

A short horizontal bar with a teal-to-orange gradient.

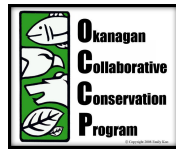
# Remote sensing techniques to classify and monitor wetlands in the Okanagan Valley using LiDAR and earth observation satellite data

Tina Deenik, B.Sc.  
University of BC - Okanagan campus  
Earth and Environmental Science  
M.Sc. Student



# Acknowledgements

This project would not be possible without the help and support from my supervisor (Mathieu Bourbonnais), the OBWB, OCCP, Mitacs, UBC - Okanagan, and Ecoscape Environmental Consultants.



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WATER BOARD

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# Overview



**Importance** - why are wetlands important?

**Concerns** - what is the problem?

**Objectives** - what are we doing to address it?

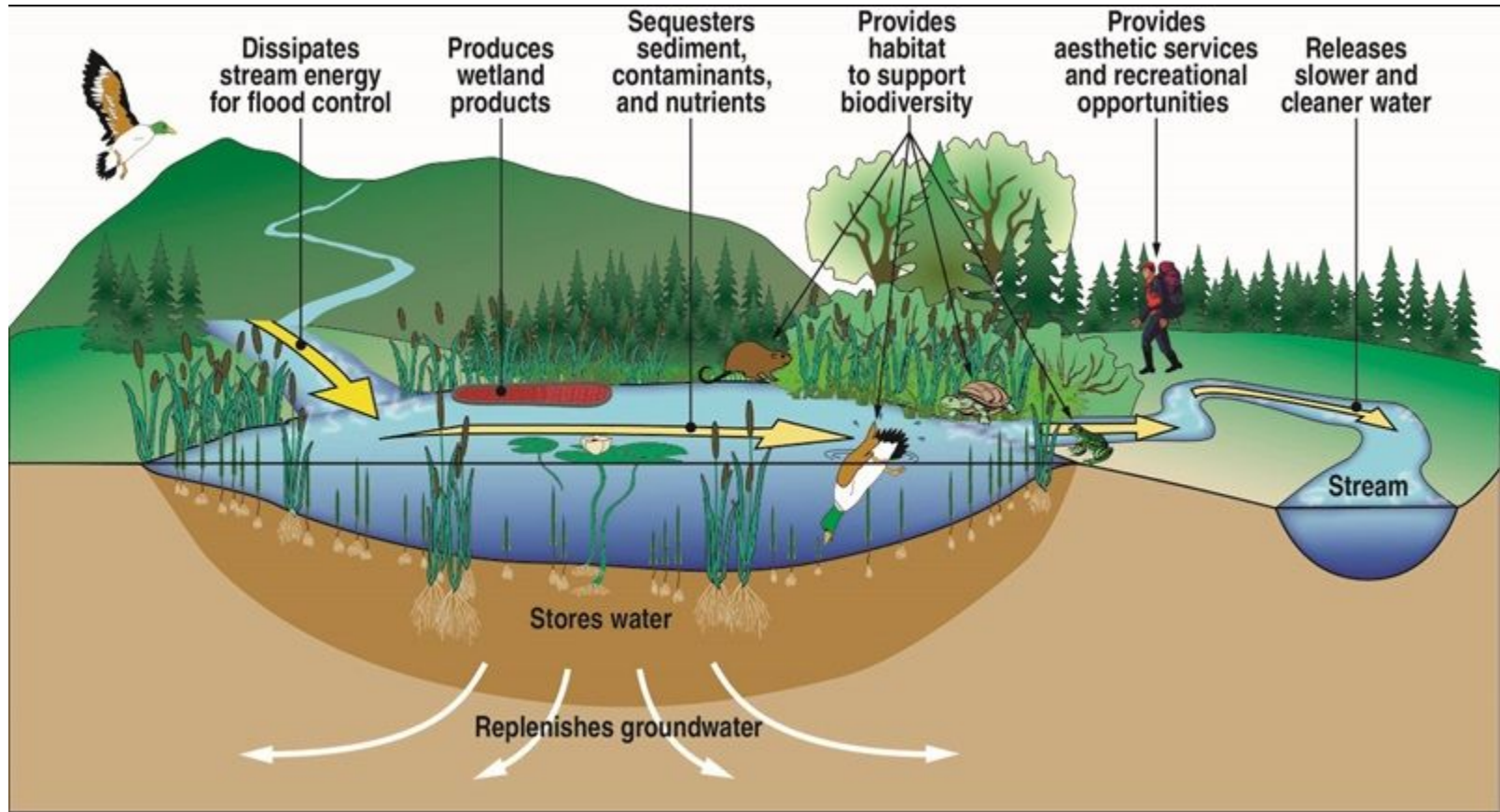
**Current Inventory** - what has already been done?

