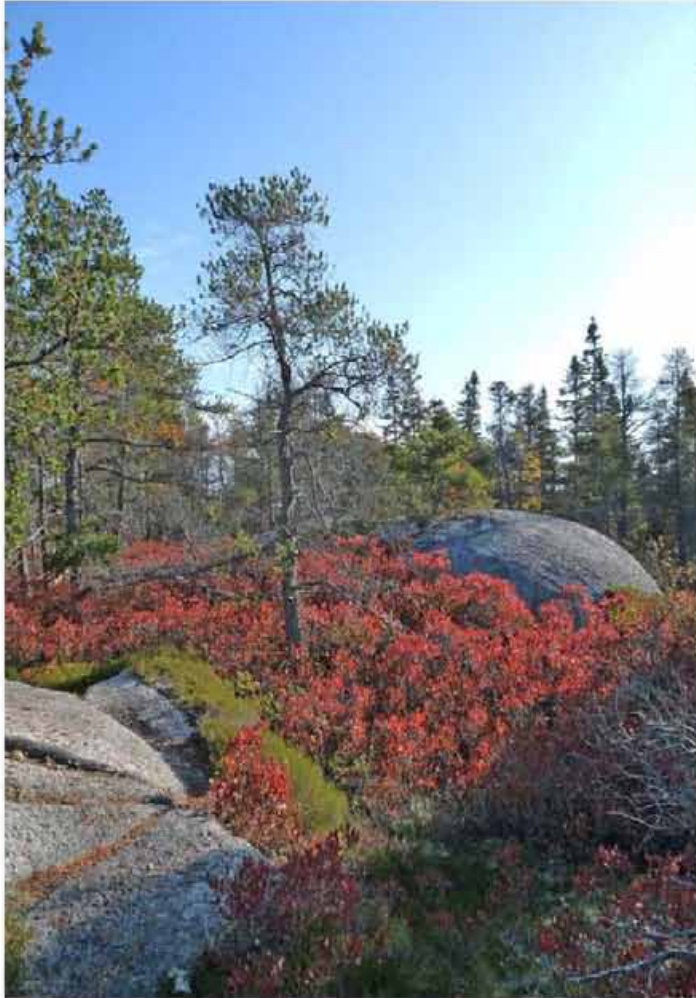


FREE PUBLIC LECTURE



Monday, Oct. 22,

1:30 – 3:30

**Captain Wm. Spry Community
Centre, 16 Sussex St.**

**The Seniors' College Association
of Nova Scotia Presents**

**The Natural History of
the Halifax Backlands**

With Dr. David Patriquin

This document is a low resolution PDF of the Power Point presentation by David Patriquin to SCANS on Oct 22, 2018.

It is posted for personal use and should not be further distributed. (Please refer interested persons to www.versicolor.ca/scans)

All images are ones that I created or have permission to use or for which public use is permitted except for four; in those there are diagonal black lines through the images. Sources of those images are given and can be consulted to view the unadulterated, hi-res images,

At some point I will post an annotated, hi-res version on Dalspace.

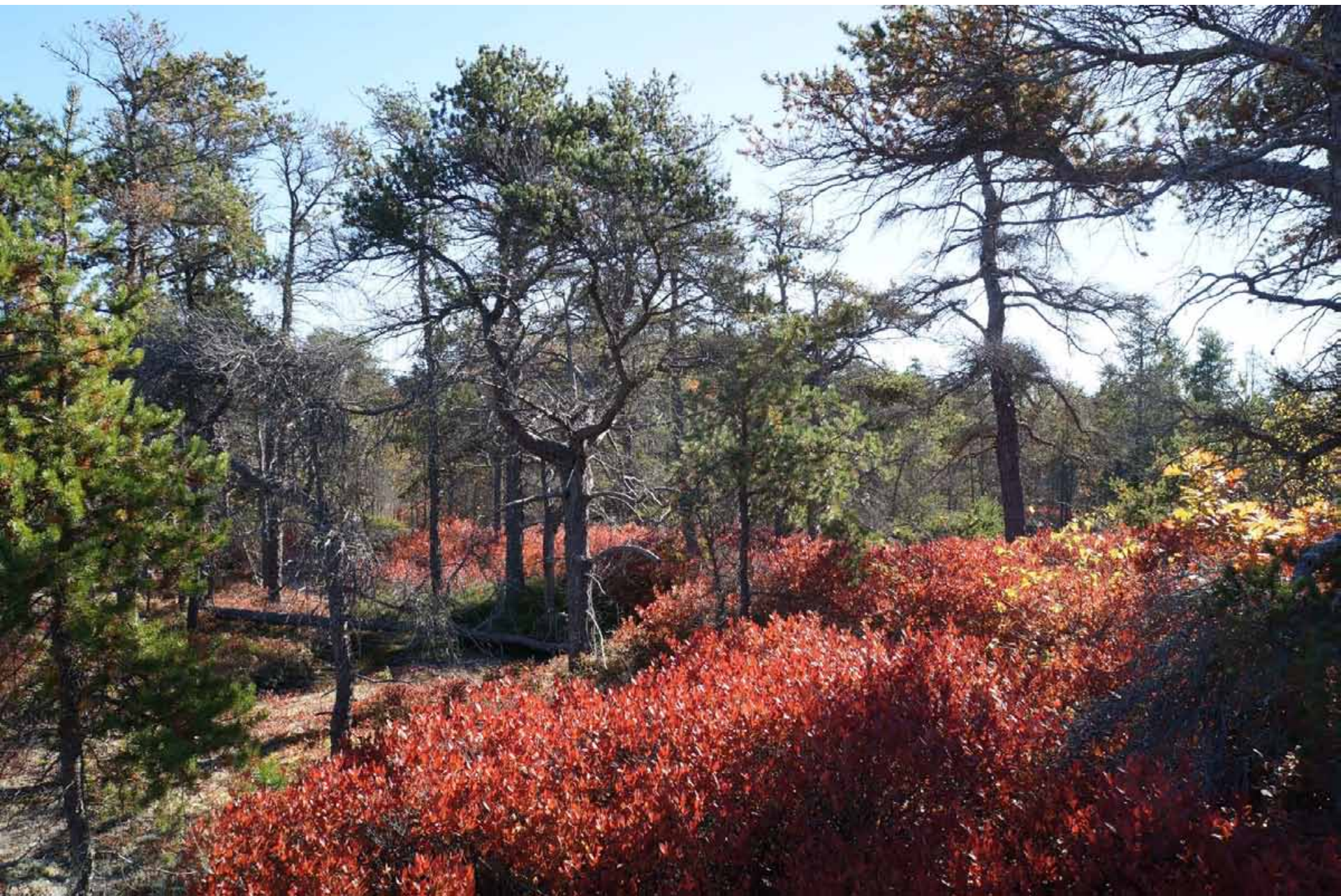
- David Graham Patriquin, 22 Oct 2018

What's Ahead

- **The best time to view the Backlands**
- **My Bioregion: the Chebucto Peninsula**
 - Key Ecological Processes
 - The Fire-embracing Species
 - The Jack Pine/Broom Crowberry Barrens
- **A piece of the Backlands under the microscope**
 - Geology, Fire and Water
- **Why conserve the Ecological Integrity?**
- **Threats**
- **Action**

Some links at: www.versicolor.ca/scans







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[Contact Us](#)

Artwork & Photos

A few photographs of the Backlands and their inhabitants are shown below. See Geoffrey Grantham's page on this website with his [impressionist landscapes](#) for a sense of the place.

Click on photos for larger versions



Water Flowing Over Rocks, Flat Lake (Geoffrey Grantham)



Barrens Between the Captain Arnell Lands and Piggy Mountain (Geoffrey Grantham)

Search

Recent Posts

- [Monday October 22, 2018: The Natural History of the Halifax Backlands](#)
- [Wilderness through the Eyes of an Artist](#)
- ["Nova Scotia commits \\$1 million for Halifax wilderness park"](#)
- [Thurs Sep 20, 2018: Event for Proposed Halifax Wilderness Park](#)
- [NCC Art in the Wilderness Sun Aug 26th, Halifax Wilderness Park campaign launch Thurs Sep 20, 2018](#)

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Archives

- [October 2018](#)
- [September 2018](#)
- [August 2018](#)
- [July 2018](#)
- [June 2018](#)
- [May 2018](#)



Hobble bush by outflow from Williams Lake, May 24, 2014 (David Patriquin)



Summer in the Jack Pine Barrens (David Patriquin)



Fall heathland (David Patriquin)



Boulder field (David Patriquin)



West Pine Island Pond (David Patriquin)



Swimming spot at East Pine Island Pond
(David Patriquin)



This mushroom is not edible! (David Patriquin)



Canadian Landscape (David Patriquin)



Purcell's Pond Morning (David Patriquin)

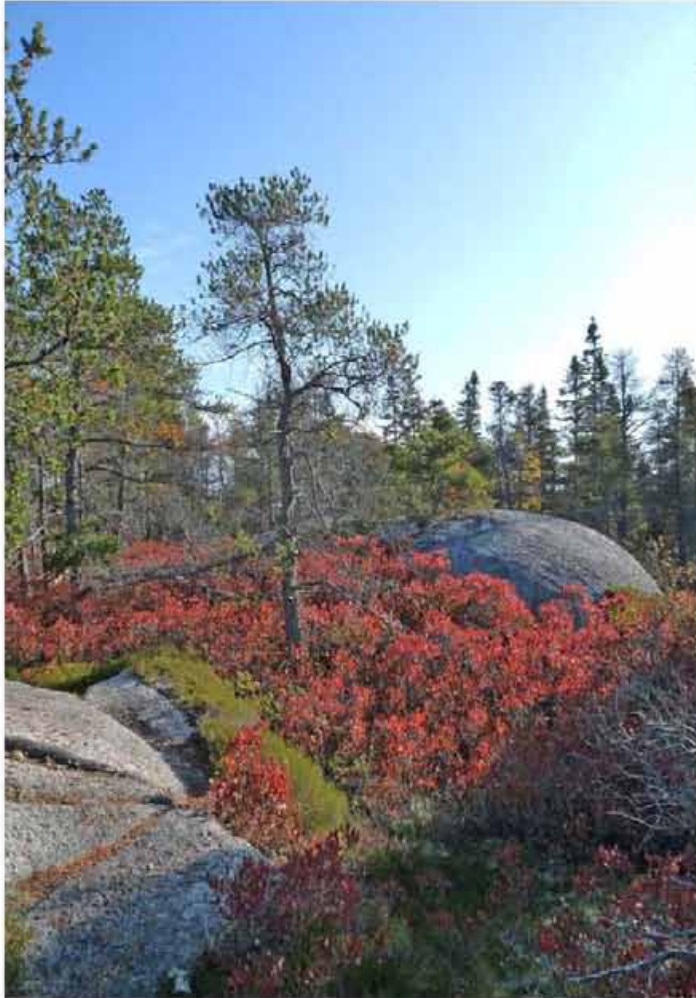


Backlands Fen (David Patriquin)



Spring in the Lower Mac Run
Woodlands (David Patriquin)

