

Geology and Wildflowers

Earth, Fire, and Water

Relationship between Flowering Plants and Geology on Manitoulin Island



Massey Naturalists
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Disclaimer

- Not a biologist
- Not a trained horticulturist
- I am a geologist
- Wildflowers are my hobby
- **Prefer not to discuss medicinal or culinary uses of plants**

Messages

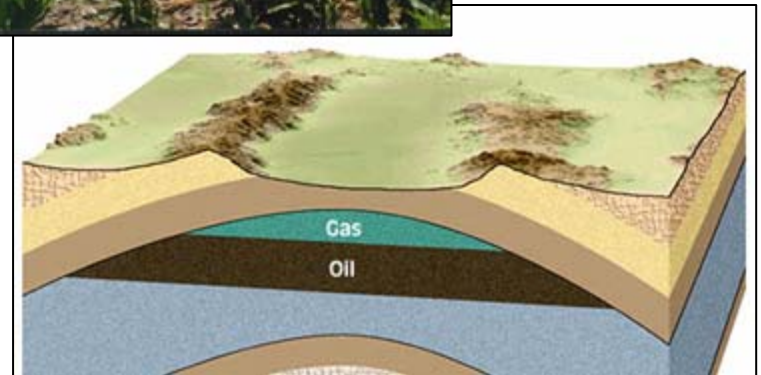
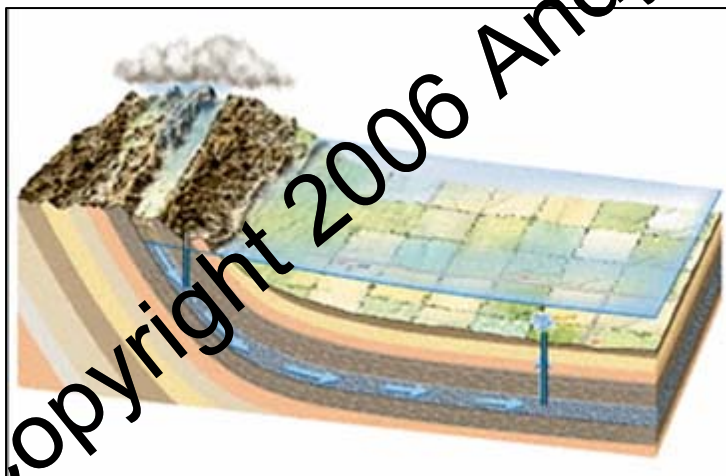
- Geology is very much part of our daily lives
- On Manitoulin Island:
 - Geological history controls regional landforms, habitats, and climate
 - Habitats and climate define plants
 - Geological history creates opportunities for plants to fill voids
 - Geological history has a strong influence on types of plant communities

Part 1

“Geology” in our Lives

Geology in Our Lives

- We eat minerals
- We grow food in geological materials
- We get drinking water from the Earth
- Rocks are a source of energy



Geology in Our Lives

- Construction material



- Metals



- Horticulture materials



Geology in Our Lives

- We depend on geological materials from the moment we wake up until we go to sleep
- So do plants