**Remote Sensing** - where can we go from there?

**Approach** - how will we do it?

**Deliverables** - what will it look like?

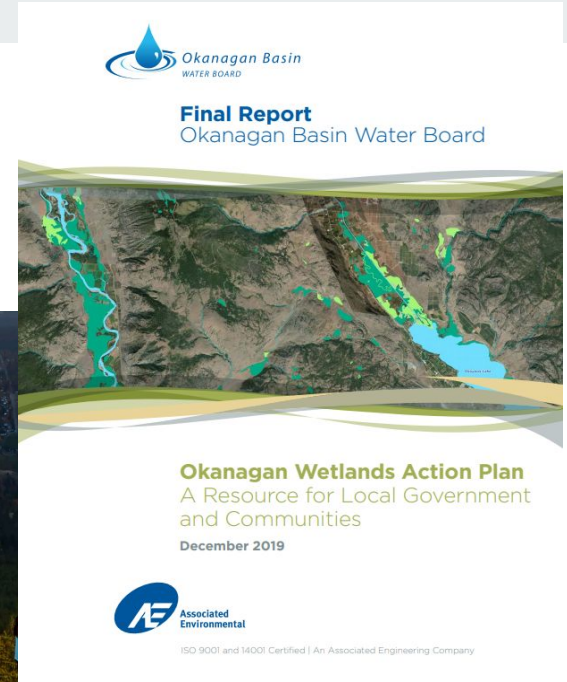
**Applications** - how will it be used?



Source: Booth and Shock (2016). *Corporate Land Management: Realizing the Value of Natural Capital*.

# Concerns

- 1 Wetland loss of 98% near urban centers
- 2 Existing maps are insufficient for long-term monitoring purposes



