1. A coffee with two cream and two sugar

2. A wetland restoration bringing back ecosystem function and Canada's rarest plant

"a Brier Island Double-Double"

Nick Hill

John Brazner

Gavin Kennedy

Jess Tudor

Westport

David Garbary

St. Francis Xavier

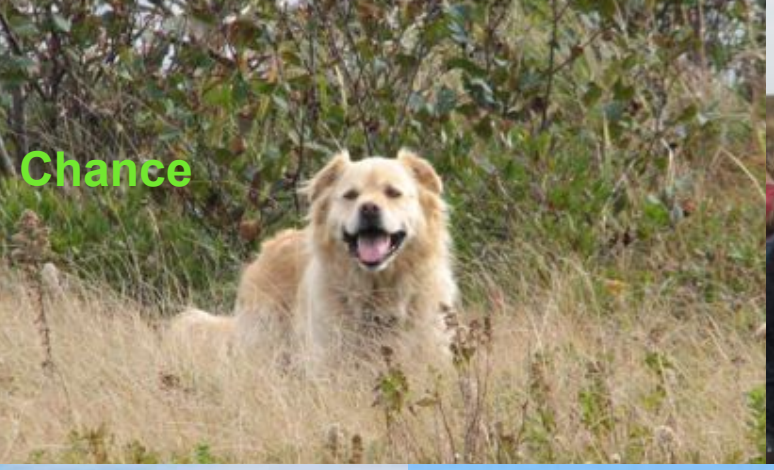
Ian and Dewey

Acadia U/DNR

Alain Belliveau

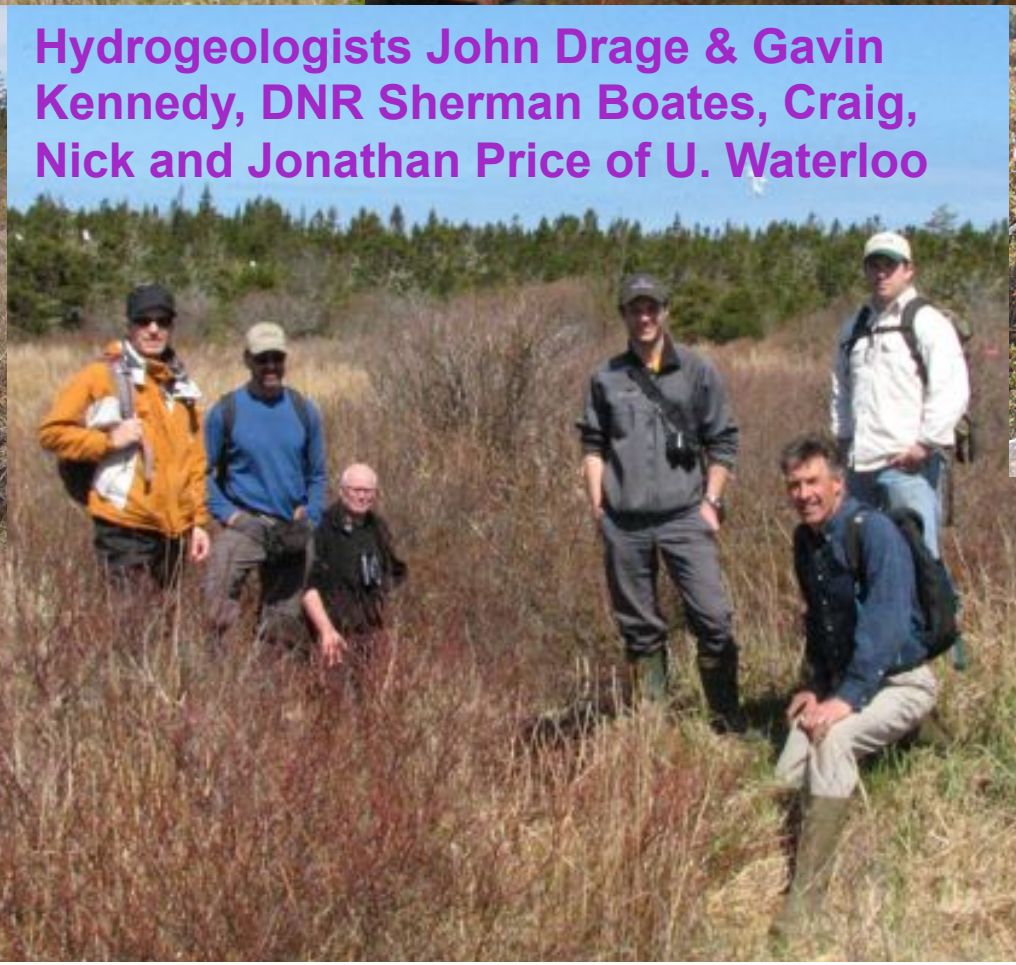
GOMI students

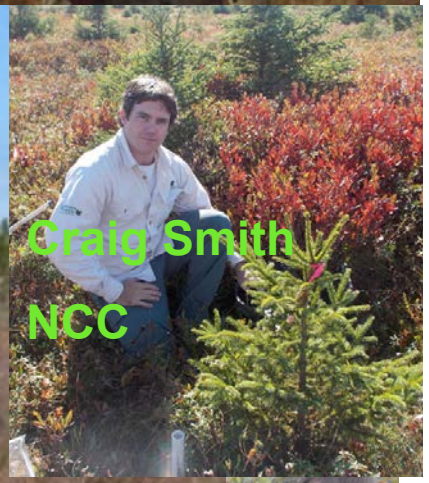
MTRI Brad Toms

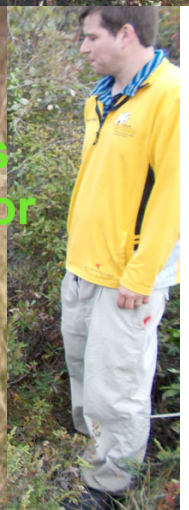

Chance


Samara Eaton
Environment Canada
Nick Hill, Fernhill


John Brazner
DNR


Hydrogeologists John Drage & Gavin Kennedy, DNR Sherman Boates, Craig, Nick and Jonathan Price of U. Waterloo


Craig Smith
NCC


Jess Tudor

Geum peckii G2 Imperilled = high risk extinction

a) very restricted range, AND/OR

b) very few populations (<20), AND/OR

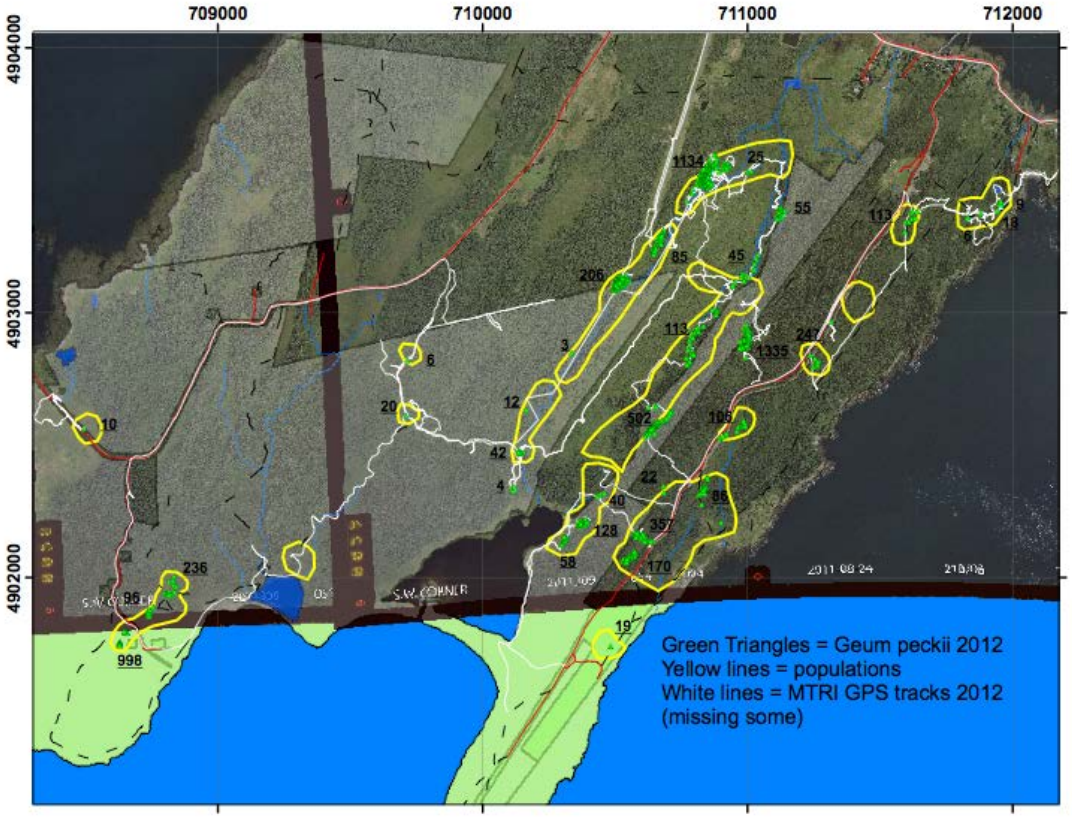
c) steep population declines ...yes to a,b,& c

