

R: Yes, but you can't see them since their intensity is low. If we change the legend breakpoints

we will be able to better detect lower intensity footprints.

Q: Does this consider edge effects around seismic lines?

R: Not currently, but we could buffer the total oil and gas footprint by a certain distance in order to simulate those edge effects.

Q: What is the resolution? How big are the cells?

R: Currently each cell is 100 m X 100 m.

Justin then went on to present a map of road density that is similar to the indicator used in the Athabasca State of the Watershed (SOW) report: we can see some tertiary basins that have high pressure in the upper and central basins. It's a similar story with linear features (minus roads), where higher densities occur in the upper and central tertiary watersheds because there are more linear features concentrated there. He then presented a map of agriculture averaged by tertiary sub-basin (same as in SOW) and he explained that even though agriculture is the most widespread footprint, there are no tertiary basins that show high risk ratings if we use the SOW ratings.

Justin then explained the idea behind temporal simulations. The model is capable of doing temporal simulations such as back-casts. For the oil and gas back-cast, you will see the map change over time with each decade that passes. We did the oil and gas back-cast based on historical well data. We can also simulate the natural range of variability of fire through time. This is based on fire return intervals and fire class sizes.

Q: Are you comparing them over the same timeframes?

R: If we dropped into a pre-industrial landscape at any point in time, we would see 10-25 thousand km² of fire, whereas we see 5 thousand km² of cut blocks currently right now.

Justin: By far the dominant agent that creates young forest on the landscape is fire. Forestry is less than half the footprint of fire. If we look at a range for natural variation there is no more young forest today created through harvest and fire than there has been in the past from fire and pests.

Comment: But the implications between forestry vs fire are very different. Industrial forestry creates roads, invasive, etc.. Fire has some of those temporary effects, but roads are much longer lived. Forestry selects of what's highest values to industry, whereas fire does not.

Ryan then spoke about landscape change as it specifically relates to hydrology: There are a range of different disturbances that can occur on the landscape (pests, fire, harvest, etc.). Regardless of the forest disturbance, it results in reduced interception, reduced transpiration, increased evaporation from soil, and/or changes in timing of runoff. Agriculture impacts include land conversion, crop types and practices, and irrigation (significant water use). Oil and gas activities can impact connectivity, increase forest removal, impact on-site water management, and increase water use. In terms of roads, they affect

connectivity, result in forest removal, and increase compaction/runoff. Human settlements can also result in lower infiltration and create higher runoff, alter connectivity, and increase water use.

Q: You mentioned irrigation a couple of times, to my knowledge there's no large-scale irrigation in the basin. Not a significant part of the water budget right now.

R: Not right now, but has potential to be in the future.

Q: When you calibrate the hydrologic model are you using the current landscape condition?

R: Yes we have calibrated the hydrological model with inputs from ALCES so yes it is using this data right now.

6 Potential landscape effects on water in the ARB: How landscape can be included in the modelling and Roadmap development

Claire explained how this landscape modelling part of AIRM can be used to look at effects on hydrology from changes in landscape, and how it will help to test the strategies in the Roadmap against a wide range of potential change. For this Initiative and today's discussions we are suggesting a focus on the water supply aspect of landscape change. For example, if we talk about converting areas of wild grasses to paved communities, this will reduce infiltration, increase evaporation, and result in faster and higher runoff to the river. For scale, we recommend focussing on the sub-basin and regional landscape scale changes and associated effects to hydrological processes. This is the scale of thousands and tens of thousands of km², not the reach scale (10's km²) or the entire ARB scale (100,000's km²) scale.

Q: Can we look at cumulative impacts of small scale (reach scale) changes?

R: We can simulate those small-scale changes, but then we would aim to look at the overall results at the sub-basin or regional scale, rather than looking at the reach scale.

Action item: Add examples to each of the scales mentioned on slide 79 to provide clarity on the focus of scale for this work.

7 Breakout groups: Issues and opportunities related to changes in landscape in the ARB

Participants were asked to break into three groups again, to discuss and identify potential issues for water management due to changes in landscape, and for each issue, identify potential opportunities.

Participants went to one of three tables each representing one of three regions in the basin:

Table 1 (Megan and Danielle): Lower Basin

Table 2 (Mike and Ryan): Central Basin

Table 3 (Claire and Justin): Upper Basin.

The following is a summary reflecting the discussions at the tables in the readouts as well as points from

flip charts.

Table 1 (Megan and Danielle)

Q: Is there a plan to build the recently released 2016 ABMI footprint data (2015 data) into ALCES? It would be beneficial for this work as the data has improved considerably.

R: It can be confirm later, but it is believed that the 2015 data is being used in the model.

ACTION: Provide clear definitions for data sets of what is and is not included in ALCES land use parameters. Example: what is included in “oil and gas” vs. “oil sands mining”?

Landscape change issue: linear fragmentation causing interruptions in hydrological connectivity.

- Primary concerns are roads and pipelines, both if BMPs are not followed.
- Seismic lines would also be a concern if they are compacted by additional uses and ongoing access.
- This is an issue throughout the oil sands area.
- This issue would be cumulative over space and time.
- Gap: data on which seismic lines are compacted.

Action: Check AWC State of Watershed work and LARP for indicator(s) to use to reflect linear fragmentation pressure. Metrics are currently being developed for Fox Creek.

Landscape change issue: hardened surfaces

- For example, from central processing units, large well pads, municipal development (housing).
- Hydrological impact depends on the location of the hardened surface, the landscape that it replaced, and the reclamation requirement for hydrology.
- This issue would be cumulative over space and time.

Opportunity: Reclamation requirements, practices and implementation for hydrology.

Opportunity: Restoration requirements e.g., for cut lines

Opportunity: surface disturbance limits

- This is a “front end” opportunity.
- Examples include:
 - Pooling leases
 - Nodes of disturbance e.g., long distance directional drilling
 - Common infrastructure e.g. roads
 - Best Management Practices (BMPs) e.g., for well pads

Opportunity: road and seismic line BMPs and monitoring their effectiveness

Opportunity: priority reclamation

Landscape change issue: key hydrology features being intersected by land use features resulting in disrupted hydrology.

- Challenge is in defining “key hydrology features”. How do you determine which are hydrologically sensitive?
- Example: wetlands - overall, fens (connected to groundwater) may be more sensitive than bogs (typically the driest), swamps (depressions holding precipitation) and marshes. However, the value of the fen would depend on its class, its rich/poor, its location in the watershed, its connectivity.

Opportunity: provide more information on which wetland areas are more sensitive” (or more significant) from a hydrological perspective and an isolated/local/regional scale.

Landscape change issue: Hydrological impacts from mining.

- Example area: Muskeg River Basin where ~30-40% of the land is or has been a mine pit.
- Channel rerouting and diverting changes stream flow and structure.
- Reclaimed landscapes have proven difficult to recreate the original peat wetland functions.
- The Muskeg River Watershed Integrity Management Framework is working to impose requirements on mining operations to maintain watershed functions target ranges.

Landscape change issue: Fire

- Impacts water in two main ways:
 - Increases run off
 - Creates water quality problems

Opportunity: maintain the wetland network in the region to offer key functions associated with fires:

- Water storage in the basin to keep the system wet
- High flow mitigation and buffering post fire
- Sinks for water quality contaminants post fire

Opportunity: Increase monitoring related to runoff concerns

- Address flooding concerns
- Identify erosion risks
- Inform reclamation prioritization

Opportunity: Fire suppression in hydrologically sensitive areas – maybe – depends on the nature of the fire suppression e.g. forest clearing to create burn barrier would not be positive.

Landscape change issue: land impact of new reservoirs (area directly flooded)

Table 2 (Mike and Ryan)

AGRICULTURE

What is the maximum amount of irrigation possible under a drier/warmer climate?

- Look at the maximum amount of water use possible under the current agriculture footprint.
- Is agricultural land conversion a significant impact on hydrology in the future?

Issue: a current issue is an increase in sediment and nutrient transfer, and transport via tributaries and rivers from agriculture.

Opportunity: opportunity to make any future new farm land (converting land into farm land) that is developed to have no new net impact to the existing issue of sediment and nutrient runoff (e.g., larger buffers around water bodies, best farming practices, etc.). Education is needed, incentives work well such as technical assistance (e.g., grants for implementing best management practices) for farmers, and enforcement of a policy/regulation like this would be good.

Water quality monitoring is needed for better understanding and management.

FORESTRY

Model future increases in Ag and forestry: which would have greatest impact on hydrology?

Reduced tree canopy and fragmentation – upper Lesser Slave Lake (LSL) watershed impacts to river and lake, increase flows (faster runoff rate and earlier timing of peak runoff) and sedimentation.

Opportunity: reclamation of roads from forestry that are no longer needed; what is the hydrologic impact?

Model scenarios of X % reclaimed roads

- Model trade-offs? These actions may include reduction in use of roads by Off Highway Vehicle (OHV) users and reduction of invasive species as examples of active revegetation / reclamation
- Clarify policy and existing guidelines- need to check what those guidelines are and then model more than what is required.
- Could look at specific geographic areas e.g., Southern Lesser Slave Lake area currently being impacted by recreational and other uses to reclaim and protect LSL and other water bodies from sedimentation. Under a warmer climate, lake water quality could degrade with excess sediment/nutrients being added to the water.

OIL and GAS

Issue: decommissioning roads and wells not common or time managed practice as companies need access as they are liable for the well.

Linear density- explore effects, set target to % to decommission: will there be hydrologic impacts? (Consider elevation - sensitivity analysis)

Could look at trying to find data on the number of wells inactive and database of wells to be capped. Policy clarification (AER): is there a requirement to decommission?

ROADS

The group looked at adding trails to the road network. They seem to be in most cases access roads for forestry. Should maybe as a starting point just reclaim all of the 'trails' and see what happens hydrologically in the model. It would be a good indication of what road reclamation would do as discussed earlier.

Opportunity: Conservation areas; for example: North Lesser Slave Lake area to protect lake from runoff and contaminants

- Recommend policy with setbacks for new development
- Would be good to model wetland loss and understand if we lose wetlands at the same rate as we have over recent history what the impact would be in 20 years. Then there would be an understanding on the value of wetlands hydrologically and trying conserve rather than compensation.

How do landscape changes affect minimum flows? Could maybe compare a pre-development landscape with today and see what the changes in simulated minimum flows are to better understand impacts on.

Table 3 (Claire and Justin)

The maps of the five main land use changes in the upper portion of the ARB were reviewed.

If this group is going to discuss land use in the context of water management it will be important to understand what the impacts of land use are on hydrology, if we remove all of the roads will there really be a measureable impact from a hydrological perspective? Additionally it will be important to assess the cumulative effects of different landscape changes. Within this context it would be useful to understand how much our current development has impacted hydrology.

Agriculture and forestry have the potential to impact water supply. Forestry rates are increasing at the moment, and will increase for a while in the foreseeable future, because they are cutting down old pines that have the potential to be impacted by the mountain pine beetle. The pine beetle has not reached the ARB yet, but they are proactively trying to deal with it. Increased forestry had the potential to 'fatten' the hydrograph, it may increase the water that is seen earlier in the hydrograph.

Increased agriculture may have little impact on water supply, depending on the type of crop. It may have a similar hydrologic impact to clearcutting in that the water yields in many parts of the year would be higher and the flow would be flashier. During growing season there would be less water yield.

On the demand side agriculture may also increase demand. There is no irrigation in this basin at the moment but in the long run, and given the potential impacts of climate change, there may be irrigation.

The impacts of climate change will play an important part in this conversation – what will the landscape look like in 50 years, where we now see forests we may see grasslands.

In the long run we may see more widespread natural forest disturbances such as larger wildfires and more pests.

From a land use perspective the biggest opportunity is to implement BMPs. If there is increased land clearing for agriculture there is an opportunity to put BMPs in place early.

There is also an opportunity surrounding forestry practices. In private forested lands options that may be more water friendly could be introduced, such as varying the types of trees that are planted. Another option may be to desynchronise the watershed to ensure that heavy logging is taking place in an offset manner.

Opportunity: identifying water friendly BMPs during land management practices, how to develop these to build resilience in the system.

Opportunity: look at storage infrastructure in the upstream part of the watershed with the mountains.

7 Discussion: What challenges do you want this Roadmap to focus on?

After the afternoon breakout groups Mike reviewed the results of the dot-mocracy exercise: which basin challenges should this group focus its discussions and findings on? Five of the more popular ones with the most dots were moved up (more focus), the other five were moved down (less focus).

More focus

1. Maintaining or improving water quality (temperature, and DO). **(Note: suggestion that 'maintaining' be removed)**
2. Providing water supply certainty for municipality and development
3. Maintaining or improving ecosystem health. **(Note: suggestion that 'maintaining' be removed)**
4. Minimizing the effect of development footprint on basin hydrology
5. Accessing data and knowledge in the basin around water

Less focus

1. Ensure sufficient flow for navigation
2. Limiting damage from floods (freshet and/or ice jamming)
3. Maintaining or improving the health of the PAD. **(Note: suggestion that 'maintaining' be removed)**

4. Realizing the renewable energy potential of the basin (**Note: suggestion this be changed to “understanding the renewable energy potential in the basin”**).
5. Addressing the concerns around treaty rights.

This guidance will be taken away by the project team and reviewed in light of the project’s mandate, deliverables and expectations. It will be refined into a focus of work that will be shared with the working group at the next meeting.

Q: Treaty rights are at least in part linked to ecosystem health. If we focus on ecosystem health, will that indirectly improve treaty rights?

R: There are certainly cross over between all of these. And by moving some to the bottom of our list, it doesn’t mean that we will not be aware of them. However, it will mean that we will not identify and assess strategies that directly address them.

Q: If we are doing work that we know most likely will have impacts on the Indigenous communities, then we should devote time to understand the treaty right and how they look at those right, how they value those rights. It would be good to incorporate those rights into the outcome of this work. For example, how they value them, what they are, etc... because at the end of the day some of what the group comes up with may impact some Indigenous communities.

R: Good point. We have a meeting with GoA to make connections between this work and other water related activities in the basin that we should include in that how this work may touch on treaty rights, so that we can better understand and articulate any potential impact to treaty rights. There is an opportunity for all of us to understand and become more informed on treaty rights. If there is an opportunity to draw on folks who have an understanding on this we could incorporate that into the basin story as an educational piece for the group as well, just as what was mentioned to this morning.

Action Item: Mike to confirm meeting with GoA and include how this work may touch on treaty rights.

8 Next Steps and Close

Mike then wrapped up the day by mentioning that the next meeting on May 10th we will be starting the “assess and sort” process by using AIRM as we start to refine the opportunities the group wants to look at into strategies.

Q: Will we be doing runs that would simulate scenarios of different land use issues we talked about today?

R: Yes, today we tried to draw out what the land use issues are that people will be most interested in. We will send out a list of simulations that we plan to live-model at the next meeting. If you could get back to us with any comments that would be great and if you have a specific scenario that you want to have modelled let us know, so that we can add it to the list.

Final comments and reminders included:


- Mike made a few summary remarks, noting how valuable today’s discussion was.

Meeting Summary

Athabasca River Basin (ARB) Initiative

- Slides and meeting summary will be circulated to participants for information and comment, and the project team will follow up with individuals on specific discussion points.
- Participants were encouraged to contact the project team with ideas and suggestions for the project, model inputs, and data.
- Those interested in the data and modelling committee call please contact Mike.
- Mike will send out an invite for the September meeting when it gets booked.
- We look forward to seeing everyone at the May 10th meeting.

Mike acknowledged today's excellent contributions and thanked everyone for their support, enthusiasm and input, and adjourned the meeting at 3:45pm.

The background of the slide is a photograph of a river with clear, turquoise water. The far bank is lined with a dense forest of tall evergreen trees under a cloudy sky. A semi-transparent light blue vertical bar is on the right side of the image, containing the title text.

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

**Working Group meeting #4
March 14, 2017**

Welcome and introductions

Today's Agenda		
9:00	Welcome, introductions, and opening remarks	Mike
9:30	ARB Initiative Process: Steps to develop a water management roadmap for the ARB	Megan
9:45	Very preliminary draft of the basin story: current state, issues and opportunities	Megan
10:00	Breakout groups: Systematically refine current list of opportunities per region and basin wide	All
11:15	Readouts to plenary	Group Reps
11:30	Presentation: Landscape change in the ARB and implications for water management	Justin Straker
12:10	Lunch	-
1:00	Potential landscape effects on water in the ARB: How landscape can be included in the modelling and Roadmap	Claire
1:15	Breakout groups: Issues and opportunities related to changes in landscape in the ARB	All
2:45	Readouts to plenary	Group Reps
3:00	Break	-
3:15	Discussion: What challenges do you want this Roadmap to focus on?	Mike
3:45	Next steps, and close	Mike

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.”



Keep in mind...

- There is lots of information – slides and meeting summary will be sent out.
- Materials and information presented can be shared publically- website will be updated soon!
- 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.
- Technical information is presented today; your participation doesn't require you to understand all of it.
- Outcomes are expected to include a valuable suite of collaboratively developed strategies and potential actions toward improved understanding and planning around water in the ARB (the Roadmap). This provides a foundation for planning and policy support for organizations and communities, and is not expected to solve all water-related issues.

Reminders about the Athabasca Integrated River Model (AIRM)

- “AIRM” avoids the acronym “AIM” – a potential name for the model, suggested at the last WG meeting.
- 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.

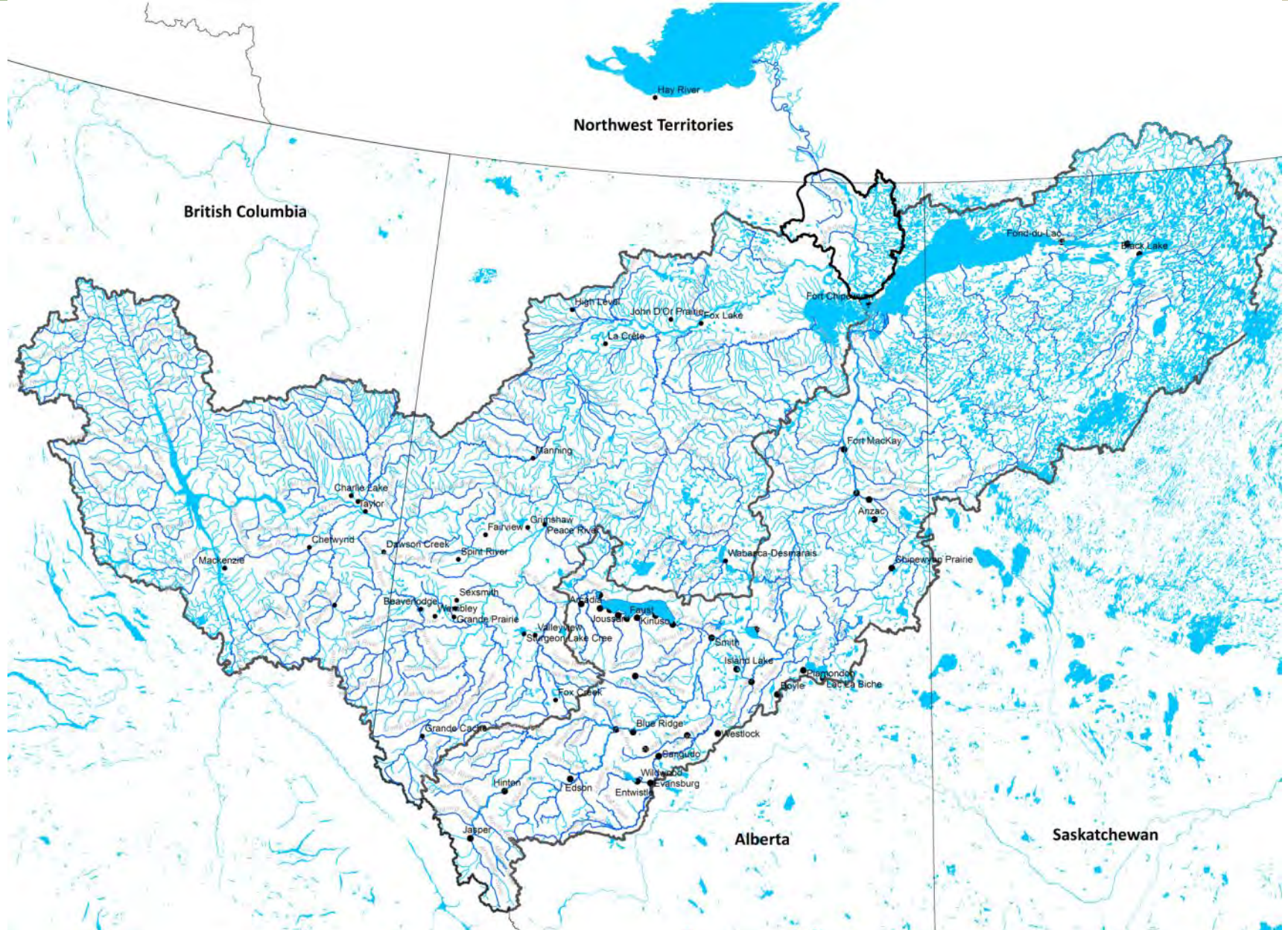
Reminders about AIRM...