In partnership with

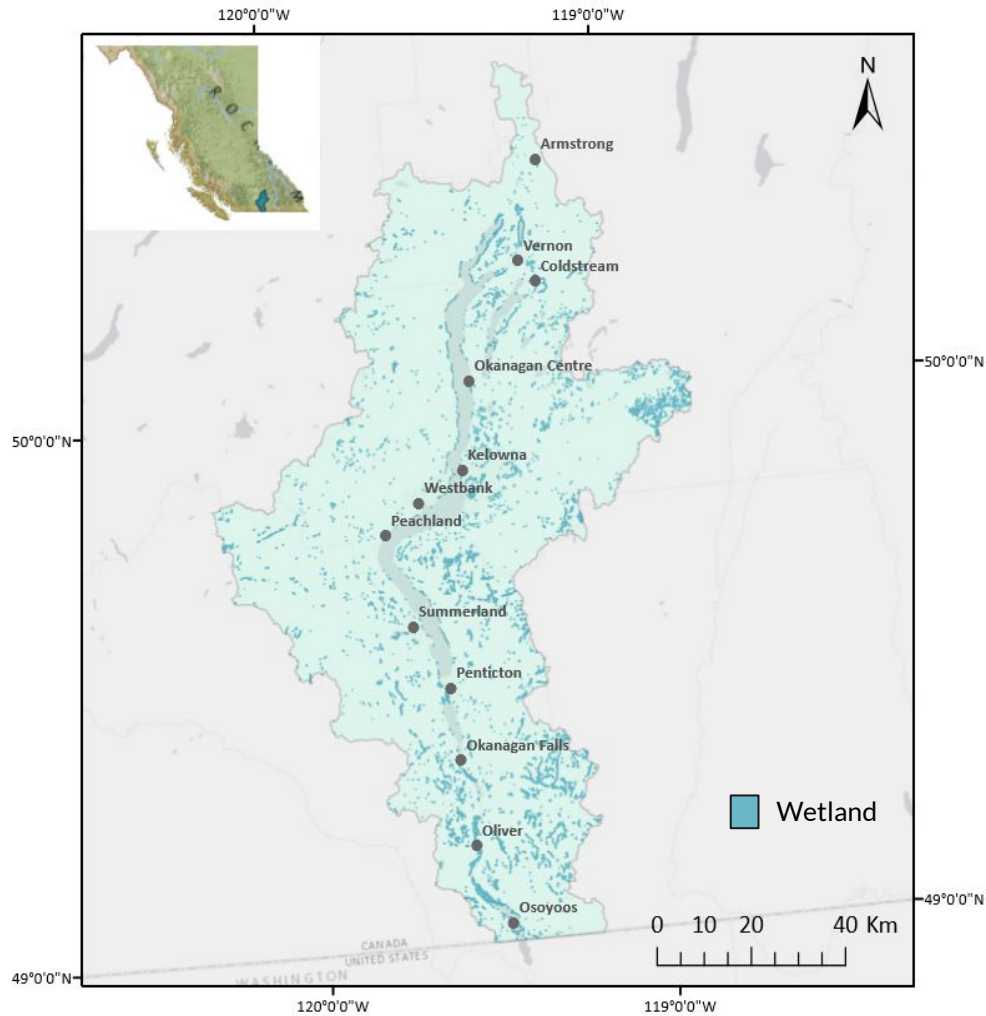




## Objectives

1. Create a replicable model to identify and classify wetlands in the Okanagan using remote sensing data
2. Explore secondary studies such as biodiversity and connectivity