CANADIAN POPULATION OF EASTERN MOUNTAIN AVENS = 6000 PLANTS IN:

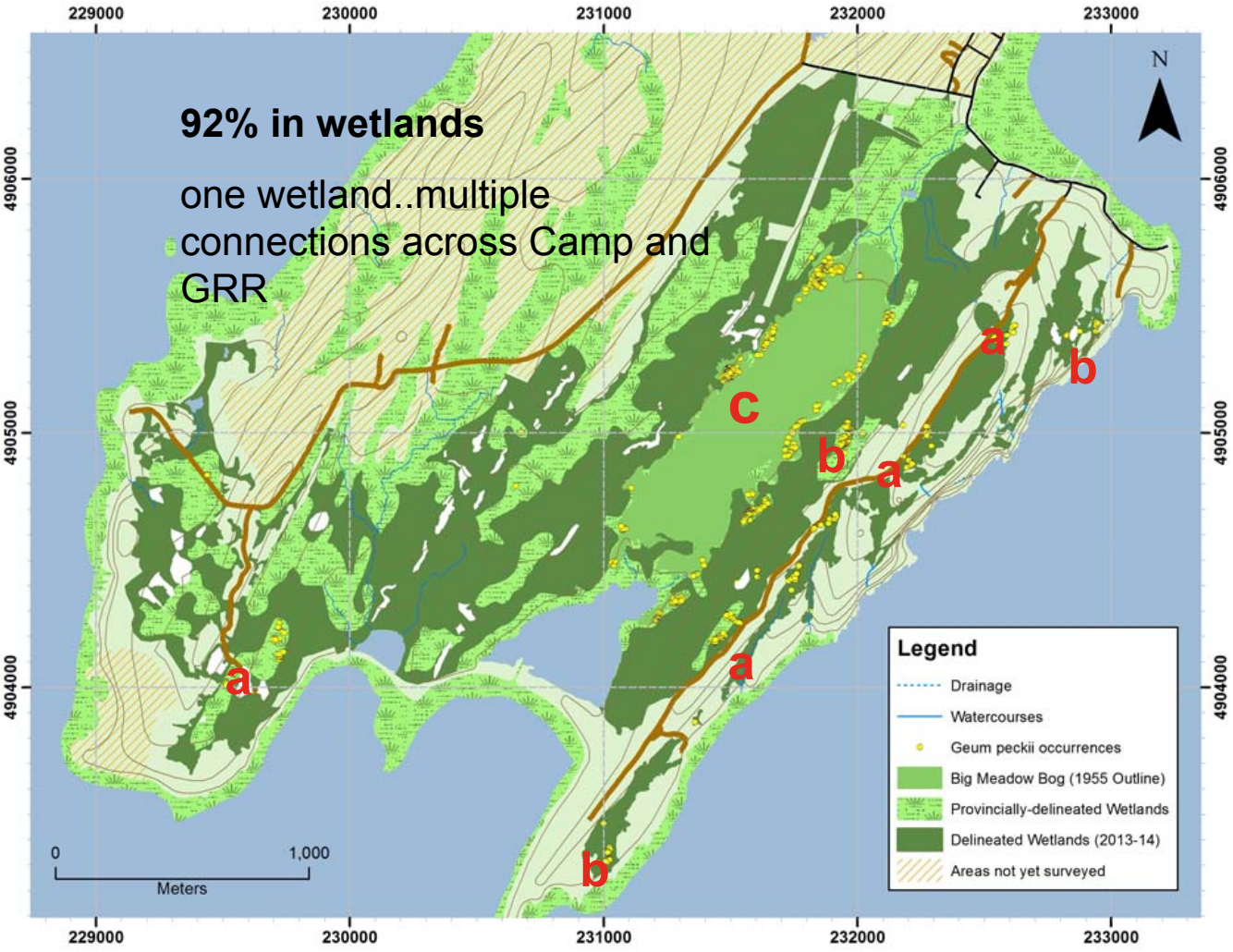
a) old-field & ATV disturbed habitat (40%)

b) isolated, high integrity peatlands (20%)

c) marginal fens of Big Meadow Bog (40%)



wetland connections and Avens habitat types (a, b, c).