Current scope



Scope looking forward



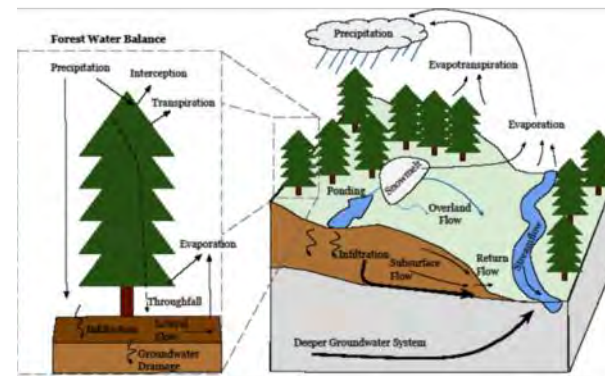
Collaborative water management creates informed discussions that can move toward action

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

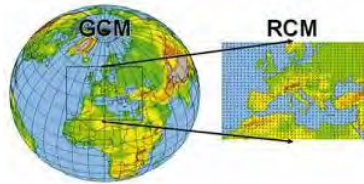


3. Work collaboratively to identify challenges and opportunities



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 in landscape composition from various scenarios



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



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

- What if precipitation occurs as rain in the spring rather than snow?
- What if current population centers were to double or triple in size?
- What if water intensive resource processing industries located in ARB because licences are available?
- What if we experience the drought of the century?
- What opportunities might potential hydropower facilities provide for water management?
- How would landscape change affect streamflow?
- What actions will improve water navigability?

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

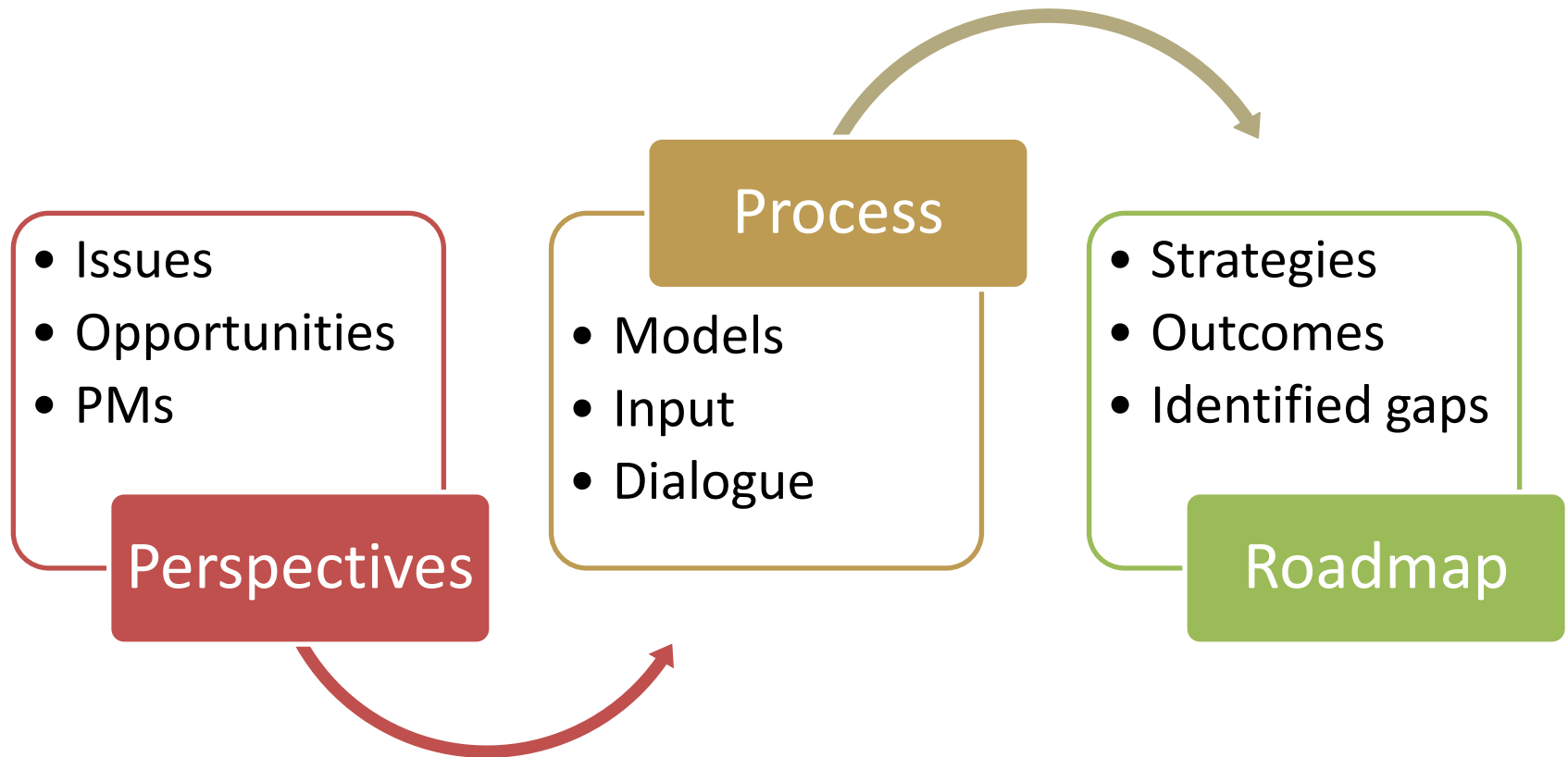
Reminder: Goal for this work is an ARB Roadmap

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 path toward sustainable water management in a basin
- intended to inform future planning and management efforts as they relate to water



Participation in the ARB Initiative



Update on concerns raised by some First Nations and Métis

Perception that the ARB Initiative and engagement process is “Consultation” and this role belongs to government.

- The Government has taken part in this Initiative as an interested stakeholder, who is likely to derive benefit from the outputs. The ARB Initiative is not a GoA Initiative.
- GoA is one of many participants in the Initiative and does not lead the process. As such, engagement activities taking place through the Initiative are not on behalf of government.
- Tools and recommendations delivered through the initiative 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.

There is no guarantee that recommendations identified through this process will be used.

- It is the hope and expectation of all that are involved, including the GoA, that the outcomes from this work will serve to further the development and ongoing improvement of regional plans, sub-regional plans, and environmental management frameworks for the ARB.

Need to understand how this Initiative fits into overall water management processes and planning.

- There is high expectation that the findings and outcomes of this Initiative will be implemented and/or used in decision making around future development and planning with respect to water. This could include things like the Tailing Management Framework, Water Reuse Policy, development plans, land use plans, conservation planning, etc.

There is no forum for dialogue with GOA on these matters of water management and underlying issues of infringements on treaty rights.

- For further concerns, please contact a GOA representative to discuss those specific concerns.

Discussions from the breakout groups last meeting...

Breakout group objective: Explore and have informed discussions of the opportunities using the model, and gain comfort with using the model.

Lower Basin opportunities

- implement Aboriginal Extreme Flow (AXF) of 400 cms in the river below the confluence with Firebag River during open water season (Apr 16 to Oct 28).
- use a new reservoir upstream of Fort McMurray to release water as needed to meet the AXF.

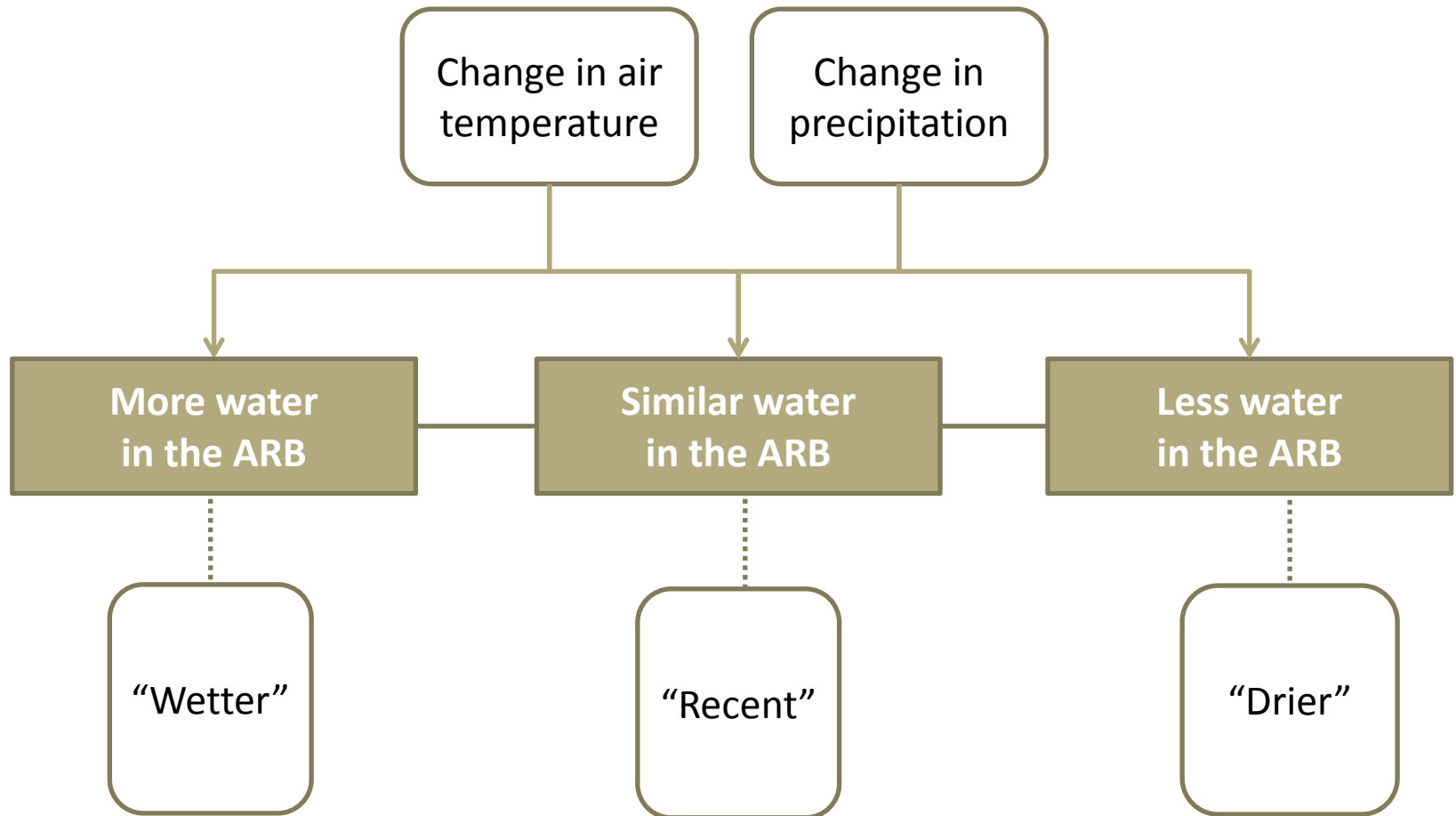
Central Basin opportunities

- mirror hydroelectric dam site potential on mainstem of the Athabasca River.
- increase irrigation with an increase to agricultural area outside the footprint of the reservoir and dam facility.

Upper Basin opportunities

- cut the water available to TDLs by half.
- create a network of storage for grey water, effluent, return water, flow back water from hydraulic fracturing.

Robust Roadmap best tested against range of climates

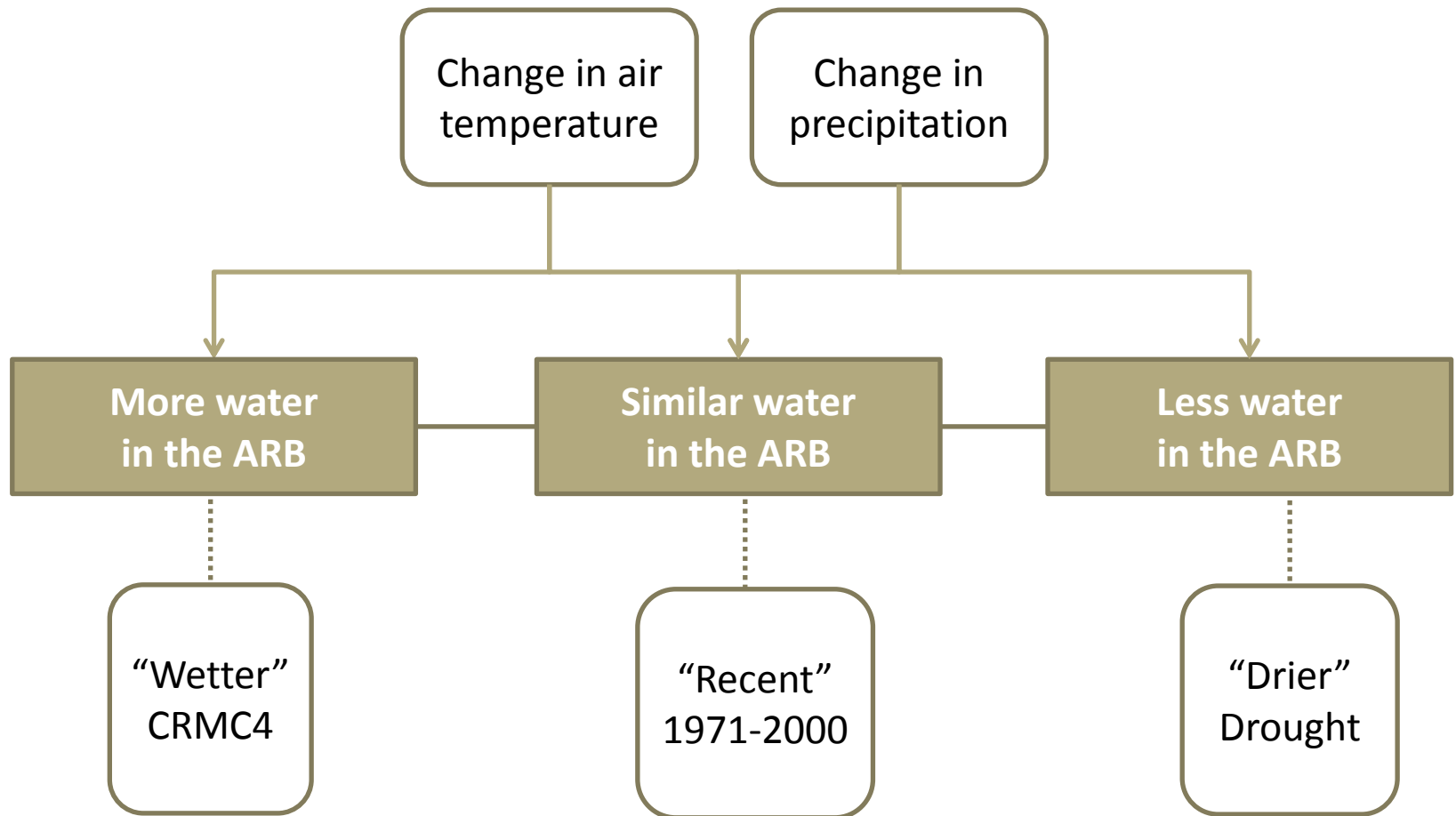


Each scenario must be credible and useful

Climate scenarios

1. Climate scenarios from Regional Climate Models
 - Provides scenarios using the most recent regional climate modelling
2. Historic (1971 – 2015) streamflow
 - Provides perspective under historical conditions and provides a meaningful baseline
3. Drought scenario from paleo climate analysis
 - Provides stressful water management scenario that is based on evidence of past droughts

Robust Roadmap best tested against range of climates



Each scenario is credible and useful

ARB issues and opportunities will form the Roadmap

Issues

An important concern or problem related to water in the basin that warrants attention.

- Can be current or future.
- Can be sub-basin specific or basin-wide.

What the Roadmap needs to address / resolve

Opportunities

Specific actions that can be implemented.

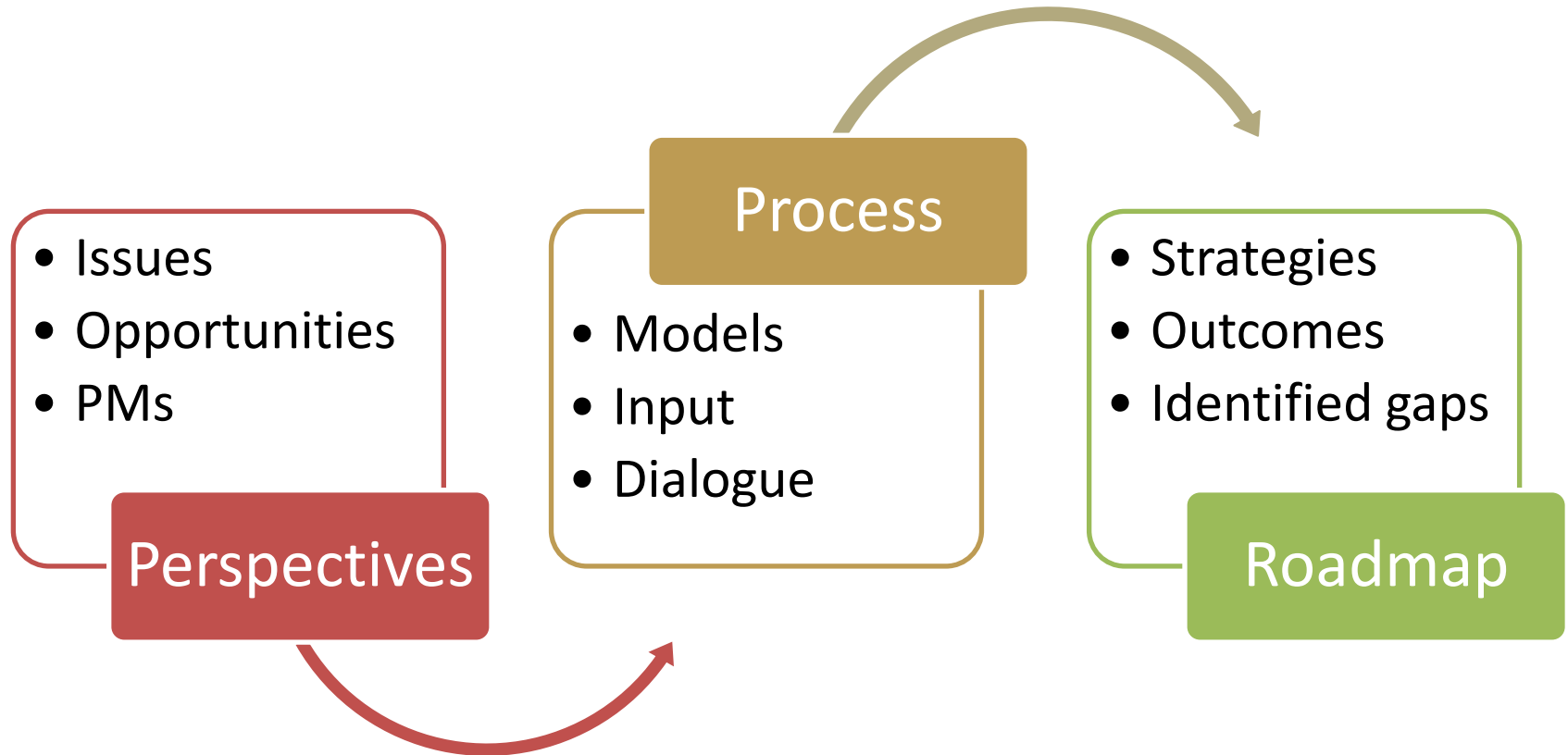
- To address the basin's issues.
- To make improvements sub-basin specific or basin-wide.