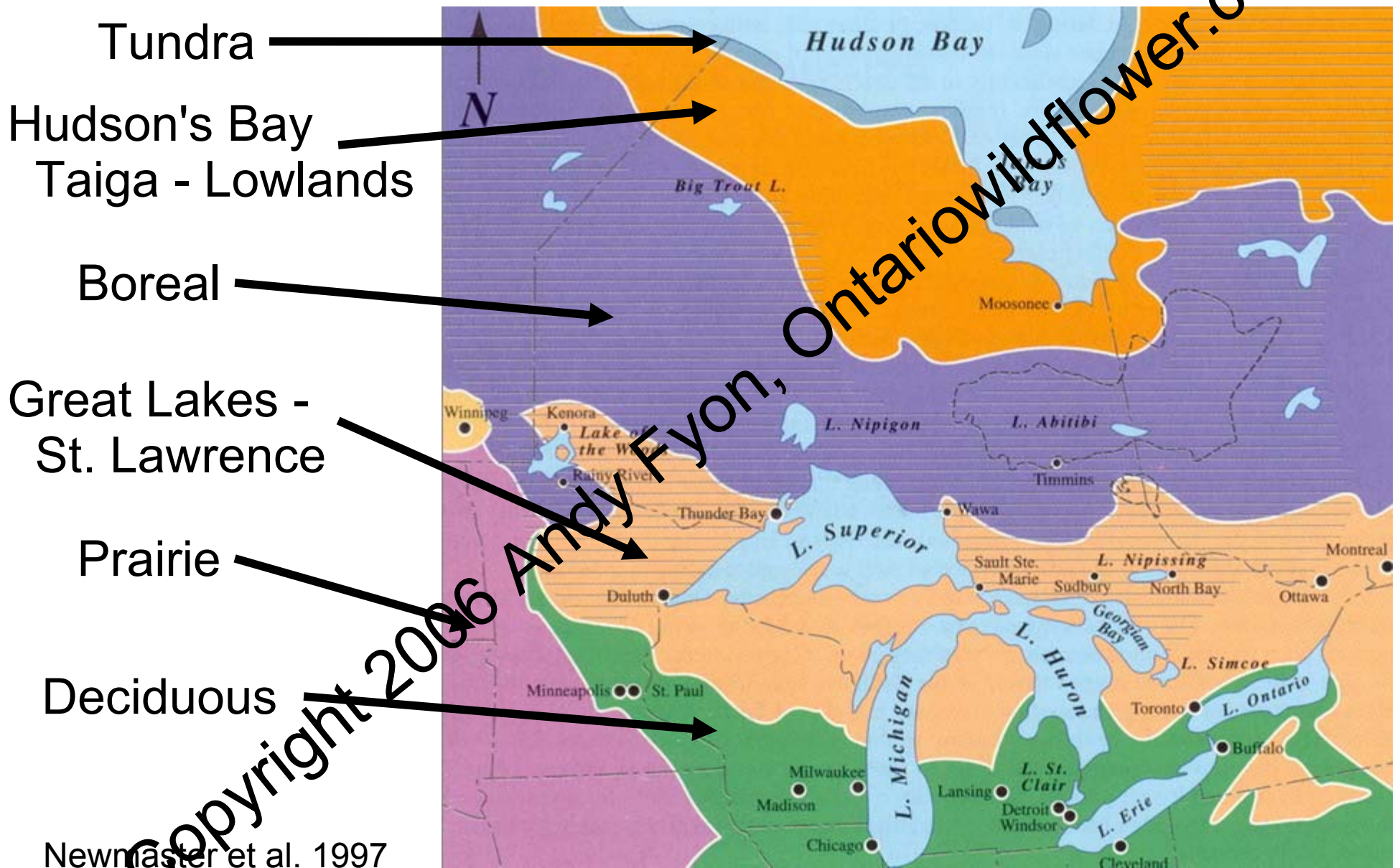
Warm rock, Iqaluit



Part 2

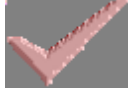



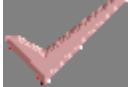




Some Flora of Manitoulin Island

Ontario Forest Regions



Newmaster et al. 1997

Manitoulin – Canadian Floristic Regions

- Arctic 
 - Alpine 
 - Prairie 
 - Boreal 
 - Northern Mixed Forest 
 - Great Lake – St Lawrence 
 - Deciduous Forest 
 - Maritime 
 - Atlantic Plains 
- 25% of Canadian vascular plant genera
 - Species from 8 of 9 Canadian floristic regions
 - Cross-roads of plant migrations over the last 12,000 years

Let's Play “Scientist”

- Observation:
 - Alpine, arctic, prairie, boreal, northern mixed forest, Great Lake – St Lawrence, deciduous forest, maritime
- Conclusion: plants come from many geographic areas
- Why???
- *Maybe this reflects the geological history?*



Manitoulin Island Dolomite Alvar



Oct. 17/06

Misery Bay, Manitoulin

12

Manitoulin Island Sand Dunes



Oct. 17/06

Carter Bay, Manitoulin

Manitoulin Island Alvars

- Naturally open areas
- Flat limestone rock
- Few to no trees
- Little or no soil, low nutrients
- Harsh and inhospitable
 - High sunlight - open
 - Temperature moderated by proximity to lake
 - Water: spring flooding, summer drought
- Diverse wildflowers



Indian Paintbrush (Cordilleran/Alpine, Prairies)

- Red colour are bracts, not flowers
- Sometimes yellow-bracted
- Parasitic on roots of other plants



Gore Bay, Manitoulin

Oct. 17/06

Cut-leaved Anemone (Cordilleran/Alpine, Prairie)



Native across
open, moist
grasslands.

Also called
Windflower
because of
the fluffy
seedhead.

Misery
Bay

Cylindric Blazing Star - (Prairie)



Feathery flower heads give rise to common name - gayfeather.

The word "*cylindracea*" refers to cylinder-shaped flower heads.

