# Old-Growth Characteristics of Disjunct *Thuja occidentalis* Stands, Central Canada

**Karine Grotte**

M.Sc. candidate

University of Winnipeg

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Supervisor: Jacques Tardif

Committee members:

- Richard Staniforth

- Andrew Park

# Old-Growth Forest: Status

- Worldwide effort to identify & protect
- Historically exploited, described as decadent & over-mature
- Old, unmanaged forests under threat of conversion

# Old-Growth Forest: Value

- Essential part of ecosystem diversity
- Supports unique elements of biodiversity
- Carbon sequestration, nutrient cycling, water & soil ecostability

- Arsenault 2003; Kimmins 2003; Villeneuve and Brisson 2003

# Old-Growth Definitions

- Traditional insufficient
- Recent based on:
  - structure
    - uneven-age, tree size, coarse woody debris (CWD)/snags
  - process
    - density independent mortality
  - composition
    - long lived shade tolerant spp

- Mosseler et al 2003

- Regionally defined, eco zone & site type
- Old-Growth Index (OGI)

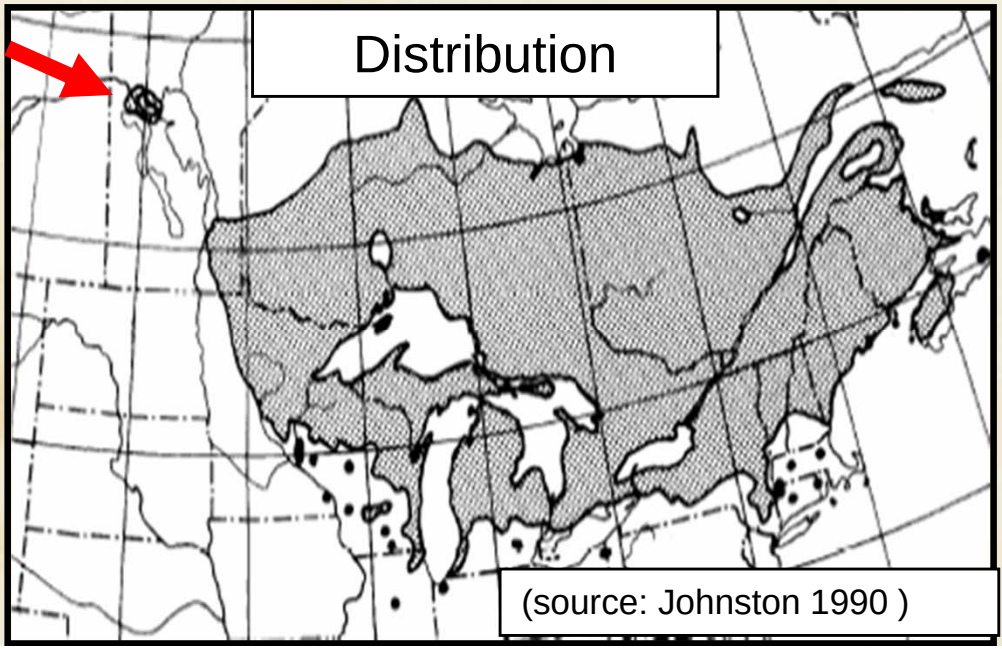
- Spies and Franklin 1988; Kimmins 2003

# Northern White-Cedar (*Thuja occidentalis*)

- Late successional
- Max age >1000
- Uneven-aged, gap phase dynamics

Disjunct stands

- West-central MB
- Stands ~ 400 yrs
- Located on the Pas end moraine



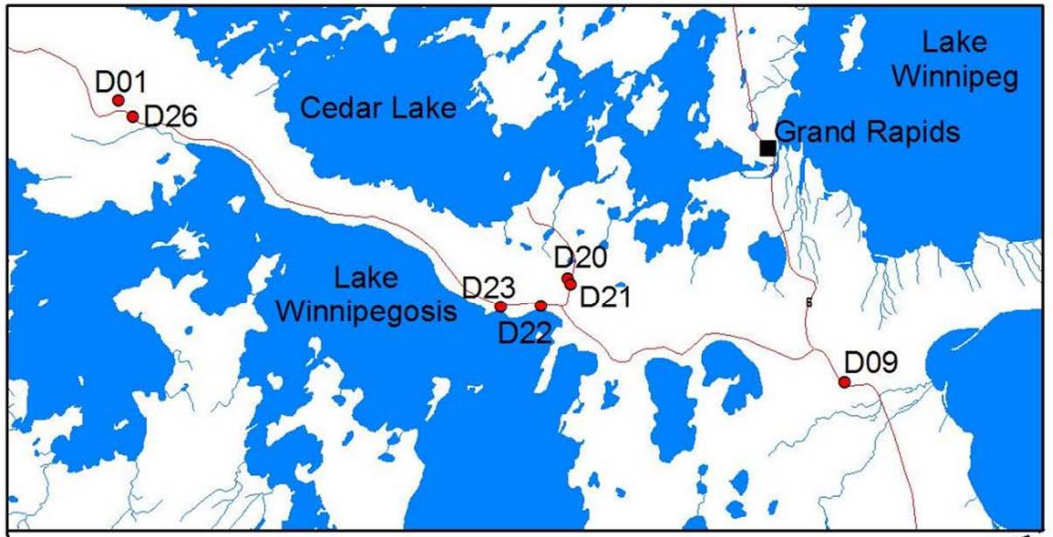
# Objectives

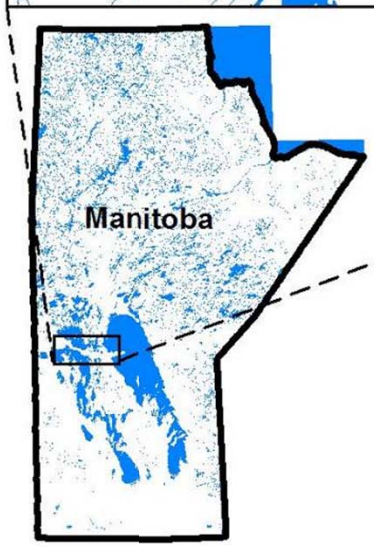
In the disjunct OG cedar stands:

1) Characterize the veg. – enviro. relationships
2) Characterize the OG characteristics
3) Compare & contrast three different stand types (xeric, mesic, hydric)