The strategies that will make up the Roadmap

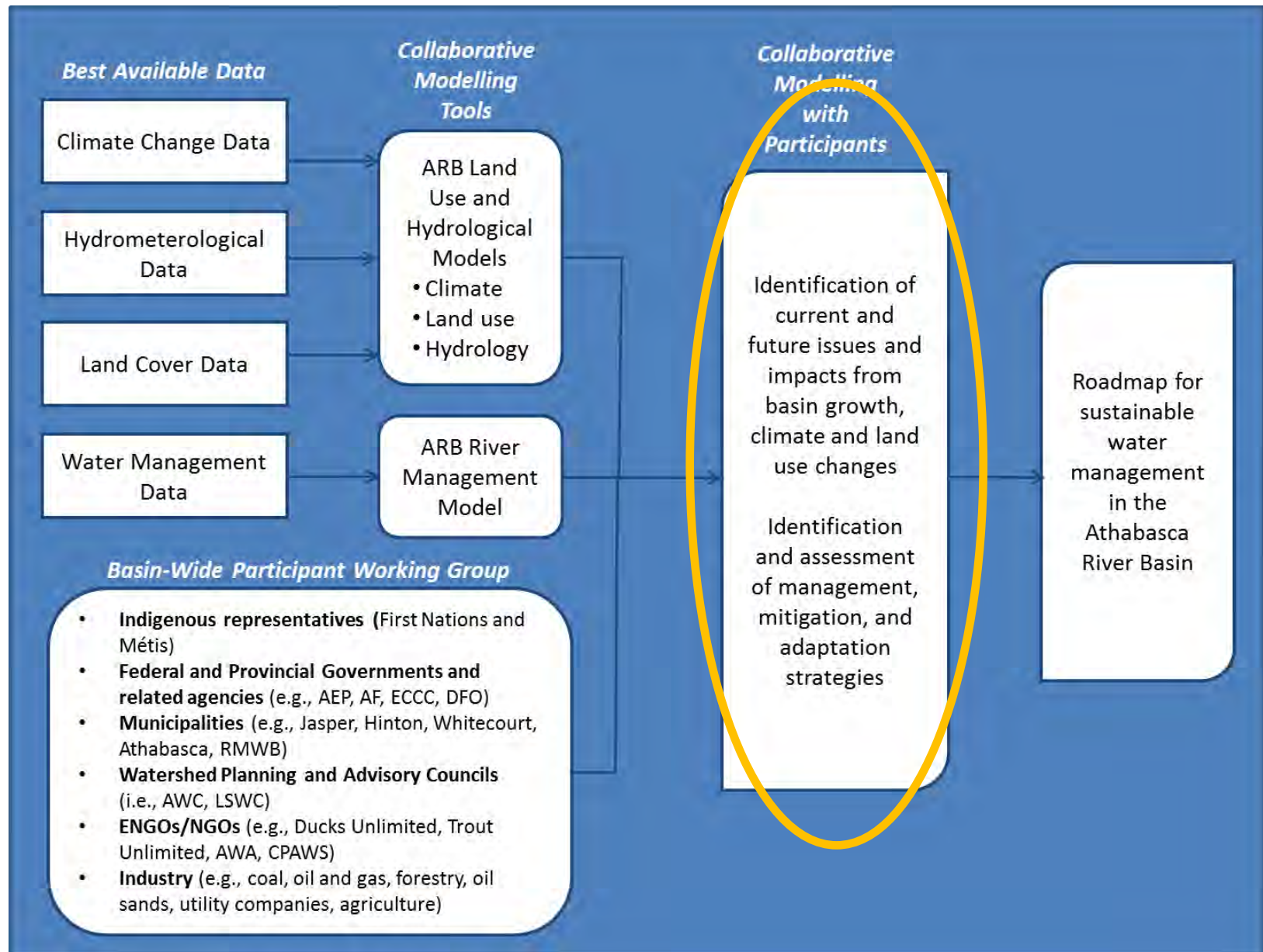
Discussions and lists advanced after each meeting

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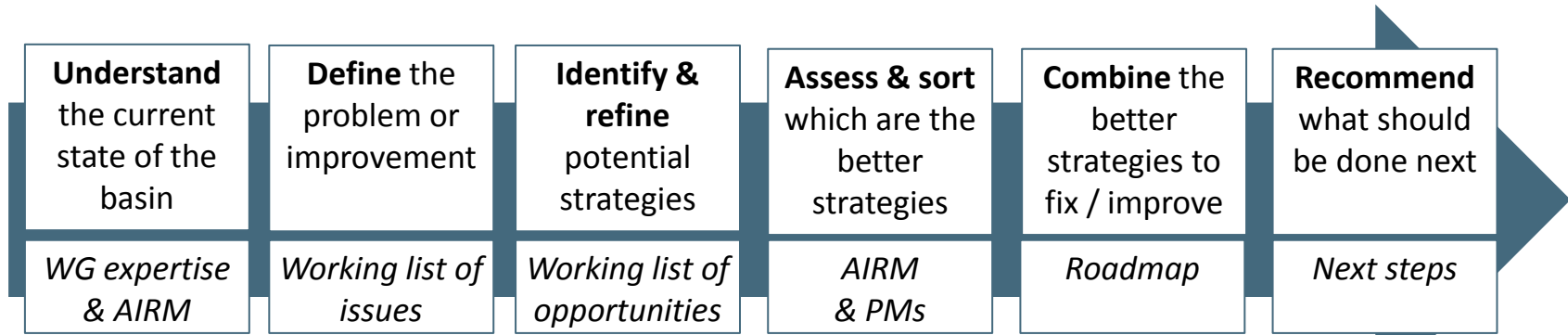
What is the process to create the Roadmap?



Exactly how will we develop strategies?



Collaborative process to develop the ARB Roadmap

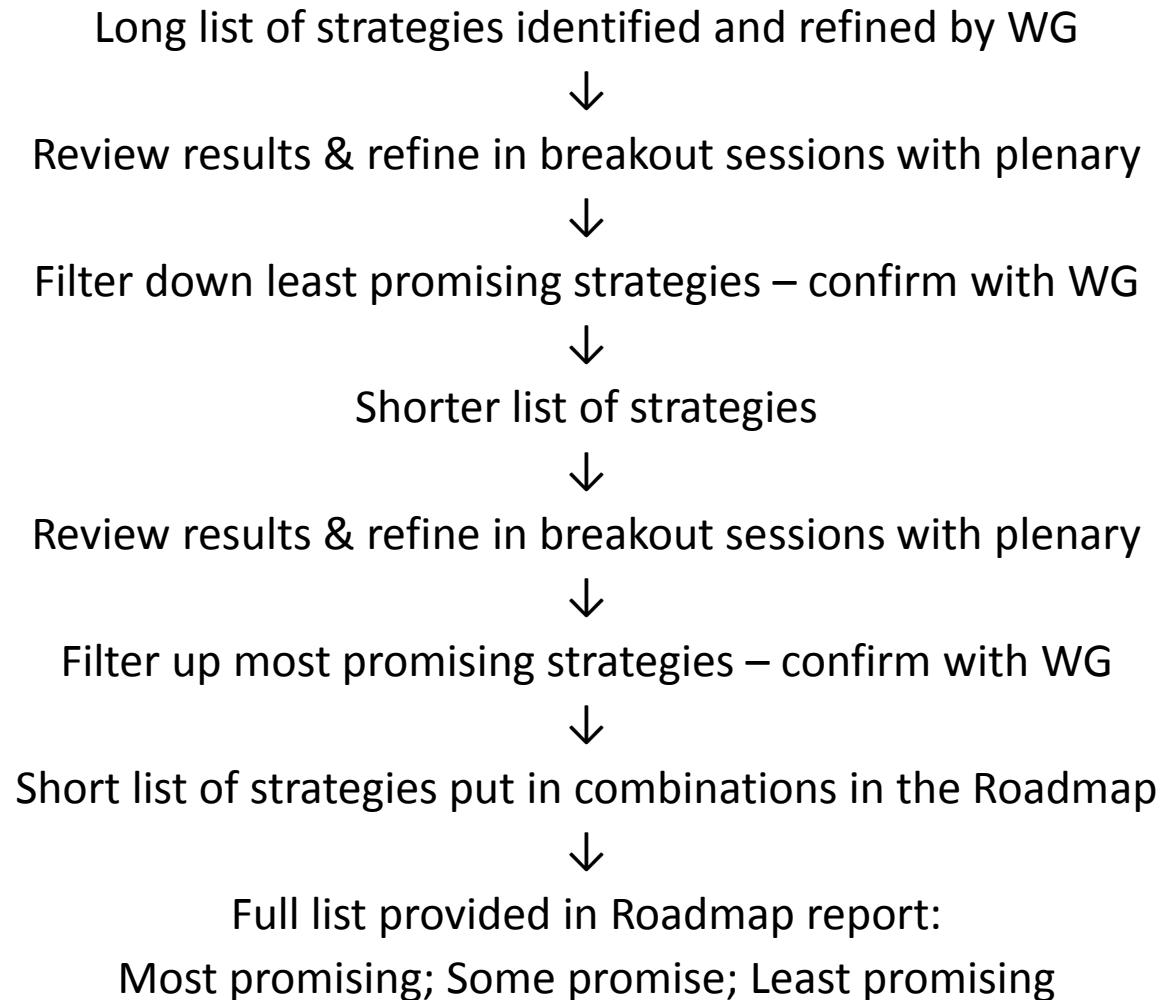


Working Group meetings	1	Focus of work	Focus of work				
	2	Focus of work	Focus of work	Focus of work			
	3	Focus of work	Focus of work	Focus of work			
	4	Focus of work	Focus of work *	Focus of work			
	5	Lesser focus		Lesser focus	Focus of work		
	6	Lesser focus		Lesser focus	Focus of work *	Lesser focus	
	7	Lesser focus		Lesser focus	Focus of work	Focus of work *	Lesser focus
	8	Lesser focus			Lesser focus	Focus of work	Focus of work *

focus of work
 lesser focus
 * key milestone

Collaborative approach to “Assess & sort”

Assess & sort
which are the
better
strategies



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 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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9:00	Welcome, introductions, and opening remarks	Mike
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3:45	Next steps, and close	Mike

“Basin story”: What is it; why do we need it?

WHAT Common understanding of the basin:

- Reflecting its size and diversity
- Recognizing its range of challenges (problems and improvements)
- Identifying some opportunities (that develop into strategies)

WHY Provides the basin context for this group’s discussions and findings

- Bear it in mind in our discussions
- Include it in the Roadmap report

WHY Equips us to decide where this group should focus its efforts

Which basin challenges should this group focus its discussions and findings on?

ARB story: Size and diversity

Large basin with 3 distinct natural regions:

- Rocky Mountains
- Foothills
- Boreal Plain

Each region is unique and has a diverse hydroclimate, geology, natural resources, and ecosystems.

The basin is connected as water flows through its river systems

- The mainstem, tributaries and wetlands, connecting from the headwaters (top) to the delta (bottom).

The heaviest development is from:

- Agriculture and forestry (upper and central)
- Oil & gas (including mining) and forestry (lower)

ARB story: Recognize basin water challenges

1. Maintaining or improving water quality
2. Providing water supply certainty for development
3. Ensuring sufficient flow for navigation
4. Limiting damage from floods or extreme events
5. Maintaining or improving ecosystem health
6. Minimizing the effect of development footprint on basin hydrology
7. Maintaining or improving the health of the Peace-Athabasca Delta (PAD)
8. Realizing the renewable energy potential of the basin
9. Accessing data and knowledge in the basin around water
10. Addressing the concerns around treaty rights

ARB story – the basin’s water challenges (I)

1. Maintaining or improving water quality

- Non-typical changes in water temperature (primarily in tributaries) and dissolved oxygen (primarily in main stem) from reduction in flow and/or industrial discharge
- All other water quality parameters out of scope

2. Providing water supply certainty for development

- Development can include community/municipal, agricultural and/or industrial needs
- Impacted by both the volume and the timing of flow
- This issue is specific to certain areas at certain times of year, for example:
 - Hydraulic fracturing demand in the upper tributaries
 - Oil sands demand on the lower main stem

3. Ensuring sufficient flow for navigation

- In the main stem and tributaries

4. Limiting damage from floods (from freshet and/or ice jamming)

- Athabasca, Fort McMurray, Lesser Slave Lake

Continued...

ARB story – the basin's water challenges (II)

5. Maintaining or improving ecosystem health
 - Natural variability in water supply
 - Impact of withdrawals (on tributaries)
 - Sustainability of fisheries (e.g., Pembina River)

6. Minimizing the effect of development footprint on basin hydrology
 - Major wetland loss
 - Large scale forestry
 - Cumulative linear fragmentation

7. Maintaining or improving the health of the PAD

8. Realizing the renewable energy potential of the basin (hydropower)

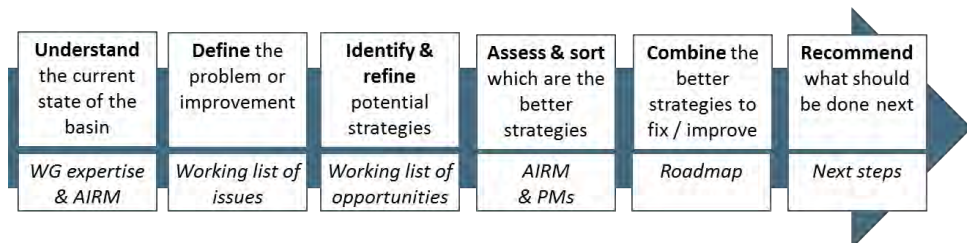
9. Accessing data and knowledge in the basin around water

10. Addressing the concerns around treaty rights

ARB story: Some of the basin's water opportunities

- Optimize water reuse potential (action: policy clarification)
- Implement minimum flows on high risk tributaries (action: regulatory review)
- Enable withdrawals to support development (action: water management plan)
- Build offstream storage to supplement supply (action: site assessment)
- Build on-stream multi-purpose dams (e.g., hydropower generation, flow augmentation) (action: site assessment)
- Manage landscape footprint through land conservation areas (action: link to land use planning)
- Produce a basin water management plan (action: consultation)

Opportunities are refined into strategies then assessed and sorted for the Roadmap.



Today's milestone: Define the problems +/- improvements

Which basin challenges should this group focus its discussions and findings on?

We will use an informal, visual, selection tool:

- Every challenge is posted on a chart around the room
- Every participant will be given 9 stickers
- Throughout the day, place your stickers on the challenge(s) you want the group to focus on, given:
 - who is participating
 - the tools we have
 - the project scope and timeline
- You can add comments using post it notes

Later today:

- As a group, we will look at the stickers to see where most interest lies
- Based on that, we will agree which challenges to work on and which to set aside

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Breakout Groups

Systematically refine current list of opportunities per region and basin wide

Discussion focus:

- Systematically refine current list of opportunities per each region and basin wide
 - Vet each opportunity in the current list:
 - Is it still relevant?
 - Is there additional information?
 - Does it address a current issue?
 - What do preliminary model results show?
 - Add additional opportunities as they are identified
- Feel free to move between tables
- Scribes will record notes on flip charts

**Table 1: Megan and Danielle
Lower Athabasca**

**Table 2: Mike and Ryan
Central Athabasca**

**Table 3: Claire and Justin
Upper Athabasca**

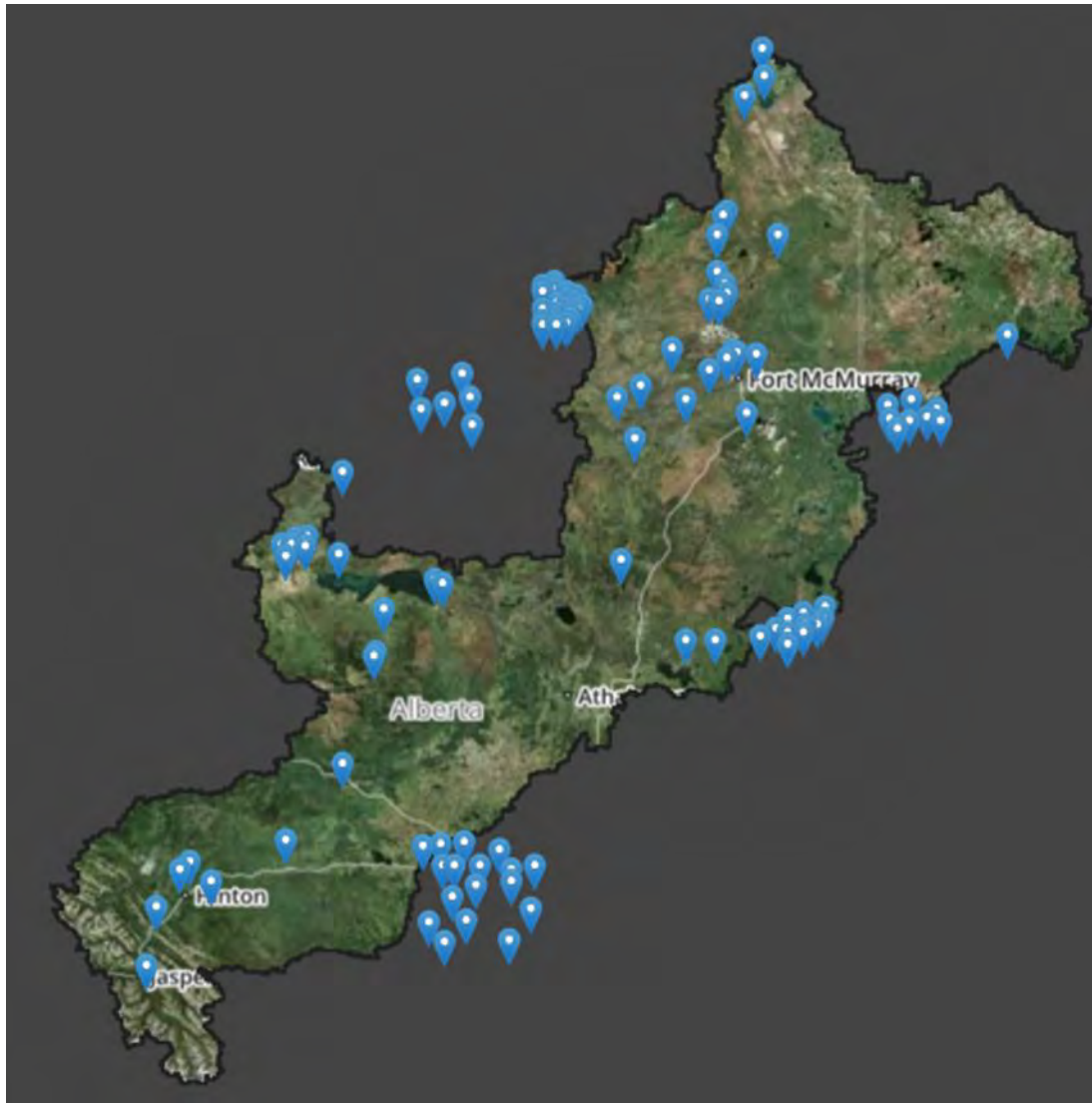
A volunteer from each table needs to provide a brief readout 😊.

Readouts

Which opportunities did the group think we should focus on?

Which opportunities were parked (e.g., not something we could or should look at)?

Some of the opportunities for the Roadmap



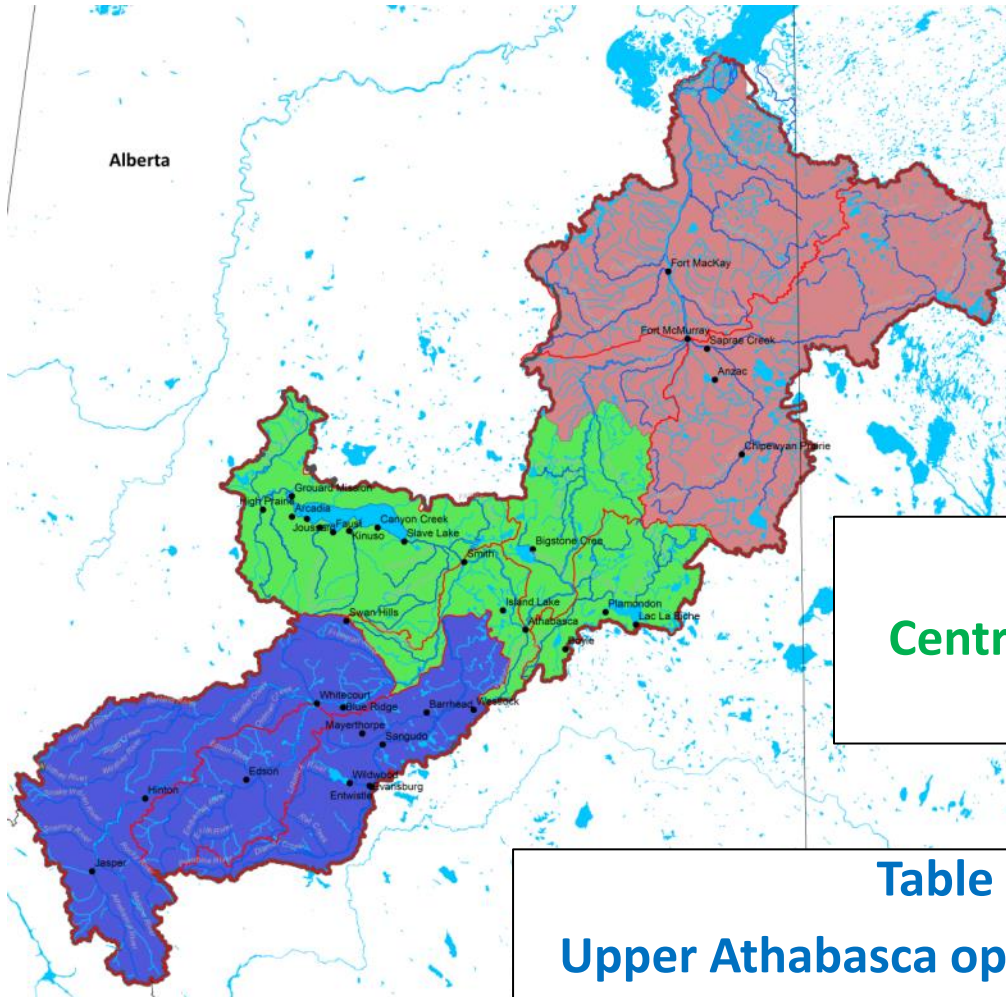
Opportunities are broken down into:

- Basin wide
- Upper
- Central
- Lower

Grouped into 4 buckets:

- Supply and Demand
- Regulatory
- Lands and Ecosystems
- Data and Knowledge

Breakout Groups



**Table 1: Megan and Danielle
Lower Athabasca opportunities
and basin wide Supply and
Demand**

**Table 2: Mike and Ryan
Central Athabasca opportunities basin
wide Regulatory**

**Table 3: Claire and Justin
Upper Athabasca opportunities and basin wide Lands
and Ecosystem Use, and Data and Knowledge**

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Landscape change in the ARB and implications for water management