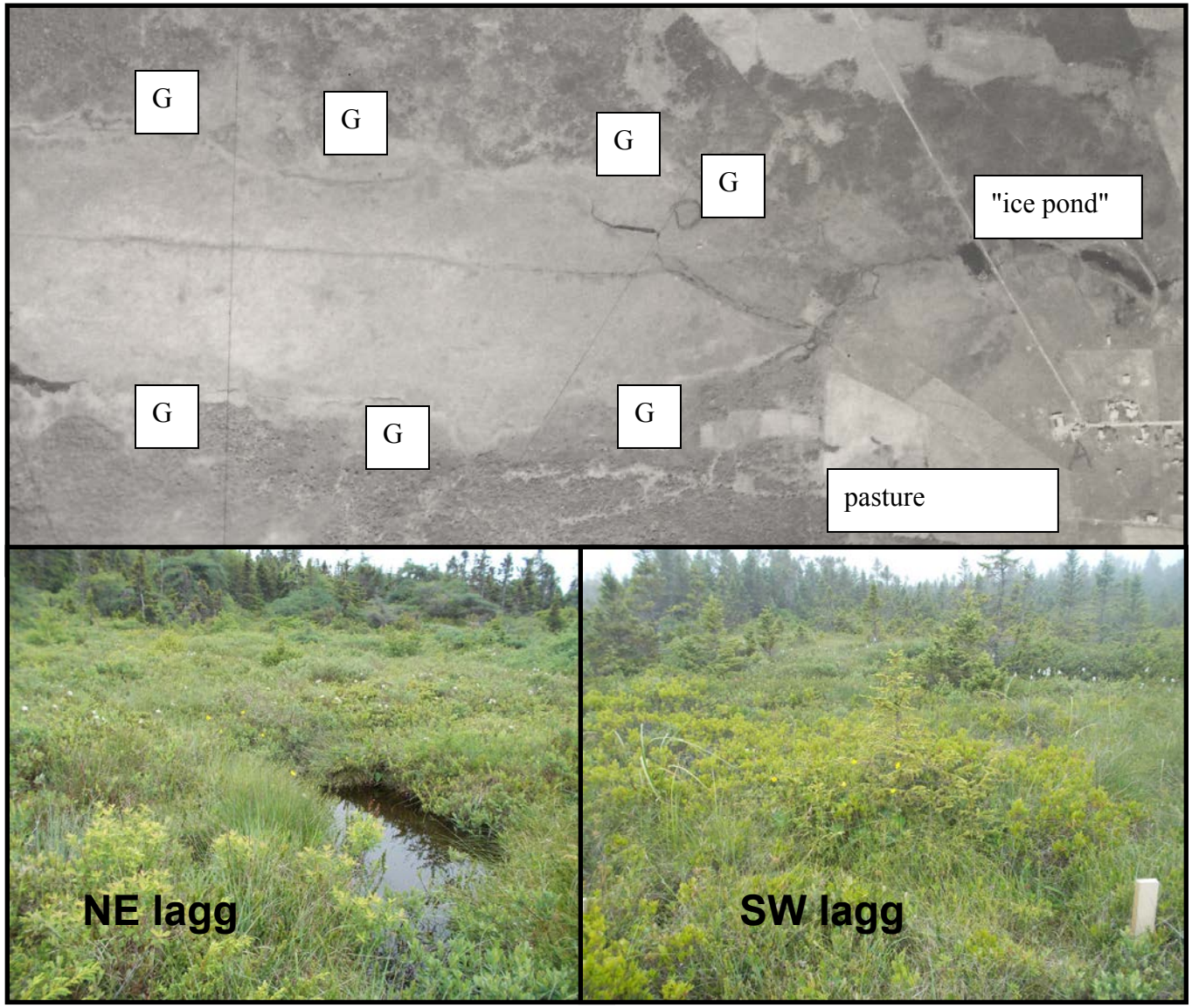


a = old field ATV

b= stable small peatland

c = Big Meadow

Big Meadow in 1928. Extant Geum populations overlaid. Intact lagg habitat zones below.



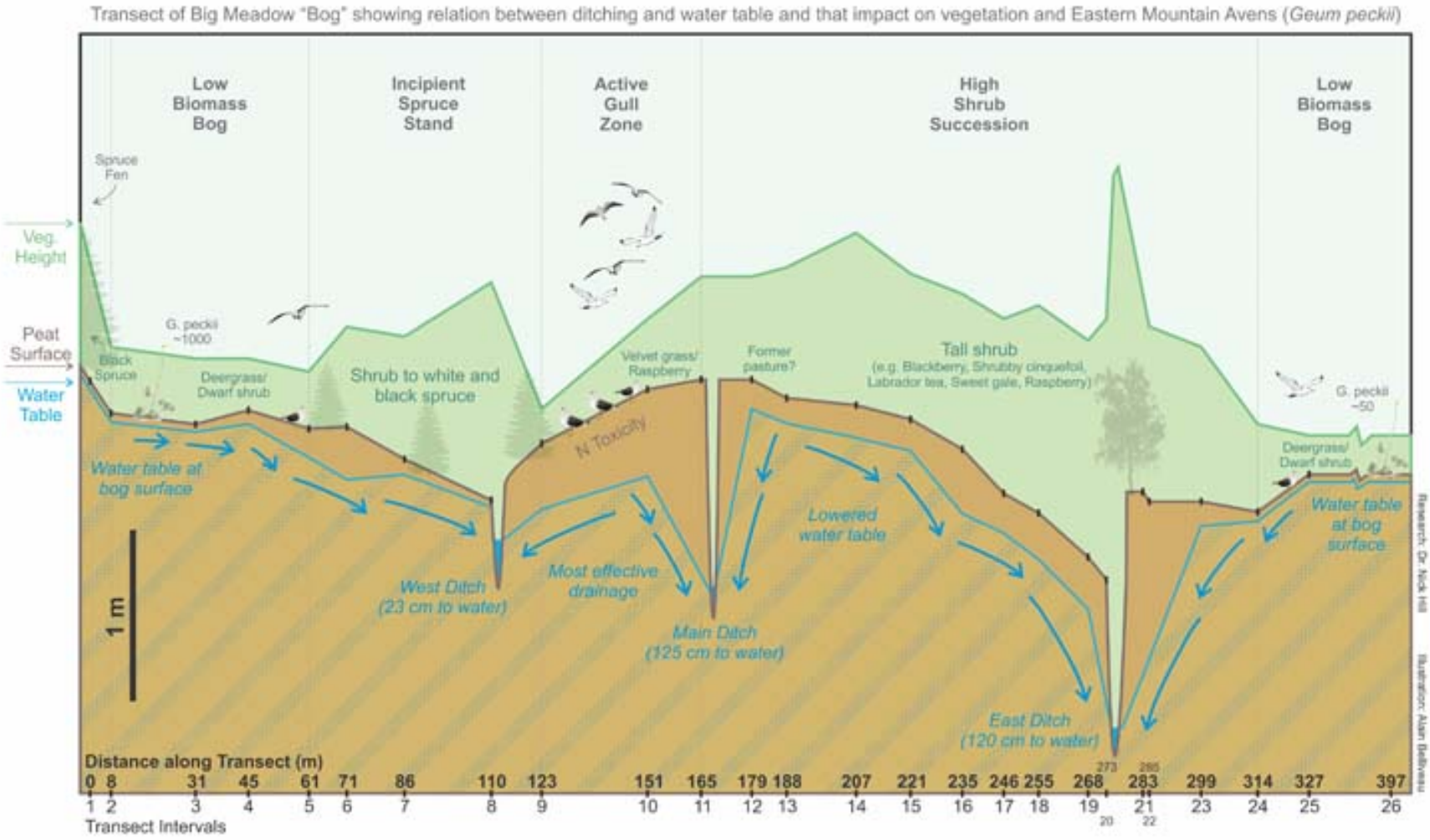
three impacts of 50 years of ditching

trees extend into lagg ⇑

shrub overgrowth ⇑

gull colony nesting ⇒

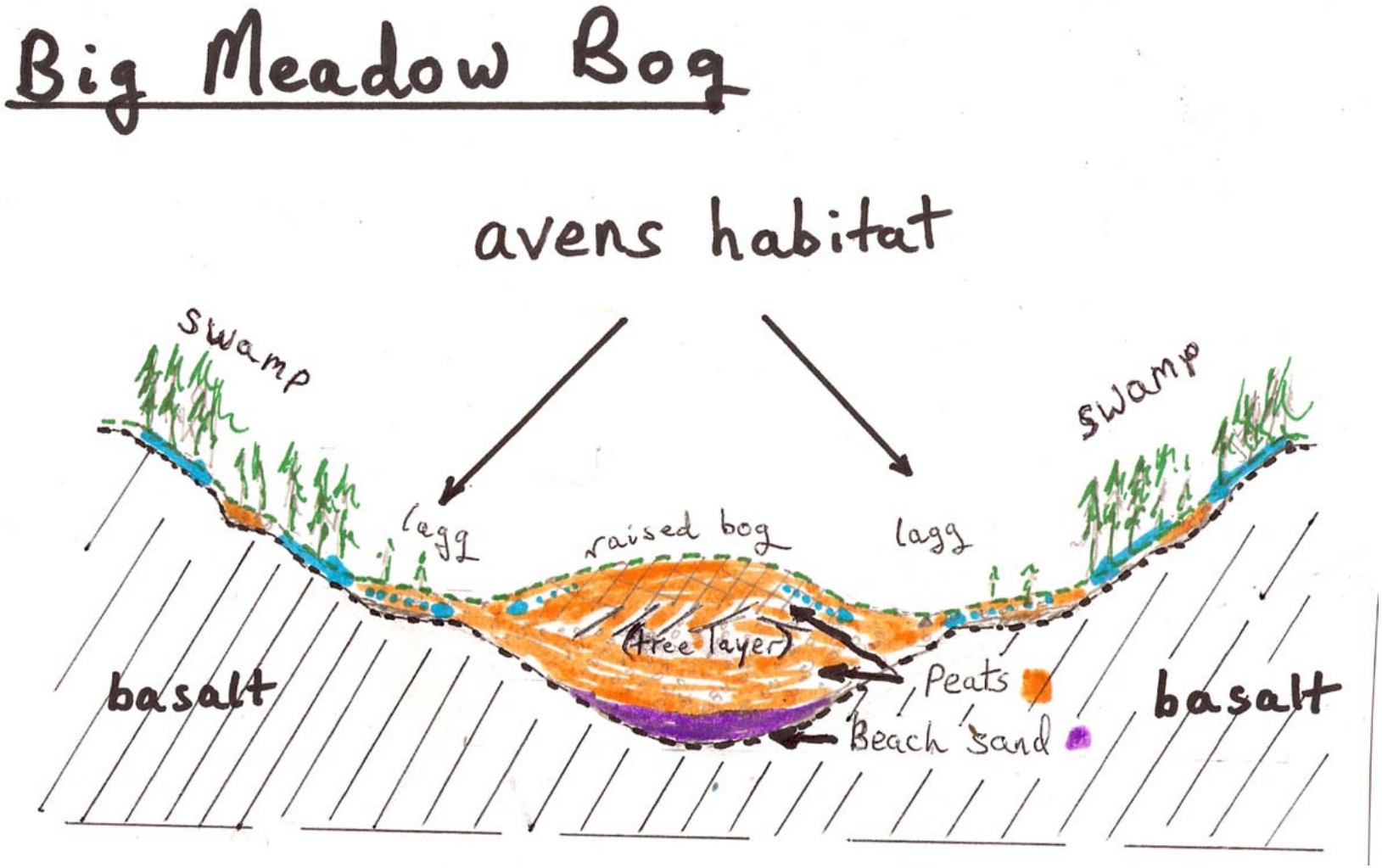
“..to save the plant we must restore the Big Meadow.”



