Are Baseline and Modeling Supporting EA Follow-up for Hydroelectric Dams?

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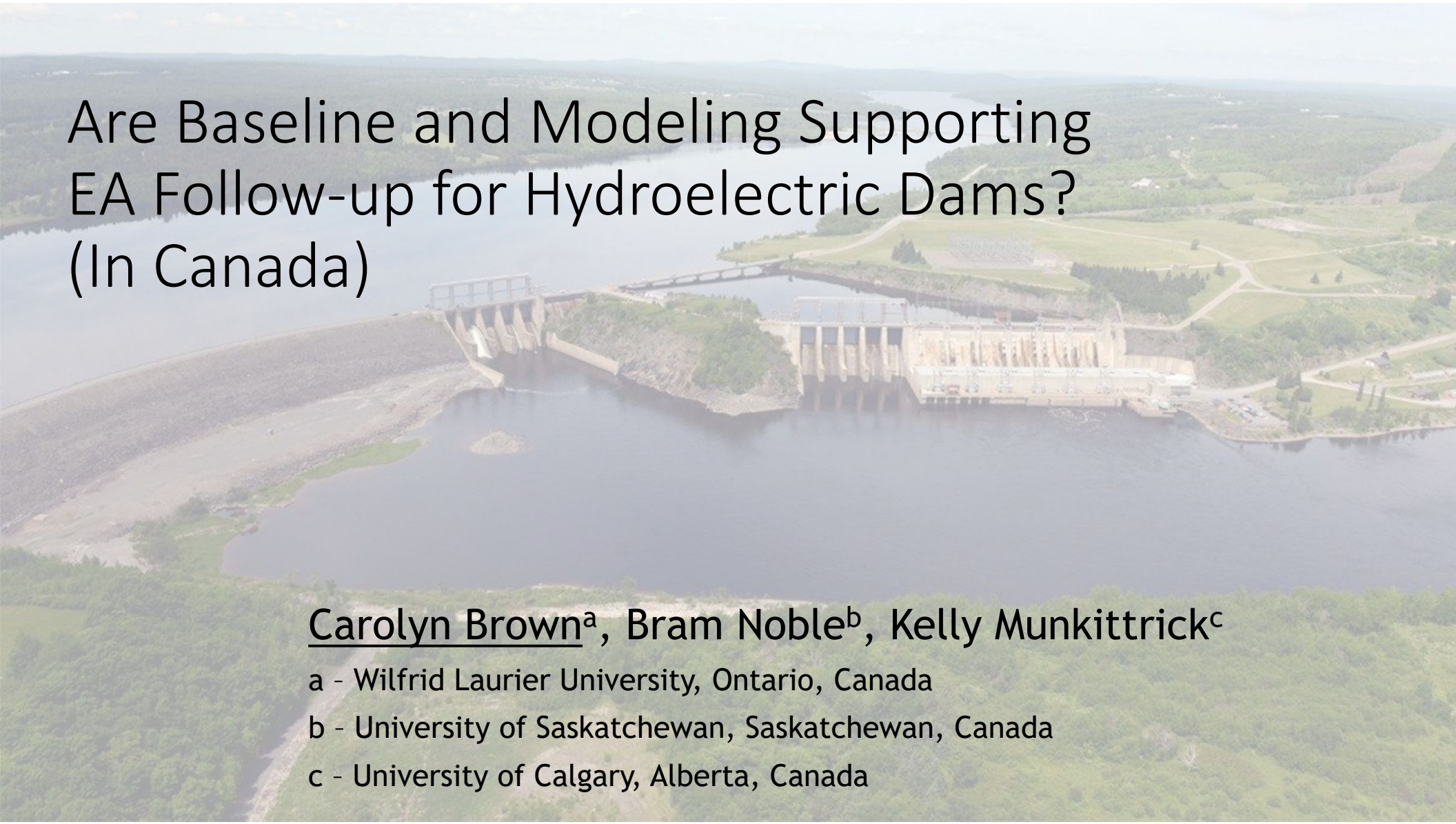

Are Baseline and Modeling Supporting EA Follow-up for Hydroelectric Dams? (In Canada)