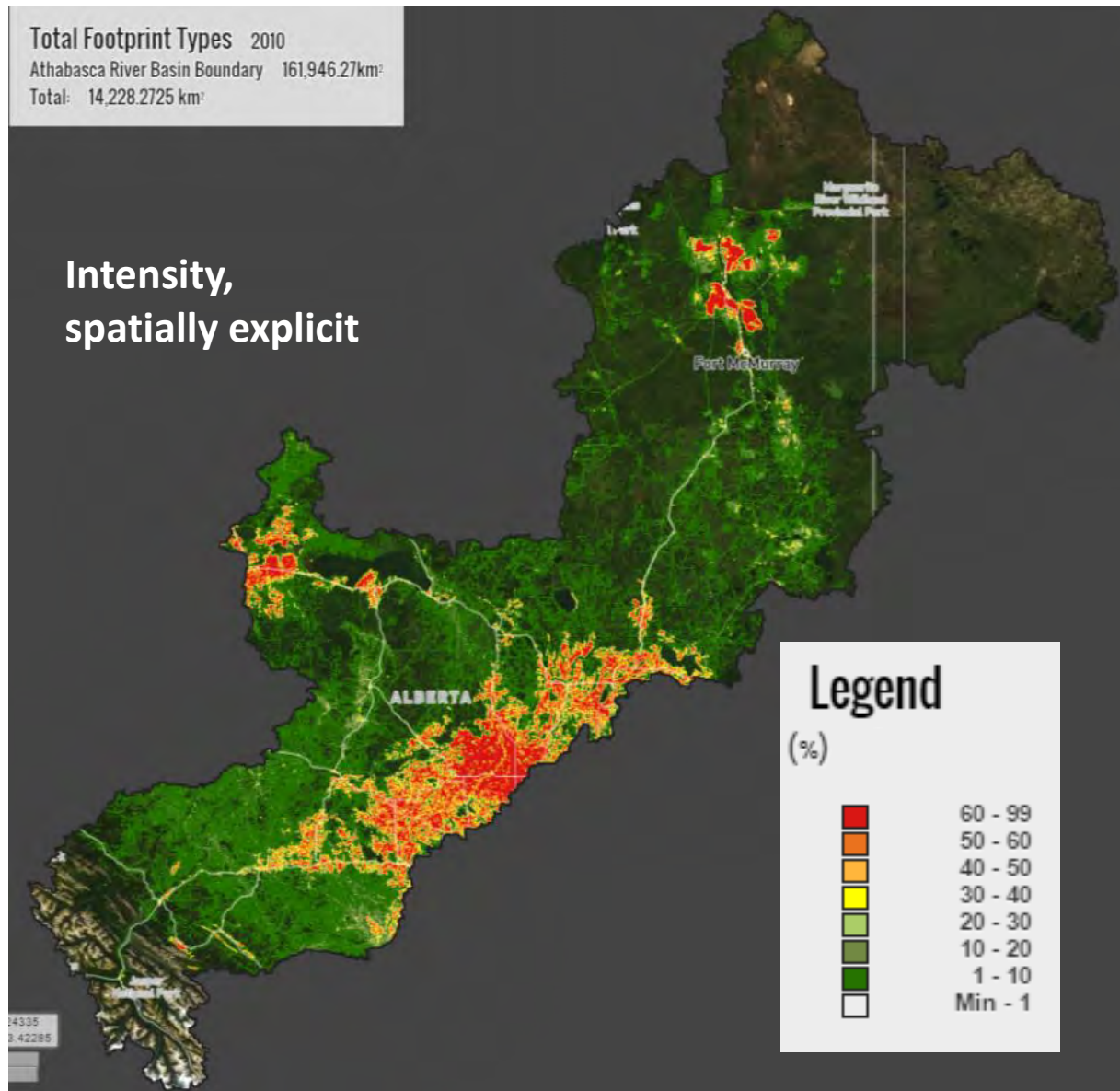


Land uses and natural features we are tracking relevant to water management

- Agriculture
- Alpine
- Feedlots
- Forests
- Glaciers
- Grasslands
- Industrial
- Landfills
- Lakes
- Rail
- Road
- Mine
- Petroleum wells
- Pipelines
- Powerlines
- Reservoirs
- Recreation/campgrounds
- Rivers/streams
- Rural settlement
- Seismic lines
- Trails
- Urban settlement
- Water management structures
- Wetlands



All human land uses in the ARB, ~2015

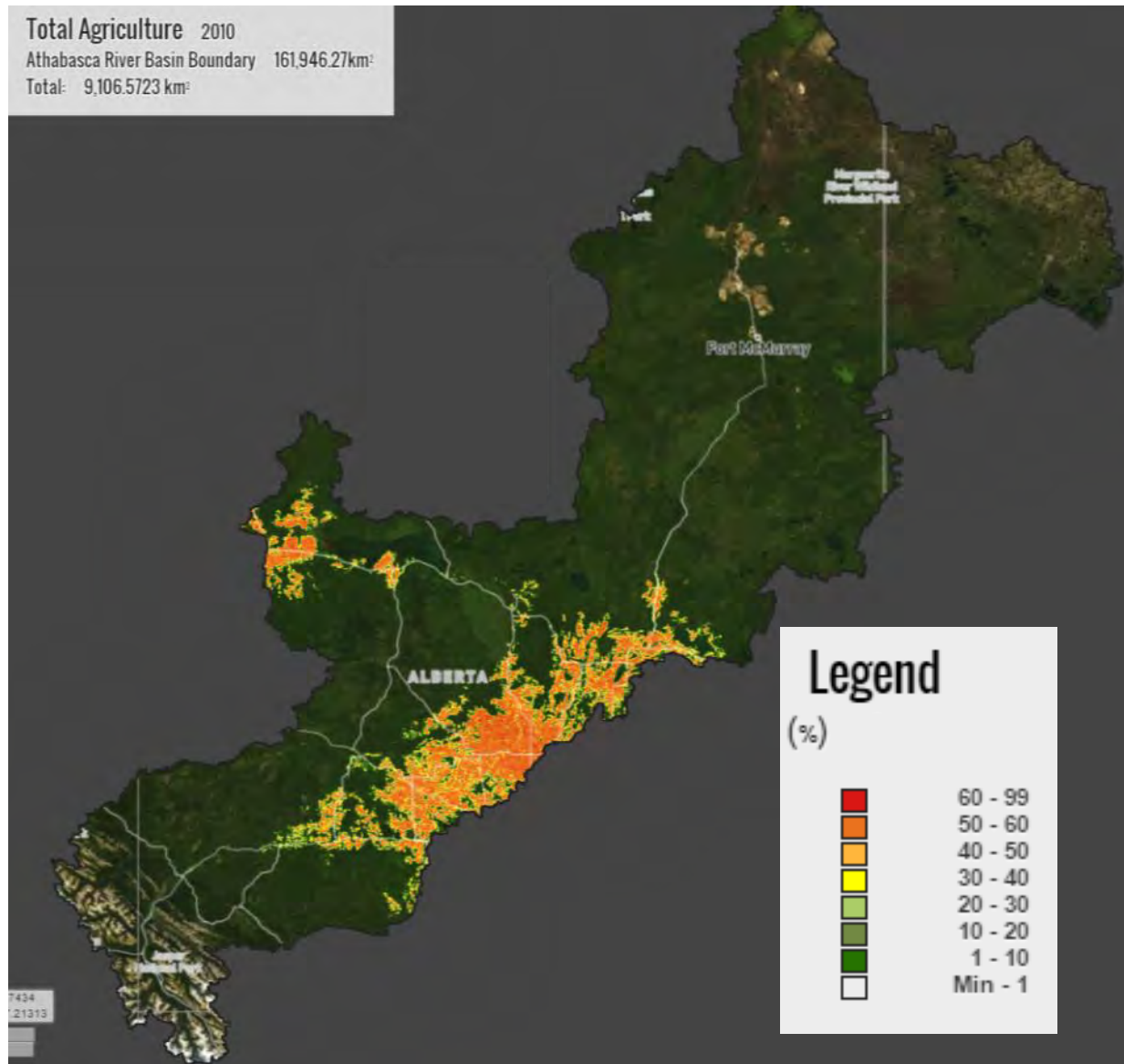


Landscape change in the ARB and implications for water management

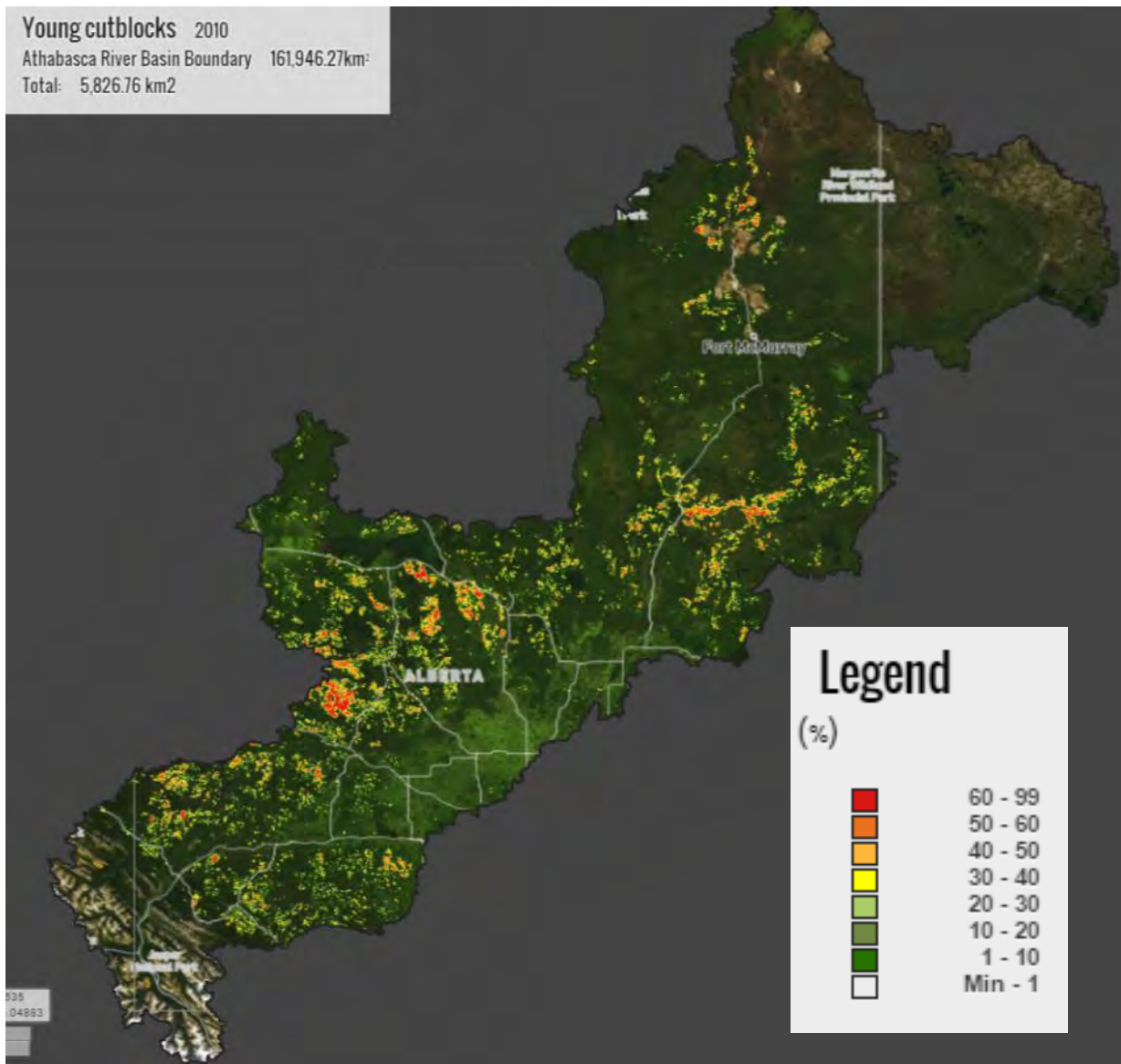
The “big three” human land uses in the basin based on total area footprint:

1. Agriculture
2. Forestry
3. Oil & gas (including mining)

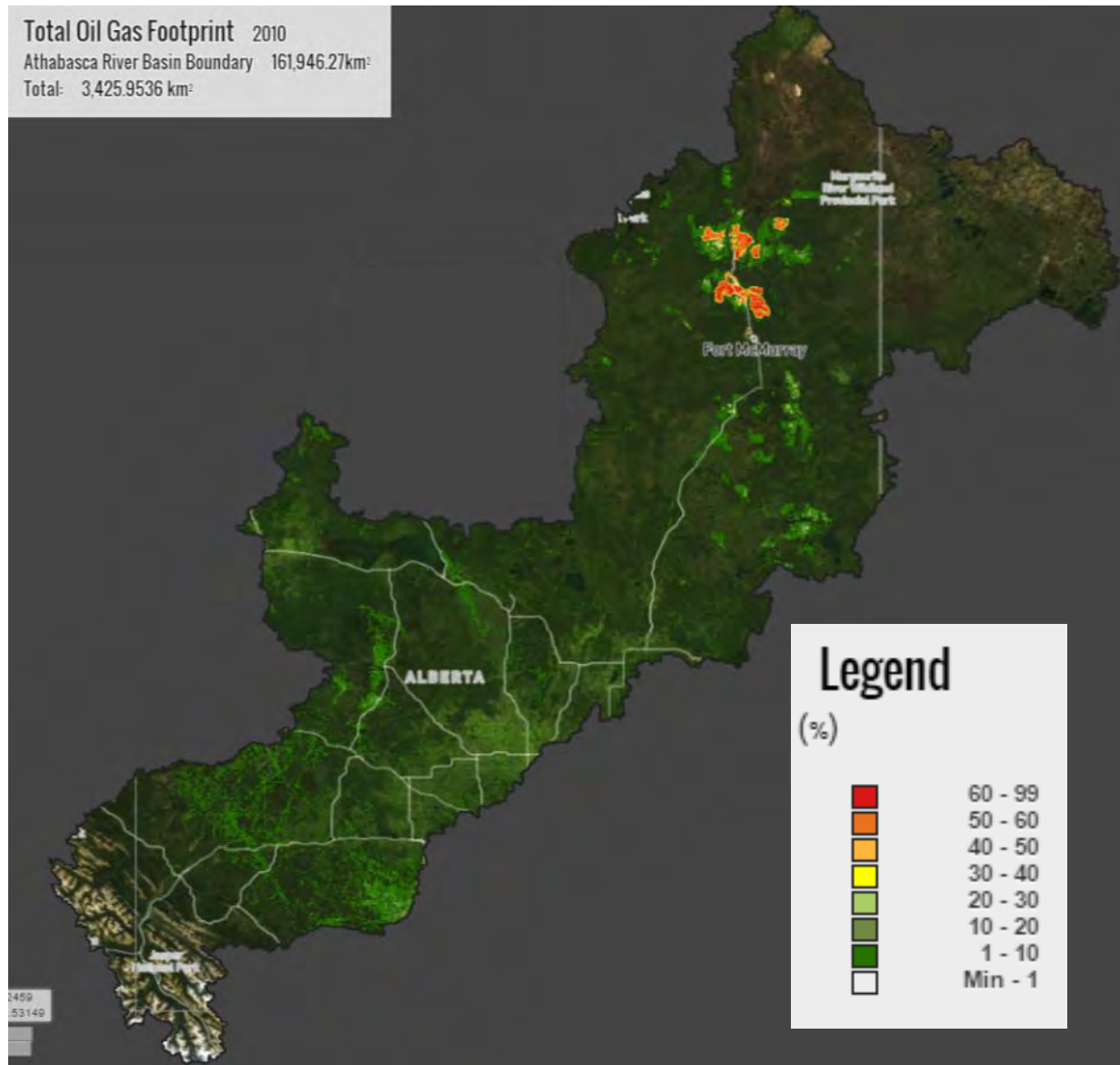
Agriculture – overall largest land use by area; conversion of vegetation types



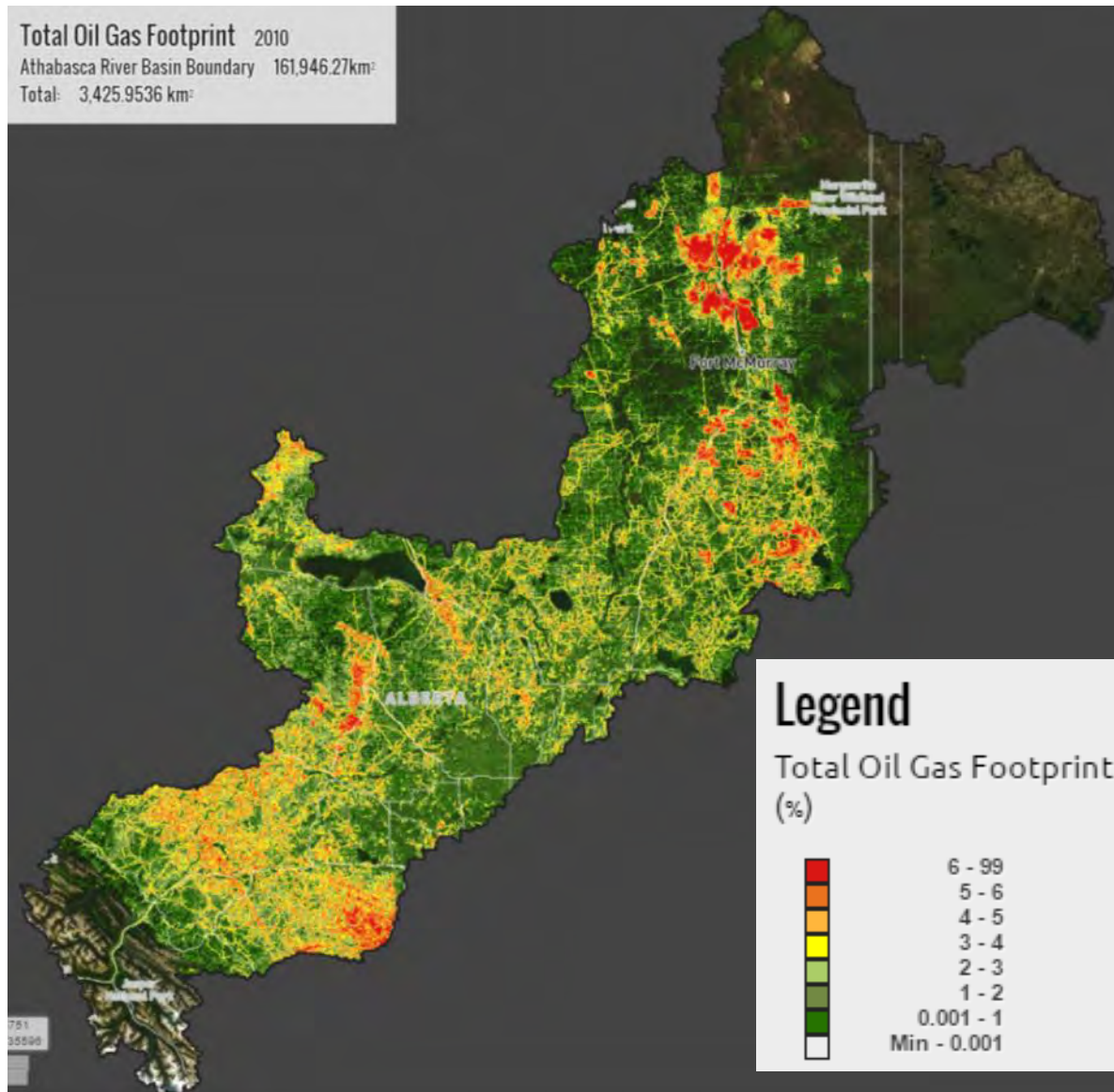
Forestry – distributed throughout the basin; conversion of vegetation ages