2014 CORING: Ian Spooner

1958 ditching

ecosystem goal: pre-ditched landscape

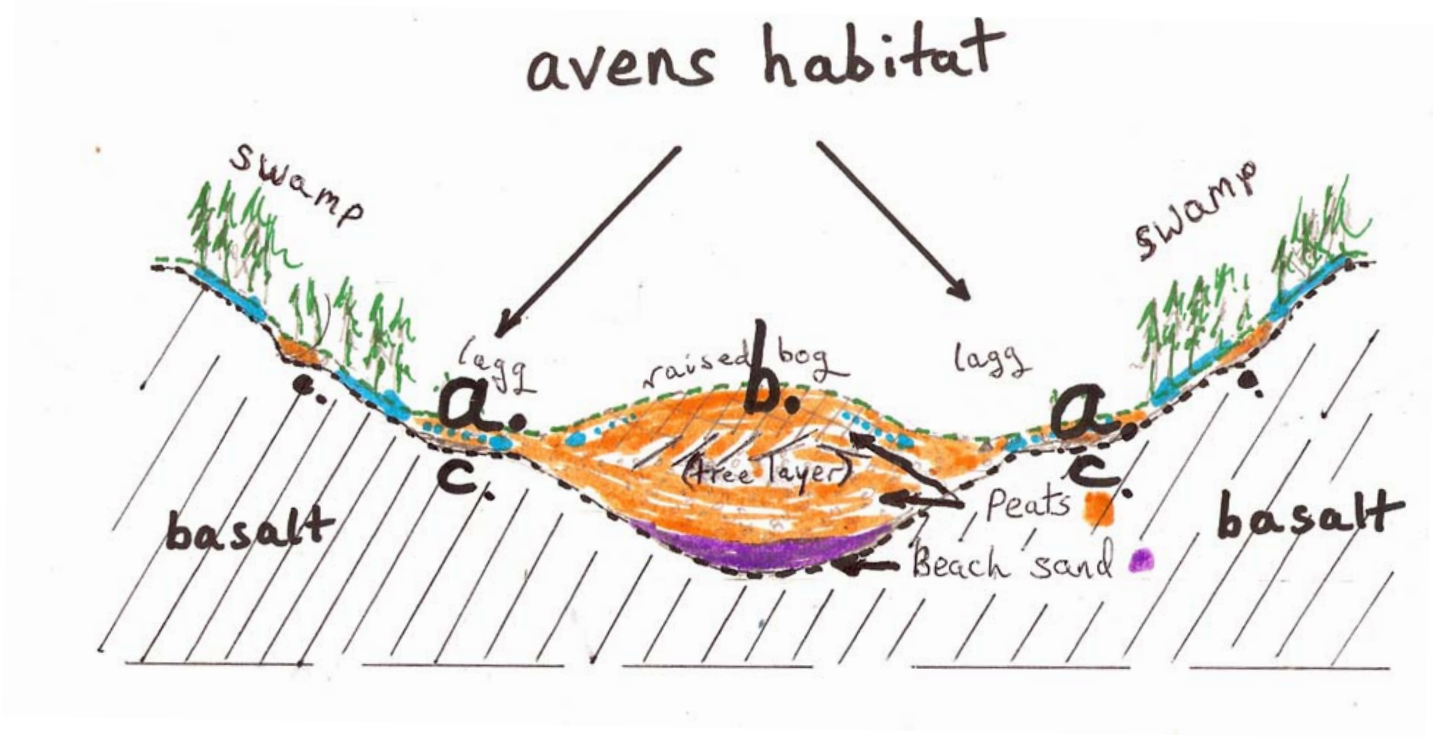


Processes to restore:

a) lagg hydrology

b) ombrotrophy (high C:X ⇒ sequestration)

c) open metapopulation landscape for avens



Hydrology

wells monitoring:

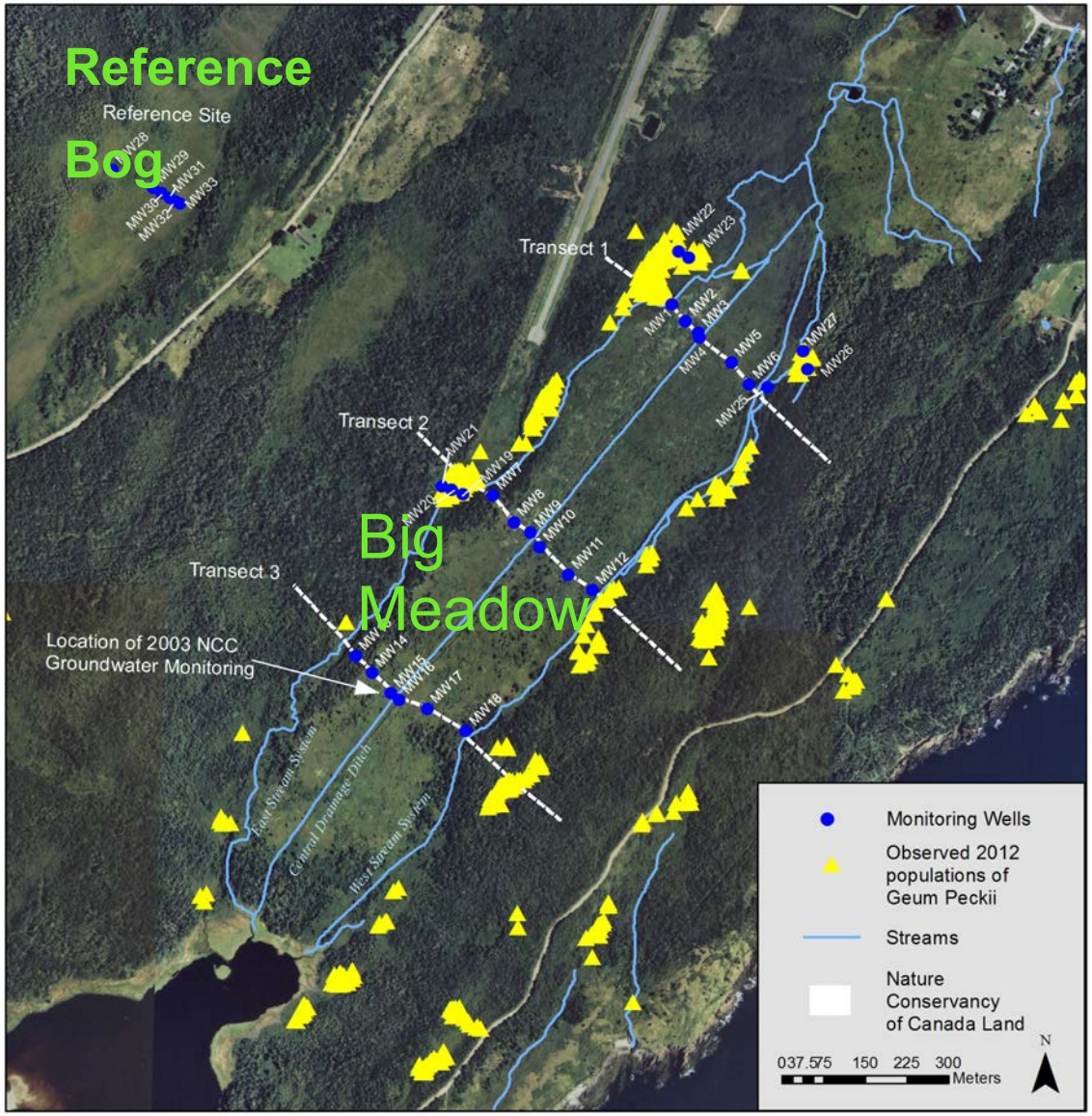
-- degraded state

-- reference state

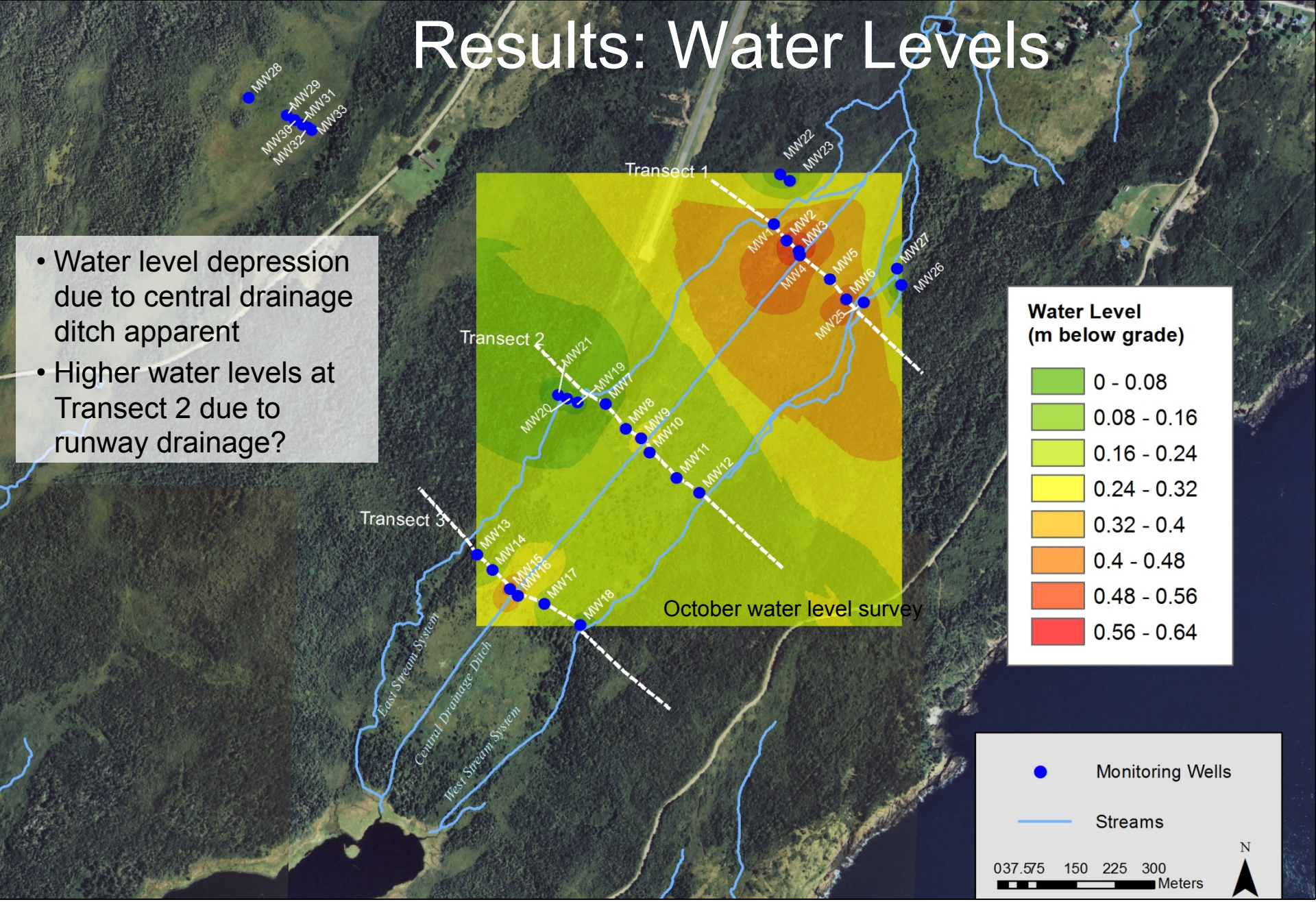
hydrological model

--predicts future states

(surface and groundwaters)



Results: Water Levels



- Water level depression due to central drainage ditch apparent
- Higher water levels at Transect 2 due to runway drainage?

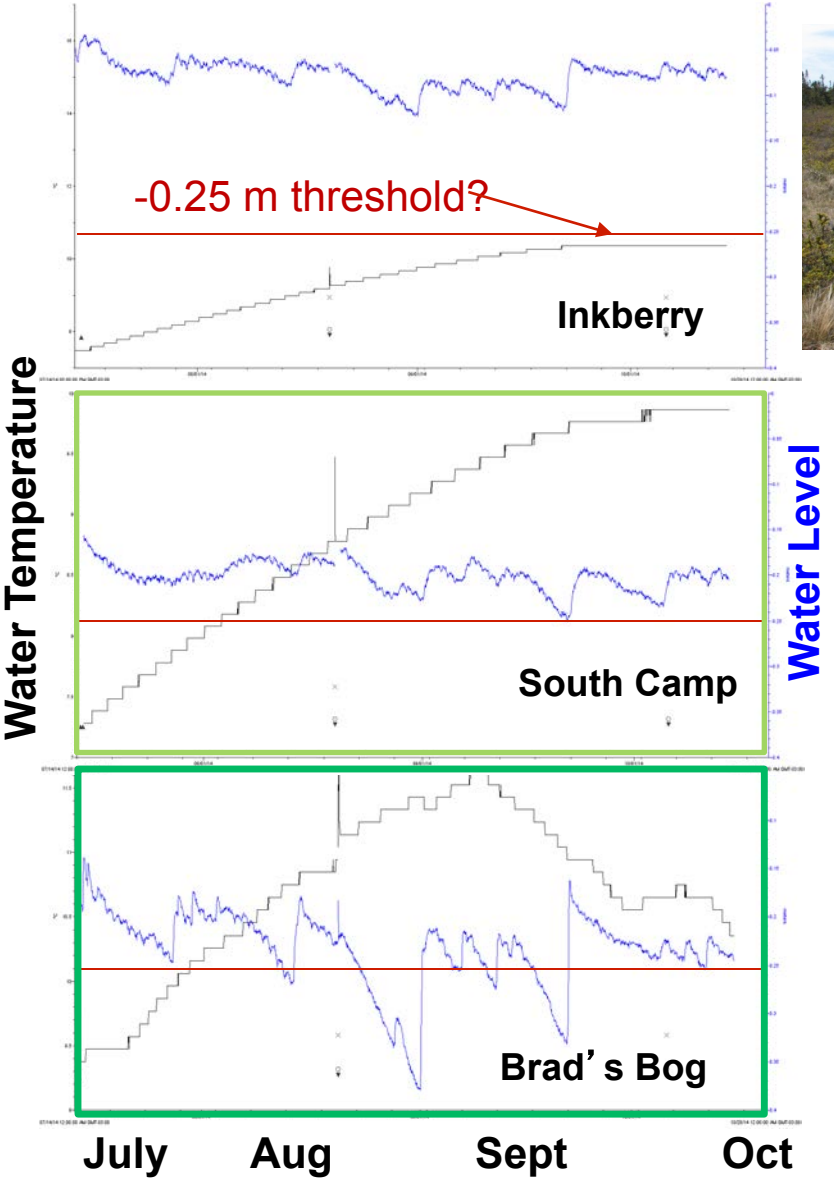
a. lagg hydrology and impact of ditching

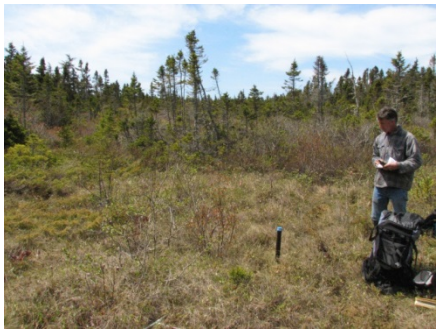
healthy/ degraded	INFLOW water level	OUTFLOW water level	SHRUB & GULL
"Runway bog"	- 5.6 cm	- 5.6 cm	low shrub few gulls
BM1	- 11.3 cm	- 17.6 cm	high shrub gull invasion
BM6	- 3.4 cm	- 18.7 cm	moderate shrub few gulls

overgrown northwest lagg with white spruce

What's Driving *Geum* Distribution?