# Okanagan Wetland Inventory

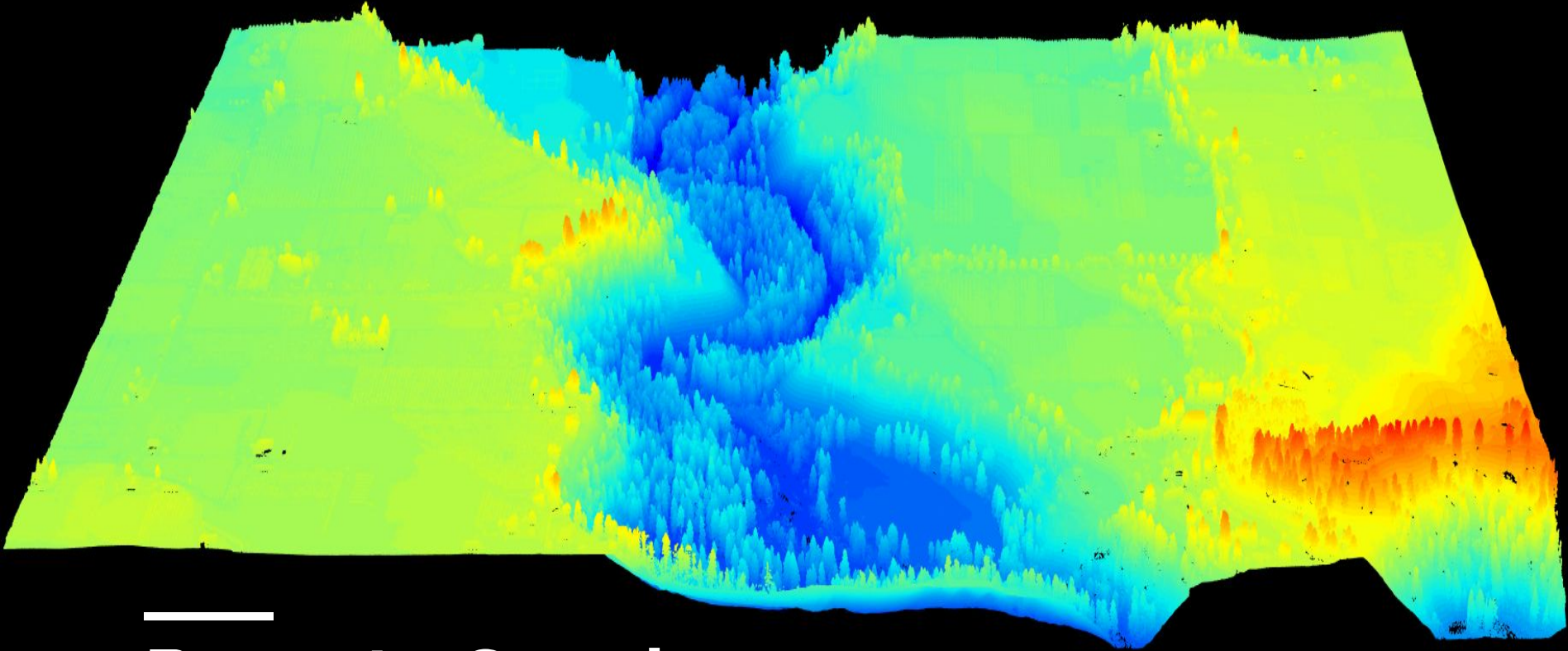
Data sources: City of Kelowna WIM, BC Freshwater Atlas, MOE Wetland Inventory Project, Alkali-Saltgrass Herbaceous Vegetation Community Assessment, SEI/TEM, SHIM, FIM, LRIM and Ducks Unlimited data. Mostly field-based inventories.