Prairies, limestone outcrops, bluffs, barrens, marl, sandstone outcrops, dunes.

Murphy Point

Prairie Smoke (Prairie)



- Widespread across Prairies
- In Ontario, restricted to alvars
- Prefers limestone alvar
- “Uncommon” Ontario Species (COSEWIC - Committee on the Status of Endangered Wildlife in Canada)

Early Buttercup (Prairie)

- Early prairie wildflower
- Calcareous soils and rocky areas
- Calciphile: tolerates calcium-rich conditions

Oct. 17/06



Groved Yellow Flax (Prairie)

- Annual
- Flowers bloom in the morning but petals fall off by noon
- Limestone alvar
- Calciphile: tolerates calcium-rich conditions
- Tolerates drought



Field Chickweed (Prairie Calciphile)

Prairies, rocky
hillsides, and
subalpine and
alpine.

Calciphile:
tolerates calcium
rich conditions.

Tolerates drought.



Misery Bay

Birds-eye Primrose (Prairies and Boreal)

Primula mistassinica

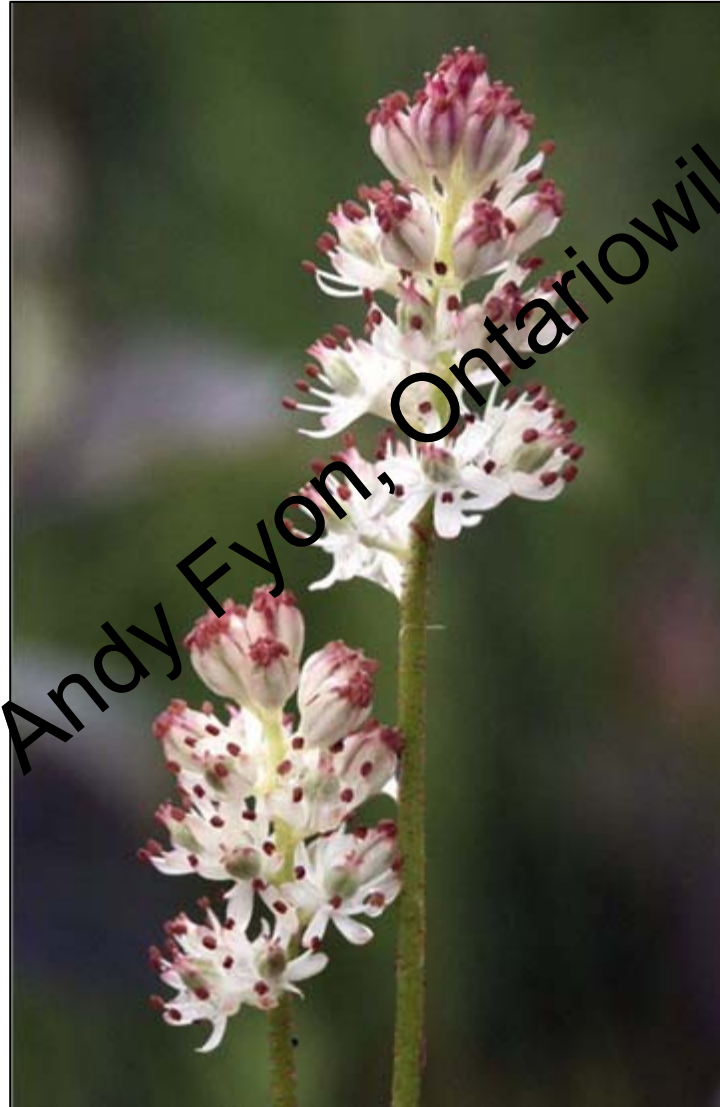
Moist
limestone or
calcareous soil
and seepage.

Discovered
1786 near Lk
Mistassini,
northern
Québec.

Named after an aboriginal word for “big-
rock water” (Mista-assini)



Sticky False-Asphodel (Boreal)



Open wetland
underlain by
limestone.

Carbonate-rich
groundwater
seeps.

Mississagi
Lighthouse

Clintonia – Bluebead Lily (Boreal Forest)



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Massey Naturalists - A. Fyon

Starry False Solomon's Seal (Boreal Forest)



sand prairies,
moist meadows,
edges of
woodland,
shaded
riverbanks,
calcareous
seeps, shrub
zone of sand
dunes.

