Research and monitoring activities and needs in related to ABoVE and POLAR activities (Old Crow, YK area)
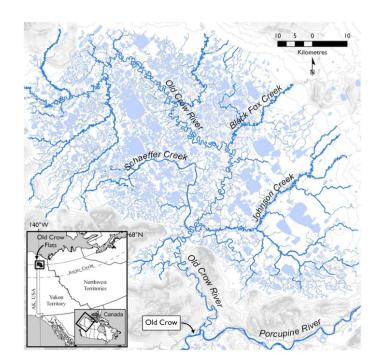
Dr. Kevin Turner, Assistant Professor
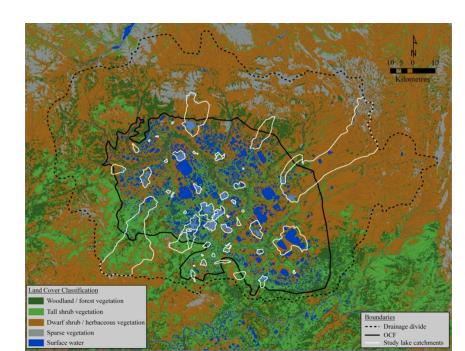
Brock University, Department of Geography

May 16, 2016

Ongoing research and monitoring
Related to ABoVe and POLAR activities

- *Identify spatial variability in lake and river hydrological and land cover characteristics*
  - *What landscape changes have occurred and where?*
  - *i.e., how are changes in the landscape (shrub proliferation, permafrost slumps) affecting water and carbon balances?*

Land Cover Classification
- Woodland / forest vegetation
- Tall shrub vegetation
- Dwarf shrub / herbaceous vegetation
- Sparse vegetation
- Surface water

Boundaries
- Drainage divide
- OCF
- Study lake catchments

Planned research and monitoring
Related to ABoVe and POLAR activities

- *NSERC-supported research 2016-20*
  - *mapping variability in land cover change over multiple spatial and temporal scales*
  - *identifying spatial variation in runoff generation processes and carbon export from major OCF sub-catchments*
  - *evaluating spatial association of catchment features on lake water balance and chemistry*
  - *reconstructing past hydrological responses to climate and landscape changes*
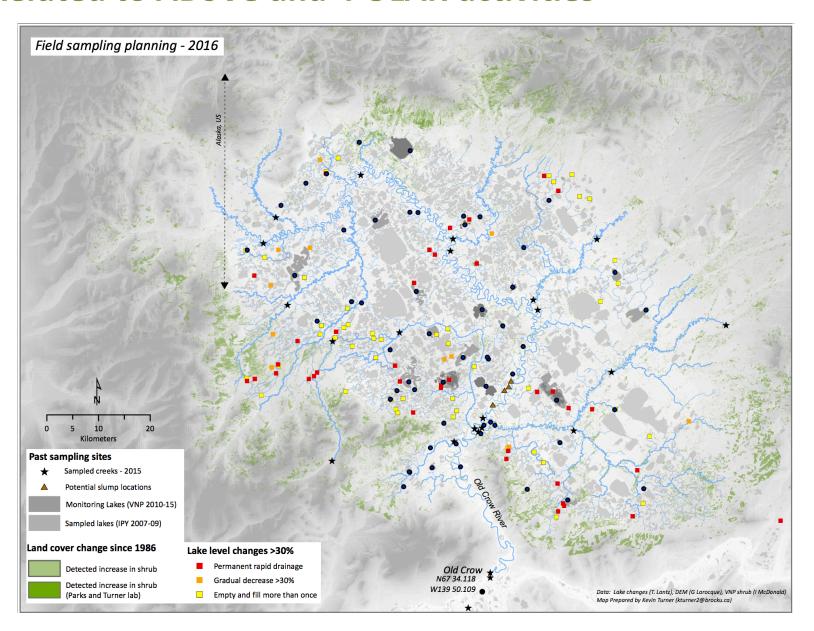
Planned research and monitoring
Related to ABoVe and POLAR activities

Research Interest	Approach	Parameters	Location(s)
Shrub proliferation	Landsat change detection	NDVI, TC	Entire OCF basin (14,500 km^2)
	Dendrochronology	Shrub ring width	15 sites in and out of detected shrub proliferation
	UAV-assisted ground truth	Aerial photos	Same sites as dendro
Permafrost slump change and influence on hydrology	UAV/DGPS surveys	Seasonal/inter-annual changes in slump and influence on downstream	Slumps along Old Crow River
Lake – river connectivity Influence of landscape change on hydrology	Lake and river water sampling	Isotope tracers (d13C, d18O, d2H) Nutrients, major ions	Monitoring lakes (14 since 2007) River sampling network (22 sites)
Influence of shrub proliferation on active layer and subsurface flow pathways to lakes	Mapping of active layer properties under varying land cover types	Active layer and peat depths, moisture, nutrients (including C)	Accessible lake site
Model changes across OCF based on determined relationships	Evaluate ability to predict future hydrology based on scenario changes in landscape conditions (shrubs, slumps, active layer)	OCF-wide remote sensing data (i.e., elevation, SAR for active layer properties, higher-res NDVI)	OCF-wide, or as much as possible

Planned and ongoing research and monitoring
Related to ABoVe and POLAR activities

Field sampling planning - 2016

Alaska, US

Old Crow River

Past sampling sites

★ Sampled creeks - 2015

▲ Potential slump locations

■ Monitoring Lakes (VNP 2010-15)

■ Sampled lakes (IPY 2007-09)

Land cover change since 1986

■ Detected increase in shrub

■ Detected increase in shrub (Parks and Turner lab)

Lake level changes >30%

■ Permanent rapid drainage

■ Gradual decrease >30%

■ Empty and fill more than once

Old Crow
N67 34.118
W139 50.109

Data: Lake changes (T. Lantz), DEM (G Larocque), VNP shrub (I McDonald)
Map Prepared by Kevin Turner (kturner2@brocku.ca)

Management related research & monitoring <u>needs</u>
Related to ABoVe and POLAR activities

- *Integrate protocols for investigating carbon mobility*
  - *OCF represents a key node within the Yukon River Basin, which is the focus of an ABoVe project*

- *Remote sensing data*
  - *SAR, DEM, and additional data from ROSES*
  - *Useful for investigating relation among active layer, vegetation, disturbance and hydrology*
  - *Will be useful for modeling carbon and water balance response to scenarios of future climate and landscape changes*

Opportunities/Recommendations for ABoVE/POLAR for engagement, education, outreach

- *Important to interact with community members and learn of their research priorities in addition to disseminating science-based findings*

- *Have participated in many community meetings, school workshops, and other events in Old Crow during IPY*
  - *Will be doing more community engagement moving forward*