FREE PUBLIC LECTURE



Monday, Oct. 22,

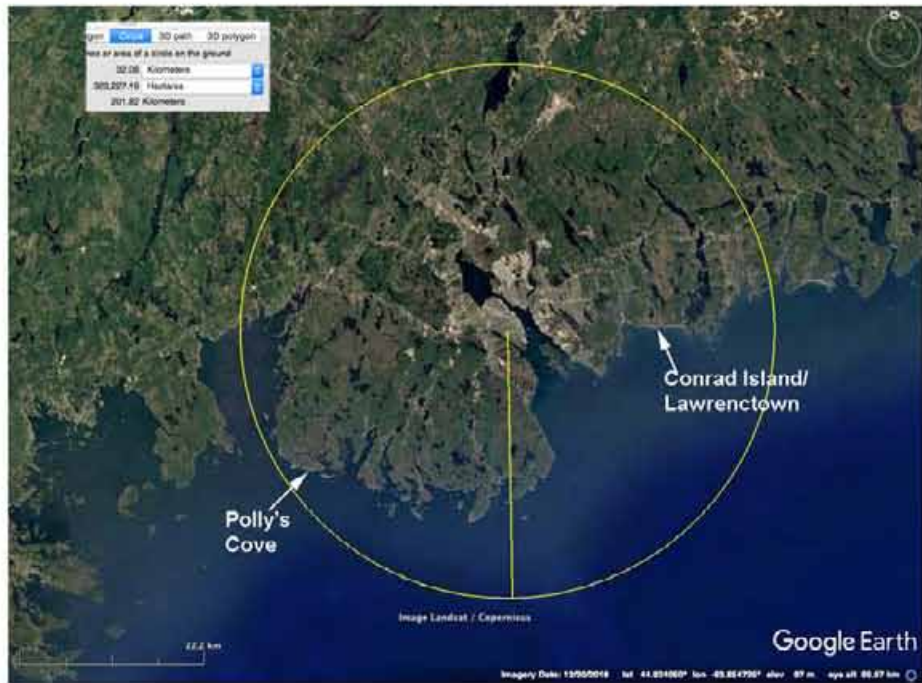
1:30 – 3:30

**Captain Wm. Spry Community
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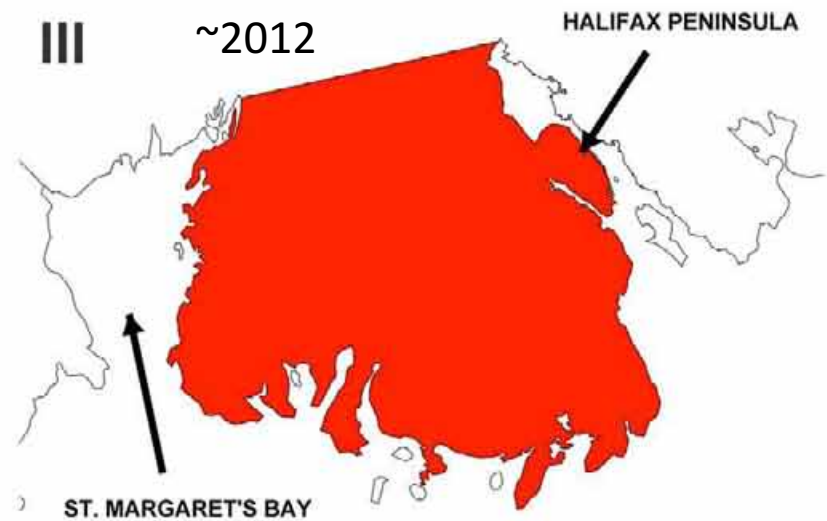
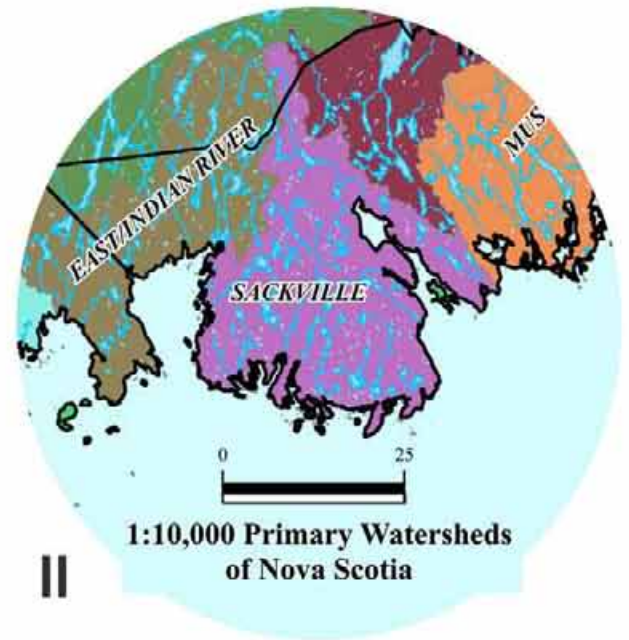
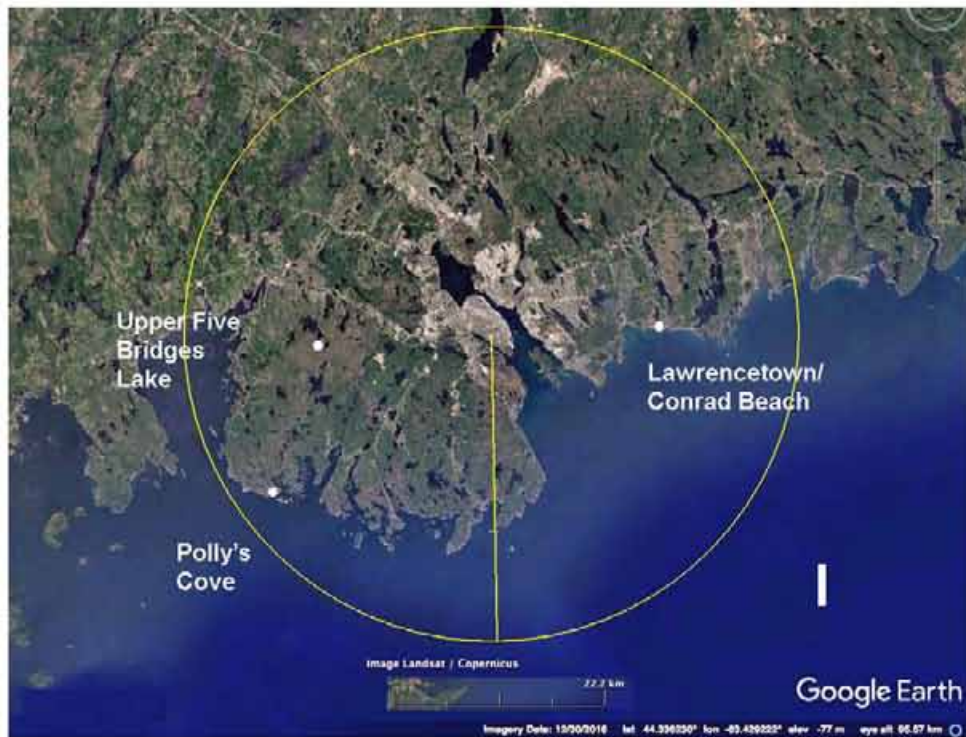
**The Seniors' College Association
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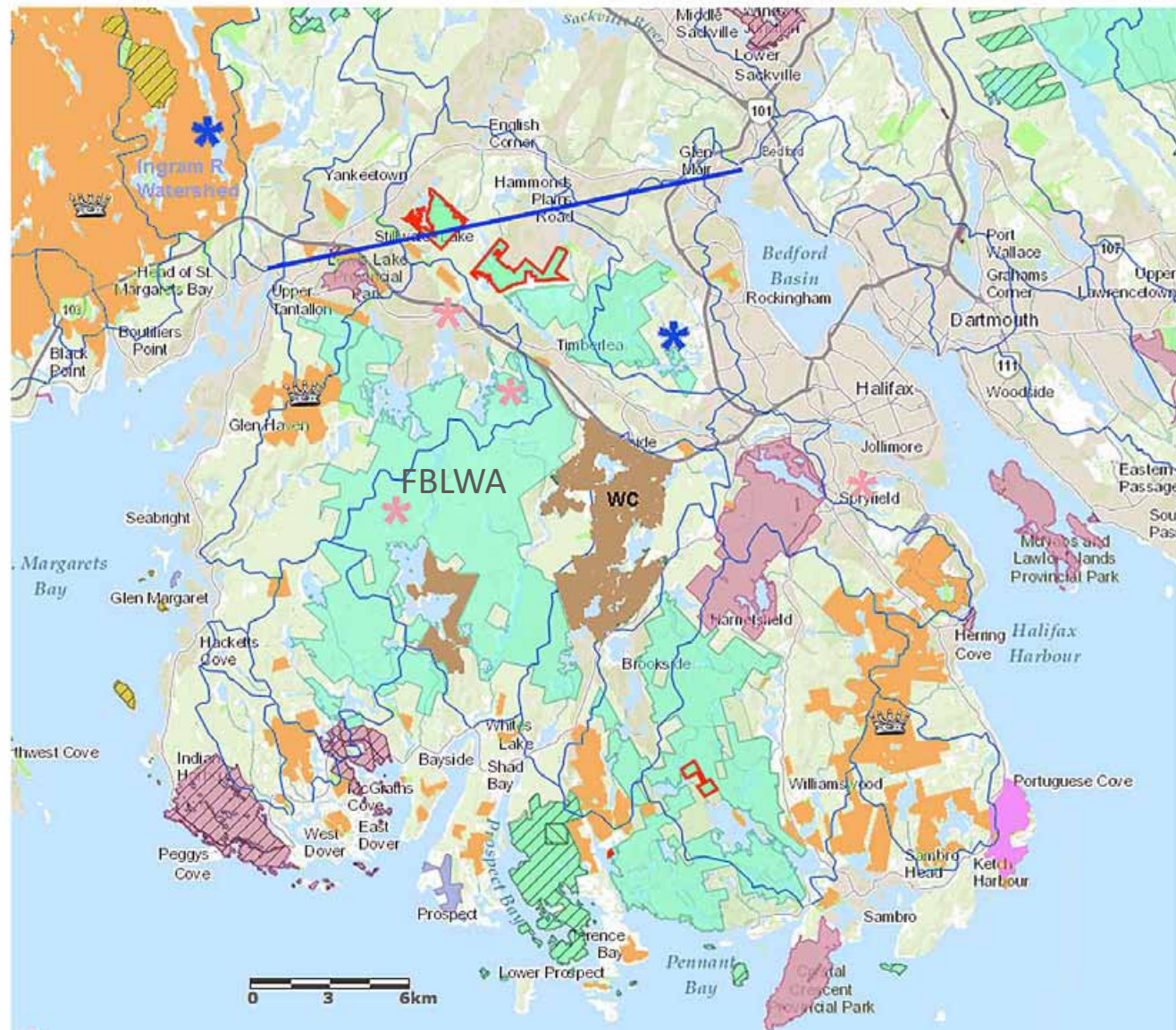


My Bioregion 2004
 ~ 50 km driving distance



The Chebucto Peninsula

- Parks & Protected Areas
- Environmental Factors influencing types of landscapes, plants & animals
 - Glacial Landscape
 - Hard, mineral-poor rocks
 - Disturbance, especially fire



* Hike the
* Greenbelt Events

The Chebucto Peninsula

Parks & Protected Areas

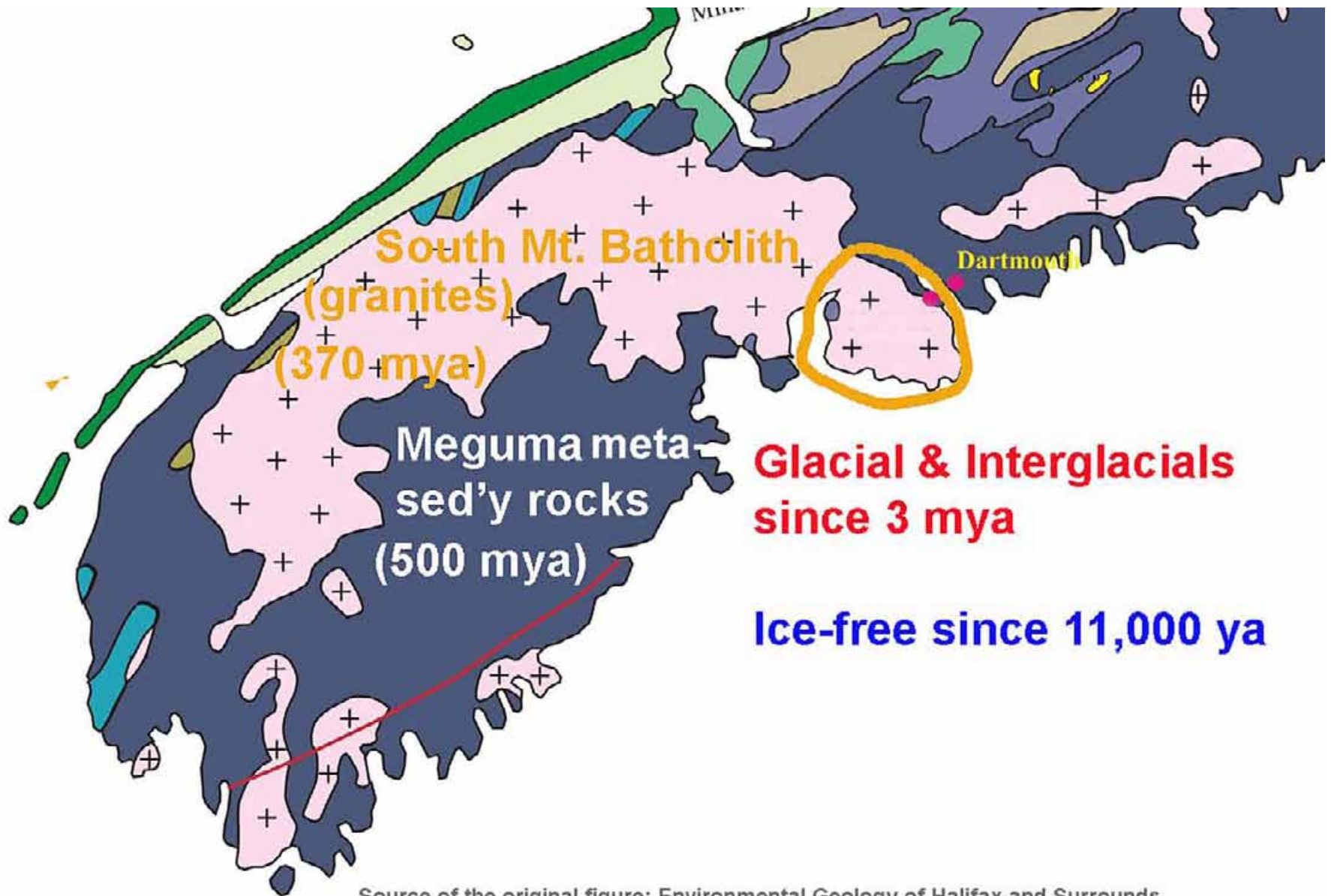
HRM lands; WC = Western Common

Crown Lands

Watershed boundary

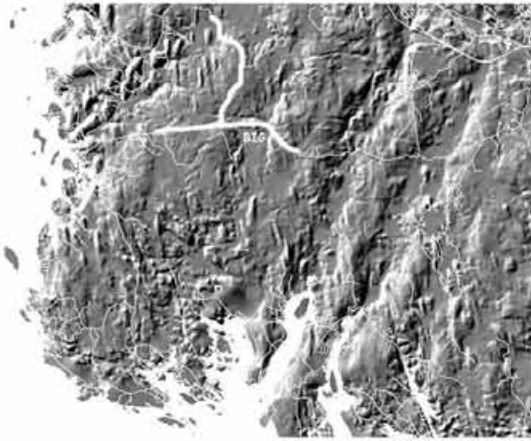
Adapted from <http://www.novascotia.ca/parksandprotectedareas/plan/interactive-map/>

Aug 6, 2016



Source of the original figure: Environmental Geology of Halifax and Surrounds.
EdGEO Field Excursion: Guidebook 20-21 August 2008.
Used with permission of the Atlantic Geological Society (March, 2010).

1: Glacial Landscape



blanket till



Forest



erratics

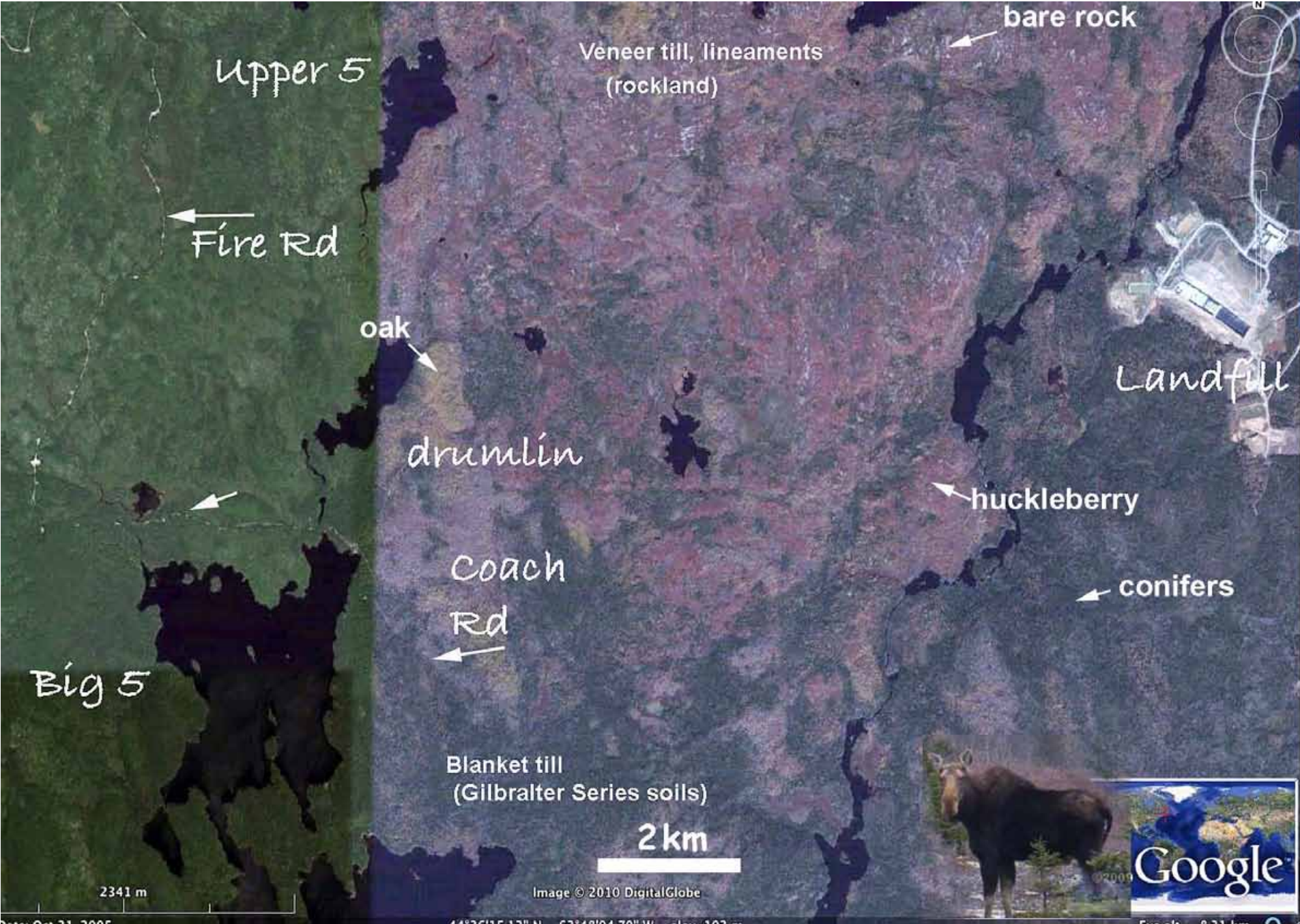


drumlins



veneer till
"The Barrens"





2: Granitic Rock & till (mostly)

- bedrock impermeable to water & roots; few fissures

extreme droughtiness



elevated areas & slopes are droughty & veg'n fire-susceptible/ fire/adapted

till, soil moderate moisture stress



extreme wetness

low-lying areas are wet, waterlogged or water filled



- rocks, till are nutrient-poor

acidic, brown water, oligo-mesotrophic lakes



acidic, low calcium soils

humic acids

Disturbance

Natural
Wind
Disease
Pests

3:
Fire

Humans
Logging
Roads
Trails

1950s+
Acid Rain
Water Pollutants
Rapid Climatic Change
Habitat fragmentation

- Natural: infrequent/200+yrs?
- Aborigines: some
- Europeans: lots!