Studies in Eight Adjacent Botanical Reference Wetlands





Key Factors?

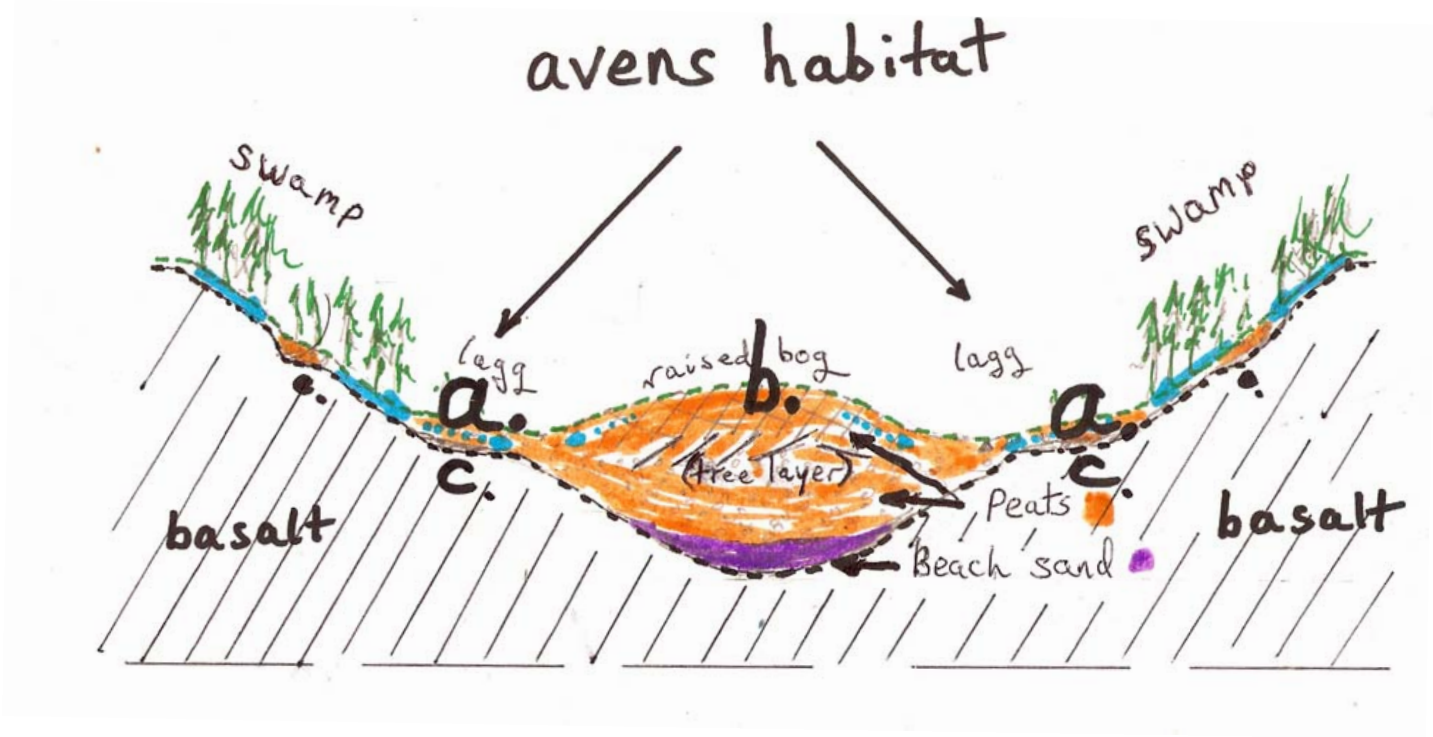
- Groundwater
  - level
  - fluctuation
  - temperature
- Adjacent slope
- Aspect
- Island geography
- Shading
- Plant Community
  - Sphagnum cover
  - Shading
  - Shrub height

Processes to restore:

a) lagg hydrology

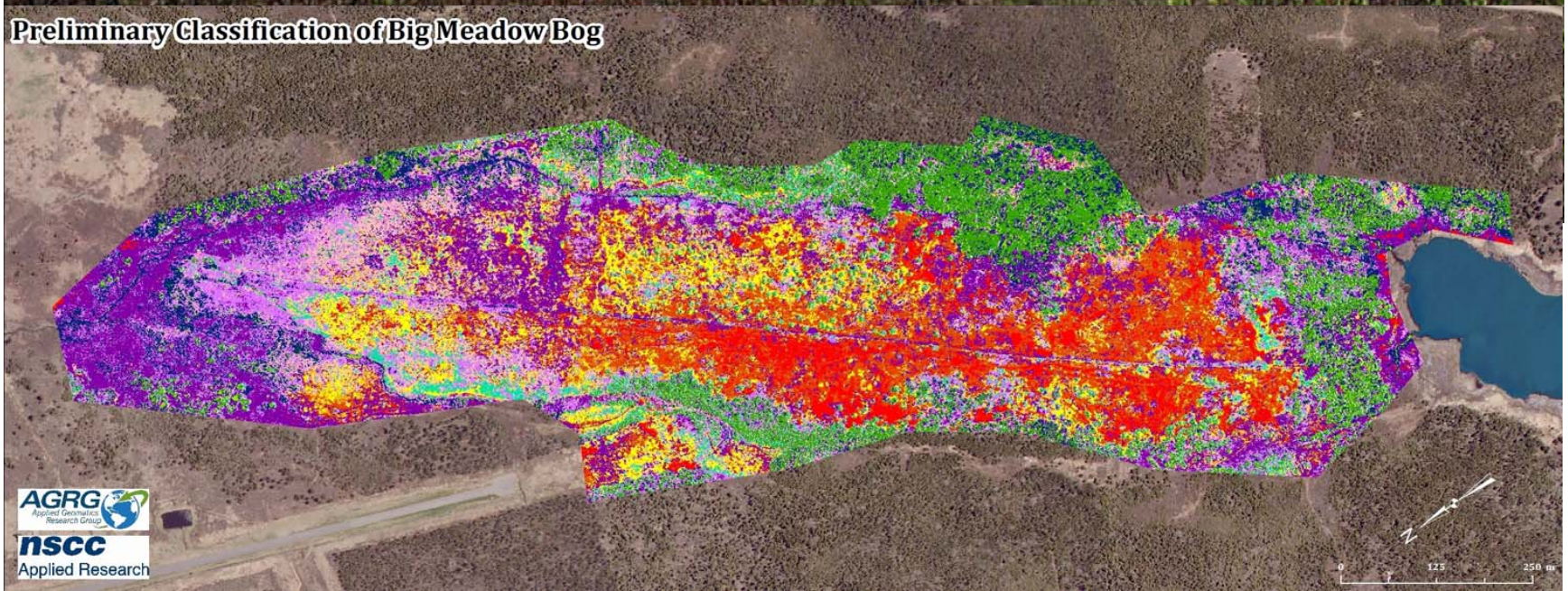
b) ombrotrophy (high C:X ⇒ sequestration)