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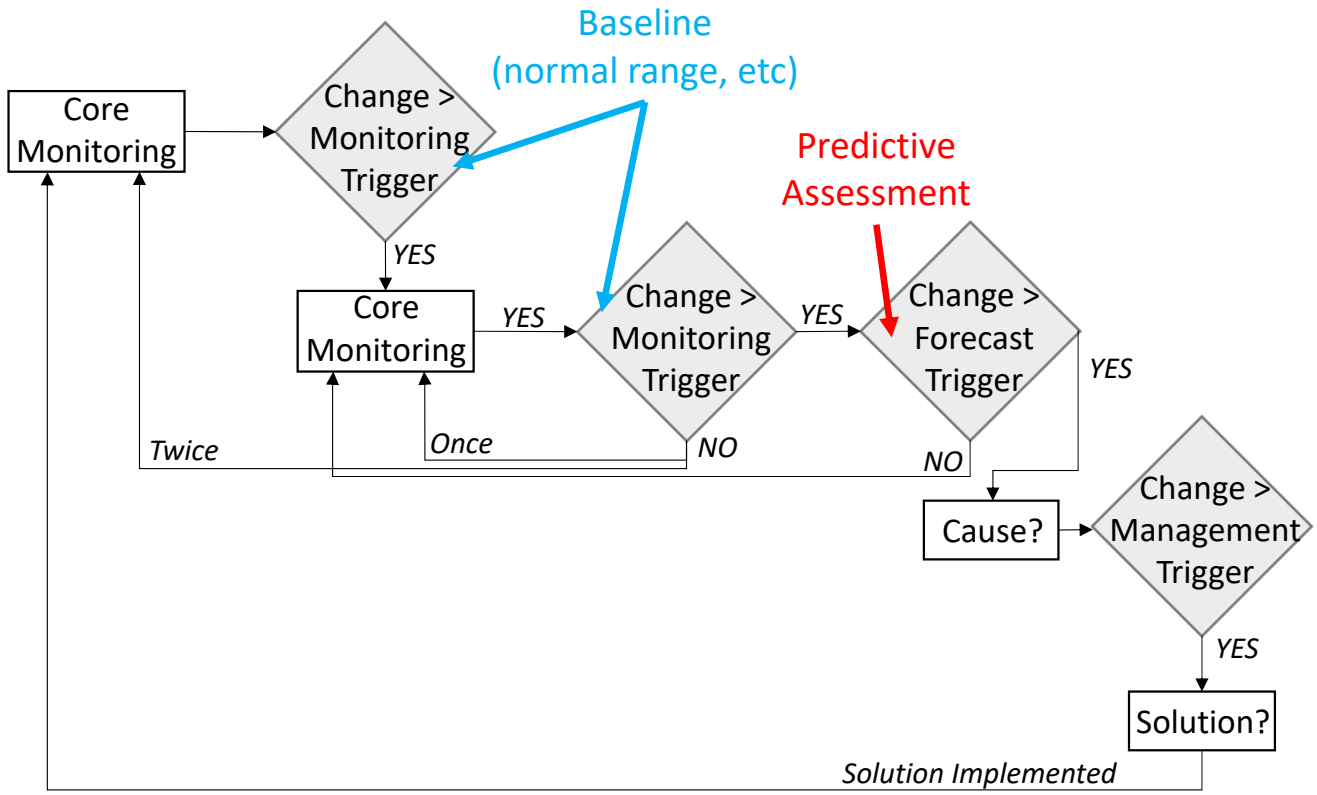
Follow-Up Monitoring

- Is there an effect?
- Is the effect expected?
- What do you do about it?

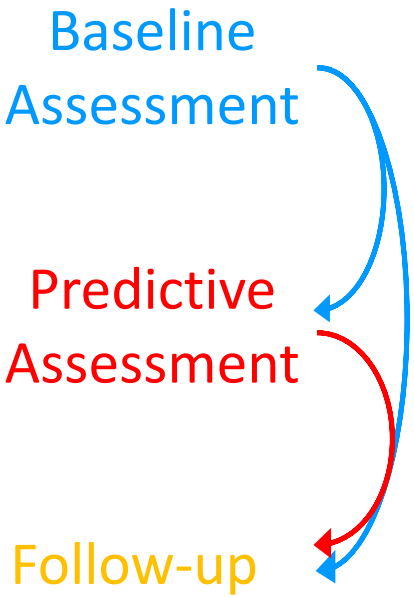
Adaptive Monitoring Plan

Tier	
Surveillance	Is there an effect?
Confirmation	Can we confirm an effect?
Investigation of Cause	What is the cause of effect?
Investigation of Solution	What solutions can be implemented to reduce effect?



Adapted from Somers *et al.*, 2018

Environmental Impact Assessment



- What are the current conditions?
  - At least 3 years of data
  - Sample future reference and exposure areas
- Will there be an effect?
  - Quantitative models for relevant endpoints
- Is there an effect?
  - Is there a difference between now and baseline? (Monitoring Trigger)
  - Is it different than what was predicted? (Forecast Trigger)
  - What do you do about it? (Adaptive Monitoring Plan)

Question

- Are baseline and modeling supporting follow-up monitoring for hydroelectric dams in Canada?