Forests: earlier
successional stages

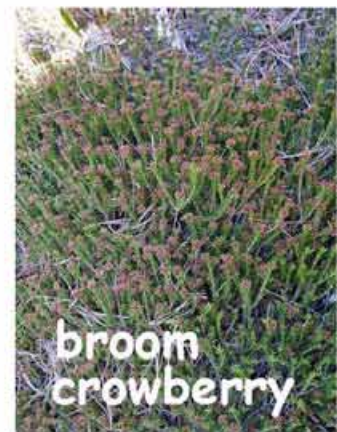


aspen, birch

?Increased area
of barrens



Fire adapted species



broom
crowberry



jack pine

huckleberry

The “fire-embracing” species

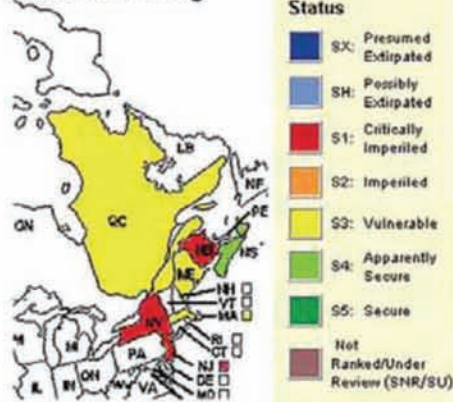
- Broom Crowberry (*Corema conradii*)
- Jack Pine (*Pinus banksiana*)



Subfamily Ericoideae

| | Tribe EMPETREAE* | |
|----|---|---------------------|
| 13 | <i>Corema conradii</i> | Broom Crowberry |
| 14 | <i>Empetrum eamesii</i> | Pink Crowberry |
| | <i>Empetrum eamesii</i> ssp. <i>atropurpureum</i> | Pink Crowberry S2S3 |
| 15 | <i>Empetrum nigrum</i> | Black Crowberry |
| | <i>Empetrum nigrum</i> ssp. <i>hermaphroditum</i> | Black Crowberry |

C. conradii
from natureserve.org



Map is from NatureServe. 2013. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 18, 2013).



mature fruit with elaiosomes



Male plants 2 Apr. 2012

Corema conradii

State/Province
Conservation
Status

- SX: Presumed Extinct
- SH: Possibly Extinct
- S1: Critically Imperiled
- S2: Imperiled
- S3: Vulnerable
- S4: Apparently Secure
- S5: Secure
- Not Ranked/Under Review (SNR/SU)



E. nigrum

5 mm



E. eamesii



C. conradii

Empetrum nigrum



5 July 2008 at Chebucto Head

Empetrum eamesii



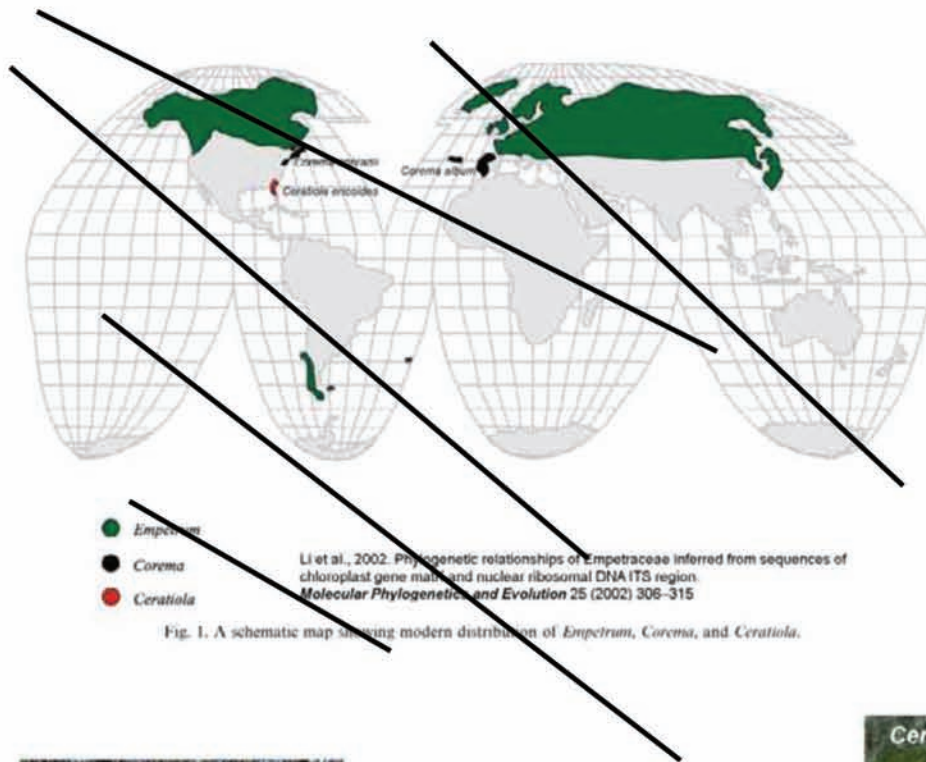
E. nigrum female flowers
28 Apr 2009

Magnus Popp, Virginia Mirre, and Christian Brochmann

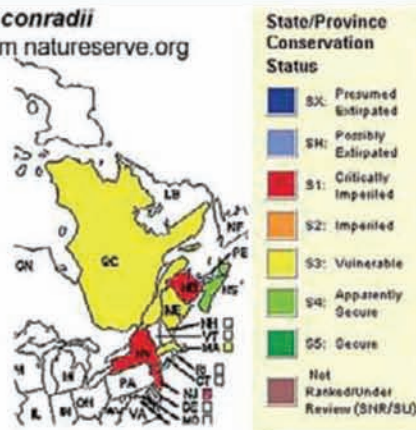
A single Mid-Pleistocene long-distance dispersal by a bird can explain the extreme bipolar disjunction in crowberries (*Empetrum*)
6520-6525 | PNAS | April 19, 2011 | vol. 108 | no. 16



Fig. 1. Total geographic range of crowberries (the genus *Empetrum*) and the origin of the accessions included in this study. Black squares and black dots indicate diploid and tetraploid *E. nigrum*, and blue, pink, and red dots indicate *E. atropurpureum*, *E. eamesii*, and *E. rubrum*, respectively. The dotted lines approximate the distribution of *Empetrum*, namely north of 40°N in the northern hemisphere and south of 36°S in South America and the Falkland, Tristan da Cunha, and Gough Islands. Reproduced with permission of Magnus Popp.



C. conradii
from natureserve.org



Map is from NatureServe. 2013. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 18, 2013).



2. COREMA D. Don

1. *C. Conradii* Torr. Fig. 95. Map 357. BROOM-CROWBERRY
Sandy or rocky soils; scattered in southern Yarmouth and Shelburne Co.; common on the sand plains of the Annapolis Valley, and in Colchester and Cumberland Co. on the sandiest soils; on the rocky barrens of Halifax Co. near the coast and rare to Antigonish and Guysborough. Flowering about the first of May.

Nfld.?, and P.E.I. to Que. S. to the sand barrens of N.J.

From: Roland & Smith
Flora of Nova Scotia
NS Museum, 1969



1. *E. nigrum* L. Fig. 95. Map 356. BLACK CROWBERRY

Bogs, acid barrens, sea-cliffs and headlands around the whole Province; in places in the southern region of acidic rocks it is one of the predominant plants in bogs; inland and northward it is rarer and confined more to damp and exposed locations; characteristic of cliffs along the Bay of Fundy; abundant in northern C.B. and on Sable I. July-Sept.

Greenland to Alaska south to alpine areas of New Eng. and N.Y., Minn. and Calif.

3. *E. Eamesii* Fern. and Wieg. Map 351.

Rare, northern tip of C.B.: Lockhart Brook, Salmon R.; Ingonish Barrens, 7 miles west of Neil's Harbour, here growing with *E. atropurpureum* on hummocks in the barren (Erskine, D.S., 1951); scattered on rocky cliffs around the coast near Halifax. The habitat of this species is different from that of the first species, growing on exposed headlands, on top of rocks with thin soil and with lichens.

Common in southern Lab. and Nfld.; St. Pierre and Miquelon, the northern tip of C.B. and around Halifax.



May 15, 2014



Feb 11, 2007
near W. Dover

Rock Barrens



May 4, 2008, PCCL

Broom Crowberry in N.S.



Aug 16, 2013 Kingston

Sand Barrens



Aug 16, 2013 Kingston B&B



Aug 4, 2013 Indian Fields



February 11, 2007



March 25, 2006 Flower buds



Male plants 2 Apr. 2012



April 30, 2009.



April 30, 2009.



May 4, 2008.



June 7, 2009.



July 11 & 14, 2009



mature fruit with elaisomes



Aug. 27, 2010.
(Fire on Apr 30. 2009)



March 18, 2006
Halifax Field Naturalists/Burkhard Plache



Jack Pines in the
Halifax "Backlands"



Aleppo Pines at Karaeas, Greece

Athens Nature Journal by Dr. Zógaris



Landscape of Aleppo pines (*Pinus halepensis*)
<http://www.niwaki.com/blog/2013/03/19/a-few-days-in-greece/>



1999 Kareas
Fire

4 Volunteer firefighters extinguish a forest fire in Kareas
suburb, east of Athens, Greece.

patrizioradaelli.blogspot.com



Ross O'Flaherty
April 30, 2009



Spryfield Fire 2009

- 800 ha burned (~60% of PCB)
- Destroyed 8 houses, damaged 10 others
- Crown Fire: Jack Pine cones opened
- All ground vegetation burnt

Of all boreal forest conifers, jack pine is best adapted to fire [66]. With medium thick bark [15], mature individuals have only a moderate tolerance of fire, but populations survive because of delayed seedrelease from serotinous cones, early reproductive maturity, fast growth rates in full sun, and preference for mineral soil seedbeds [54,66]. (Source: Carey, Jennifer H. 1993. USDA Fire Effects Information Service)





Cones at
5-10 yrs

Maturity
75 years

Max.
lifespan;
ca. 200

PHYLOGEOGRAPHIC STRUCTURE OF JACK PINE (*PINUS BANKSIANA* ; PINACEAE) SUPPORTS THE EXISTENCE OF A COASTAL GLACIAL REFUGIUM IN NORTHEASTERN NORTH AMERICA 1
Julie Godbout et al., Am J. Botany 97 (2010): 1903–1912

"MtDNA data suggest that populations from the Maritimes region derive from genetically depauperated northcoastal refugium.

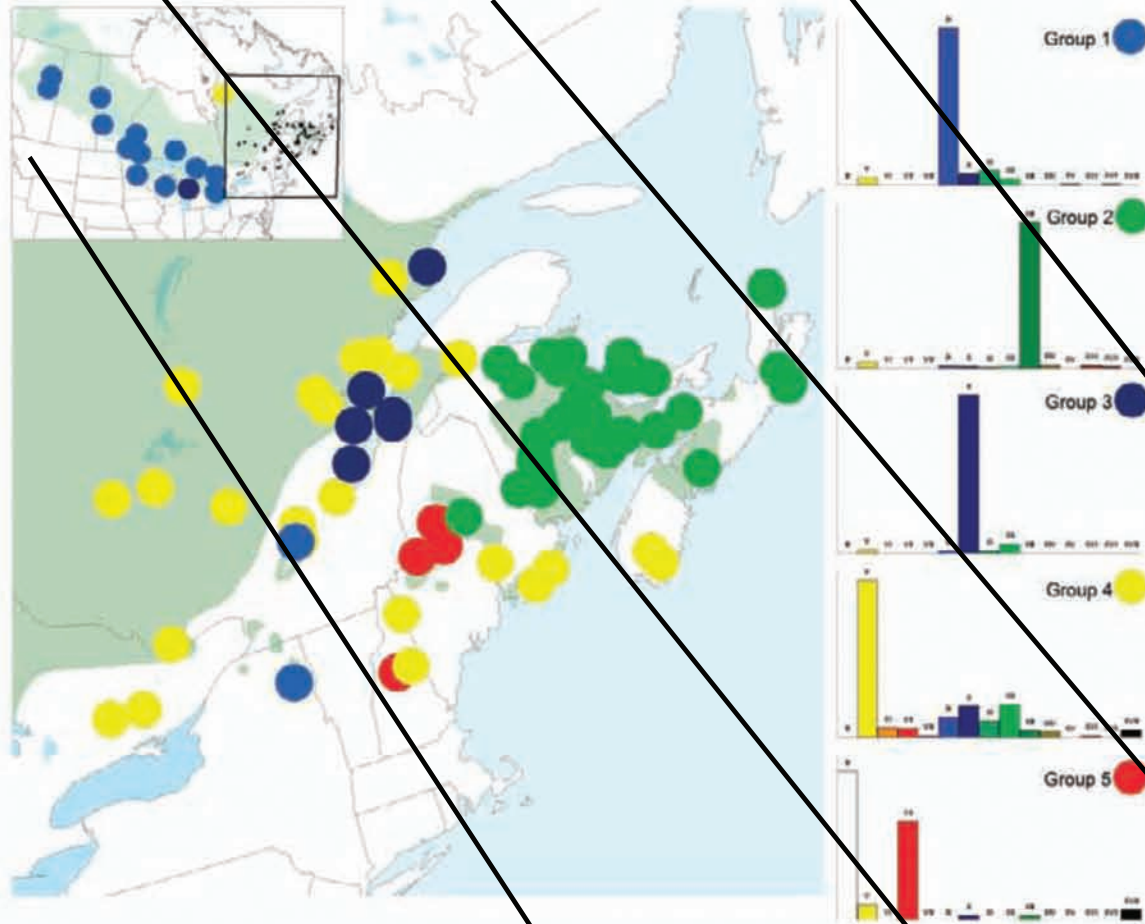


Fig. 3. Geographical distribution of jack pine populations following their membership to the five groups delineated by the spatial analysis of molecular variance analysis (Dupanloup et al., 2002) of mitochondrial DNA haplotype frequencies. Histograms represent the relative proportion of mitotypes in populations included in each of the groups. Group and mitotype colors correspond to Fig. 1 .

NS Forest Ecosystem Classification Part I: Vegetation Types

SP1

Jack pine / Bracken – Teaberry

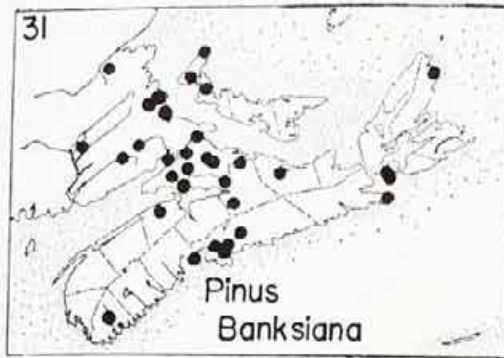
Pinus banksiana / *Pteridium aquilinum* –
Gaultheria procumbens

SP1a

Black spruce variant

Picea mariana

n=15



Chase Lake,
Cumberland County

4. *P. Banksiana* Lamb. Map 31. Fig. 8, d. JACK PINE

Rock outcrops, shallow gravelly soils or sand plains, more rarely on clay soils, consistently on highly acid soils. Jack Pine occurs mainly in the central portion of the Province: most common in Cumberland County; on sandy areas in Colchester Co., as at Debert and back of Stewiacke; and in rocky locations in Halifax Co. Two areas are known in the Annapolis Valley: at Cambridge and east of Centreville in Kings Co. Elsewhere it occurs in rather small stands from Shelburne Co. to northern C.B. where it is known from Black Brook and New Haven in Victoria Co. (Bentley and Smith, 1958).

Forma procumbens Rousseau, Nat. Canad. 65: 301. 1938, is a shrubby form 0.5-2 m high, with the branches procumbent. Found on the exposed rocky headlands in the vicinity of Canso. Known also from Que.

N.S. to the Mackenzie south to northern N.Y. and Minn.



WC3

Jack pine – Black spruce / Rhodora / Sphagnum

Pinus banksiana – *Picea mariana* /
Rhododendron canadense / *Sphagnum* spp.