c) open landscape for metapopulation dynamics

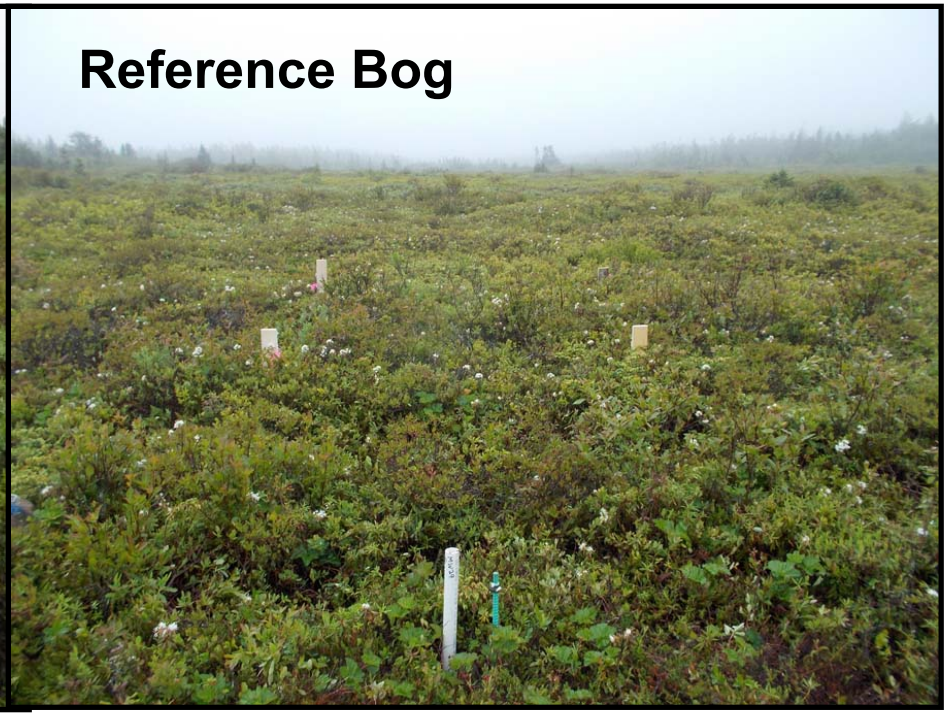


b. restoring ombrotrophy

Ditching lowered water table and ushered in gulls. Nesting started in south, 1980, and is now in northern third of bog

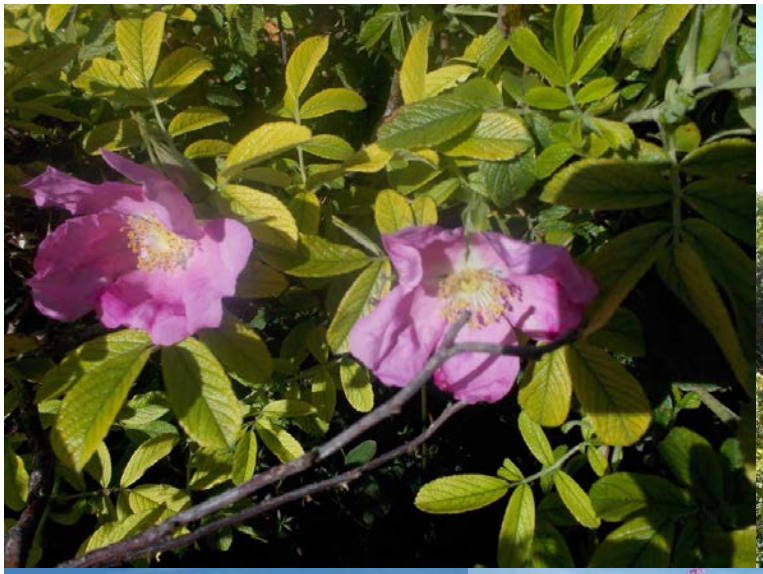


b. Ombrotrophy--indicator Ericaceae



other indicators: deergrass, hare’s tail, insectivorous plants, bakeapple

b. The War of the Roses: The Battle for Ombrotrophy!







Results: Water Chemistry

- Nutrient (nitrogen and phosphorus) concentrations increased from the upland areas of the wetland complex towards the central areas of BMB
- Followed trend Transect 1> Transect 2> Transect 3, which corresponds with intensi[illegible]

	Inorganic Nitrogen (mg/L)	Total Phosphorus (mg/L)
Transect 1 – Central Bog Wells	1.7 - 7.2	7.2 – 15.0
Transect 2 – Central Bog Wells	0.5 – 4.3	0.4 – 12.0
Transect 3 – Central Bog Wells	0.3 – 3.4	0.3 – 3.7
Margin Wells	0.2 – 1.2	0.1 – 0.8
Reference Site Wells	0.2 – 0.4	0.3 – 0.4

b. Short term fix = remove biomass save rare plants

..cutting shrubs, herbicide treatment, fire, grazing

e.g. Restoration of Garry Oak Prairie

restoration

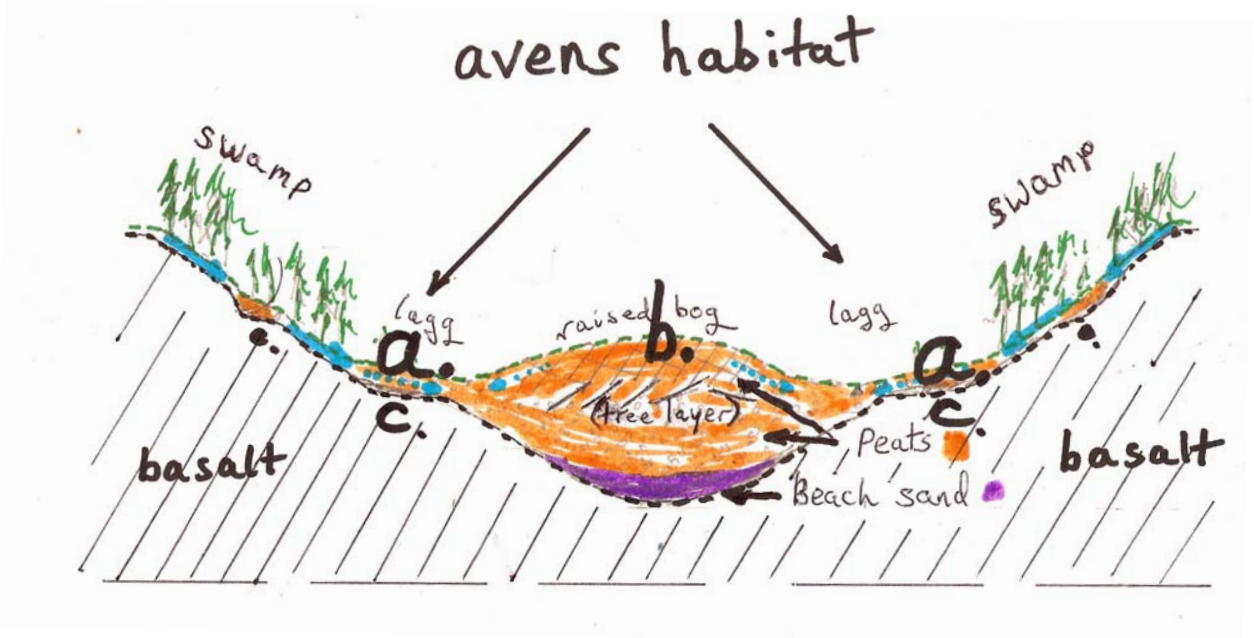
1. consultation (Jonathan Price, Waterloo, Ft. Mac; Sarah Howie, Delta, BC: “the importance of the lagg”)
2. water retention
    a. phased approach?
    b. fit peripheral ditches with barriers at adjustable levels
    c. fill central ditch and partially the peripherals
3. vegetation management
4. nutrient concerns
5. safety net: manage old field Avens

time course

1. finish collecting benchmark data..2014-2015

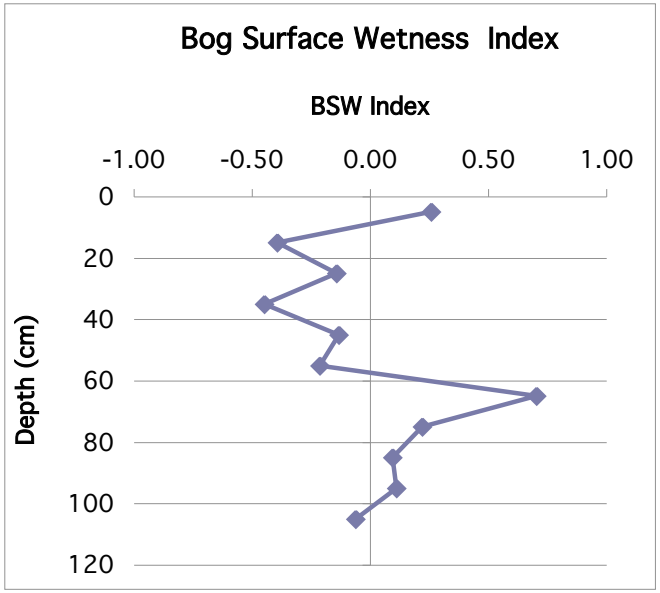
.....oh, and get some money

2. assess engineering options 2014-summer 2015
3. install regulation devices Fall 2015
4. monitoring feedbacks to adaptive management of regulation: 2015-2100