Spurred Gentian (Boreal Forest)



- Woodland
- Self fertile

Wild Chives

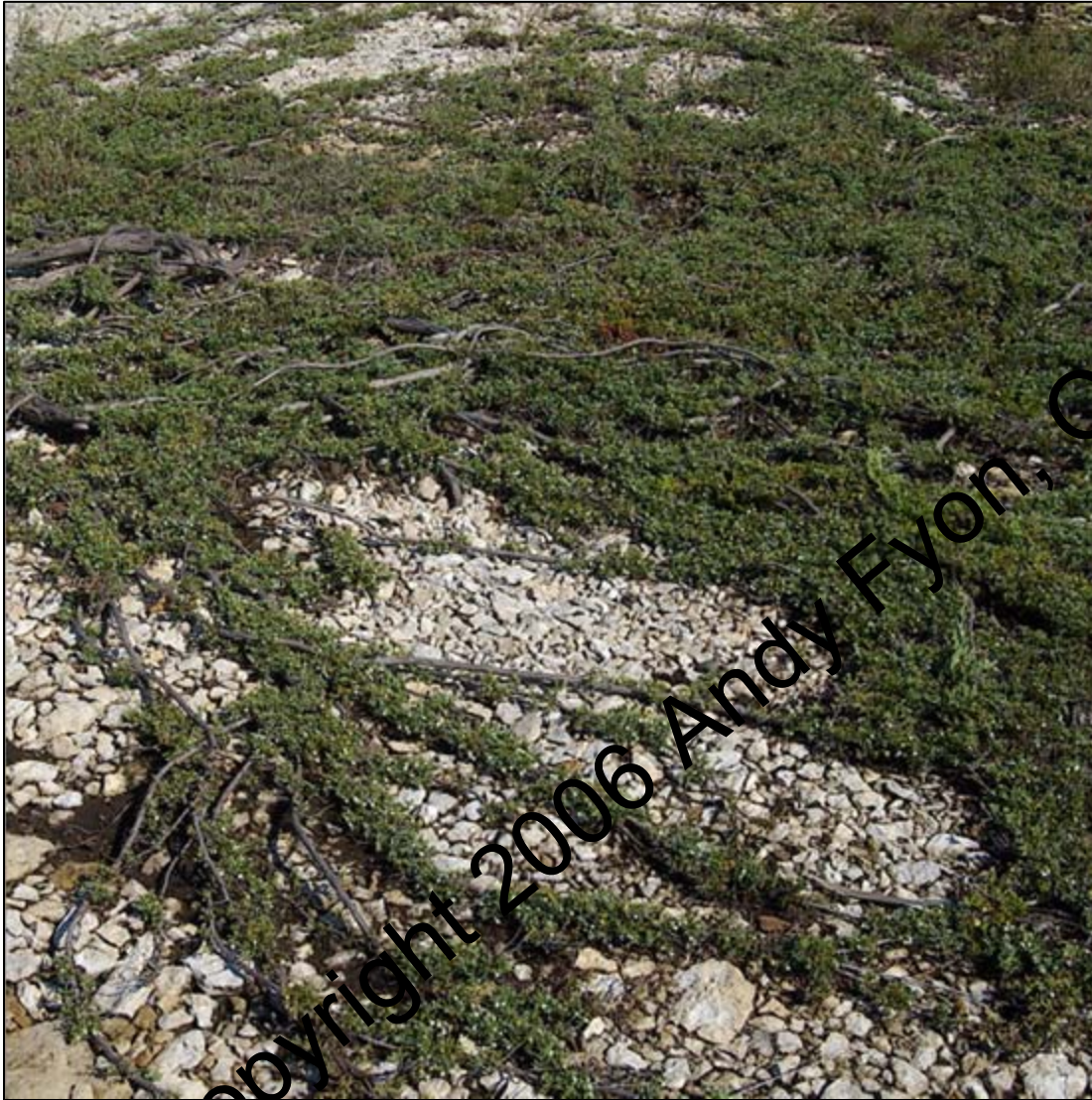
(Alpine, Boreal, Prairies)



Rare in south except on Alvar.
Crushed bulbs used to treat insect bites
and stings.

Creeping Juniper

(Alpine, Boreal, Arctic)



Great La Cloche Island



Calcareous soil.
Harsh dry areas, rocky
or sandy slopes,
hillsides, dry open
woods.

Ohio Goldenrod

(Great Lakes – St Lawrence)

Calcareous
fens, wet
prairies,
groundwater
seepage.

Domestic
gardens.



Fringed Gentian

(Great Lakes – St Lawrence)

- Damp, sunny, calcareous alvars



Beach Pea (Maritime Species)

- Sand dunes around Atlantic coast
- Tough roots bind sand
- Nodules on roots house bacteria - take nitrogen from air and fix in sand soil.