WC3a

Black spruce variant

Picea mariana

n=9

Thomson Station,
Cumberland County

OW1

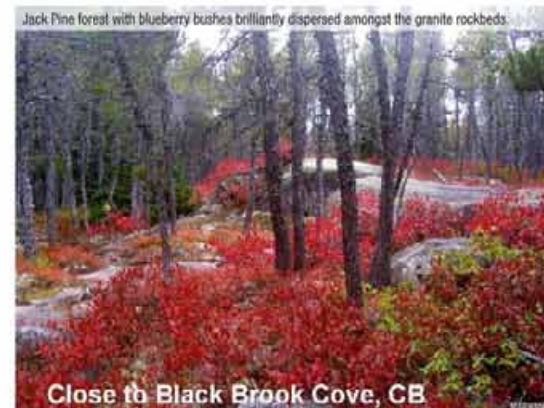
~~Jack Pine / Huckleberry / Black crowberry / Reindeer lichen~~ **Broom**

Pinus banksiana / *Gaylussacia baccata* /
Empetrum nigrum / *Cladina* spp.

n=8



Blandford,
Lunenburg County



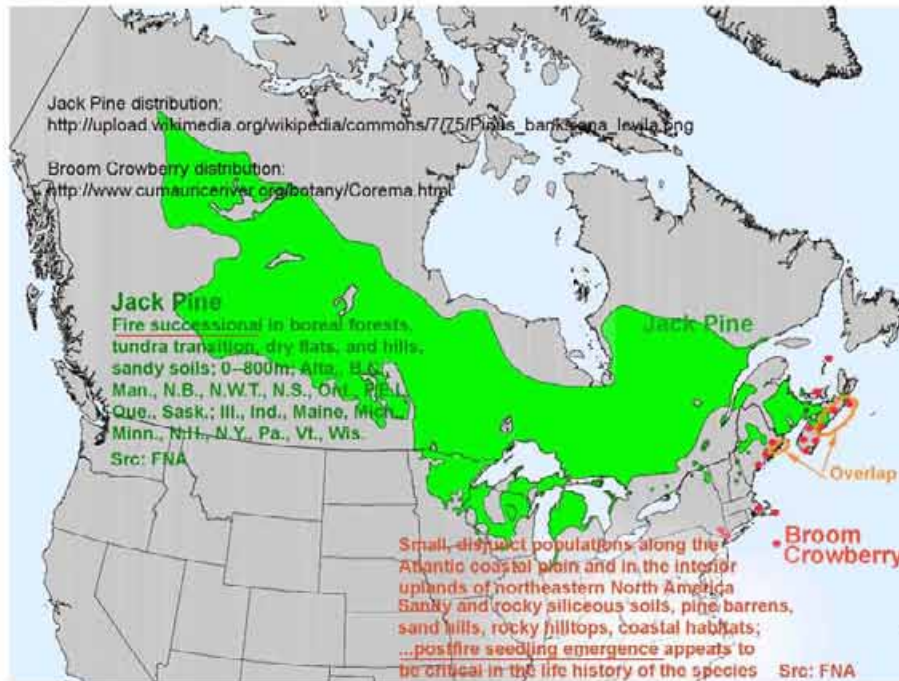
Close to Black Brook Cove, CB

Putting Broom Crowberry and Jack Pine together

- **The Jack Pine – Broom Crowberry Barrens, nationally unique and globally rare**
- **Pine Barrens and Pine Woodlands broadly as endangered, fire-dependent ecosystems**



Jack Pine/Broom Crowberry Barrens: Nationally *unique* & Globally rare



Patches on high, windswept outcrops of hard rock within a few kilometres of the Atlantic coast, from the Aspotogan Penin. east to Canis. A few on coastal barrens (within 500 of coast).



“A nationally unique and globally rare ecosystem for which Nova Scotia would seem to have the primary global responsibility for conservation”

Pine barrens

From Wikipedia, the free encyclopedia

Pine barrens, **pine plains**, **sand plains**, or **pinelands** occur throughout the U.S. from Florida to Maine (see Atlantic coastal pine barrens) as well as the Midwest, West, and Canada and parts of Eurasia.

Pine barrens are plant communities that occur on dry, acidic, infertile soils, dominated by grasses, forbs, low shrubs, and small to medium-sized pines.

The most extensive barrens occur in large areas of sandy glacial deposits (including outwash plains), lakebeds, and outwash terraces along rivers.

Botany

The most common trees are the Jack pine, red pine, pitch pine, blackjack oak, and scrub oak; a scattering of larger oaks is not unusual.

The understory includes grasses, sedges, and forbs, many of them common in dry prairies, and rare plants such as the Sandplain Gerardia (*Agalinis acuta*). Plants of the heath family, such as blueberries and bearberry, and shrubs, such as prairie willow and hazel, are common. These species have adaptations that permit them to survive or regenerate well after fire.

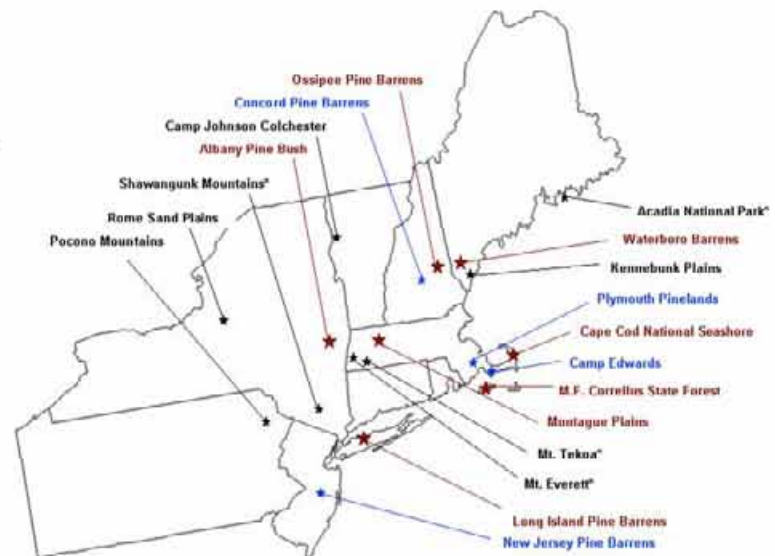
Fire ecology

Barrens are dependent on fire to prevent invasion by less fire-tolerant species. In the absence of fire, barrens will proceed through successional stages from pine forest to a larger climax forest, such as oak-hickory forest. European settlers found extensive areas of open game habitat throughout the East, commonly called "barrens". The American Indians used fire to maintain such areas as rangeland.^[1] Open barrens are now rare and imperiled globally. Suppression of wildfires has allowed larger climax forest vegetation to take over in most one-time barrens. In North America, the largest natural pine barrens exist primarily in parts of the American Midwest and in dry sandy areas along the East Coast.

Pitch Pine-Scrub Oak Barren



Source: NY Natural heritage Program, photo by Stephen M. Young



* denotes Rock Outcrop Barrens; all other sites are Sand Plain Barrens

Northeastern Pitch Pine Barrens

http://www.umass.edu/nebarrensfuels/ne_barrens/

“Pine Barrens” share many features with fire-dependent or fire-stimulated Pine and Pine-Oak Woodlands..., most, also endangered ecosystems.

E.g., prominent in B.C., Western USA, US southeast...
Mexico, Mediterranean Basin

Pines: ~ 95 species; 34 native to NA, 9 to Canada, 3 to NS

Keeley’s four pine syndromes (strategies, suites) in relation to fire*

1. **fire-avoiders** (not fire-adapted; with thin bark)
2. **fire-toleraters** (adapted to surface fires; with thick bark and self-pruning of dead branches; tall pines)
3. **fire-embracers** (adapted to crown fires; with retention of dead branches and serotinous cones)
4. **fire-refugia** (with marked metapopulation dynamics) strategies - refugia populations act as sources for expansion after fire.

Examples:

- **Mediterranean:** *Pinus halepensis* (Aleppo pine) & *Pinus brutia* (Turkish pine)
- **High Latitude North American:** *Pinus contorta* (lodgepole pine),
- **Boreal:** *Pinus banksiana* (jack pine)
- **California chaparral:** *Pinus attenuata* (Knobcone pine)

* Jon E. Keeley. 2012, Ecology and evolution of pine life histories
Annals of Forest Science (2012) 69:445–453



A piece of the Backlands under the Microscope

- **The Williams Lake Backlands**



Ecological Assessment of the Plant Communities of the Williams Lake Backlands

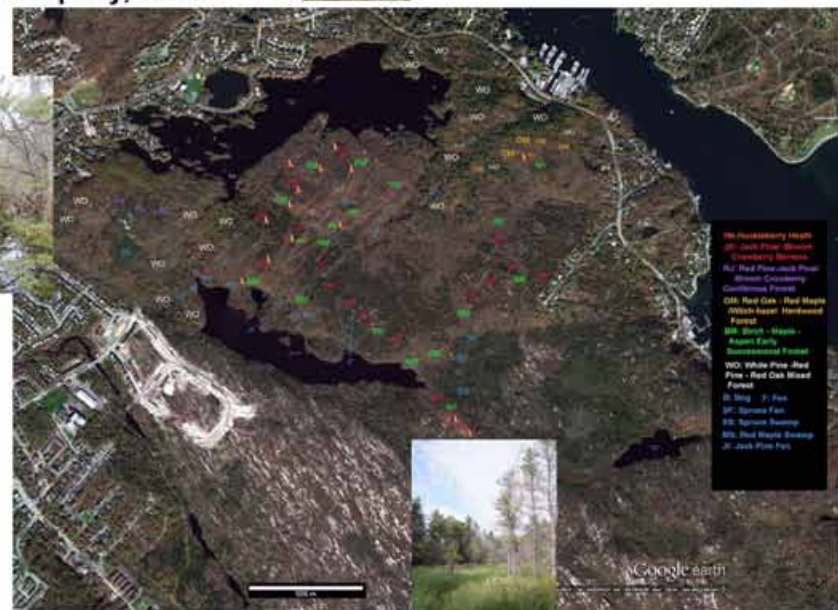
A REPORT to The Williams Lake Conservation Company, 2013*
by N. Hill & D. Patriquin 108 pp

Objectives

(i) to contribute to WLCC's understanding of the Williams Lake Watershed & how it influences water quality of Williams Lake;

(ii) to characterize the area in relation to efforts to see it formally protected

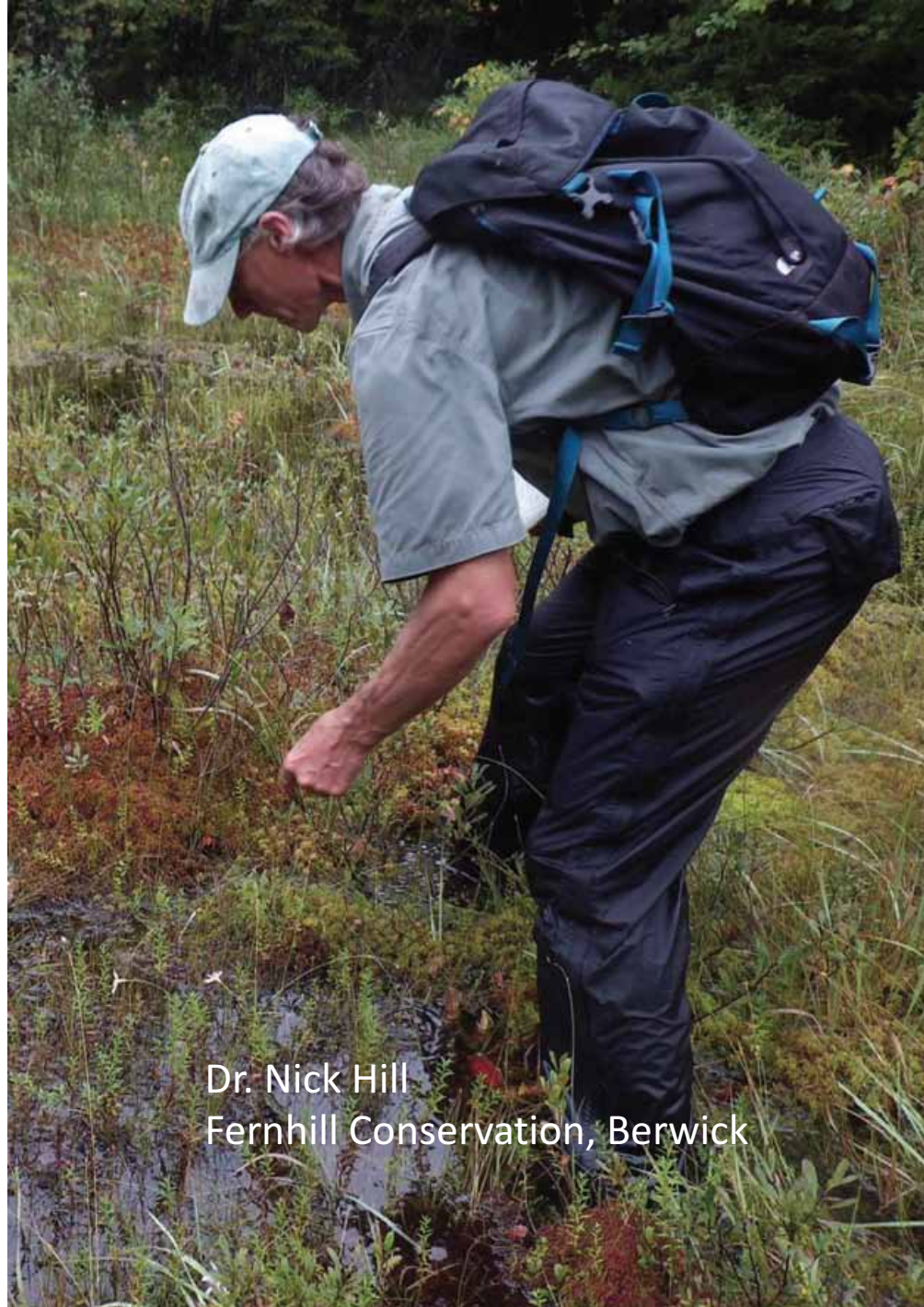
(iii) to document wetlands and other features that should be protected in the event some of the area is developed.



*Link: versicolor.ca/wlcc



Fig. 1.1 Google Map showing Purcell's Backlands and major watersheds. The boundaries for the watersheds are approximate. Broken line marks eastern boundary of the McIntosh Run watershed.