Oil & gas – intense in lower basin; distributed at low intensities throughout



Oil & gas – Intense in lower basin; distributed at low intensities throughout



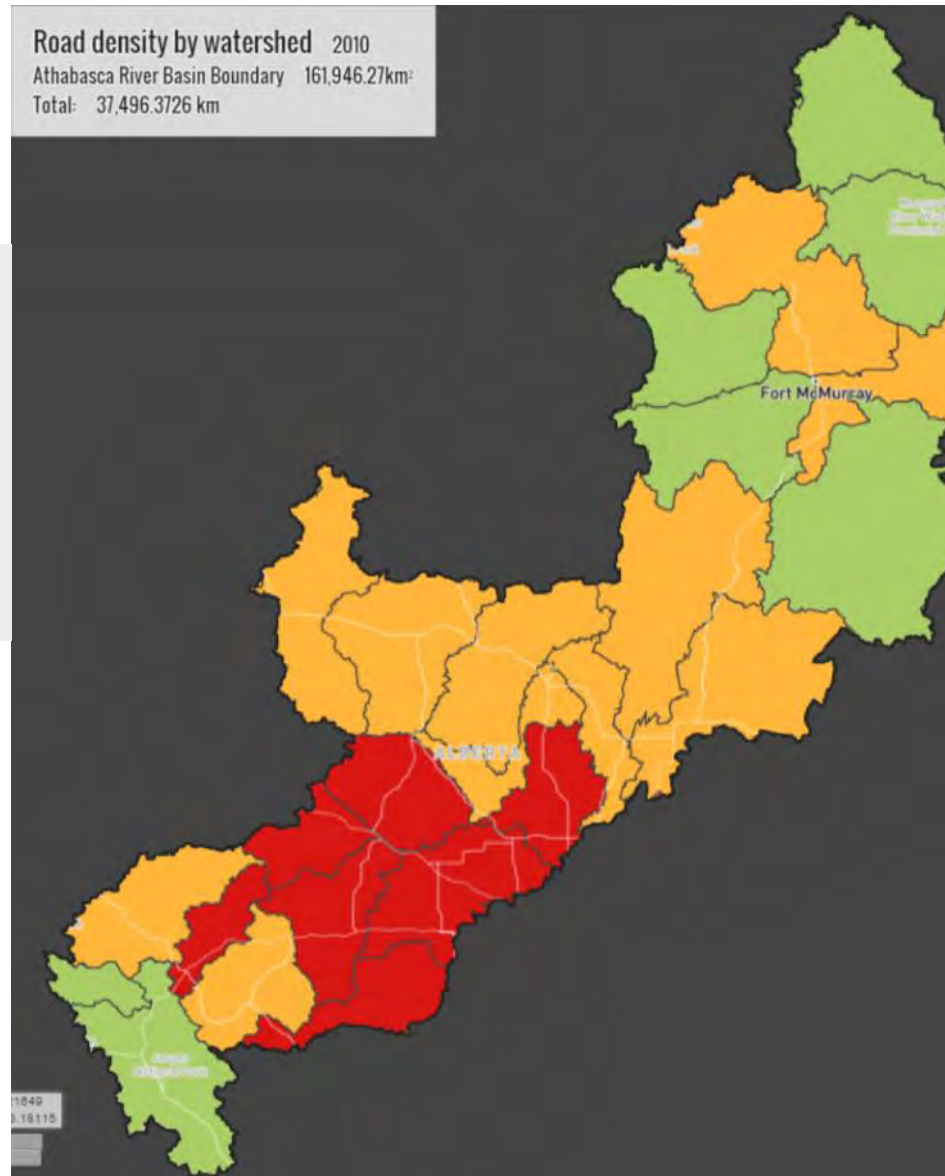
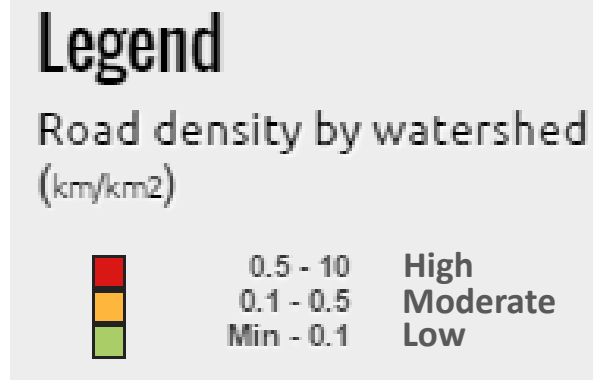
Linking in previous work – footprint area isn't the only thing that matters

Athabasca State of the Watershed Report, 2012

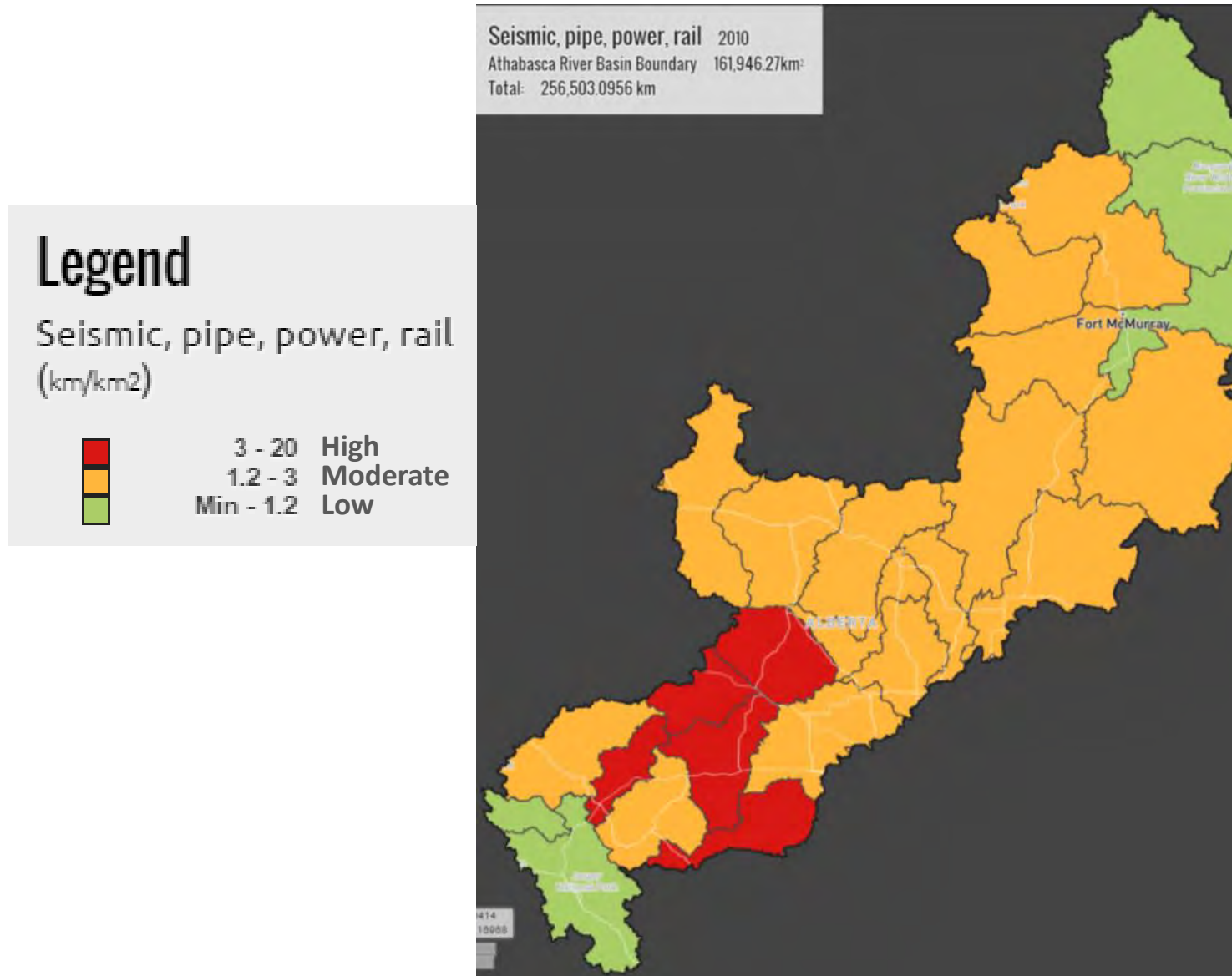
Table 3. Indicators for which Pressure Ratings were developed based on thresholds derived from the scientific literature.

INDICATOR	UNIT	HIGH PRESSURE	MODERATE PRESSURE	LOW PRESSURE
Road Density	km/km ²	≥0.5	>0.1 to 0.5	0 to 0.10
Seismic, Pipeline, Power Line & Railroad Density	km/km ²	>3	>1.2 to 3	0 to 1.2
Large Patches of Natural Vegetation	% aerial coverage of tertiary watershed with large patches	≤30%	<30 – 65%	>65%
Stream Crossing Density	# of road crossings/km ²	>0.6	>0.4 – 0.6	≤0.4
Human Population Density	Growth rate by tertiary watershed (%)	>5.67	>0 to 5.67	≤0
Human Land Use - Agriculture	% aerial coverage of tertiary watershed	>60	>25 to 60	≤25

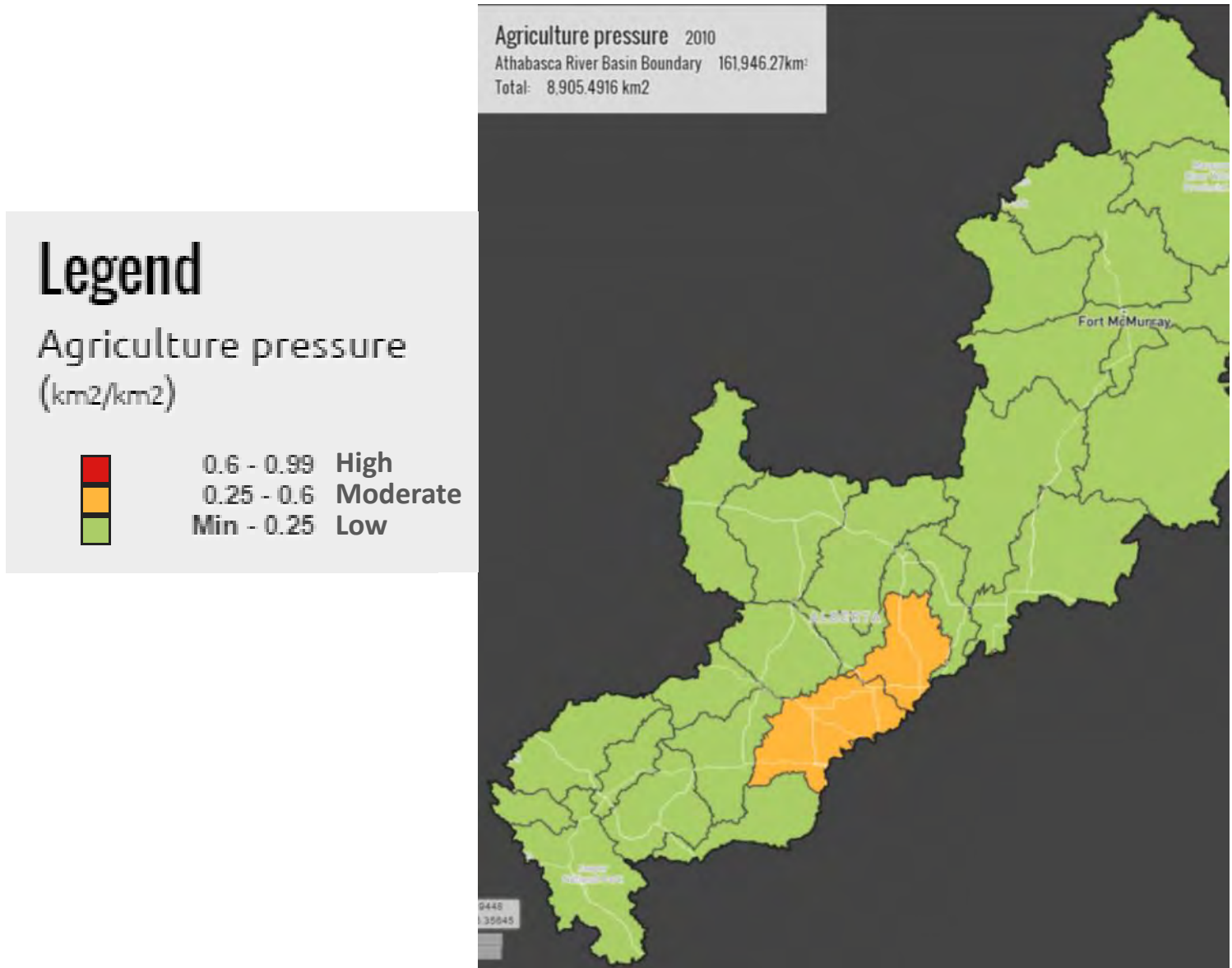
Road density – highest pressures in upper basin



Seismic, pipelines, power and rail density – highest pressures in upper basin



Agriculture – low pressure throughout except upper Pembina watershed



Temporal simulations

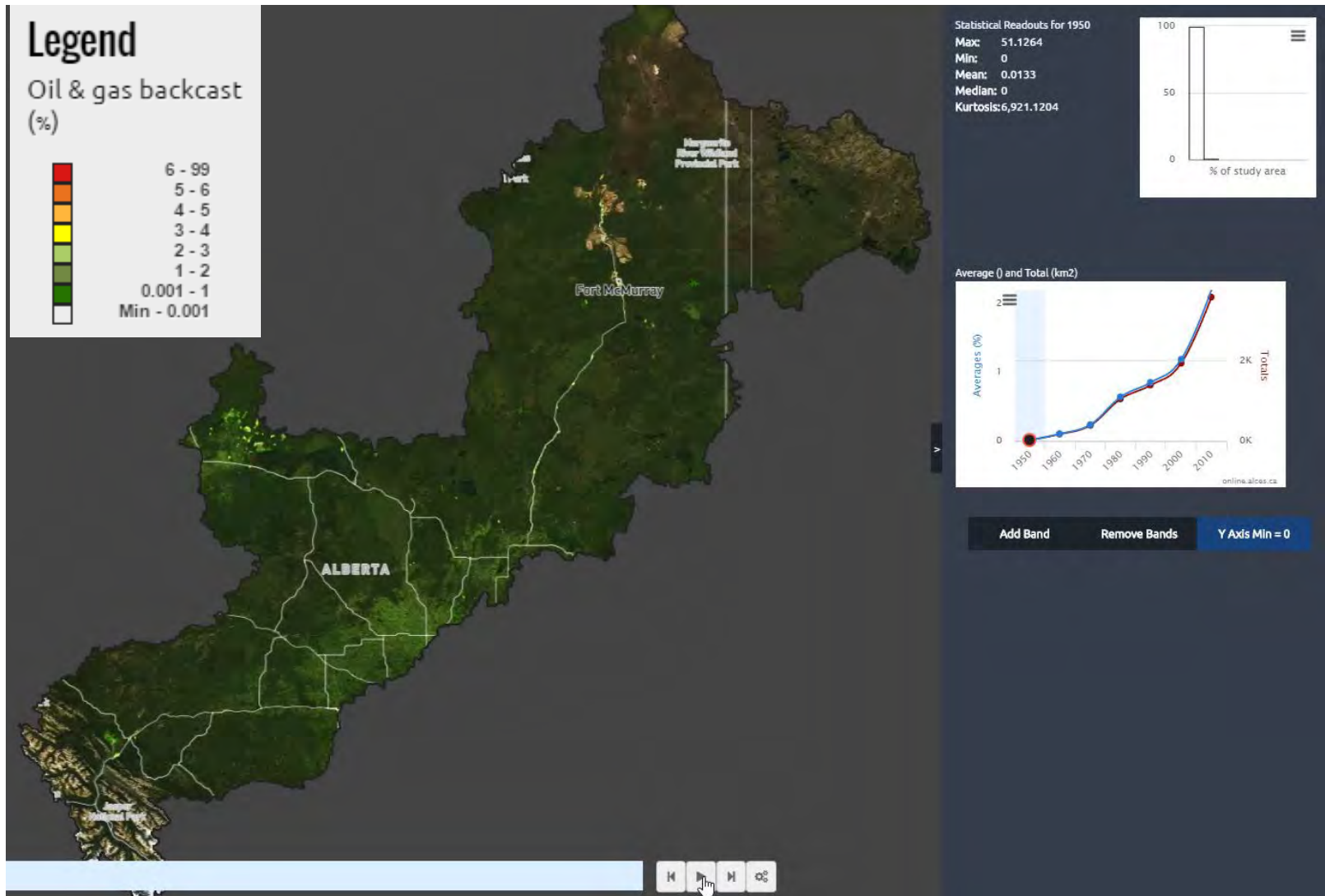
“when you don’t know how much things have changed, you don’t see that they are changing or that they can change”

Rebecca Solnit, Hope in the Dark

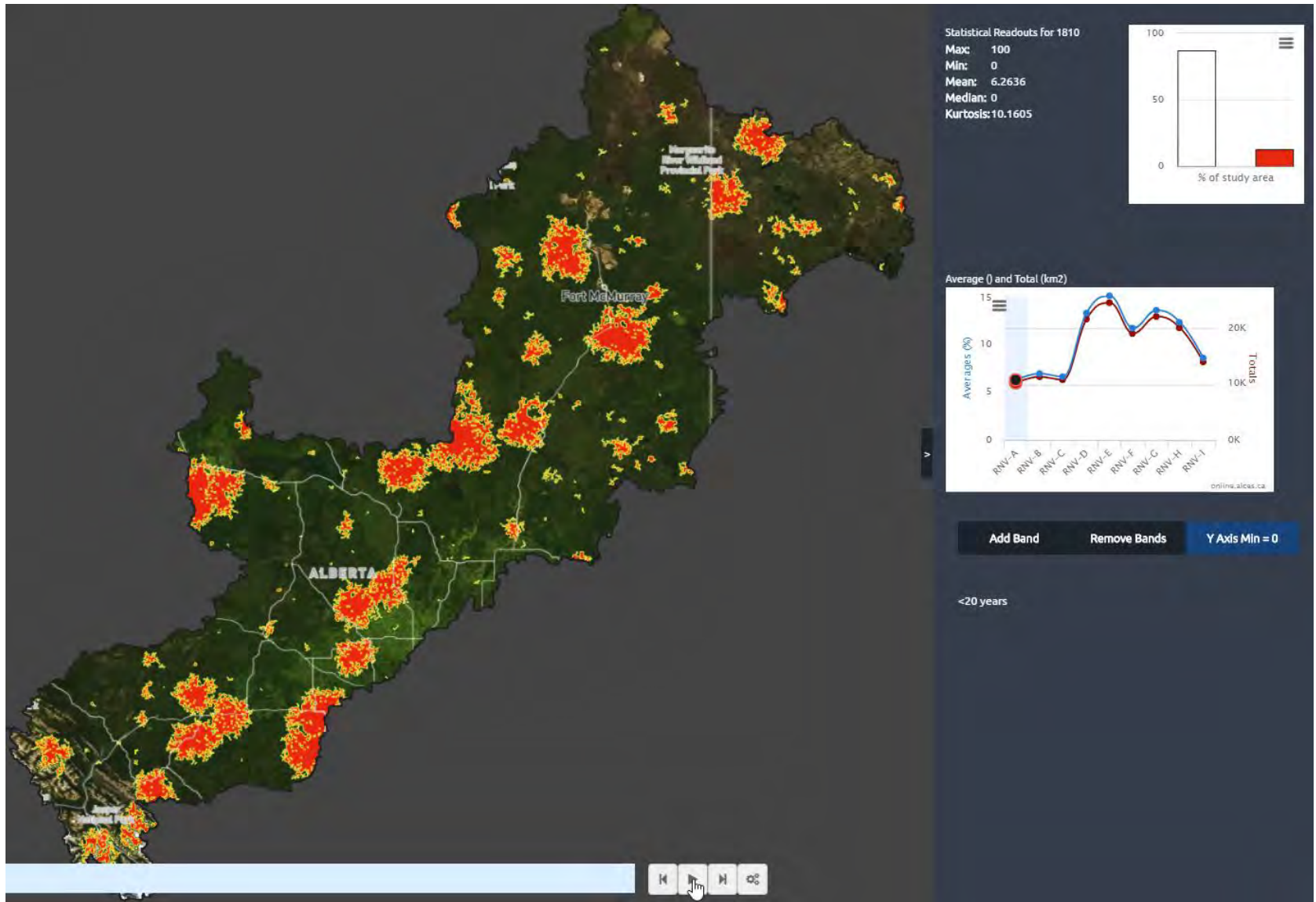
Temporal simulations – backcast (agriculture); rapid development over the last five decades



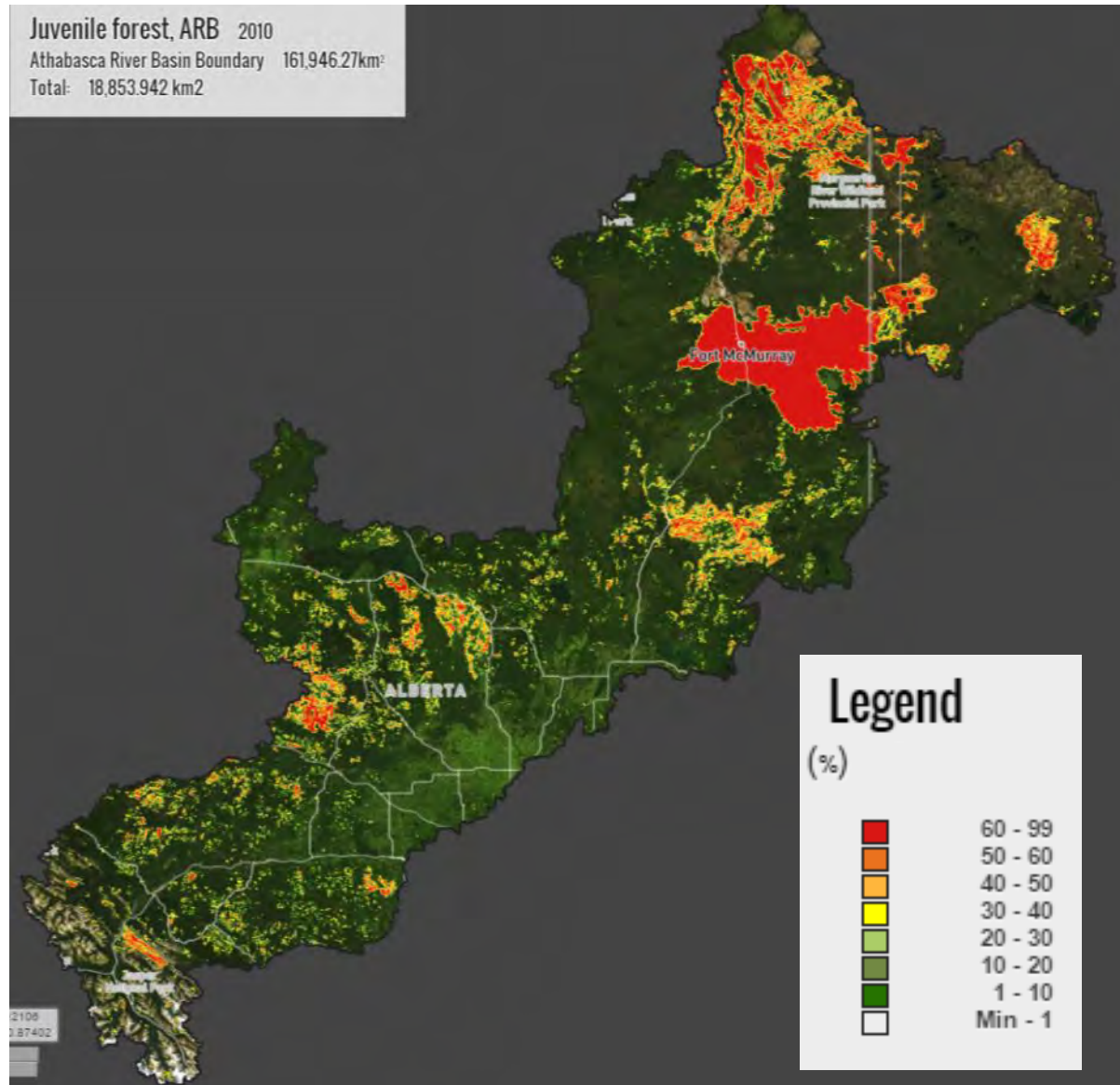
Temporal simulations – backcast (oil & gas); longer time frames than agriculture, lower footprint