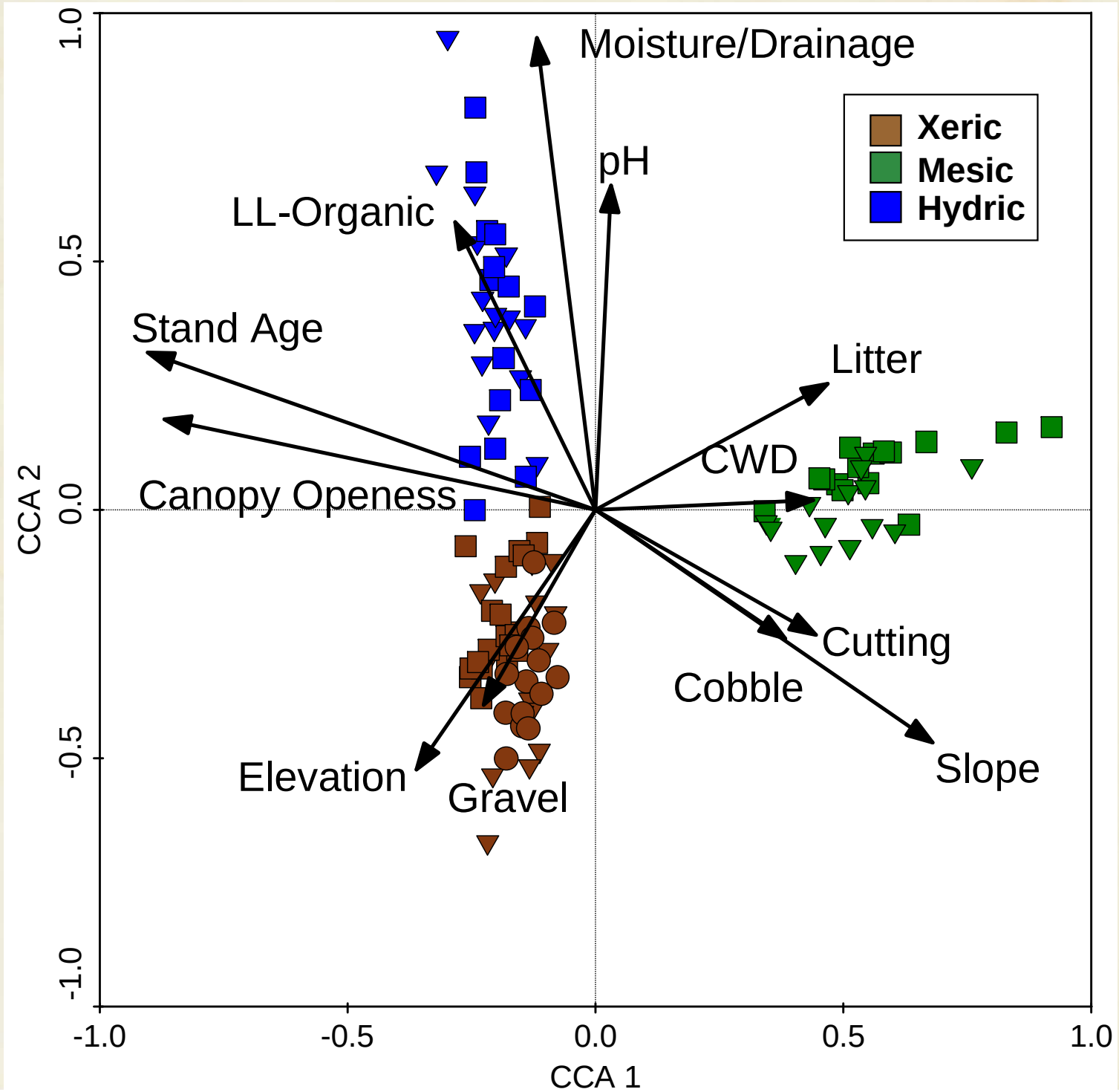
# Sampling

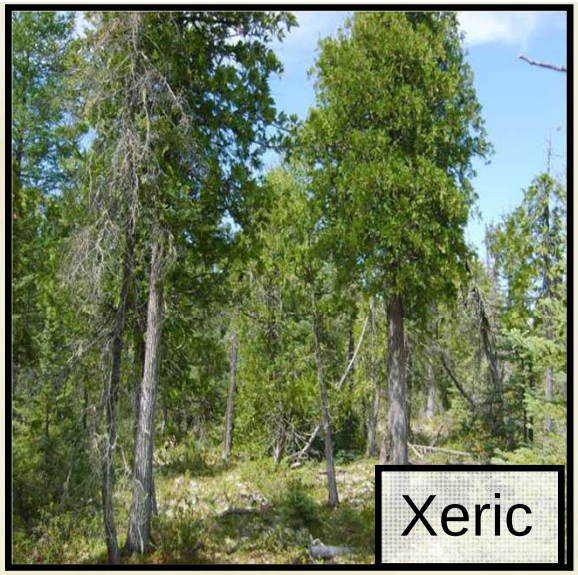
- 7 sites
- Point center quarter, 15 points
  - saplings, trees, snags
- Soil profile, hemispheric photo, vegetation plot
- CWD intercept transect
  - 150m each site