# Okanagan Wetland Inventory

- 9,005 wetlands were identified
- 923 classified
- Likely missing small, ephemeral, or forested wetlands
- No temporal component
- Labour intensive to replicate





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# Remote Sensing

Bog



Shrubs, moss  
& sometimes  
trees

Fen



Graminoids  
& shrubs

Swamp



Tall woody  
vegetation

Marsh



Emergent  
veg (rushes  
etc.)

Shallow Open Water

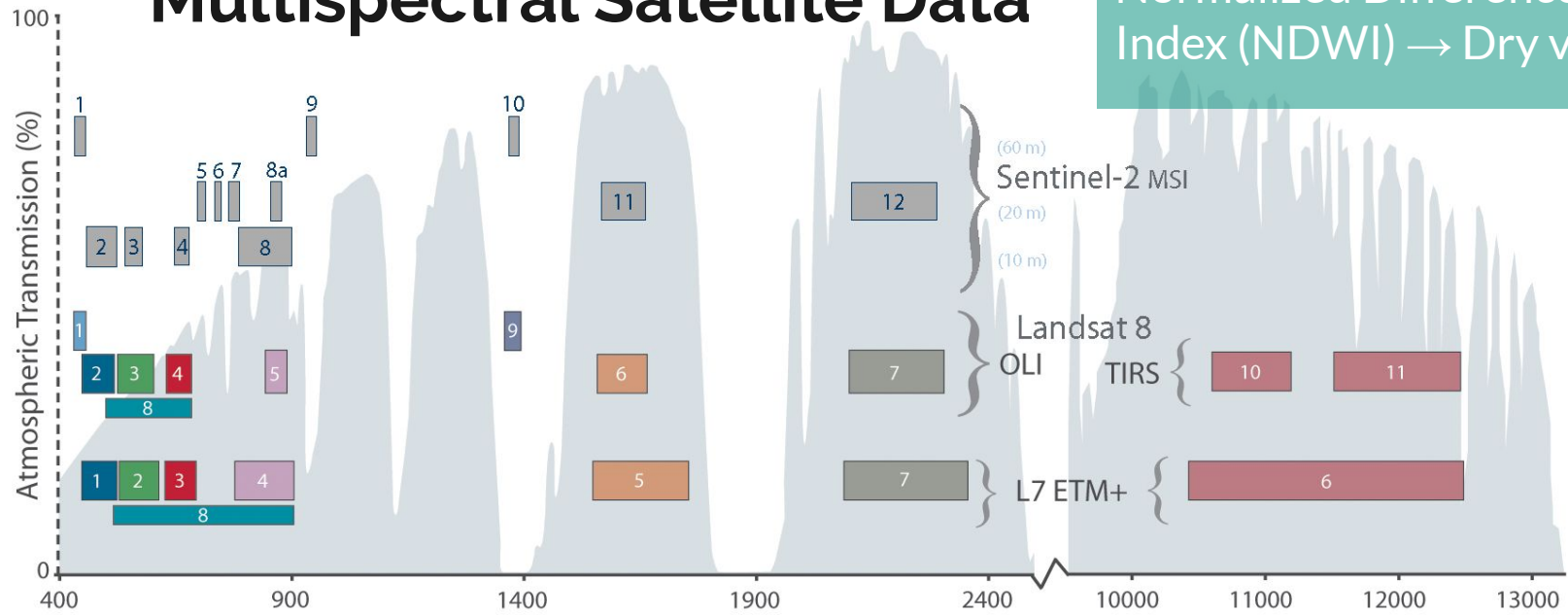


Sections of open  
water with no  
vegetation

**Wetland:** *Land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment.*

(Definition from the Canadian Wetland Classification System, Warner & Rubec, 1997)

# Multispectral Satellite Data



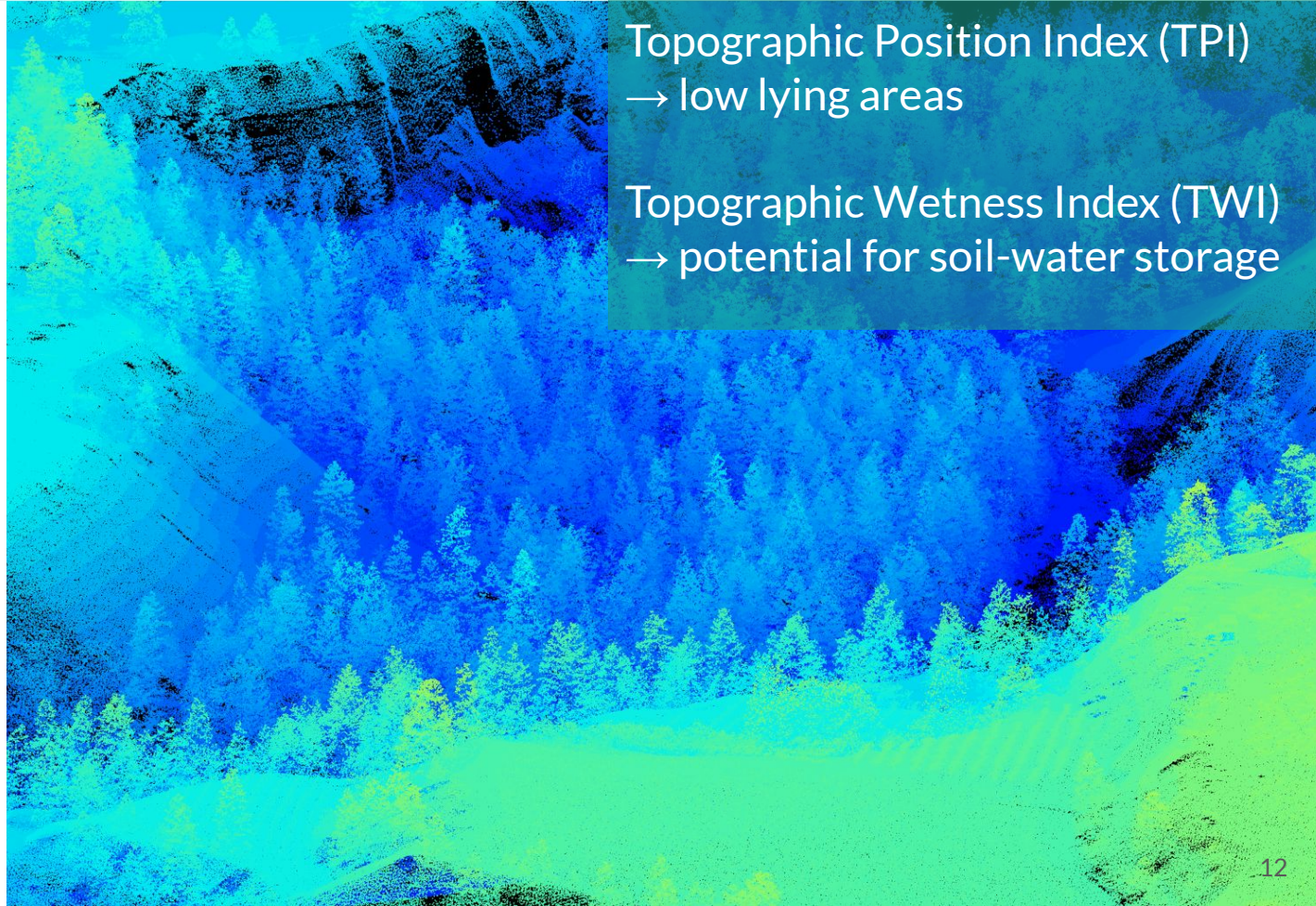
Normalized Difference Vegetation Index (NDVI) → Vegetation type