Sea Rocket (Maritime Species)

- Sandy beaches above the high tide line
- Fleshy stems and leaves



Special Species – Calciphiles

Manitoulin Island Alvares

- Tolerate calcium- and magnesium-rich bicarbonate soil and groundwater
- Harsh, alkaline soil
- Plants of wet, seepage sites



Special Species – Calciphiles - Manitoulin Island Alvars – Lakeside Daisy



Lakeside Daisy (Great Lakes – St Lawrence)



- Endemic to Bruce Peninsula and Manitoulin Island (95% of its global range is in Canada).
- Dolomite alvar.
- Rare Species (COSEWIC - Committee on the Status of Endangered Wildlife in Canada).
- Thick, rubbery leaves store water needed to withstand dry spells

Low Calamint (Dolomite Prairie)



Calciphile

Limestone alvar

Contains a camphor-like volatile oil, like other mints.



Shrubby Cinquefoil (Special Calciphile)

- Tolerates calcareous alvar.
- Landscape plant.



Grass-of-Parnassus (Special Calciphile)

Moist calcareous seepage or alvar

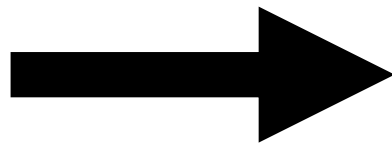


Flowering Plants on Manitoulin Island

Alpine-arctic, prairie, boreal,
Northern Mixed Forest (Great
Lake – St Lawrence),
Deciduous Forest, Maritime

Some typical of alvars +
calcareous soil

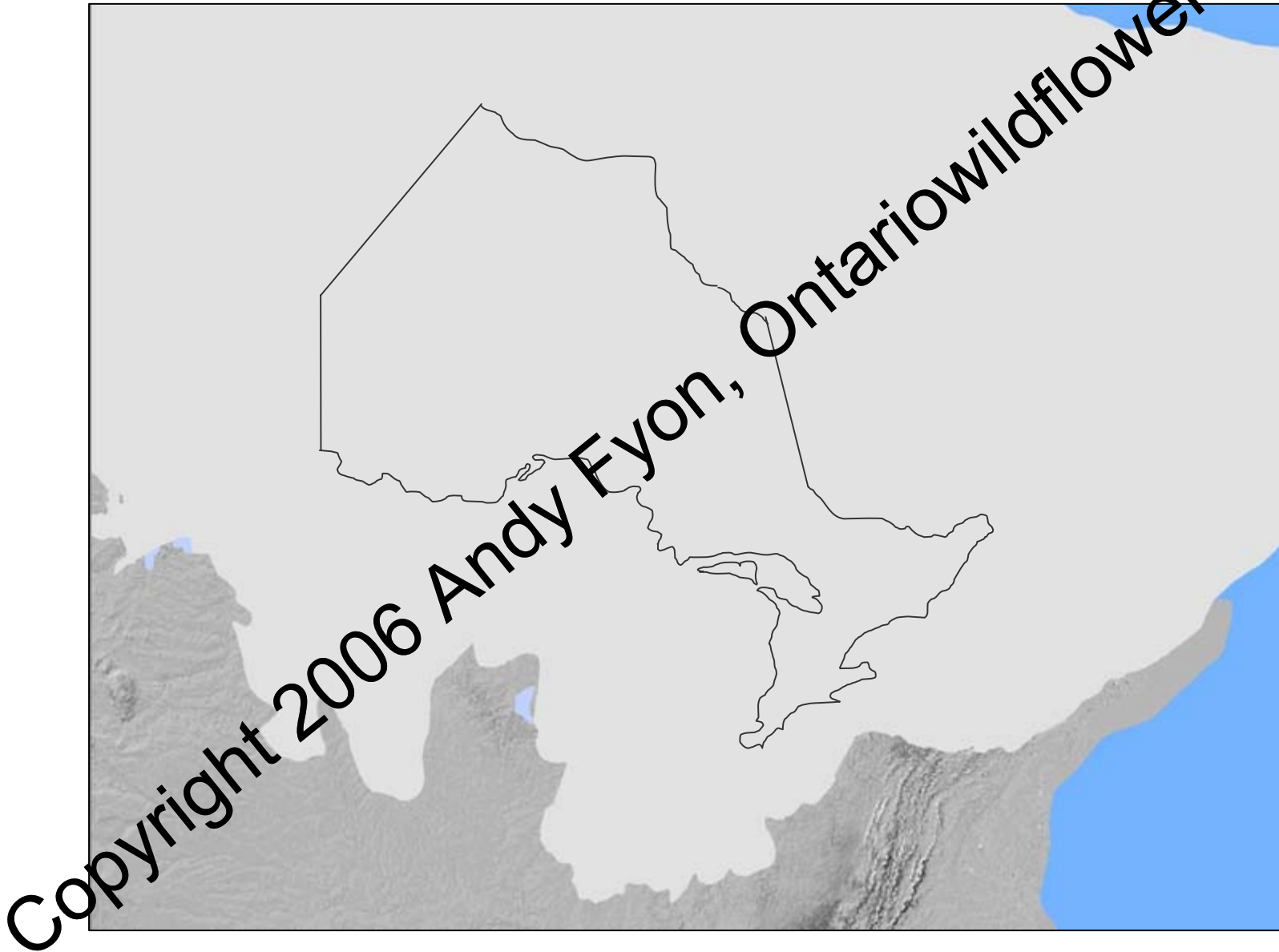
- So what does that mean?