EIA Selection

Site C
Peace River
Power 1,100 MW
Impoundment 93 km^2
Approved in 2014
Federal and Provincial

Keeyask
Nelson River
Power 695 MW
Impoundment 93 km^2
Approved in 2014
Federal and Provincial

Innavik
Inukjuak River
Power 7.5 MW
Impoundment 1.1 km^2
Approved in 2019
Provincial

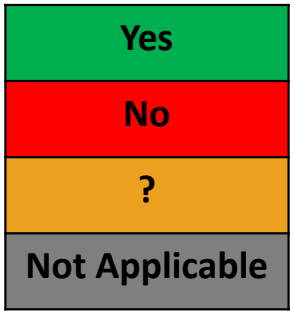
Muskrat Falls
Churchill River
Power 824 MW
Impoundment 101 km^2
Approved in 2012
Provincial

New Post Creek
New Post Creek
Power 25 MW
Impoundment 1.7 km^2
Approved in 2014
Provincial

Romaine-4
Romaine River
Power 245 MW
Impoundment 142 km^2
Approved in 2009
Provincial

Summary

- Baseline: Sampled in Reference and Exposure Areas
- Baseline: Sampled for at least 3 years in Exposure Area
- Predictive Assessment: Did Quantitative Model
- Follow-Up: Will Compare to Baseline
- Follow-Up: Will Compare to Prediction
- Follow-Up: Have an Adaptive Monitoring Plan



Summary

		Baseline		Predictive	Follow-up			
		Reference & Exposure	3 Years	Quantitative Modelling	Compare to Baseline	Compare to Prediction	Adaptive Plan	
Site C 1,100 MW	Water Quality							13
	Macroinvertebrates							
	Fish Community							
Muskrat Falls 824 MW	Water Quality							8
	Macroinvertebrates							
	Fish Community							
Keeyask 695 MW	Water Quality							15
	Macroinvertebrates							
	Fish Community							
Romaine-4 245 MW	Water Quality							5
	Macroinvertebrates							
	Fish Community							
New Post Creek 25 MW	Water Quality							6
	Macroinvertebrates							
	Fish Community							
Innavik 7.5 MW	Water Quality							2
	Macroinvertebrates							
	Fish Community							

Fulfilling Best Practices?

Baseline Assessment	• What are the current conditions?
	  • At least 3 years of data
	  • Sample future reference and exposure areas
		• Generally, Yes
		  • More to assess current effects
		  • More to determine sample size
		  • Develop monitoring trigger

Predictive Assessment	• Will there be an effect?
	  • Quantitative models for relevant endpoints
		• Generally, No
		  • Water Quality better than others
		  • Develop forecast triggers

Follow-up	• Is there an effect?
	  • Is there a difference between now and baseline? (Monitoring Trigger)
	  • Is it different than what was predicted? (Forecast Trigger)
	  • What do you do about it? (Adaptive Monitoring Plan)
		• Generally, No
		  • Most will compare to baseline
		  • Most wont compare to predictions
		  • Most don't have adaptive monitoring plan

Are Baseline and Modeling Supporting Follow-up Monitoring for Hydroelectric Dams in Canada?

- Large hydroelectric facilities such as Keeyask and Site C are doing more
  - More should be expected of smaller facilities
- There is often confusion in the role monitoring plays in adaptive management – the EA process needs to provide the information on which management decisions will be made
- Adaptive monitoring plans need to focus on providing that information – monitoring and forecast triggers can drive an adaptive monitoring process but require good baseline data and a link to modeling predictions
- Consideration for what is needed during follow-up needs to start early in the EA process

Acknowledgments

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Picture Sources:
Site C - https://www.sitecproject.com/construction-activities/photo-and-video-gallery
Keeyask - https://winnipeg.ctvnews.ca/power-starts-flowing-from-keeyask-generating-station-1.5314710
New Post Creek - https://kgsgroup.com/projects/peter-sutherland-sr-generating-station/
Innavik - https://www.crtconstruction.ca/en/realisations/94
Romaine-4 - https://aboriginalbusinessmagazine.com/?p=7049
Muskrat Falls - https://www.saltwire.com/nova-scotia/news/labrador-inuit-groups-say-methylmercury-monitoring-needs-community-involvement-531088/

Let’s continue the conversation!

Post questions and comments via chat in the IAIA22 platform.

#iaia22

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