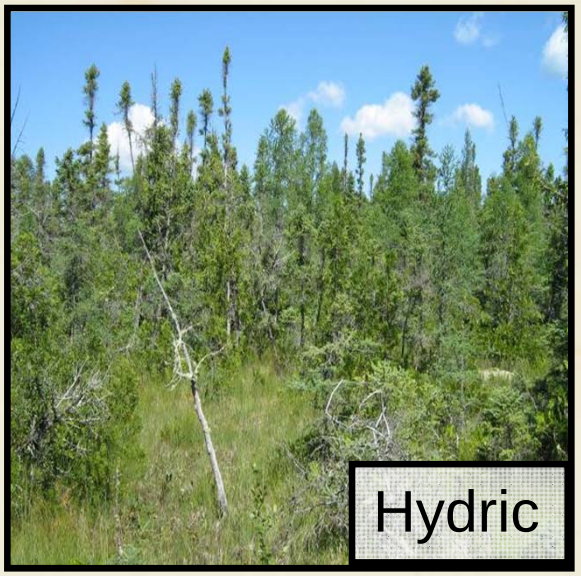


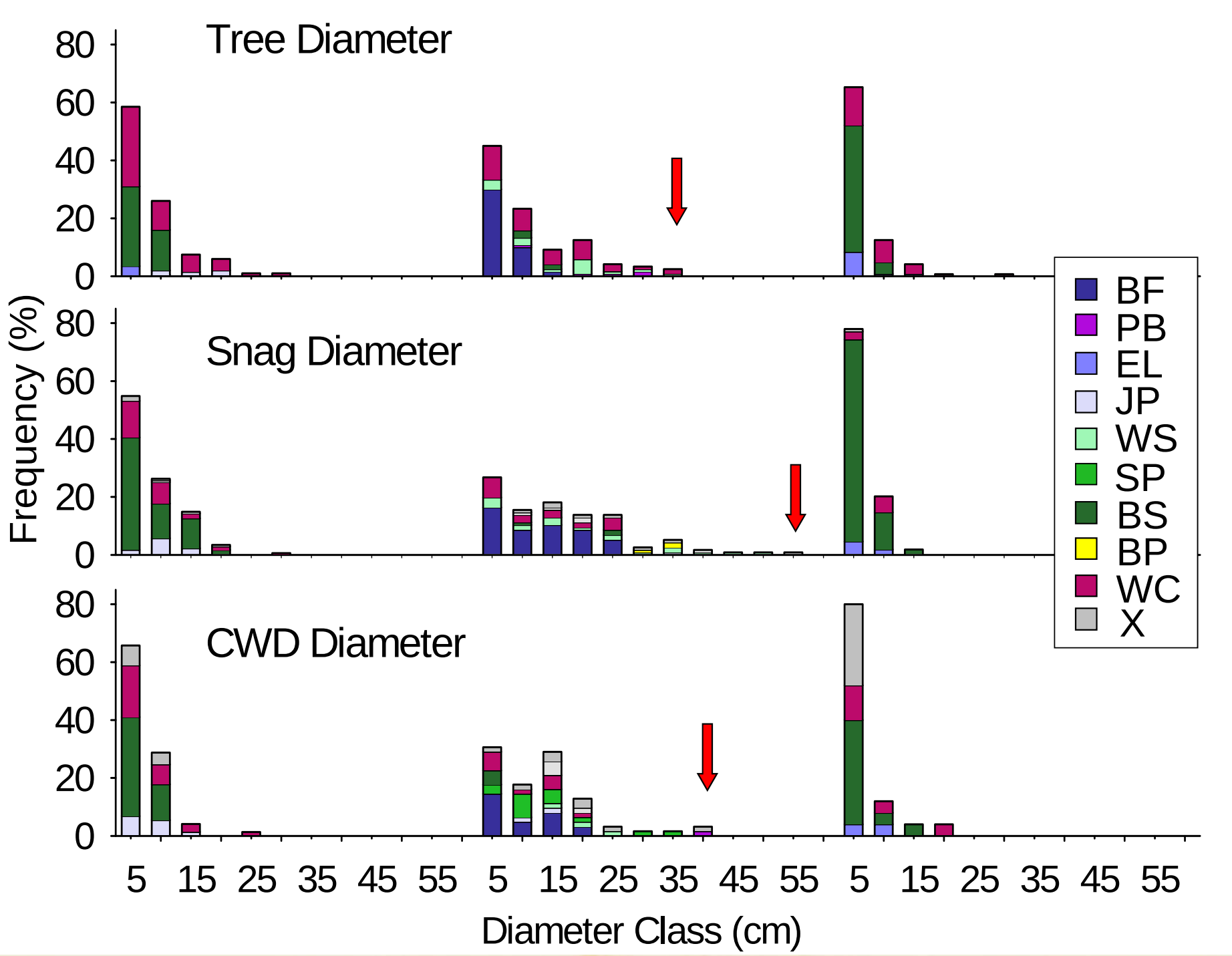
# CCA Results


Moisture/Drainage
pH
LL-Organic
Stand Age
Litter
CWD
Canopy Openess
Cutting
Cobble
Slope
Elevation
Gravel
Xeric
Mesic
Hydric
CCA 2
CCA 1
1.0
0.5
0.0
-0.5
-1.0
-1.0
-0.5
0.0
0.5
1.0