Dr. Nick Hill
Fernhill Conservation, Berwick

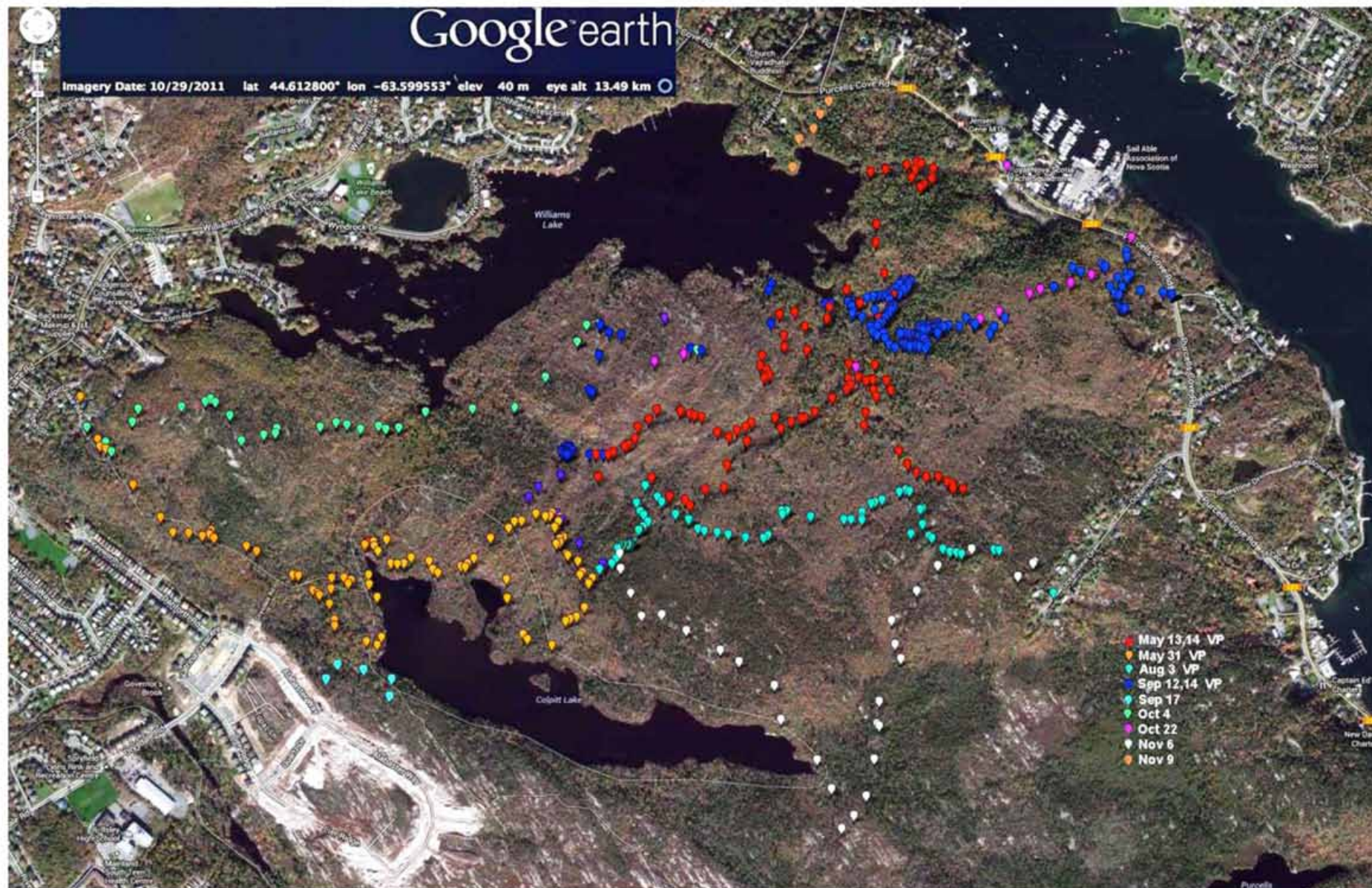


Fig. 2.2 Waypoints from all surveys on Google Satellite Map.

The Mosaic Landscape

- Geology
- Disturbance



A mosaic of landscapes & plant communities associated with high variability on a small scale in:

- Topography
- Depth of soil/till
- Drainage
- Surface Water Storage
- Ages since disturbance



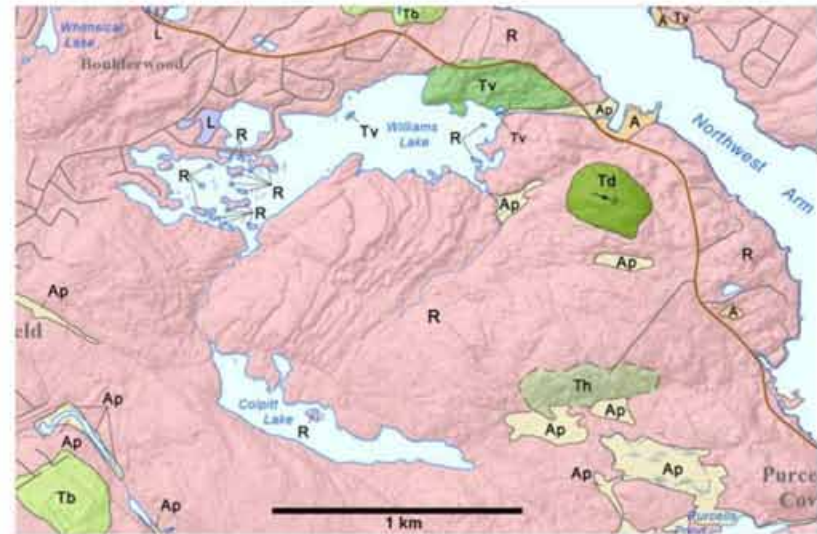
Fig. 3.1 Google Earth perspective of Williams Lake Backlands approached from the northeast.

- All related to:
- Distribution of glacially scoured hard rock outcrops of SMB
 - Outcrops of highly folded & metamorphosed Halifax Group black slates and siltstones of the Meguma Supergroup
 - A contact zone between the two rock types
 - Deposition of glacial till

BEDROCK GEOLOGY



SURFICIAL GEOLOGY



DEVONO-CARBONIFEROUS

DCImH HALIFAX PENINSULA LEUCOMONZOGRANITE: light- to whitish-grey, pinkish- to orangish-grey, medium- to predominantly coarse-grained, megacrystic (5-50%), biotite (4-6%), muscovite (trace-2%), cordierite (trace-4%)

DCImT TANTALLON LEUCOMONZOGRANITE: light- to medium-buff-orange, pink, red, light- to medium-whitish grey, fine- to medium-grained, equigranular and aplitic to porphyritic, biotite (trace-6%), muscovite (1-4%), cordierite (0-3%), large alkali feldspar phenocrysts > 2.5 cm (0-5%)

CAMBRO-ORDOVICIAN

MEGUMA GROUP (after Faribault, 1908)

COH HALIFAX FORMATION: finely laminated black slates and siltstones

CENOZOIC

QUATERNARY

HOLOCENE (postglacial)

- A** Alluvium: Alluvial or glacial material that has been deposited and redistributed by fluvial activity, before highly eroded. Sites that may consist of localised accumulations and are mapped as the original source because of the apparent and shallow nature of the modification.
- Ap** Alluvial: Gravel, sand, silt, clay and organic deposits. Deposited by alluvial streams and close to channels and floodplains. Thickness estimated from 1-10 m.
- M** Marine littoral: Beaches, mudflats, sand and organic deposits. Coarse material predominates where dunes form headlands, fine material forms beaches, barrier bars and spits. Sediments deposited or reworked in the littoral zone (i.e. between and backshore) by wave action, longshore drift and other processes. Thickness estimated from 1-5 m.
- L** Lacustrine: Sand, silt, clay and organic deposits. Sediments deposited from suspension in freshwater lakes, ponds and wetlands, includes diatomaceous material deposited or reworked by wave action. May be overlain by till or glaciolacustrine material (sand, silt and clay with siltstone drapings). Thickness estimated from 1-5 m.

PLEISTOCENE (last glaciation)

- Tb** Hummocky till: Brown River Till is a deposit with some, sandy matrix and locally derived clasts. Surface topography is irregular with small mounds of till deposits. Sediments derived from subglacial erosion and medial processes. These deposits may represent areas reworked by wind-blown silt. Thickness estimated from 1-10 m.
- Tv** Till blanket: Brown River Till is a deposit with sandy matrix and locally derived clasts. Sediments deposited by ice and derived from subglacial erosion. Thickness estimated from 5-10 m (thick enough to mask irregularities of the underlying bedrock).
- Tv** Till veneer: Brown River Till is a deposit with sandy matrix and locally derived clasts. Sediments deposited by ice and derived from subglacial erosion. Thickness estimated from 5-10 m. Some areas include exposed bedrock and fluvial till deposits (>5 m) of locally derived till.
- Td** Drumlins: Drumlins are landforms with long axes parallel to ice flow, composed of up to three till, a core of till and till (observed only at coastal locations), overlain by lacustrine till, and in some areas, overlain by Brown River Till (described above). Harbor Till is a deposit with clayey till matrix, and predominantly heavily eroded and some locally derived clasts. Lacustrine Till is a deposit with fine-grained, unsorted, clayey till matrix, and predominantly locally derived clasts. Thickness of drumlins are affected by the surface relief of the landforms they are sitting on. In some locations depth to bedrock (plotted) from water and data of Kennedy et al., 2000 records the surface relief, suggesting material likely is projected topographic line is potentially. These 900 m may exceed 30 m.

PALEOZOIC

- R** Bedrock: Bedrock exposed at surface or beneath shallow soil. It may include entire basal, lacustrine and till deposits. Exposed surface is generally covered with ice movement features, such as melt, which are indicated by symbols where identified. Obvious bedrock ridges seen on the LORAR 1:50,000 map represent areas of bedrock ridges within individual formations.

Sources:

Nova Scotia Department of Mines and Energy Map 87-6
Geological Map of Halifax and Sambro
MA Macdonald and RJ Horne 1987

Nova Scotia Department of Natural Resources - Mineral Resources Branch
Surficial Geology Map, Part of the Herring Cove Claim
D. J. Utting Open File Map ME 2011-011

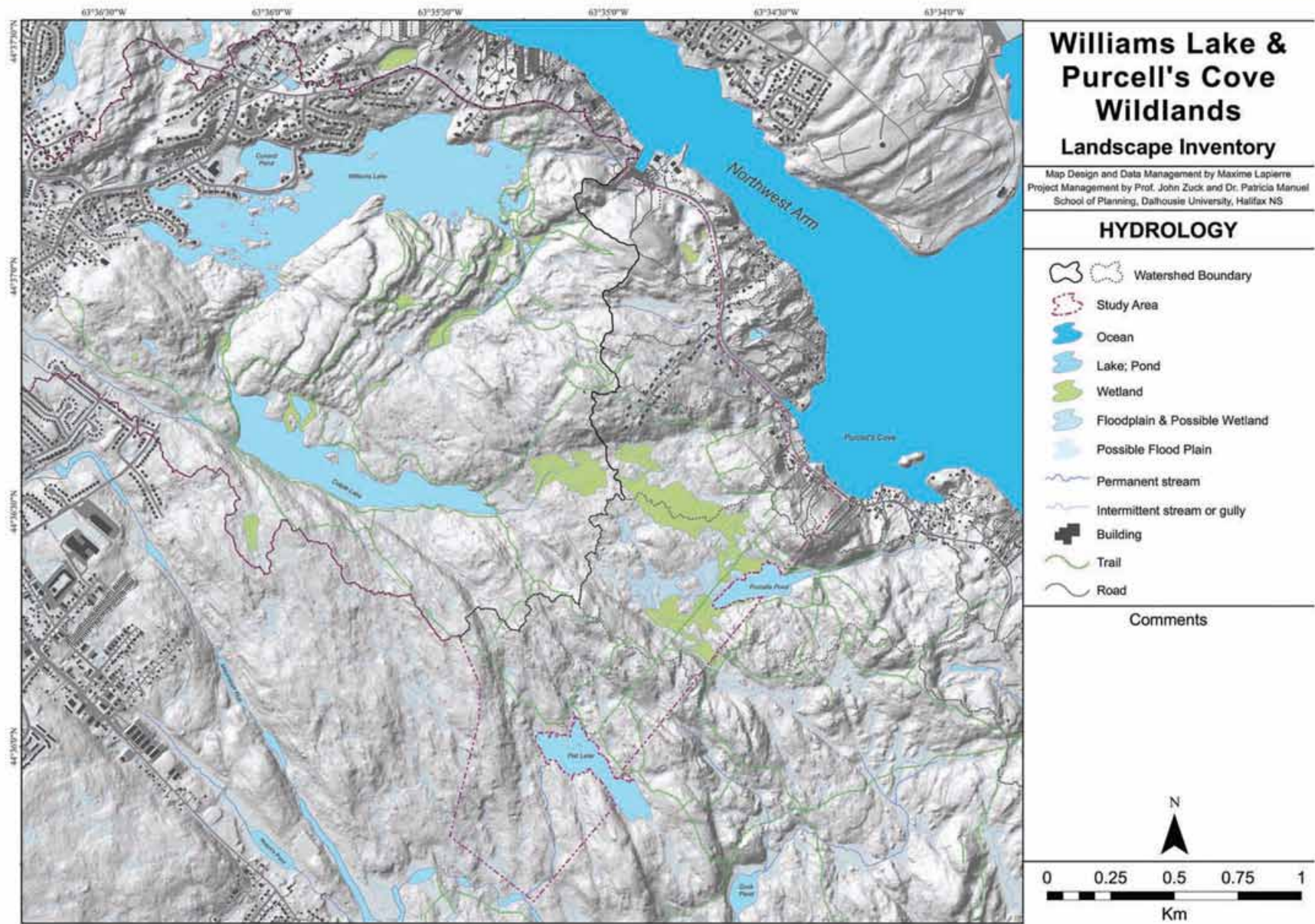




Fig. 3.2

Some prominent features of the glacial landscape of the Williams Lake Backlands

A: Large erratic & D: boulder field, both in the area of Halifax Series bedrock;

B, C: whaleback in area of granite bedrock.





Fig. 7.5

Other types of boulder accumulations.
 A, B, and C are in areas of granite bedrock,
 D and E in areas of Halifax Series bedrock.

Disturbance by fire, wind and pests in the WLB

A, B: Barrens areas that burned in spring of 2012 and 2009



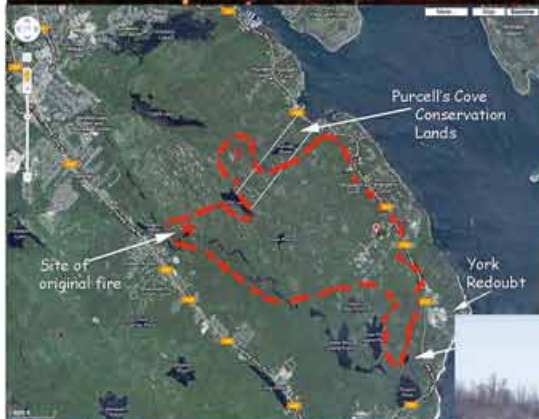
C, D: Recent tip up (Red Oak) and snap (White Pine).



E, F: Red Pine southwest of Williams Lake killed by unidentified pest,

G. Healthy Red Pine by east side of Williams Lake.





Spryfield Fire 2009

- 800 ha burned (~60% of PCB)
- Destroyed 8 houses, damaged 10 others
- Crown Fire: Jack Pine cones opened
- All ground vegetation burnt

Other recent larger fires: 2012 15 ha by Wms Lake; 2006/7 5 ha on drumlin;
1964 into forest by Wms Lake; ~1959 Lower Mud Pond area
....1917: last "big fire" on Arnell property

The Plant Communities

- The species
- What's rare
- Classification of Upland Plant Communities

Vascular Plants

-112 species

-2 exotics

-3 spp ranked S2 or S2/S3
(other S4/S5 or S5)



S5=Secure, S4=Apparently Secure
S3=Vulnerable S2=Imperiled
S1=Critically Imperiled.

- *Carex adjusta** (Burnt Sedge) S2/S3
- *Hudsonia ericoides** (Golden Heather) S2
- *Minuartia groenlandica** (Mt. Sandwort) S2

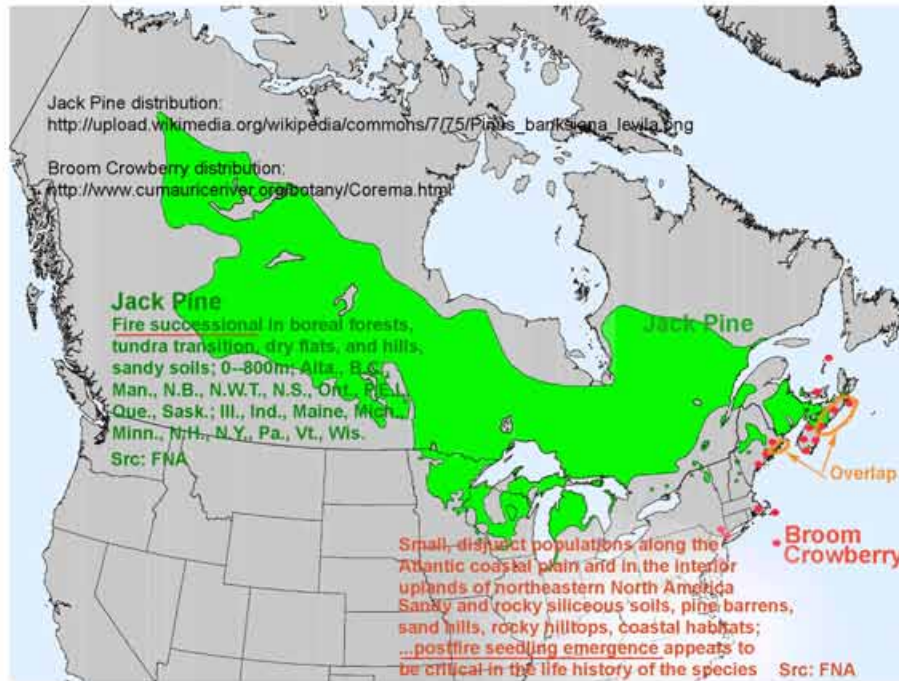


*Pinus banksiana*** (Jack Pine): S5 in N.S. but
rare on Atlantic coast A boreal forest sp.