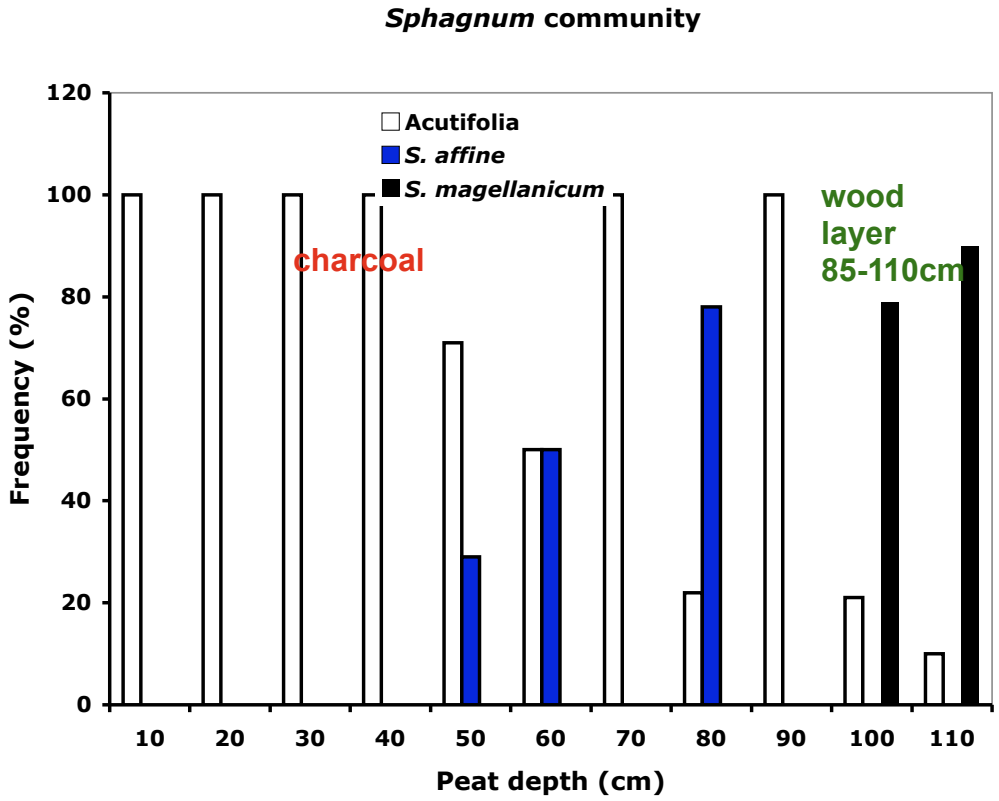


APPENDIX I. BMB--Succession with Depth

Gettysburg Quaternary Geology Lab: Humification

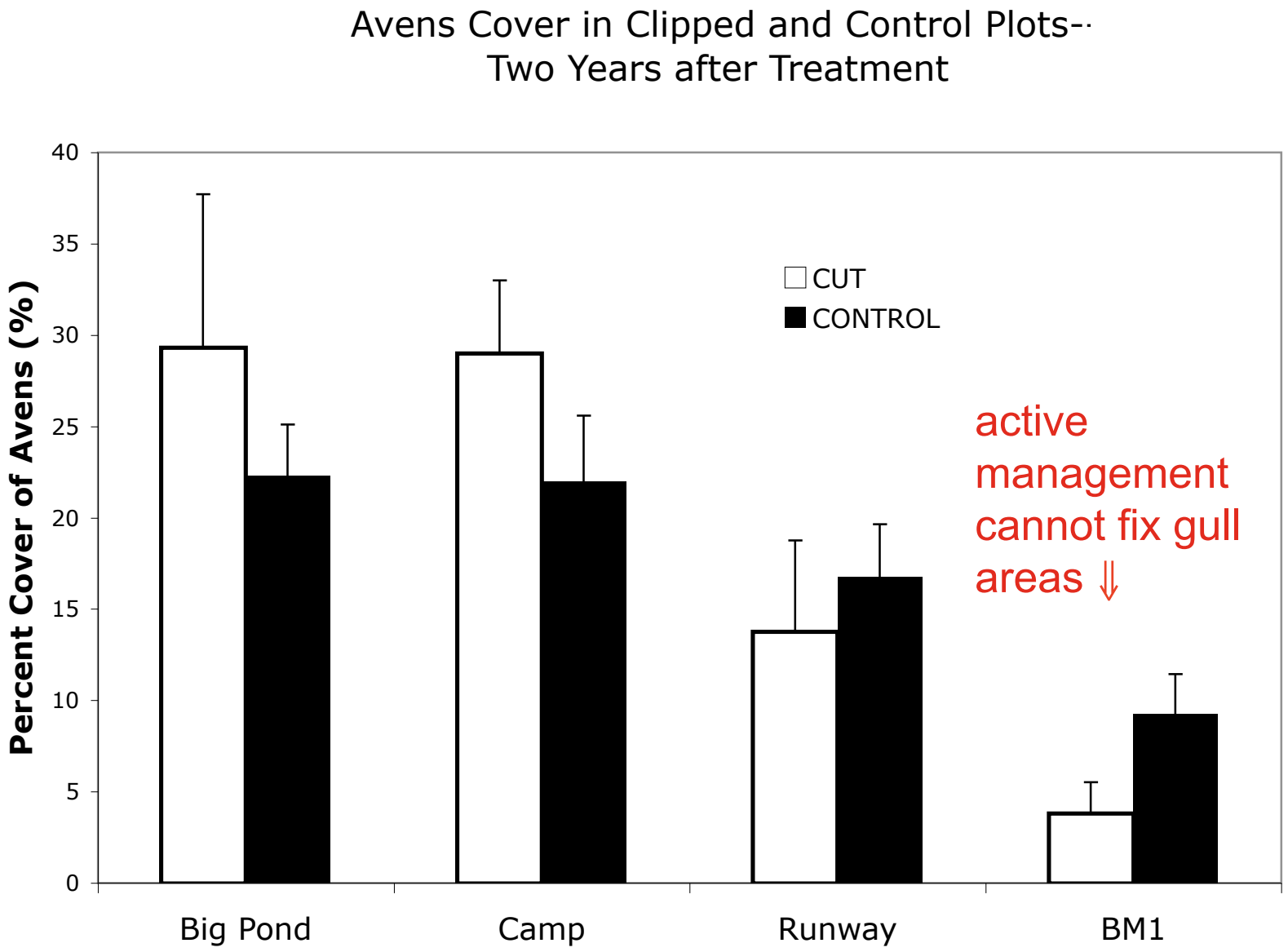


Tom Neily: Sphagnum community depth succession



BOG FEN SWAMP

APPENDIX II


Avens Cover in Clipped and Control Plots--
Two Years after Treatment
Percent Cover of Avens (%)
40
35
30
25
20
15
10
5
0
CUT
CONTROL
active management cannot fix gull areas ⇓
Big Pond
Camp
Runway
BM1