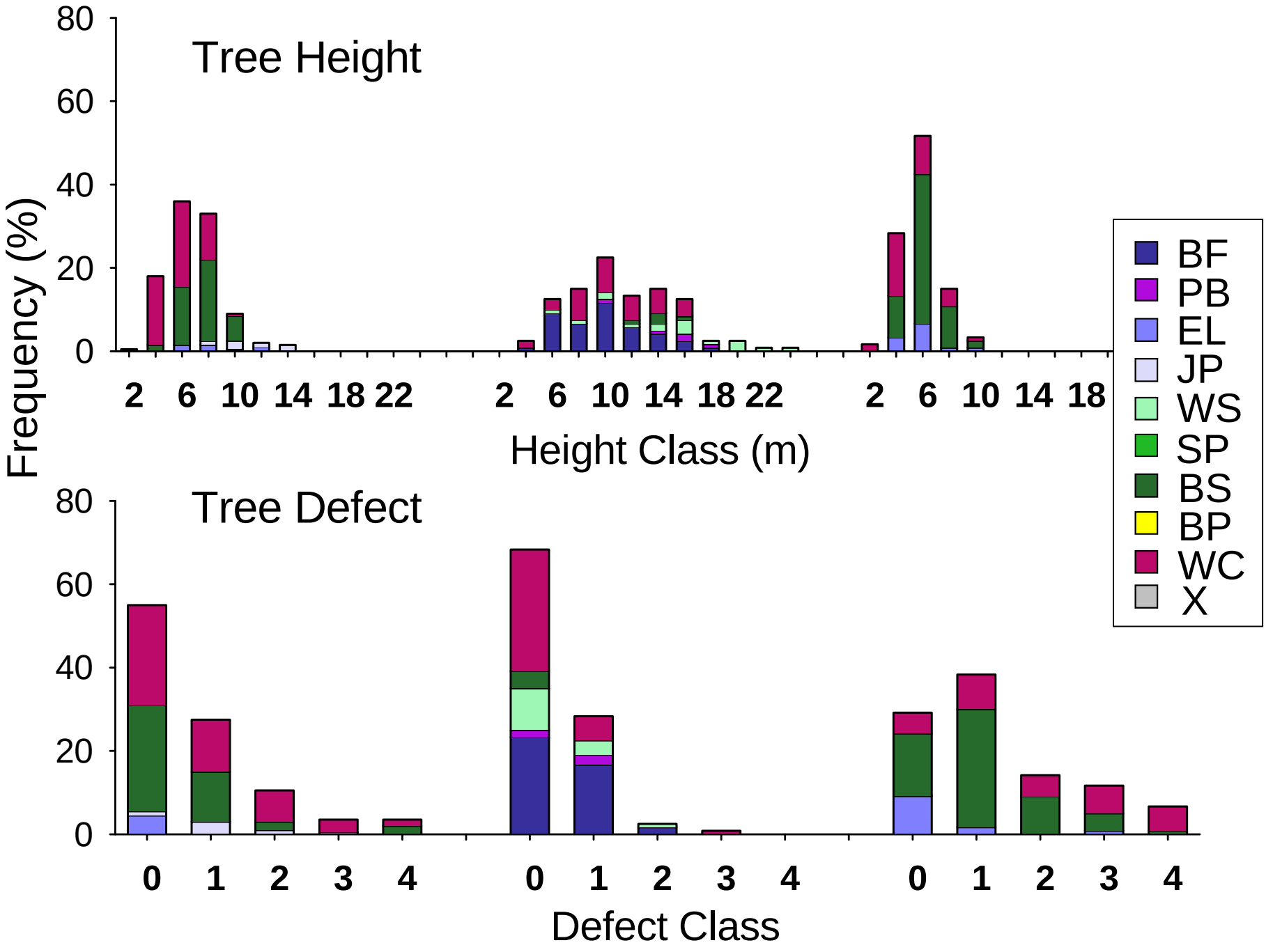





| Tree Density | Xeric | Mesic | Hydric |
|---|---|---|---|
| Balsam Fir | - | **965** | - |
| Paper Birch | - | 96 | - |
| Jack Pine | **92** | - | - |
| East. Larch | 75 | - | **201** |
| White Spruce | - | **328** | - |
| Black Spruce | 695 | 96 | 992 |
| White Cedar | 812 | 830 | 532 |
| **Total** | **1674** | **2315** | **1726** |