*Corema conradii*** (Broom Crowberry):
S4/S5 in N.S. but S1-S3 elsewhere.
An Atlantic Coastal Plain sp.

Jack Pine/Broom Crowberry Barrens: Nationally *unique* & Globally rare



Patches on high, windswept outcrops of hard rock within a few kilometres of the Atlantic coast, from the Aspotogan Penin. east to Canso. A few on coastal barrens (within 500 of coast).



“A nationally unique and globally rare ecosystem for which Nova Scotia would seem to have the primary global responsibility for conservation”

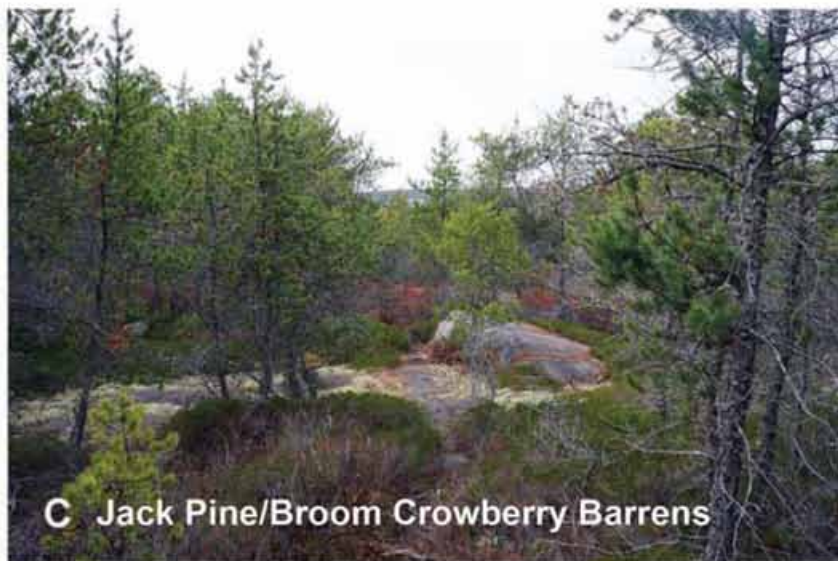
Table 3.1 Our classification of upland plant communities, wetlands and other sites of water storage or channeling in the WLB.

| Upland Vegetation Types | Wetlands & Other Sites of Water Storage or Channeling |
|---|--|
| 1. Broom Crowberry - Blueberry/Reindeer Lichen Barrens | 1. Vernal Pools |
| 2. Huckleberry Heath | 2. Swamp/Vernal Pool complexes |
| 3. Jack Pine/Broom Crowberry Barrens | 3. Shrub Swamps |
| 4. Red Pine-Jack Pine/Broom Crowberry Coniferous Forest | 4. Treed Swamps |
| 5. Birch-Maple-Aspen Early Successional Forest | 5. Fens |
| 6. Red Oak-Red Maple/Witch-hazel Hardwood Forest | 6. Lakeshore Fens |
| 7. White Pine -Red Pine - Red Oak Mixed Forest | 7. Bogs |

Two community or habitat types don't fit neatly into the Upland/Wetland classification: boulder fields and washes. Both are important in water movement and are discussed together with wetlands in Section 7.

In the WLB, upland and lowland terrains (and associated plant communities) are distributed in a mosaic of small to large patches ranging in size from a few square meters or less to several or more hectares. Even the larger units are not uniform.

Upland Plant Communities



Upland Plant Communities (continued)

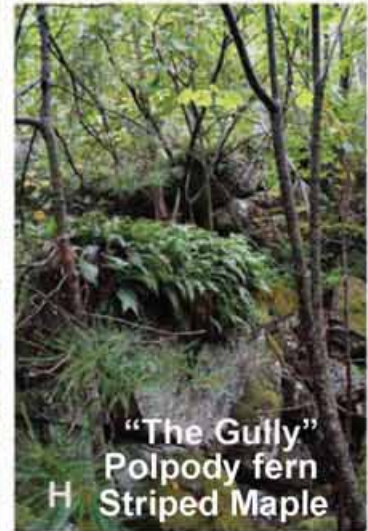
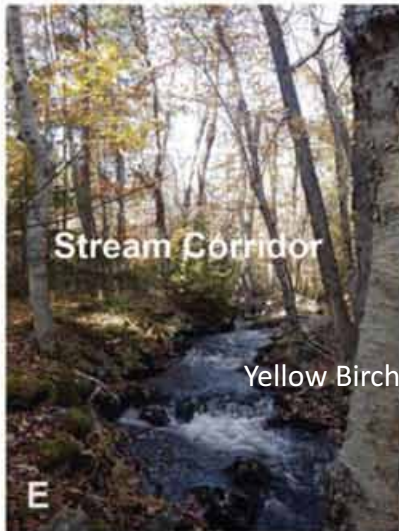


Upland Plant Communities (concluded)



White Pine-Red Pine
B
C
A,B,C Typical stands on better drained sites

Hemlock stand to RCP



E,F,G: In stream corridor, outflow from Williams Lake

Fire, Water & the Plant Communities

FIRE

- **Classification in relation to fire**
- **Where fires start**
- **Regeneration after fire**

Upland Plant Communities

The plant species in 7 upland associations are
Fire-Dependent--Fire Adapted--Fire Tolerant.

Lakeshore Pine-Oak Woods

**7. White Pine -Red Pine -
Red Oak Mixed Forest**

- Fire scarred white & red pines
- Absence of fire sensitive forest herbs



Fire-sensitive and intolerant species occur only
by larger stream corridors and close to older
residences



Fire Dependent Outcrop Communities

**1. Broom Crowberry -
Blueberry/Reindeer
Lichen Barrens**

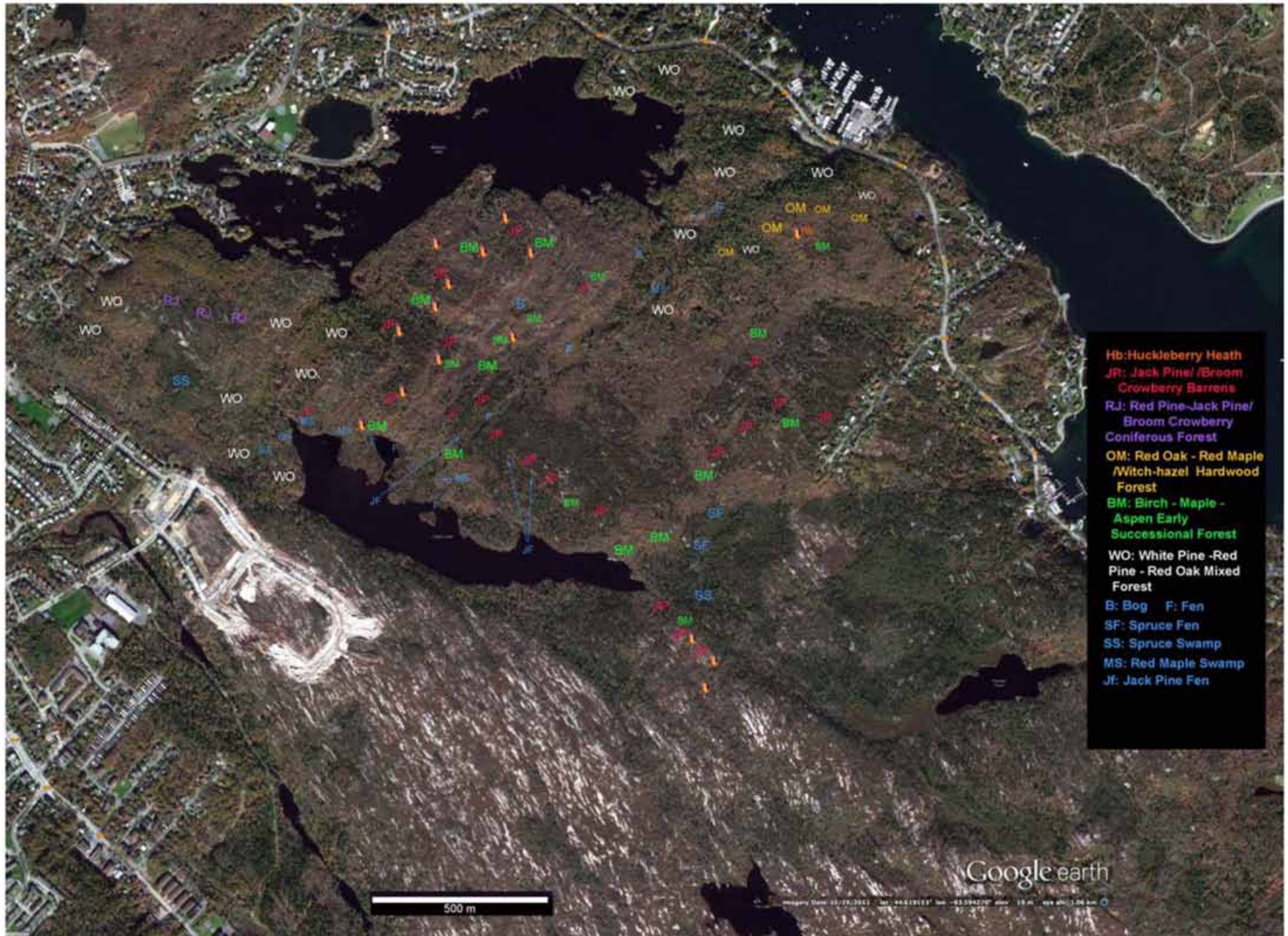


Fire-dependent to Fire-adapted Transition Communities

**3. Jack Pine/Broom
Crowberry Barrens**

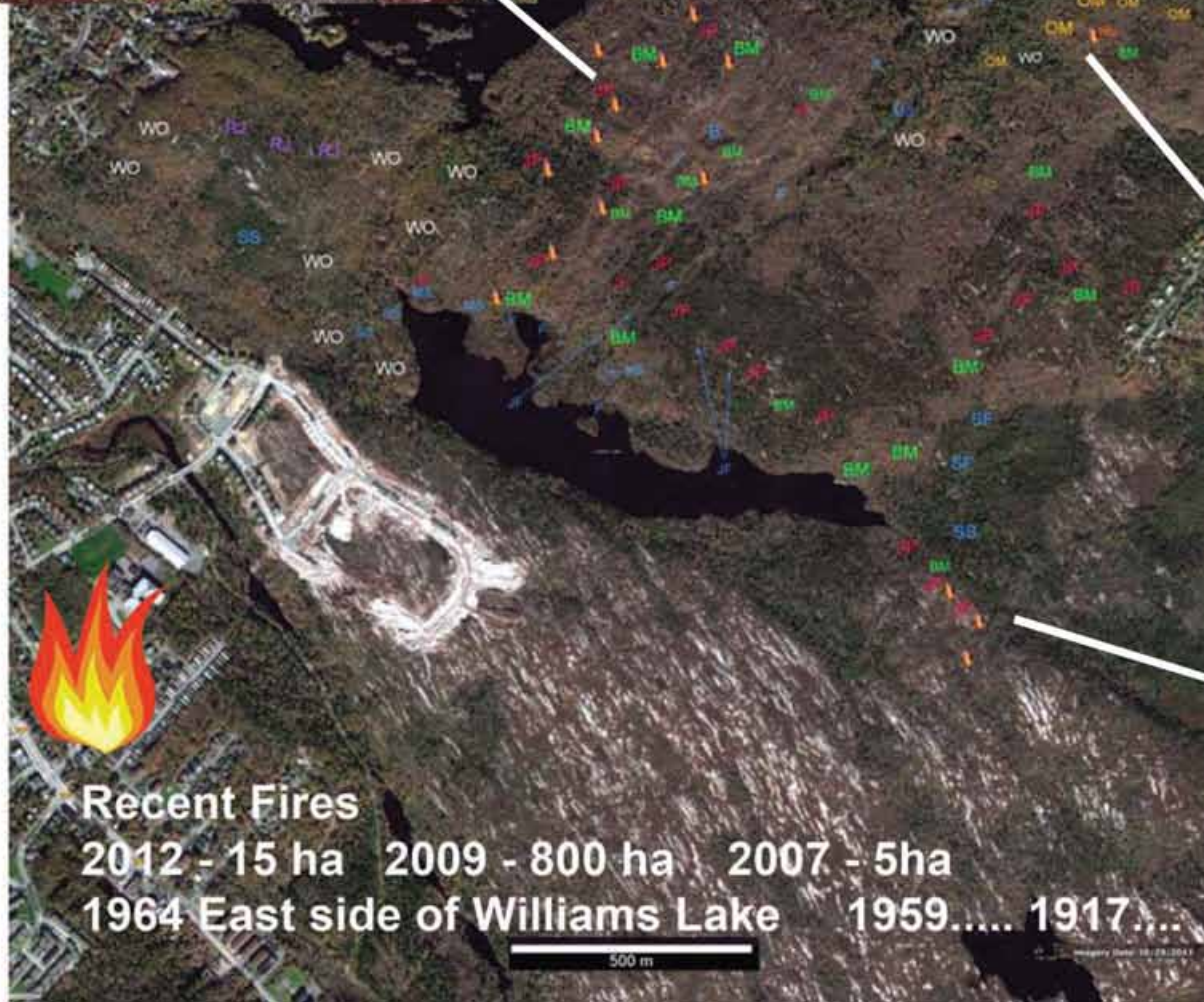


Ground-truthed Wetlands and Upland Plant Communities (larger units)





2012 fire



1964



2007



2009



Recent Fires

2012 - 15 ha 2009 - 800 ha 2007 - 5ha

1964 East side of Williams Lake 1959..... 1917....

500 m

Imagery Date: 10/19/2011 44.61



Jack Pine,
~ 44 years age



Dead lower branches
create ladder fuel.

Twigs and resinous leaves
accumulate as kindling
under Huckleberry.