- Geological history?

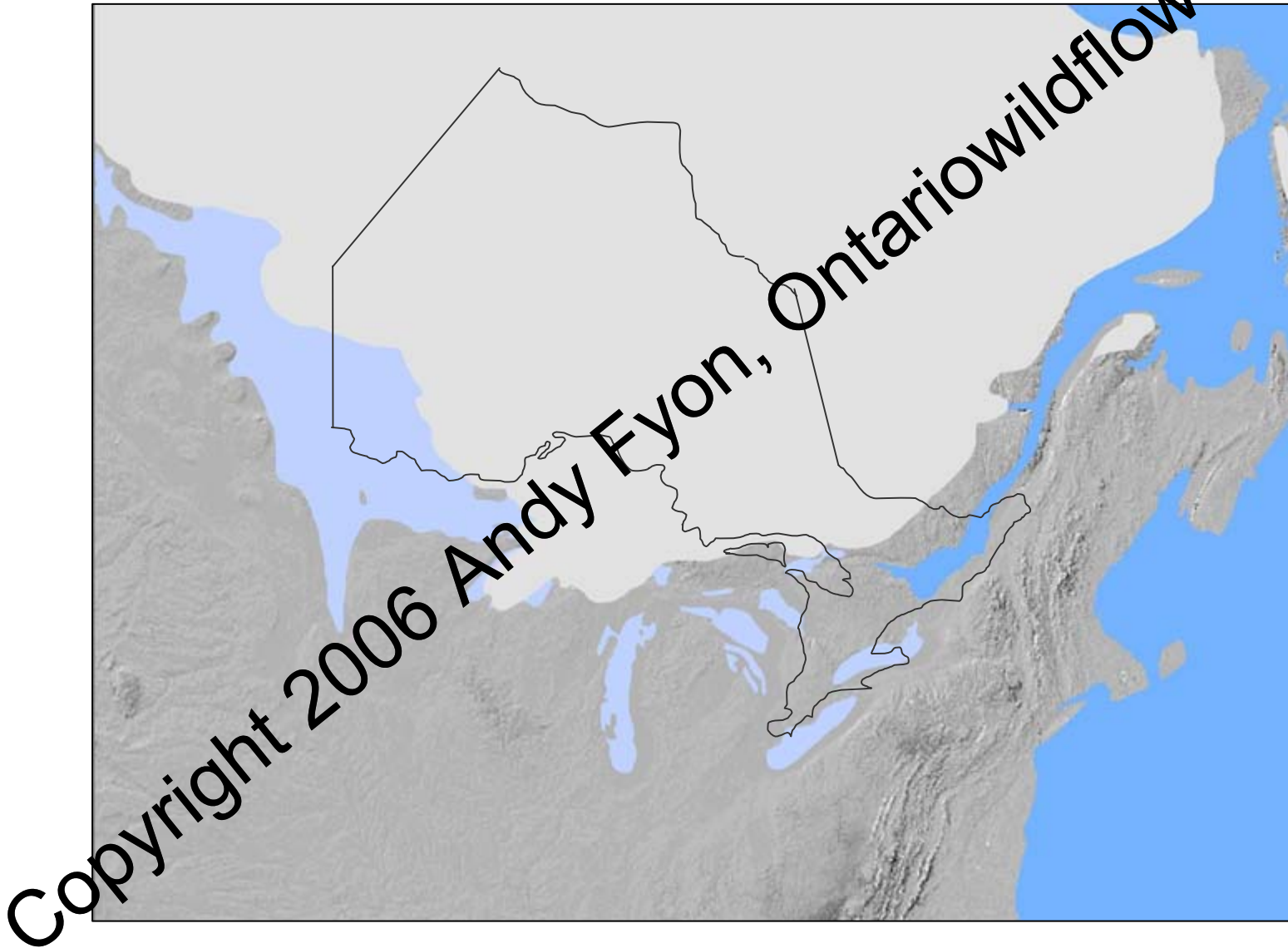


Manitoulin Island – Recent Geological History – 18,000 Years Ago



A.S Dyke, A. Moore and L. Robertson, 2003

Manitoulin Island – Recent Geological History – 10,000 Years Ago



A.S Dyke, A. Moore and L. Robertson, 2003

Manitoulin Island – Recent Geological History – 8,000 Years Ago

Glacial ice front and tundra

Harsh cold climate around glacier as it melted



Migration of Western and Southern Plant Species 8.000 to 4.000 YBP

Migration of northern
+ western species

Explanation: Alpine, arctic, boreal, prairie, endemics coexist along ice-front as the glacier melted.



Migration of southern
species

The Calciphiles?

(calcium-tolerating plants)

- **Grass-of-Parnassus**
- **Shrubby Cinquefoil**
- **Low Calamint**
- **Lakeside Daisy**