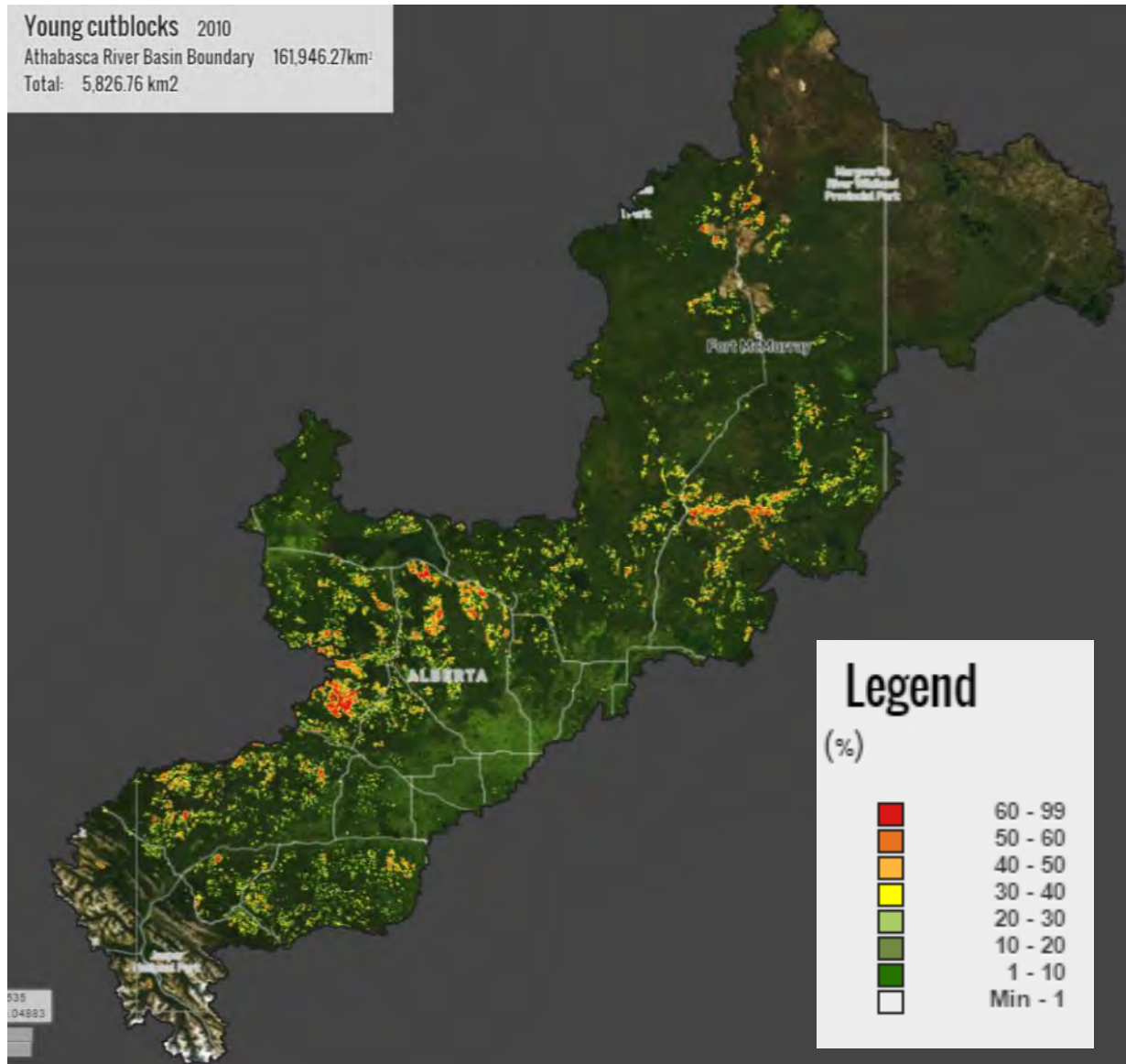
Temporal simulations – young forest, pre-industrial; fire as an agent of landscape change!



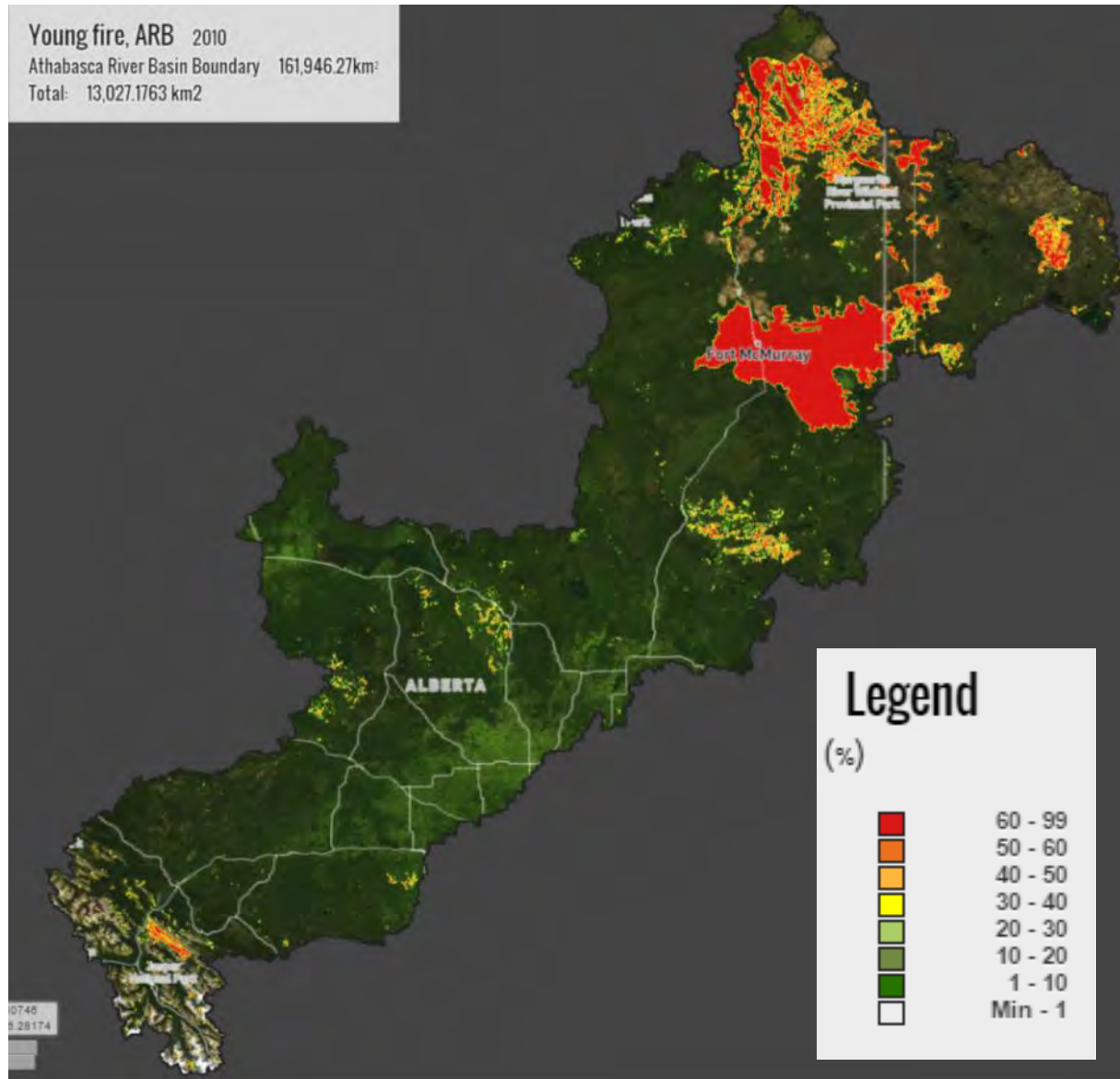
Young forest, current – substantial area from the 2011 Richardson fire and 2016 Horse River (FM) fire



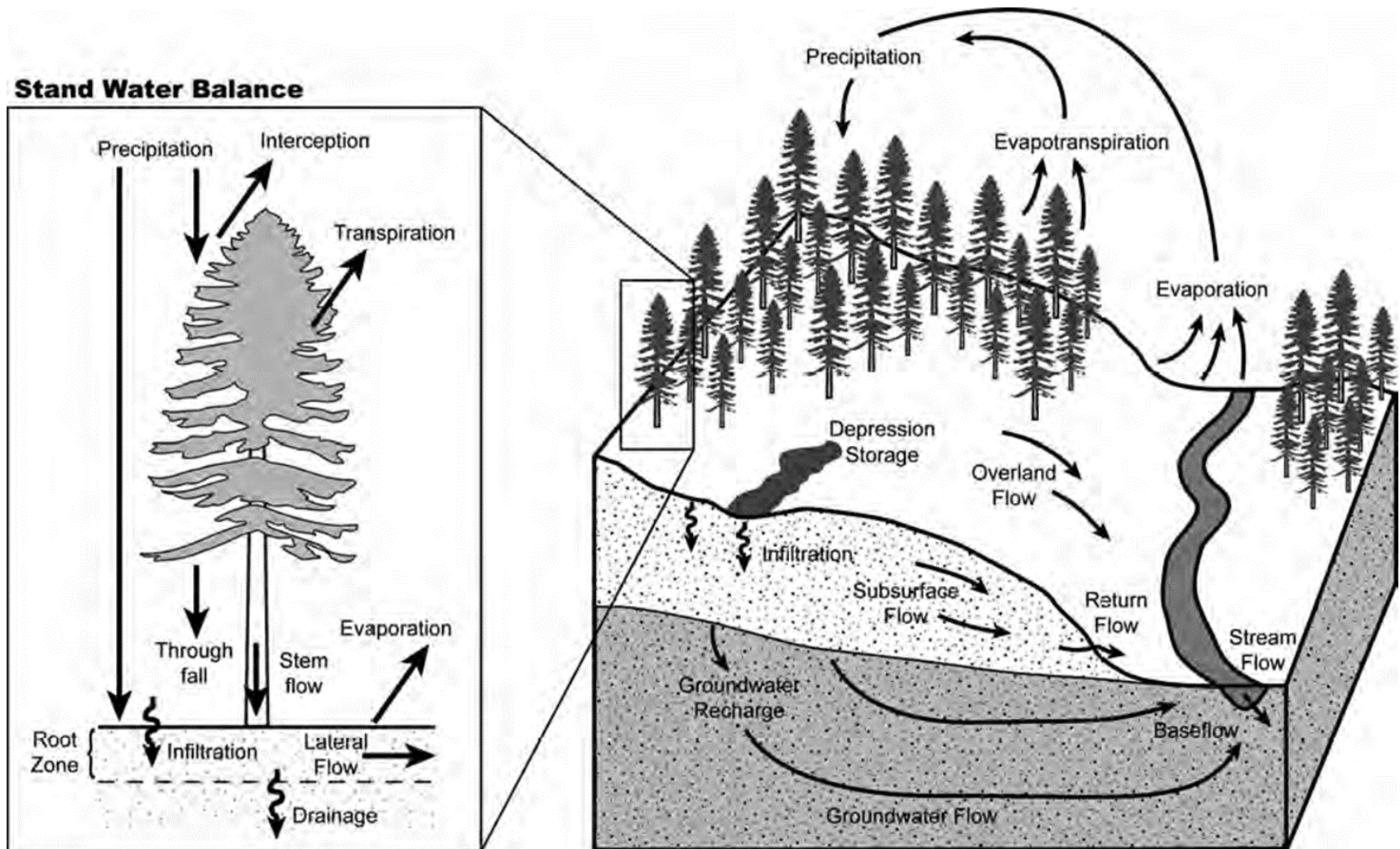
Forestry – less than half of the footprint of fire



Young forest, fire-origin; still the dominant agent of landscape change in the basin



Hydrologic implications of land use in the ARB



Hydrologic implications of land use in the ARB – Forest disturbance

Reduced interception

- More rain/snow reaching the soil surface

Reduced transpiration

- More water in soils

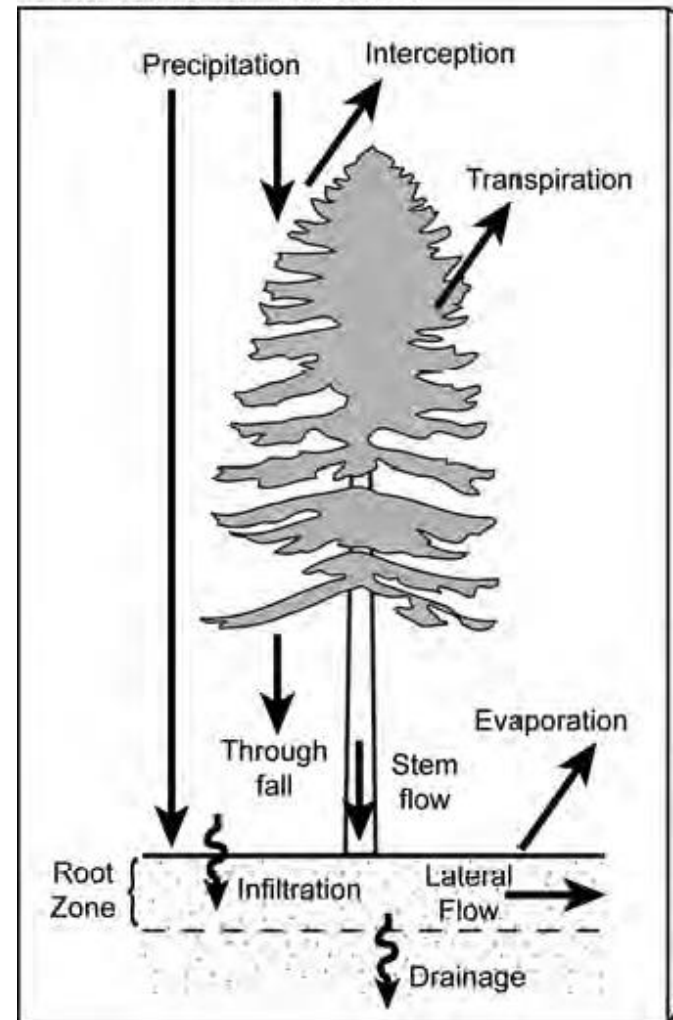
Increased evaporation from soil

- Less water in the upper part (20 – 30 cm) of soil during the summer

Changes in timing

- Faster runoff and earlier snowmelt

Stand Water Balance



Hydrologic implications of land use in the ARB – Agriculture

Land conversion

- Reduced forest cover
 - More water reaching the ground
 - Higher runoff



Crop type and practices

- Determines how much water is retained



Irrigation

- Irrigation is a significant water use

Changes in timing

- Faster runoff and earlier snowmelt



Hydrologic implications of land use in the ARB – Oil and gas

Connectivity

- Altered drainage patterns



Forest removal

- Same effects as forestry



On-site water management

- Often treated as closed systems

Water use

- Hydraulic fracturing and mining use water



Hydrologic implications of land use in the ARB – Roads

Connectivity

- Altered drainage patterns



Forest removal

- Same effects as forestry



Compaction

- Higher runoff



Hydrologic implications of land use in the ARB – Human settlements

Lower infiltration

- Higher runoff



Diversion and detention

- Altered/disrupted drainage patterns
- Faster runoff



Water use

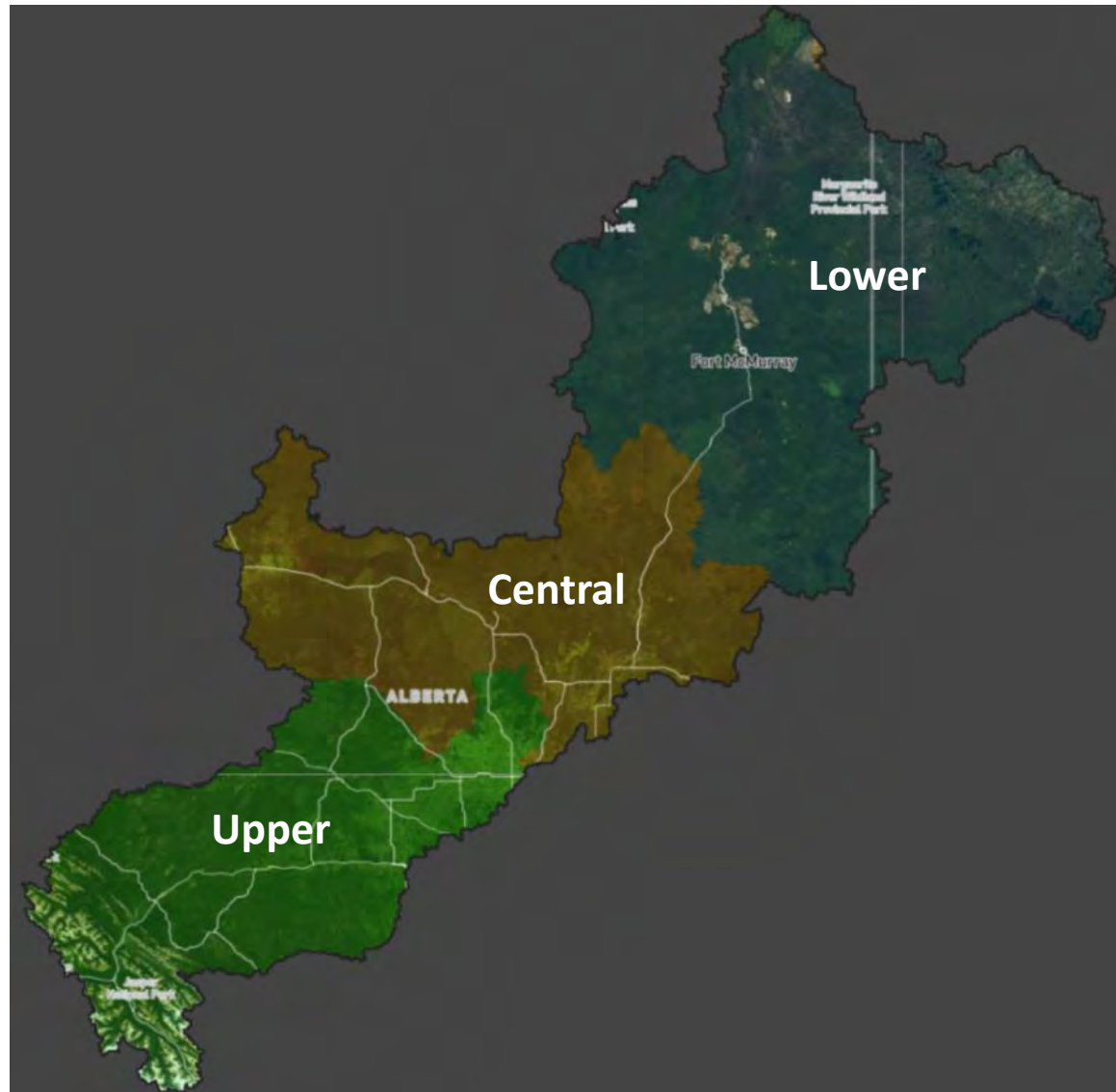
- Human and irrigation use can be substantial