Lichens form paper-like fire
starter when dry



B



C

Burned 21 May 2012
View on 14 Sep. 2013

Huckleberry



4 Oct. 2013

Jack Pine

Broom Crowberry



D

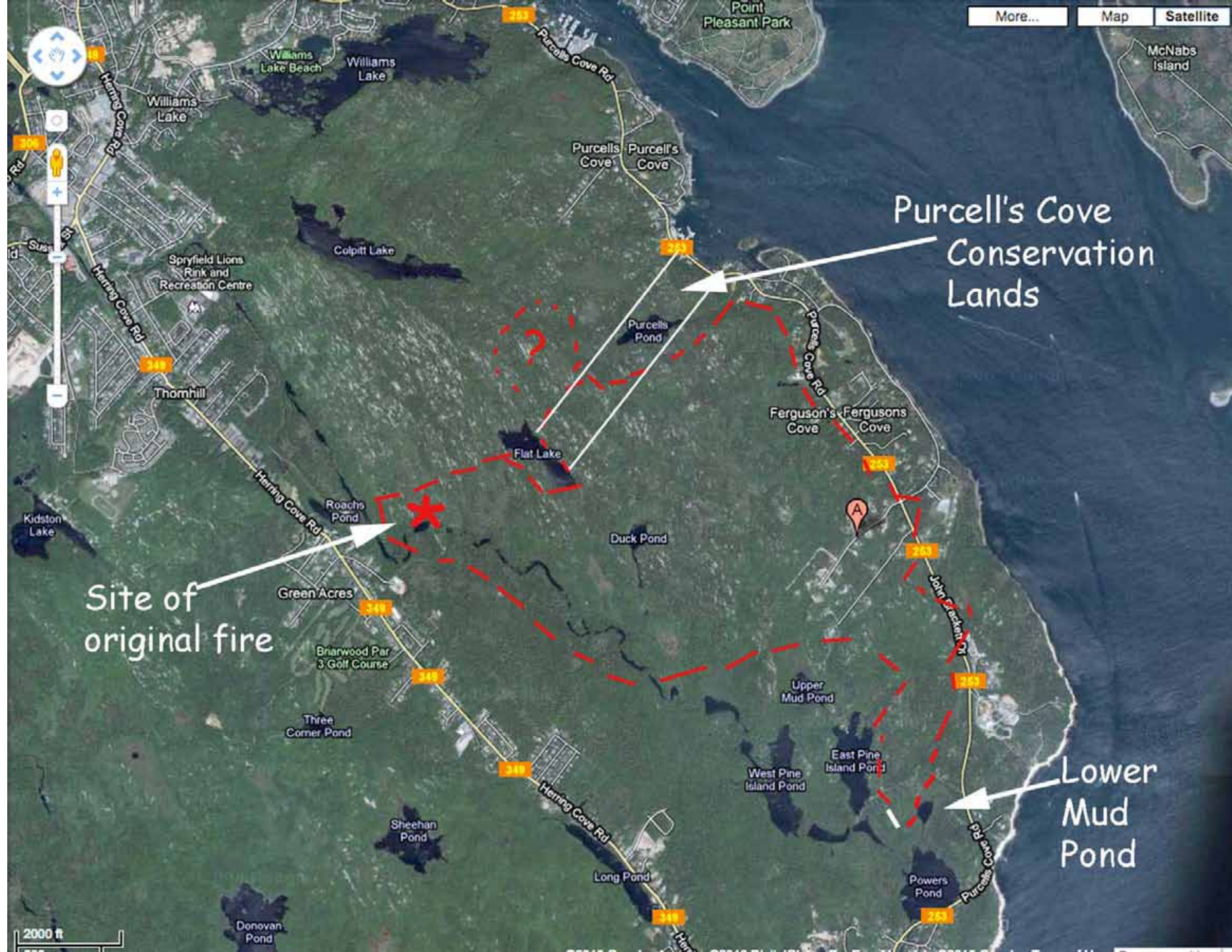
Burnt
Broom Crowberry
14 Sep 2013

Blueberry
sprouts

Regeneration of Forest & Barrens after the Spryfield Fire

Richard Beazley &
David Patriquin

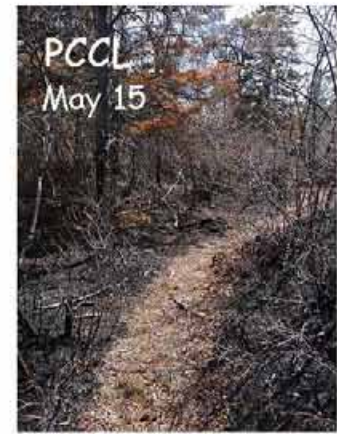
HFN Sept. 2, 2010



Purcell's Cove
Conservation
Lands

Site of
original fire

Lower
Mud
Pond



May 4, 2009

(Lower Mud Pond)





May 25, 2009
(Purcell's Cove Conservation Lands)



June 6
2009

(Purcell's Cove Conservation Lands)



Aug. 13, 2009
(Purcell's Cove Conservation Lands)



Oct. 31, 2009
(Purcell's Cove Conservation Lands)



Lower Mud Pond
May 21, 2010



June 21, 2010

(Lower Mud Pond)

10 broom crowberry
4 jack pine
5 wire birch
3 Hudsonia



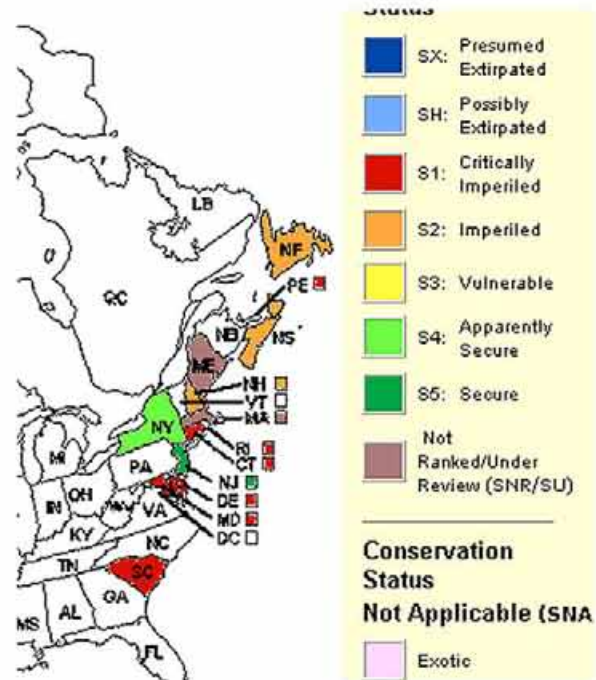
Aug. 27,
2010
LMP

47 cm

+lowbush
blueberry



Hudsonia ericoides
(goldenheather)



Aug. 27, 2010 (LMP)

Adaptations to **high intensity**
(canopy) fire by plants of the
Spryfield barrens & associated forest

1. SPROUTERS - Tops burn off; new sprouts
arise from underground buds on or in:

(a) root crown at base of stem
and/or on roots



wire birch



big tooth aspen



witherod



(Photos Aug 27 at LMP)

Adaptations to **high intensity**
(canopy) fire by plants of the
Spryfield barrens & associated forest

1. SPROUTERS - Tops burn off;
new sprouts arise from underground buds
on or in:



black huckleberry

(Photos Aug 27, 2010 at LMP)

(b) rhizomes

teaberry



bunchberry

(c) bulb or bulblike
structures

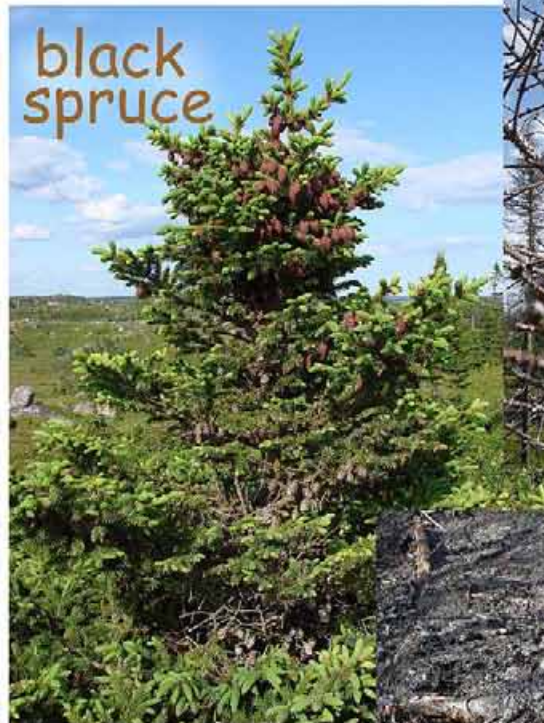
pink lady's
slipper

(May 25, 2009)



Adaptations to **high intensity**
(canopy) fire by plants of the
Spryfield barrens & associated forest

2. ABOVE-GROUND SEEDBANK - On Site:
Tops killed by fire but (some) serotinous or
semi-serotinous cones/seed survive & release seed.



black
spruce



jack
pine



Cones on burnt
ground, May 14
2009 (PCCL)



seedling
Sept.21,
2010
(LMP)



open cones &
released seed
May 4, 2009 (LMP)



Cones at
5-10 yrs

Maturity
75 years

Max.
lifespan;
ca. 200

Adaptations to high intensity
(canopy) fire by plants of the
Spryfield barrens & associated forest

3. BELOW-GROUND SEEDBANK

Plants are totally destroyed by fire
Seeds in soil survive/stimulated to germinate
by fire

broom crowberry



pre-fire



July 21, 2010

Aug 27, 2010



Serotinous Tree: >70% of cones completely sealed





Longer term history of fire



Searching for a record of historical fires in a Jack Pine fen





Table 6.1

| Site: | Site 1 | Site 2 |
|--|---|------------------------|
| Horizons with darkened debris (extruded) | 13-22 38-44 38-43 46-50 66-70 75-78* | 0-15 30-40 50-60 |
| Total length of extruded chunks | 90 | 85 |
| Depth to rock base | 83 | 75 |

*Charcoal fragments carbon dated
1250 years BP



The Jack Pine Fen

Above: Fire-adapted/dependent Jack Pines in a wet Tussock Sedge Fen.

Below: the peat record reveals several layers of charcoal (see black stripes below right) that extend to the base of the metre long core which is laid out below at left.

Fire, Water & the Plant Communities

WATER

- **Classification of wetlands**
- **Movement of water through the landscape**

WHAT'S A WETLAND WETLAND DELINEATION



Soil



Geomorphology



Vegetation



Leaf staining

*For protection,
area >100 sq meters*

III. Wetlands

The following is a dichotomous key to the types of wetlands in the WLB:

A. Small wetlands, flooded over winter or after intense rainfall, not saturated in summer

Vernal Pools

A. Larger wetlands, permanently saturated with or without seasonally flooded margins

B. Hydric soils with low accumulation of peat, or treed or shrub dominated communities on peaty soils with large seasonal waterlevel fluctuation and influenced by mineral rich groundwater

C. Wetlands where surrounding topography creates vernal pooling in the marginal zone

Swamp/Vernal Pool complexes

C. Wetlands where topography does not result in such pronounced seasonal differences in flooding, or in soil saturation, at the margin

D. Plant communities dominated by shrubs

Shrub Swamps

D. Plant communities dominated by trees

Treed Swamps: Black Spruce, Tamarack, Red Maple

B. Peatlands that remain permanently saturated and may be flooded over winter and where tree growth is usually stunted or of low (< 30%) cover.

E. Peatlands with substantial groundwater or surface flows

F. Flows from surrounding landscape and upstream wetlands

Fens (Topogenous and Soligenous)

F. Flows associated with lakeshores

Lakeshore Fens

E. Peatlands whose surface layers are largely independent of such flows

Bogs

Wetland: land saturated with water long enough to promote wetland processes as indicated by poorly drained soils and hydrophytic vegetation... **Peatlands** are organic wetlands. **Hydric Soils**: wet long enough to promote anaerobic (lack of O₂) in upper part of the soil.





Mountain Holly or False Holly

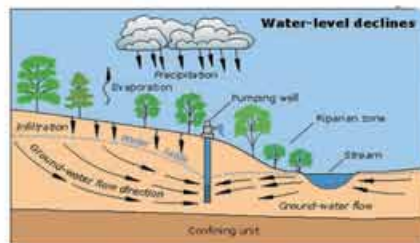
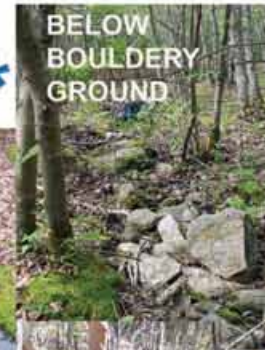


Inkberry



Canada Holly

Movement of water through watercourses/wetlands



- LAKE & GROUNDWATER**
- temperature
- oxygen
- clarity
- bacteria
- nutrients

Conservation

- **Why Conserve the Backlands**
- **Threats to Ecological Integrity**
 - **Fire (not enough or too much)**
 - **Development**
 - **Roadsalt**
 - **Recreational use**
 - **Area & Connectivity**
- **What we can do to help**

Ecological Case for Conservation of the WLB

1. Together with the larger Backlands the WLB host some of the best reps of the ***Nationally Unique/Globally Rare*** **Jack Pine/Broom Crowberry barrens**



2. The **watercourses/wetlands** have features of dryland systems in which seasonal and below-ground watercourses & small reservoirs (e.g., numerous vernal pools) are critically important for lake and groundwater Water Quality, but are not protected under current N.S. legislation.



3. **A mosaic of habitats** close to the coast supports many **breeding and migratory birds** (Fulton Lavender study)



4. **Fire Management...**

Major Local Threats to the Ecological Integrity of the Backlands

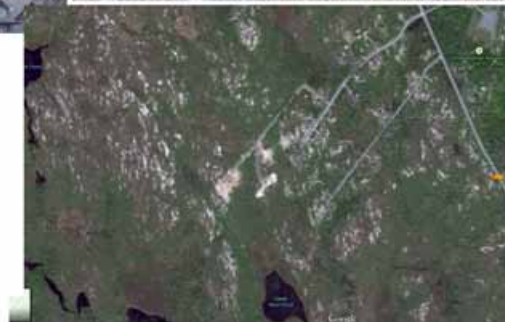
Fire Control - *apparently OK at current levels in PCB, possibly excessive for some other sites in N.S.*

Development

High Density - *Eliminates fire hazard*
- *Obliterates habitat*

Low Density/Integrative

- *High Fire Hazard --- Fire --- Rebuild with more buffer --- More loss of habitat*
- *Venues for exotic species*
- *Habitat Fragmentation*



Thus we suggest a strategy of **FireSmart protection** of current residences on the fringes _____ and extending into the PCB (low density model), and **no further development within the PCB** are appropriate ways forward. There is widespread support for preserving the PCB for natural, historical, cultural, conservation, educational, recreational and common use.

Local Threats to the Ecological Integrity...: rising human use

Some issues associated with rising use of The Bluff Trail in 2015

- Garbage – toilet paper and human waste in bushes, food waste in fire pits, garbage can was removed at trailhead
- Camping – completely inappropriate practices directly along main trail (left un-remediated these serve as models for other trail users; see examples below)
- Fire pits – inappropriate locations (directly on trail, on soft surfaces, on top of tree roots), leaving cookware and burning food and cans, chopping/sawing down live trees, peeling birch bark (some areas have 5-10 pits in a 50m radius)
- Trail deterioration (widening) in wet areas that have not received trail-hardening - especially 1st and 2nd loops
- Dogs - off leash and not under user's control, creating multiple small off-trails, scaring other hikers by barking, jumping, and unexpectedly appearing out of the woods
- Cairns – creating confusion in bare granite areas where rocks are used to mark the trail

Source: Report to WRWEO/The Bluff Trail by Heather Davis and Wade McIsaac, 2015



Ongoing degradation near Lake Frederick, Sep 2015



Brand new campsite on trail near Cranberry Lake Portage, Oct 2015

Solutions:

- Trail hardening over wet spots
- Leave No Trace ethic
- Stewardship program
- More “wildland” trails in HRM!



Fire pit with food waste Oct 2015



Newly chopped tree by old sawed tree



Fire right ON trail



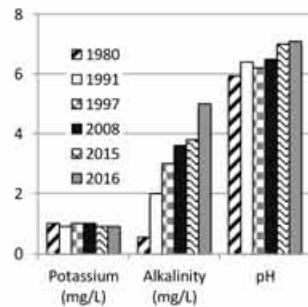
Burning live birch

ECOLOGICAL INTEGRITY OF LAKES, SURFACE WATERS

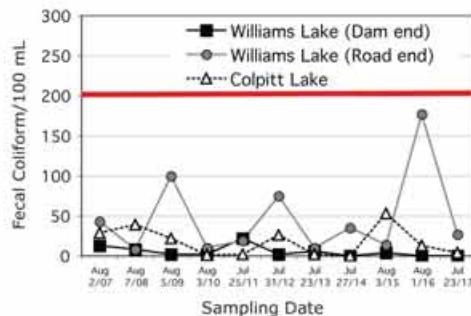
- Impacted by settled areas
of the watersheds

- Monitor!