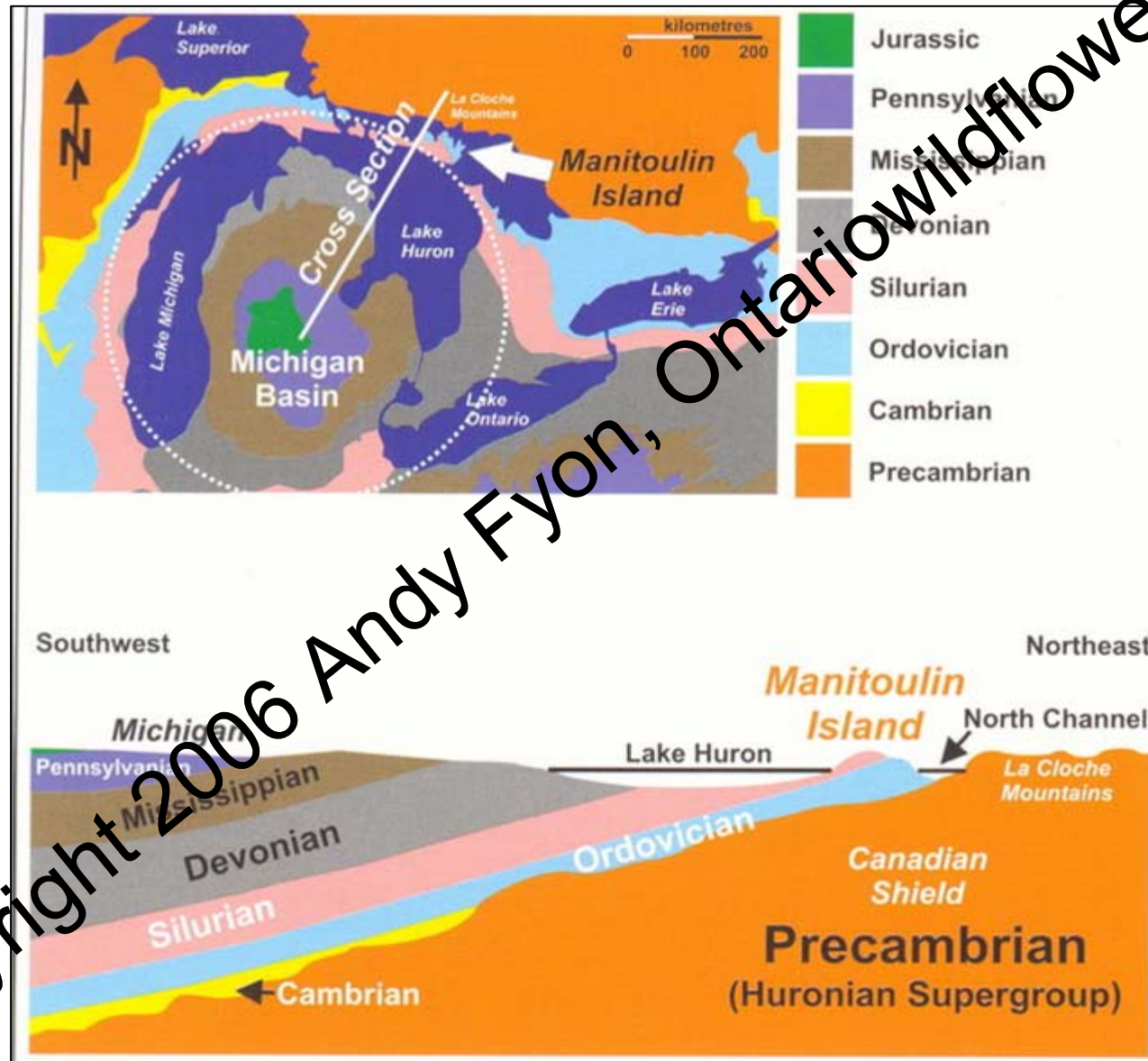
Manitoulin Geology

- Manitoulin Island

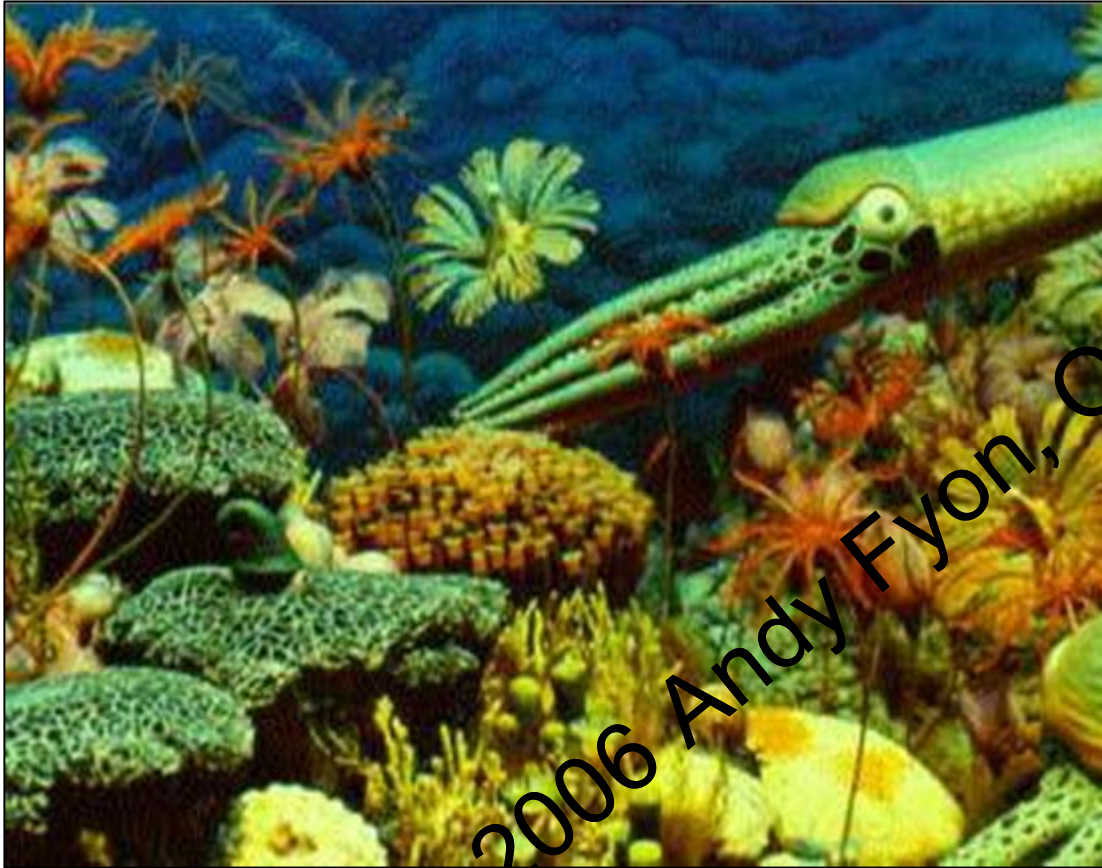
- Edge of Precambrian Shield (>2 Billion years old)
- Covered by younger rocks (~450 Million years old)



Manitoulin Island and Area Geology



Manitoulin Island Alvars – Geology In The Beginning



Manitoulin limestone rocks: bottom of tropical ocean 450 million years ago.

Explanation: Calciphile Plants

Ancient Marine Rocks – Modern Influence

- Alvars
 - Rich in calcium bicarbonate
 - Dissolve (karst, cracks)
 - Drought
 - Flood
- Sustains plants that tolerate calcium-rich, alvar conditions



Conclusion: Different Plant Communities Result of Geological History

- 8 of 9 floristic regions.
- Cross-roads in plant migration since last glacial era ended - 12,000 years ago.
- Influence of Great Lakes (climate), alvar, varied rock types, soil, topography.