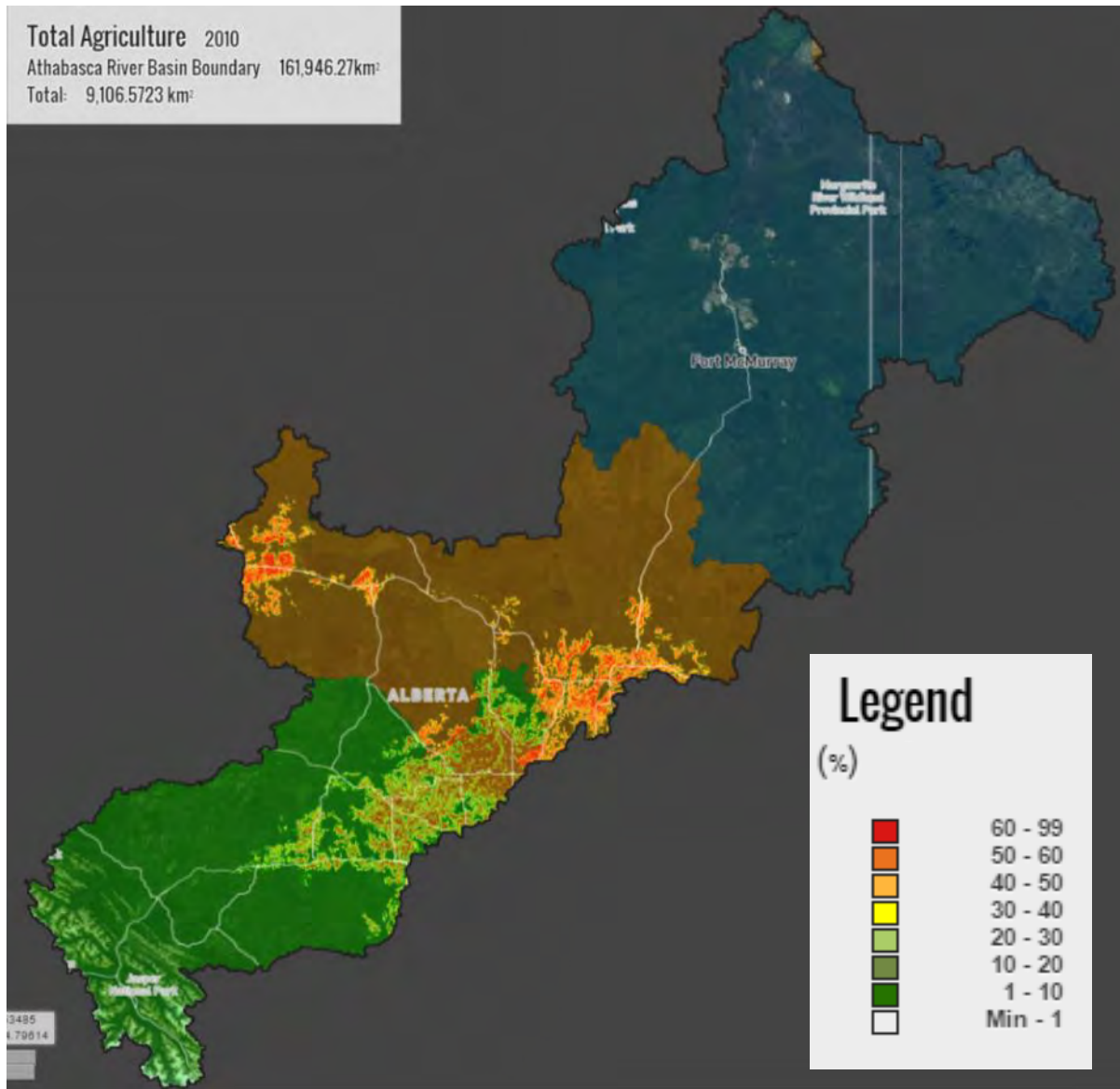
Summary of top five land-uses in each region

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%

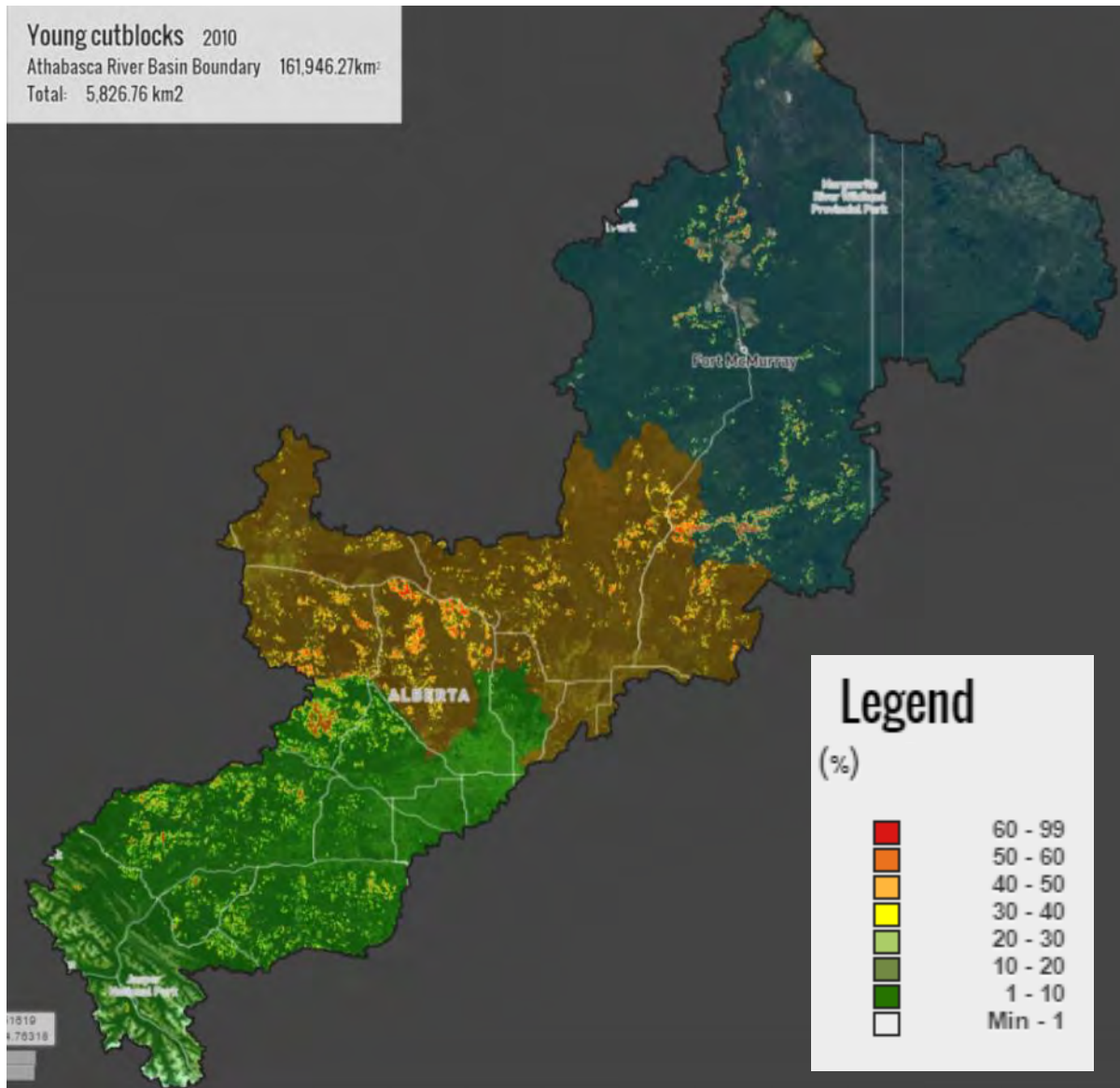
Different land-use patterns by region



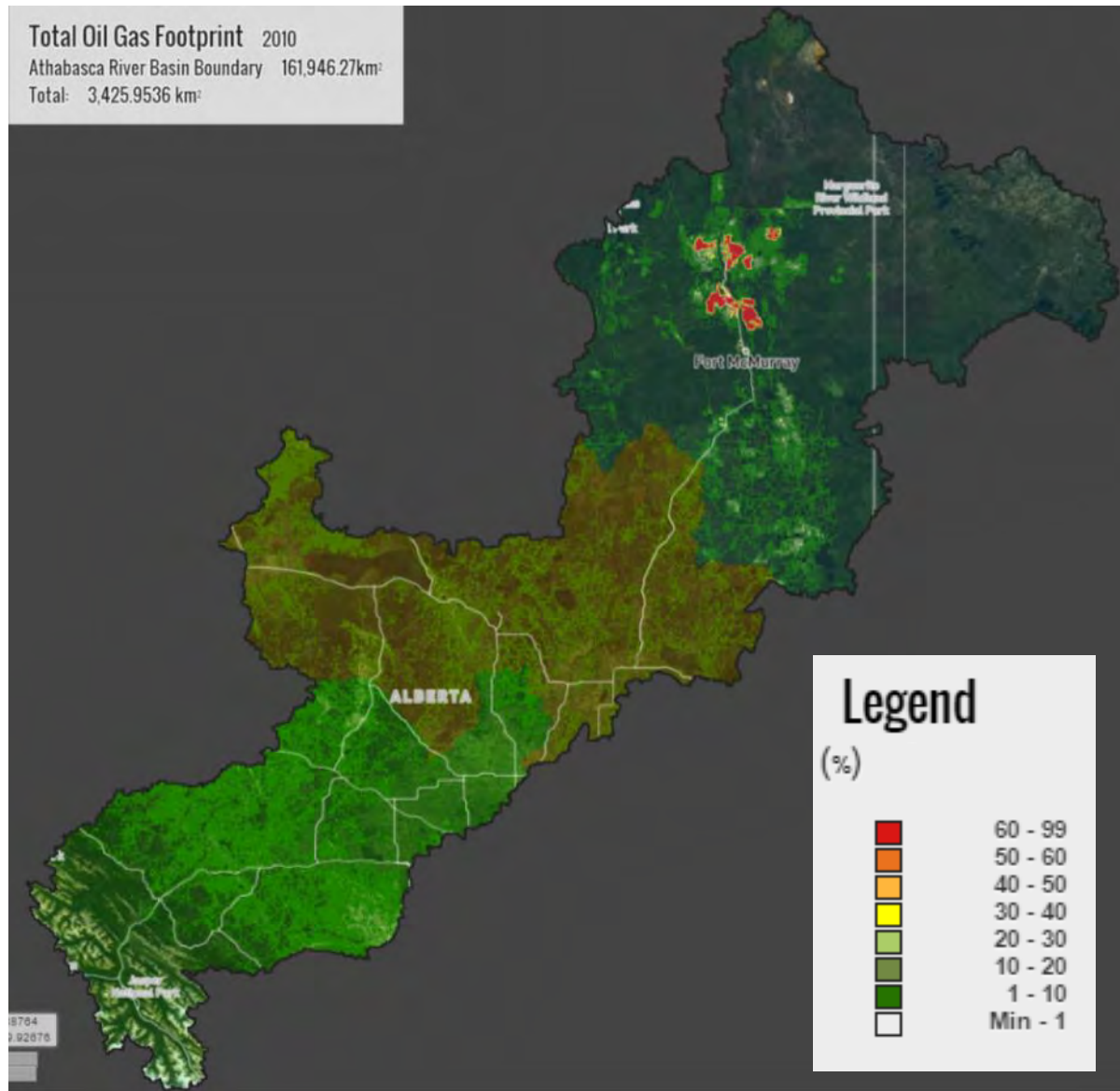
Agriculture



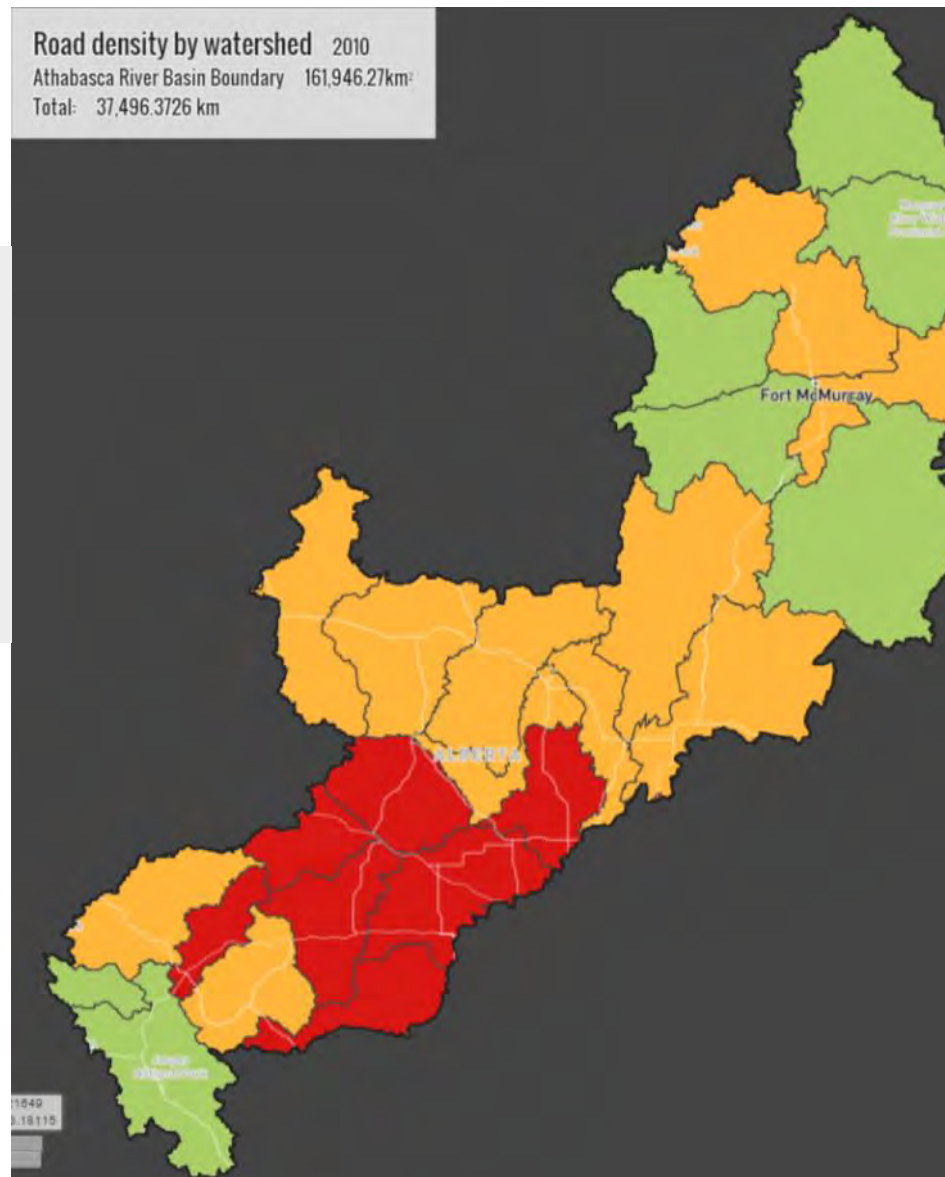
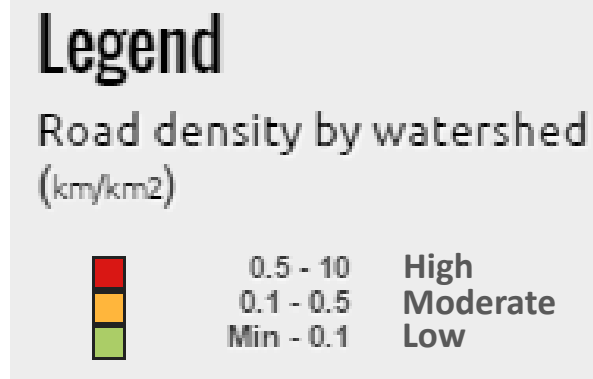
Forestry



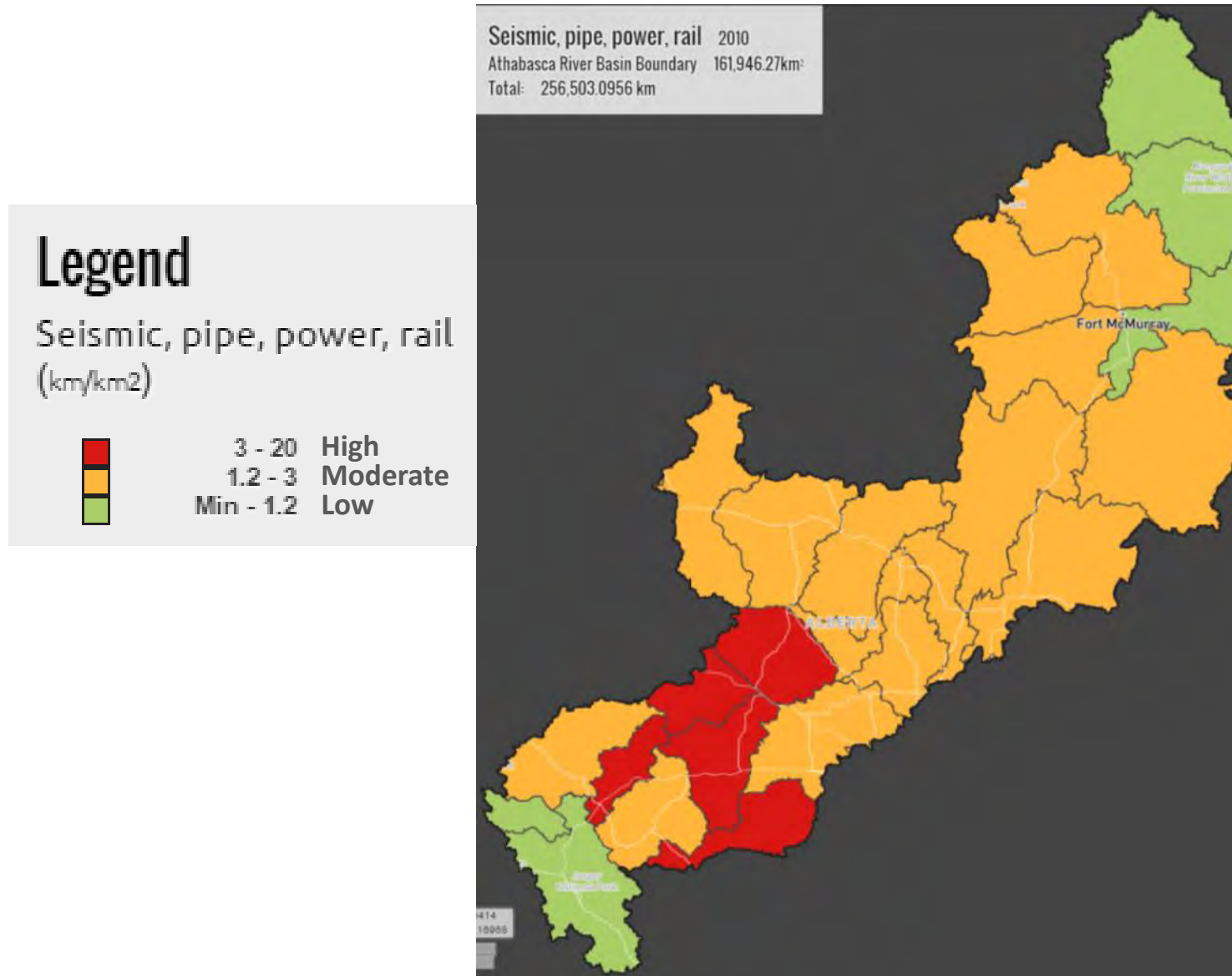
Oil & gas



Road density – highest pressures in upper basin



Seismic, pipelines, power and rail density – highest pressures in upper basin



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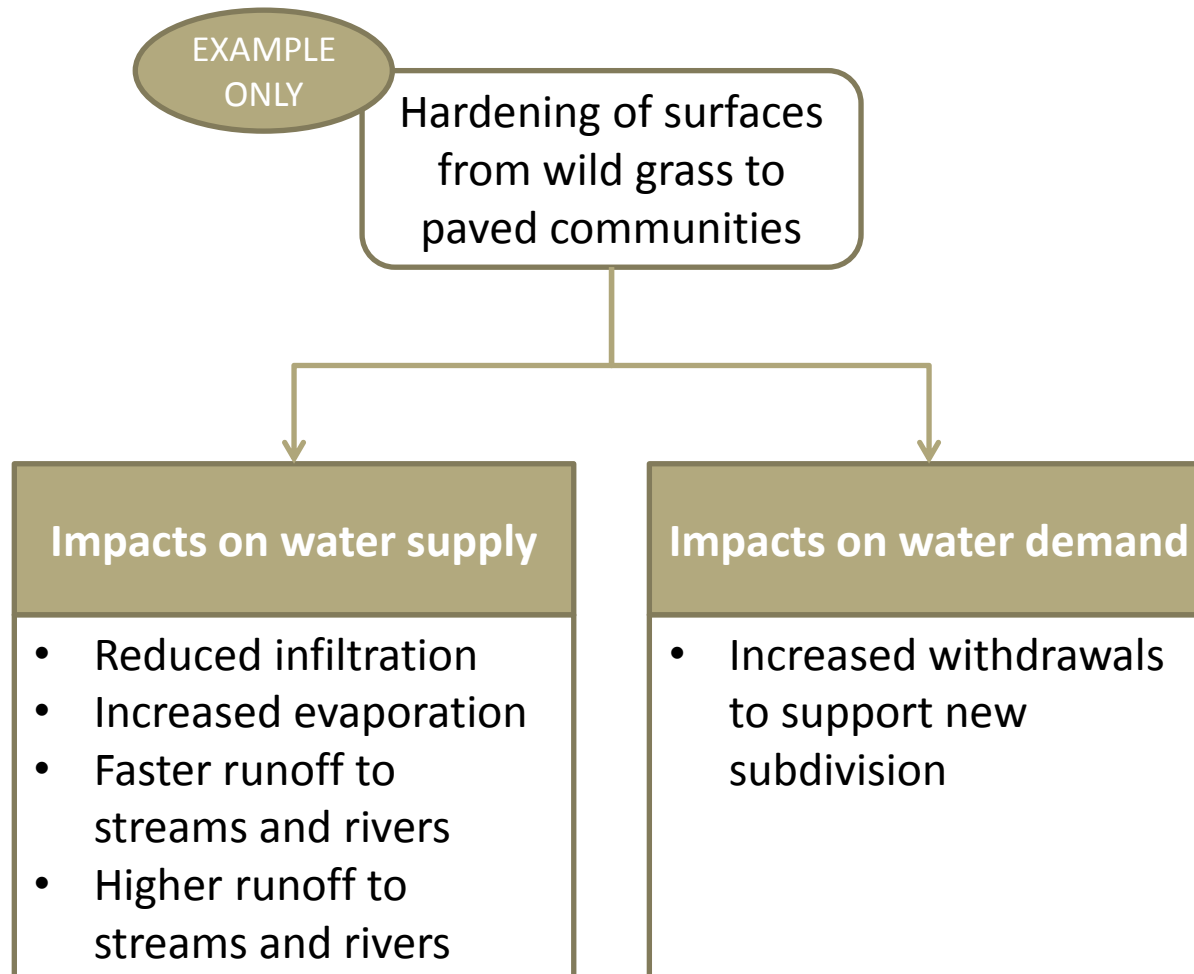
Potential landscape effects on water in the ARB