WLCC monitoring

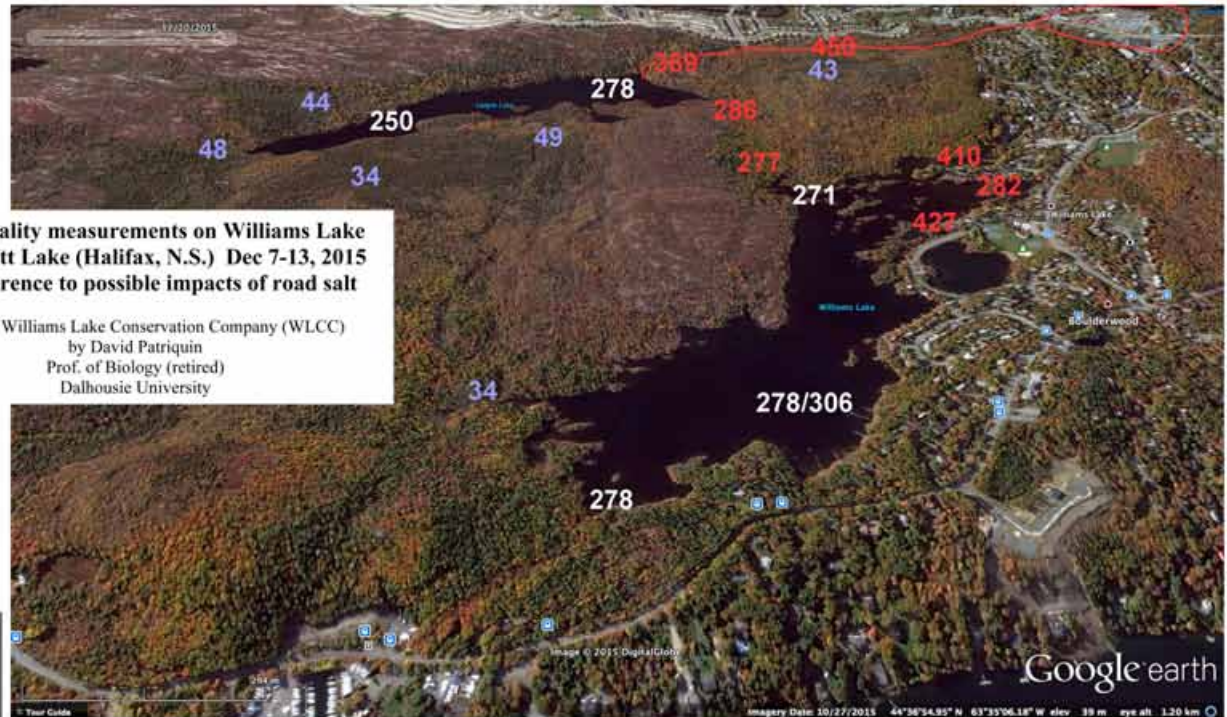


WLCC Lake Water Testing 2007-2017



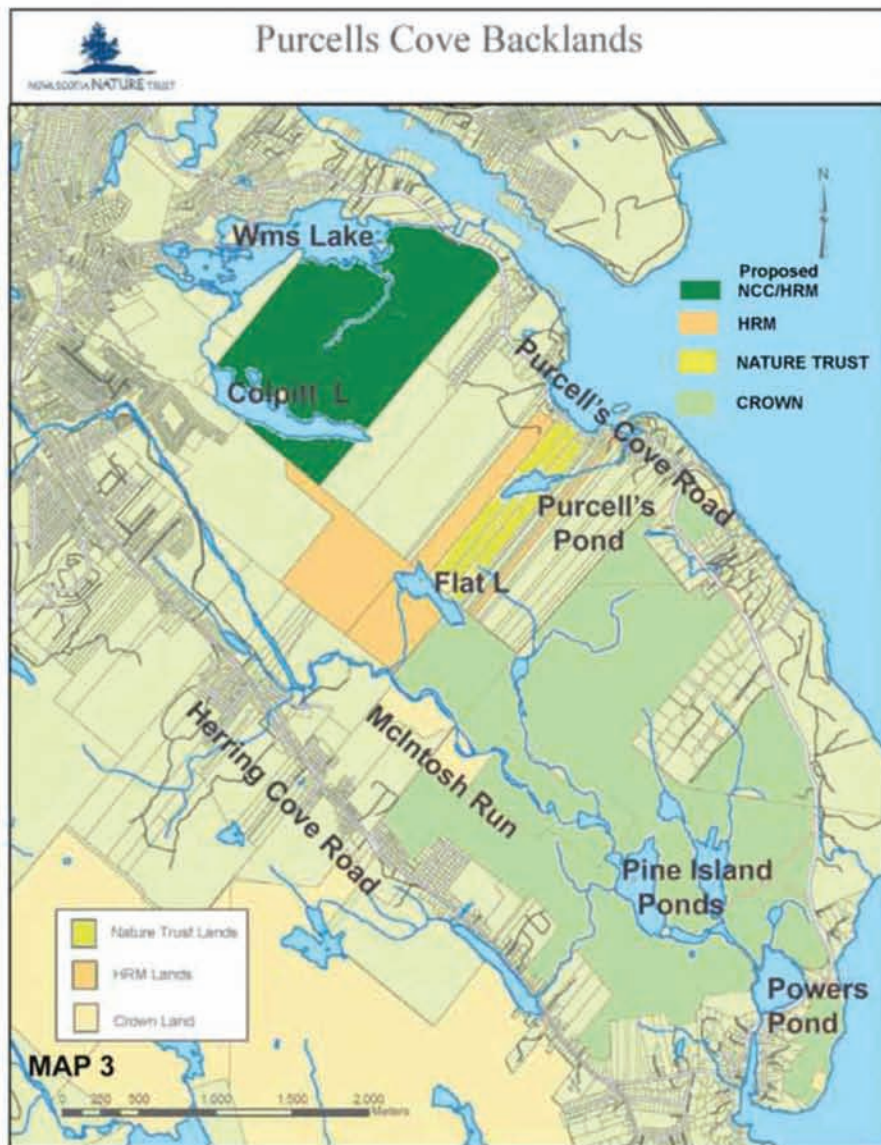
Water quality measurements on Williams Lake and Colpitt Lake (Halifax, N.S.) Dec 7-13, 2015 with reference to possible impacts of road salt

Report to Williams Lake Conservation Company (WLCC)
by David Patriquin
Prof. of Biology (retired)
Dalhousie University



- Wms Lake **vertically stratified** with 10% O2 saturation at 20 m on Dec 7, 2015
- Brooks from settled areas are major **salt** source
- Undeveloped land (3/4 of watershed) provides **pure water**
- **Organic/nutrient loading** from settled areas likely a factor in low O2





Protected and Crown Lands in the Backlands, adapted from a 2012 Nature Trust map re: Proposed protection of HRM lands.

Major Local Threats to the Ecological Integrity of the Backlands

- Area & Connectivity

Backlands Total Area ~ 1350 ha

Currently formally protected: 120 ha

Crown land: 508 ha

Total Protected + Crown: 628 ha = 46.5%

* NCC/HRM Urban Wilderness: 162 ha

Total: 790 ha = 58.5%

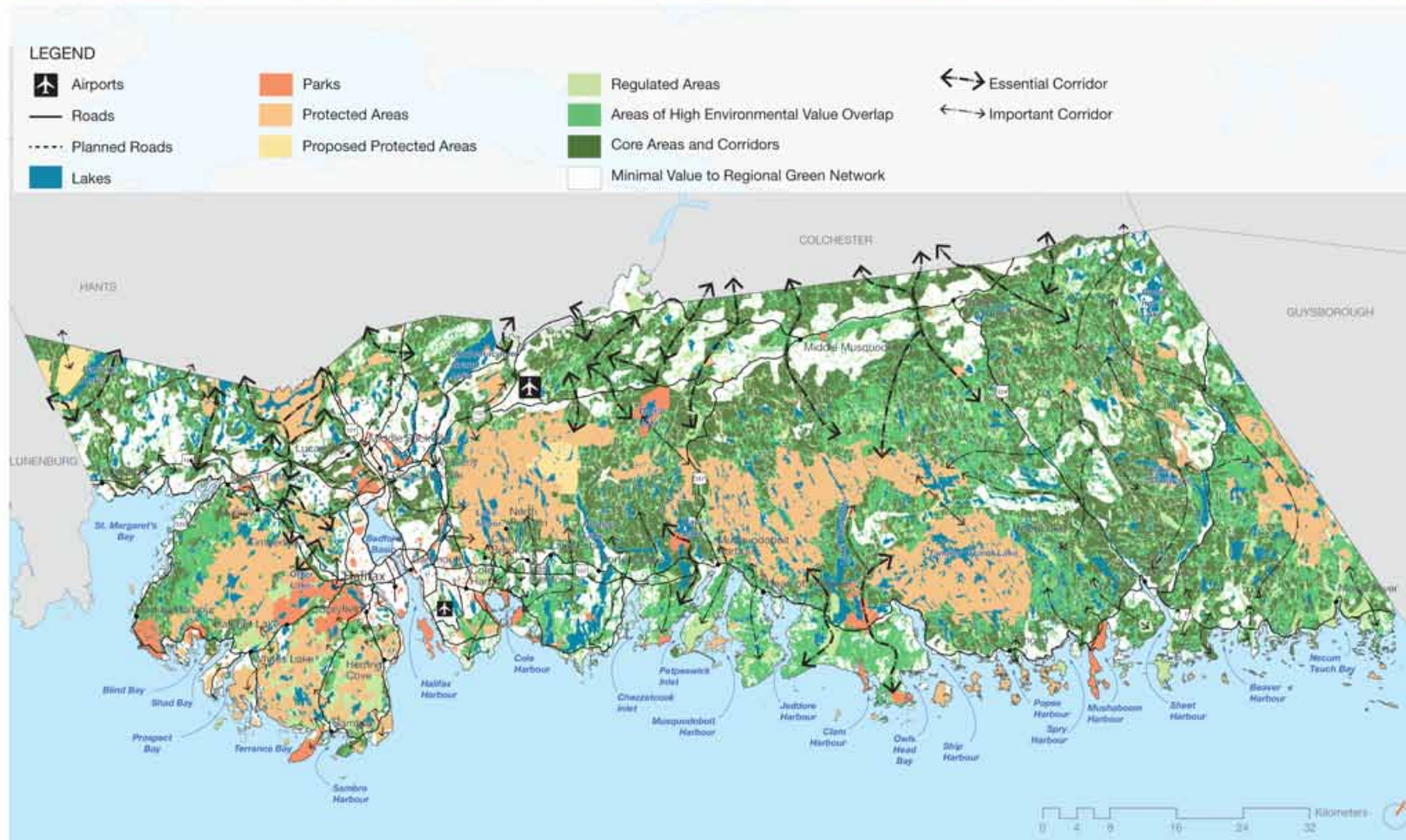
With the NCC/HRM Urban Wilderness we would have *some* connectivity from Williams Lake to Power's Pond... better connectivity needed...

* Go to www.williamslakeecc.org to learn more about the current campaign to protect this area.

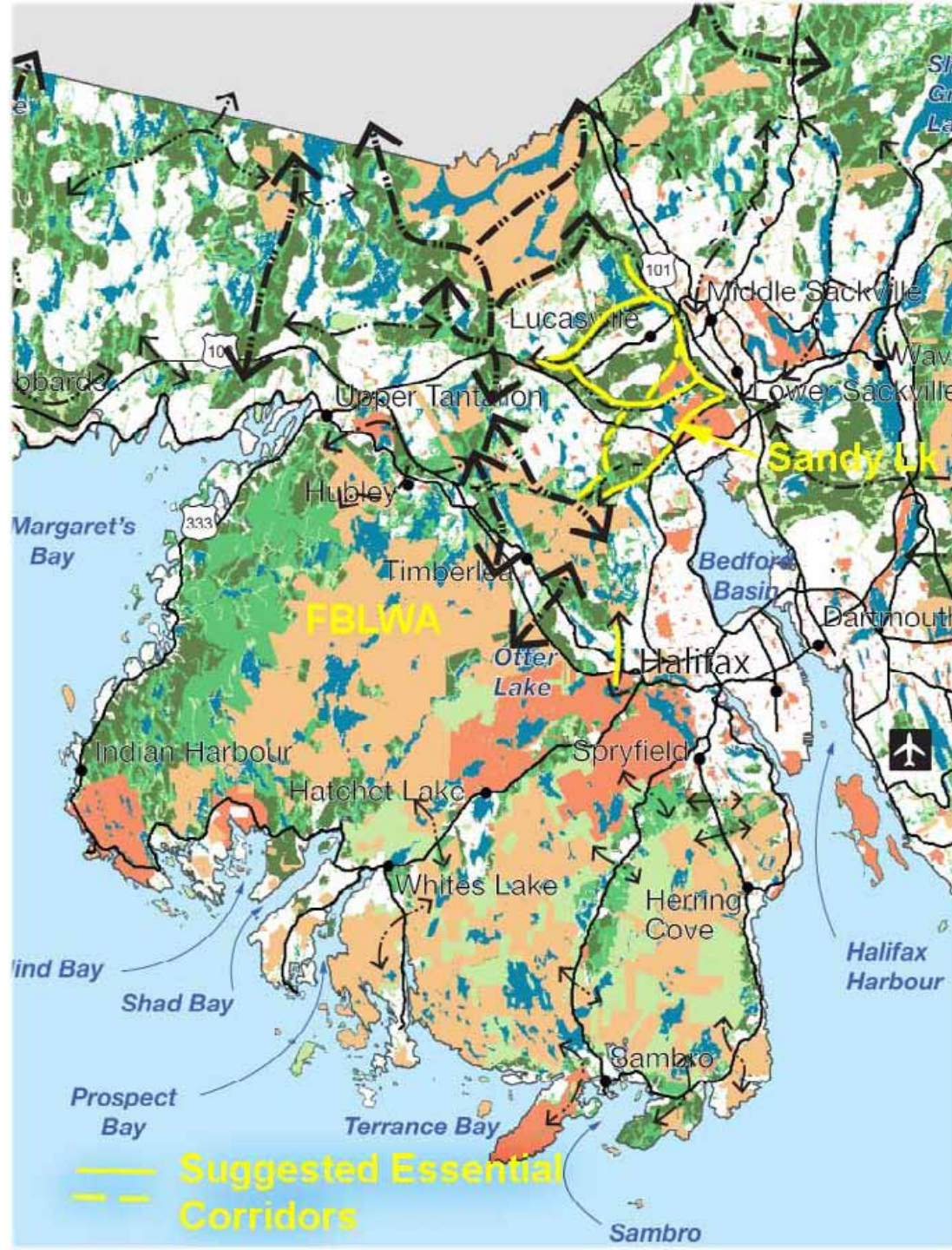
HALIFAX

GREEN NETWORK PLAN

JUNE 2018



Map 5: GREEN NETWORK ECOLOGY MAP



12/5/2011

500 meters

MARSH LAKE

NSP facility

NSP road

Eastern Drumlin

Rifle Range

Bedford Sackville Greenway

NSP

NSP

Hinterland Run

Lateral Trail

camp

Beach

SANDY LAKE

"The Loop"

The Dog Run

SL Beach Parking lot

NSP

Stream Path

JACK LAKE

PY Rd

Boreal Highland Path

Bicentennial Hwy/Rte 102

to Jack Lake

The Cliff Walk

Halifax Water Connector

Smith Road

Jack Lake Trails Parking Lot

Hammonds Plains Road

Image © 2018 DigitalGlobe

Google Earth

1007 m

2003

Imagery Date: 10/28/2011 lat 44.734372° lon -63.684790° elev 88 m eye alt 4.48 km



So... Please

- **Support the Nature Conservancy of Canada**
- **Support NS Nature Trust**
- **Support and Use the Green Network Plan**
- **Support/join volunteer organizations**
- **Get out and about & *Leave No Trace***
- **And remove a few traces left by others**

-ThanX