Normalized Difference Water Index (NDWI) → Dry versus wet





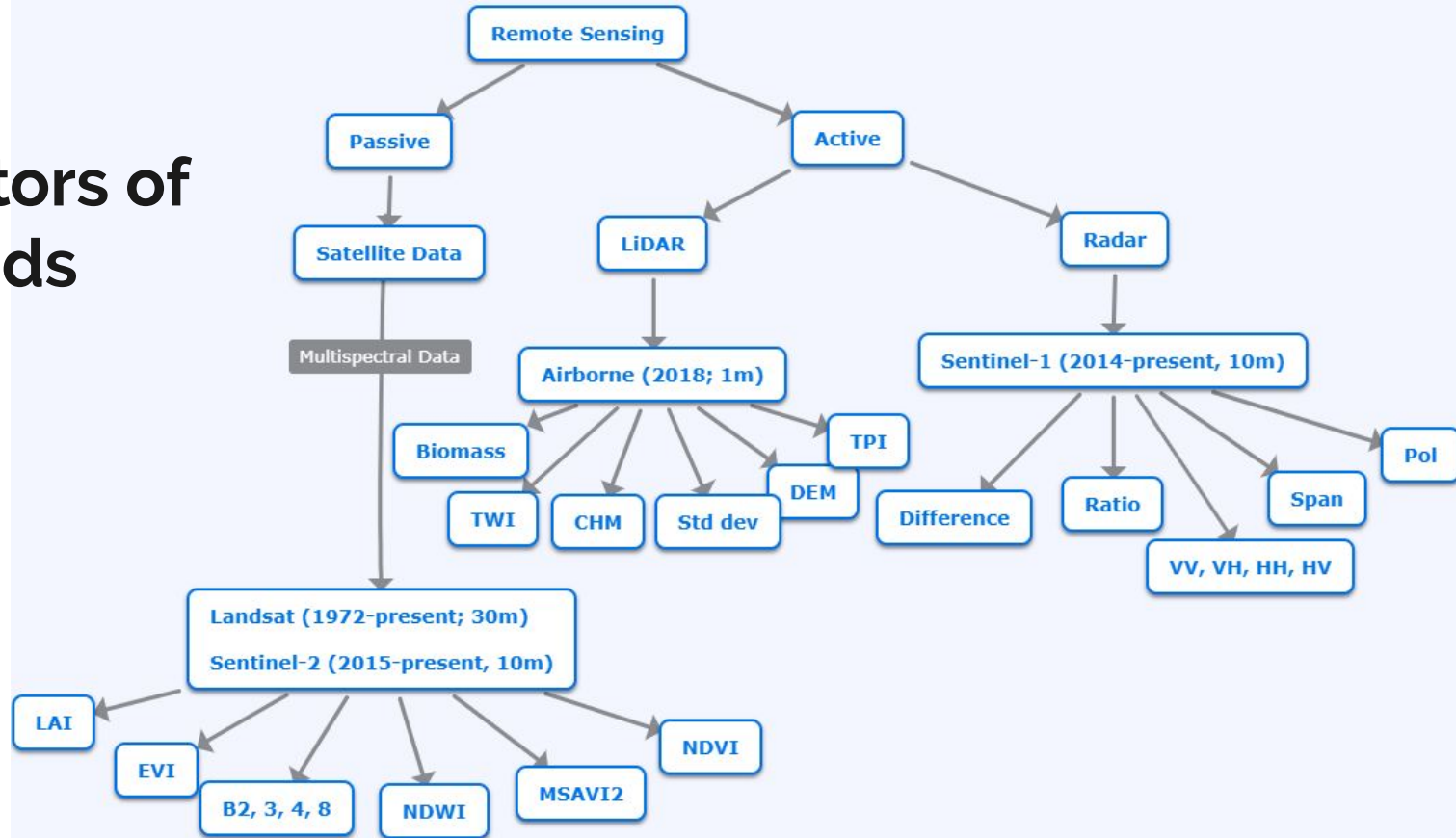
# Light Detection and Ranging (LiDAR)