This morning's presentation outlined types of landscape change:

- Agriculture
- Alpine
- Feedlots
- Forests
- Glaciers
- Grasslands
- Industrial
- Landfills
- Lakes
- Rail
- Road
- Mine
- Petroleum wells
- Pipelines
- Powerlines
- Reservoirs
- Recreation/campgrounds
- Rivers/streams
- Rural settlement
- Seismic lines
- Trails
- Urban settlement
- Water management structures
- Wetlands

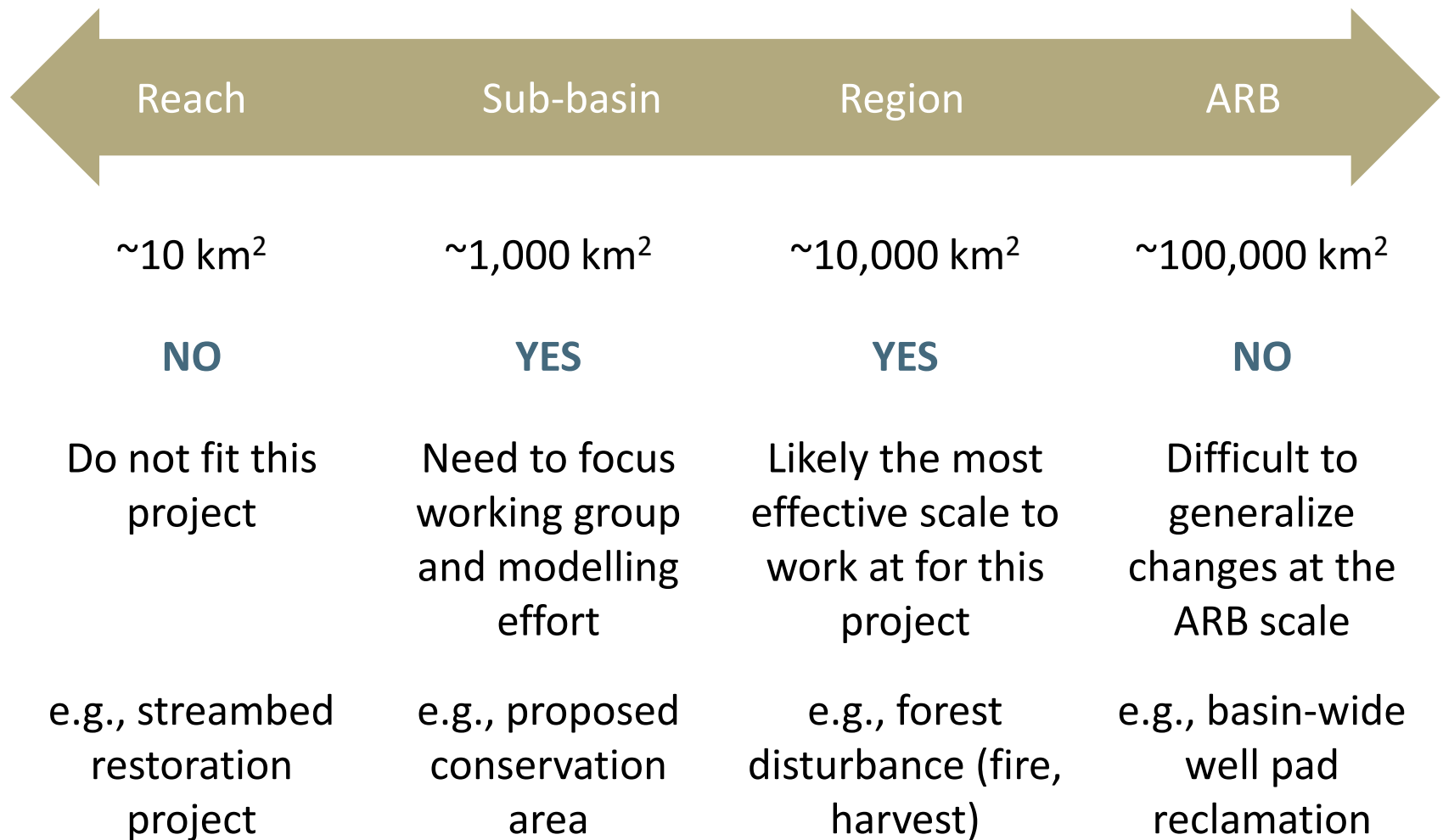
Need to confirm how to approach changes in landscape
for this Initiative's Roadmap

Suggest we focus on water supply impacts (for now)



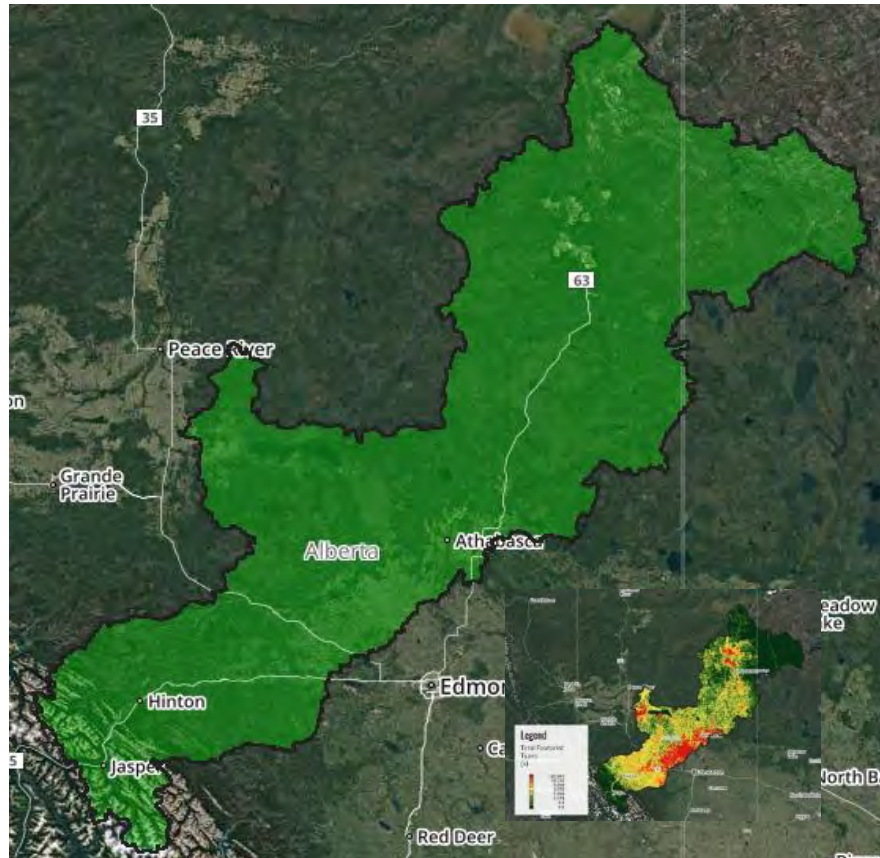
Suggest we focus on sub-basin and regional scale

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



Tool we will use: Landscape simulator

ALCES Online



- ~ 200 landscape and footprint types
- 100 m spatial resolution
- Annual temporal resolution
- Web-based simulator
- Driven by explicit assumptions and data:
 - Working Group knowledge
 - Land Use Framework
 - Alberta Energy Regulator
 - Detailed Forest Management Plans
 - Municipal Plans

The tool draws in best available data

Best and publicly available data

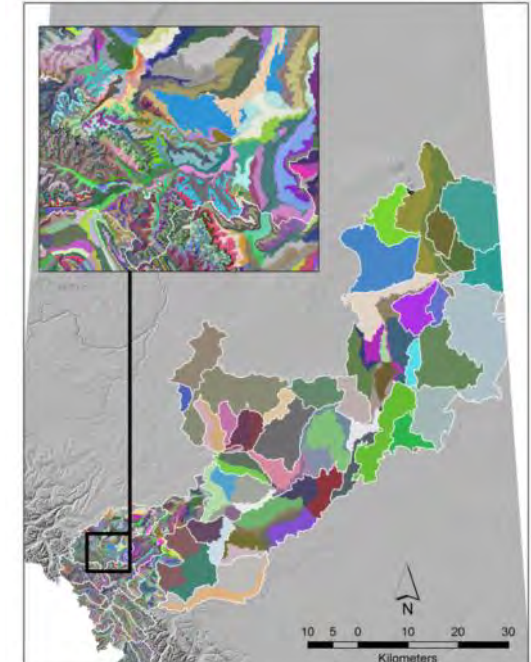
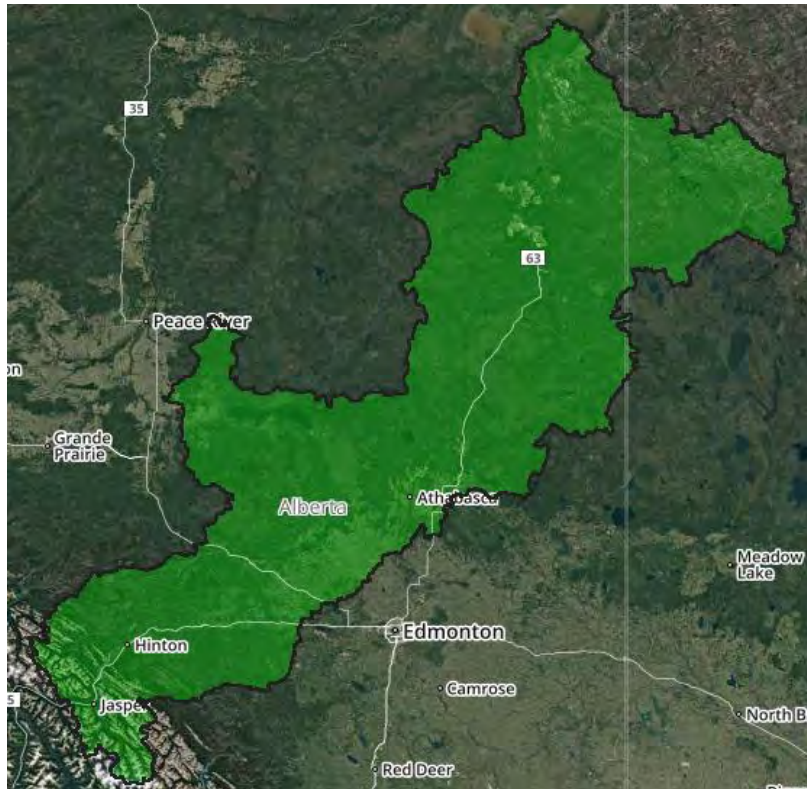
- ABMI
- AltaLIS
- AAFC
- NHN
- EOSD
- AER
- AEP
- CanVec
- LUF
- GVI
- Combined wetlands inventory
- Cities
- Counties
- HikeAlberta
- Alberta Parks
- TransCanada Trail
- Geo Discover
- Open Street Map
- ESRI Basemap
- NRCB



Landscape and hydrologic model coupling

ALCES used to build Hydrologic Response Units (HRUs) ~10,000

- Sub-basin (split in headwaters)
- Elevation
- Landscape composition
- Surficial geology
- Groundwater flow direction



Raven parameters – describe how hydrologic processes (e.g., interception, evapotranspiration) relate to the physical landscape (e.g., forest, grass, developed)

Discussion: changes in landscape affecting water in the ARB

Issues

An important concern or problem related to water in the basin that warrants attention.

- Can be current or future.
- Can be sub-basin specific or basin-wide.

What the Roadmap needs to address / resolve

Opportunities

Specific actions that can be implemented.

- To address the basin's issues.
- To make improvements sub-basin specific or basin-wide.

The strategies that will make up the Roadmap

This afternoon we would like to explore both issues and opportunities related to changes in the landscape

Breakout Group Discussion

Issues and opportunities related to changes in landscape in the ARB

Discussion:

- Review changes in landscape footprint
 - Identify potential water supply issues stemming from changes in landscape
 - Define the issue
 - Establish the location and scale
 - Consider how to model it
 - Identify potential opportunities related to change in landscape
 - To resolve an issue
 - To make an improvement
- Feel free to move between tables
- Scribes will record notes on flip charts

**Table 1: Megan and Danielle
Lower Athabasca**

**Table 2: Mike and Ryan
Central Athabasca**

**Table 3: Claire and Justin
Upper Athabasca**

A volunteer from each table needs to provide a brief readout 😊.

Readouts

What the issue is (what, where, etc.)?

1.

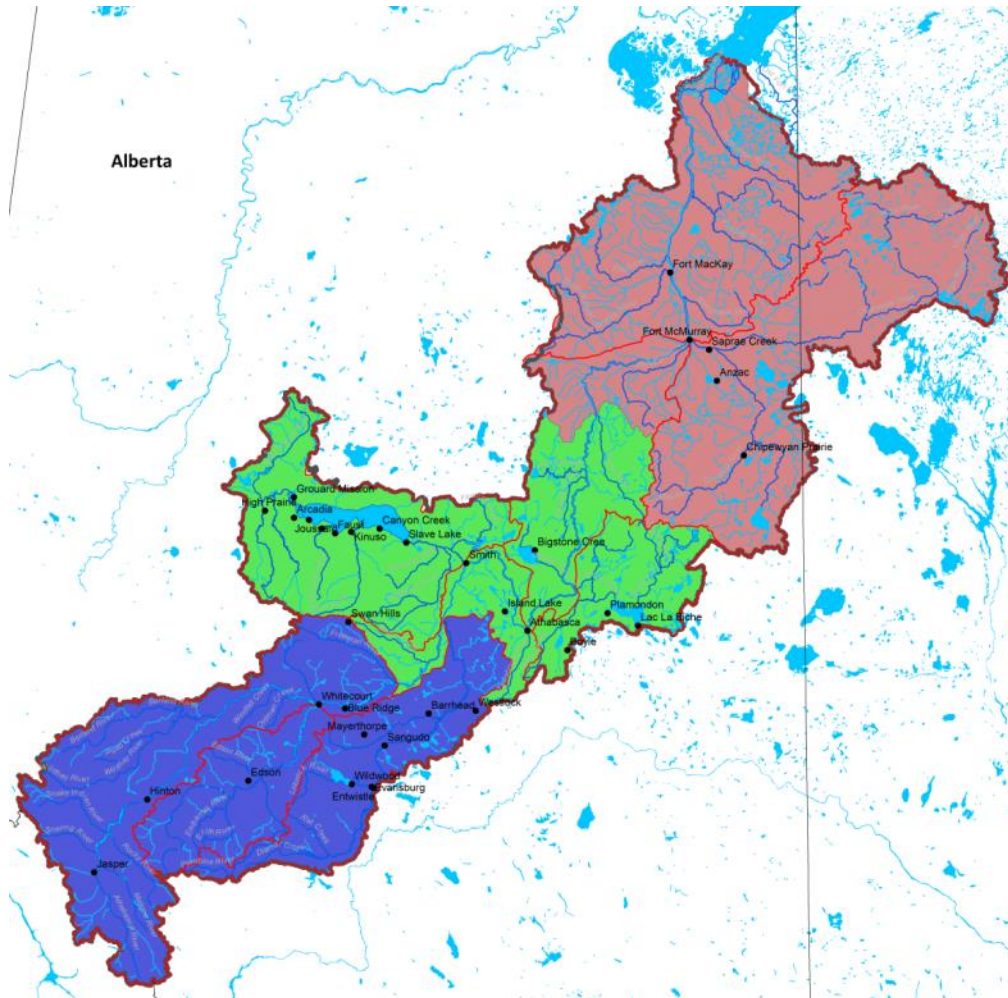
2.

What opportunities might address the issue?

1.

2.

Breakout Groups



**Table 1: Megan and Danielle
Lower Athabasca**

**Table 2: Mike and Ryan
Central Athabasca**

**Table 3: Claire and Justin
Upper Athabasca**

Today's Agenda		
9:00	Welcome, introductions, and opening remarks	Mike
9:30	ARB Initiative Process: Steps to develop a water management roadmap for the ARB	Megan
9:45	Very preliminary draft of the basin story: current state, issues and opportunities	Megan
10:00	Breakout groups: Systematically refine current list of opportunities per region and basin wide	All
11:15	Readouts to plenary	Group Reps
11:30	Presentation: Landscape change in the ARB and implications for water management	Justin Straker
12:10	Lunch	-
1:00	Potential landscape effects on water in the ARB: How landscape can be included in the modelling and Roadmap	Claire
1:15	Breakout groups: Issues and opportunities related to changes in landscape in the ARB	All
2:45	Readouts to plenary	Group Reps
3:00	Break	-
3:15	Discussion: What challenges do you want this Roadmap to focus on?	Mike
3:45	Next steps, and close	Mike

Readouts

What the issue is (what, where, etc.)?

1.

2.

What opportunities might address the issue?

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3:45	Next steps, and close	Mike

Today's milestone: Define the problems +/- or improvements

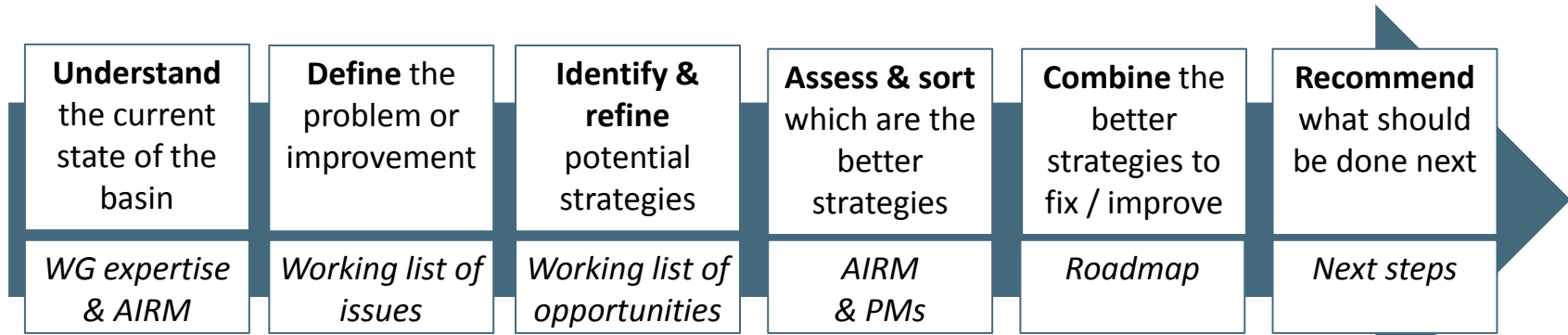
Which basin challenges should this group focus its discussions and findings on?

Later today:

- As a group, we will look at the stickers to see where most interest lies
- Based on that, we will agree which challenges to work on and which to set aside

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Collaborative process to develop the ARB Roadmap



Working Group meetings	1	Focus of work	Focus of work				
	2	Focus of work	Focus of work	Focus of work			
	3	Focus of work	Focus of work	Focus of work			
	4	Focus of work	Focus of work *	Focus of work			
	5	Lesser focus		Lesser focus	Focus of work		
	6	Lesser focus		Lesser focus	Focus of work *	Lesser focus	
	7	Lesser focus		Lesser focus	Focus of work	Focus of work *	Lesser focus
	8	Lesser focus			Lesser focus	Focus of work	Focus of work *

focus of work
 lesser focus
 * key milestone

Final Reminders

This work is focused on identifying practical options for adapting to change throughout the ARB

- WaterSMART to draft meeting summary and distribute to Working Group members for review.
- Likely to have another Data and Modelling Committee call.
- **Next meeting: May 10th - Edmonton**
 - Refine potential strategies in the model, based on opportunities identified to date
 - Discuss potential strategies that can't be modelled
 - Explore the effects of climate and landscape changes on strategies
 - Begin to assess & sort which are the better strategies
- September Working Group meeting: Any weeks to avoid in September? (14th or 21st?)
- Please contact us if you have any thoughts, questions, comments!

Thank you for all your support and participation



Thank you



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For more information:

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Reference slides