Topographic Position Index (TPI)  
→ low lying areas

Topographic Wetness Index (TWI)  
→ potential for soil-water storage

# Predictors of wetlands

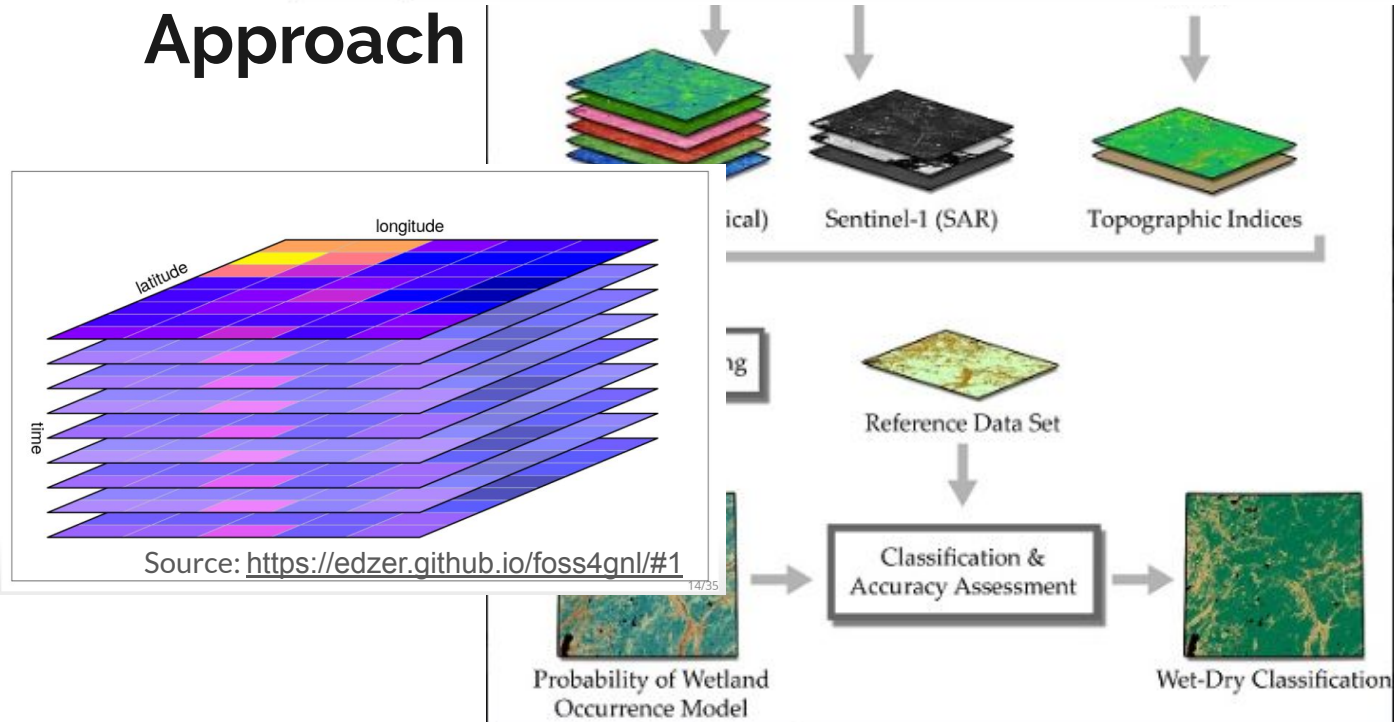




Wetland	NDVI	NDWI	TPI	TWI	B2	B3	B4	B8
Yes	0.5	-0.2	10	14	2000	1500	1000	2000
Yes	0.7	-0.4	0	20	1500	1400	1200	1000
??	0.6	-0.03	60	10	1800	1100	1000	750

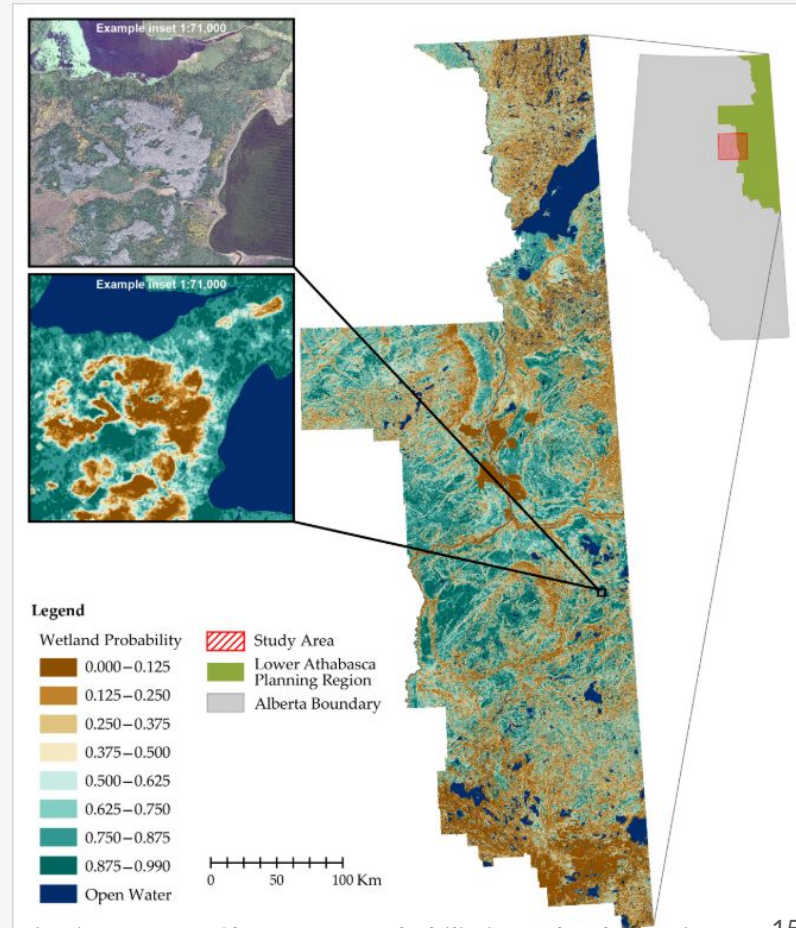
Note: These values are not based on actual data and do not accurately depict values for these parameters in wetland versus non-wetland areas.

## Approach



# Deliverables

- Map showing probability of wetland locations
- Map showing wetland classifications



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# Applications

1. Biodiversity
2. Connectivity
3. Land-use planning
4. Wetland evaluation
5. Monitoring
6. Conservation
7. Flood mitigation
8. Restoration





## Objectives

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## Goals for the Okanagan

1. No net loss by 2025
2. Net gain within areas rated as high value for biodiversity and habitat connectivity by 2030





Questions?