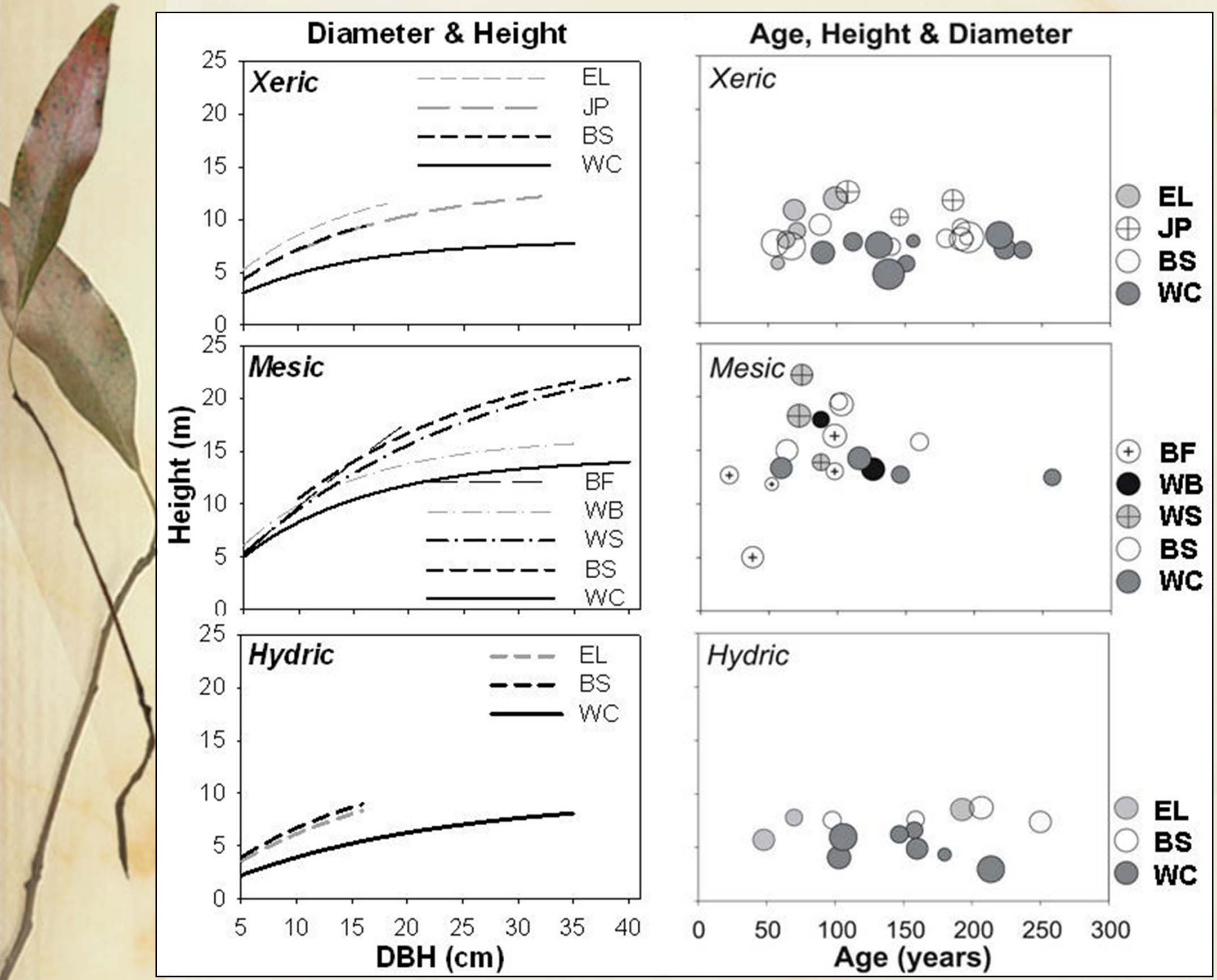

**XERIC** **MESIC** **HYDRIC**







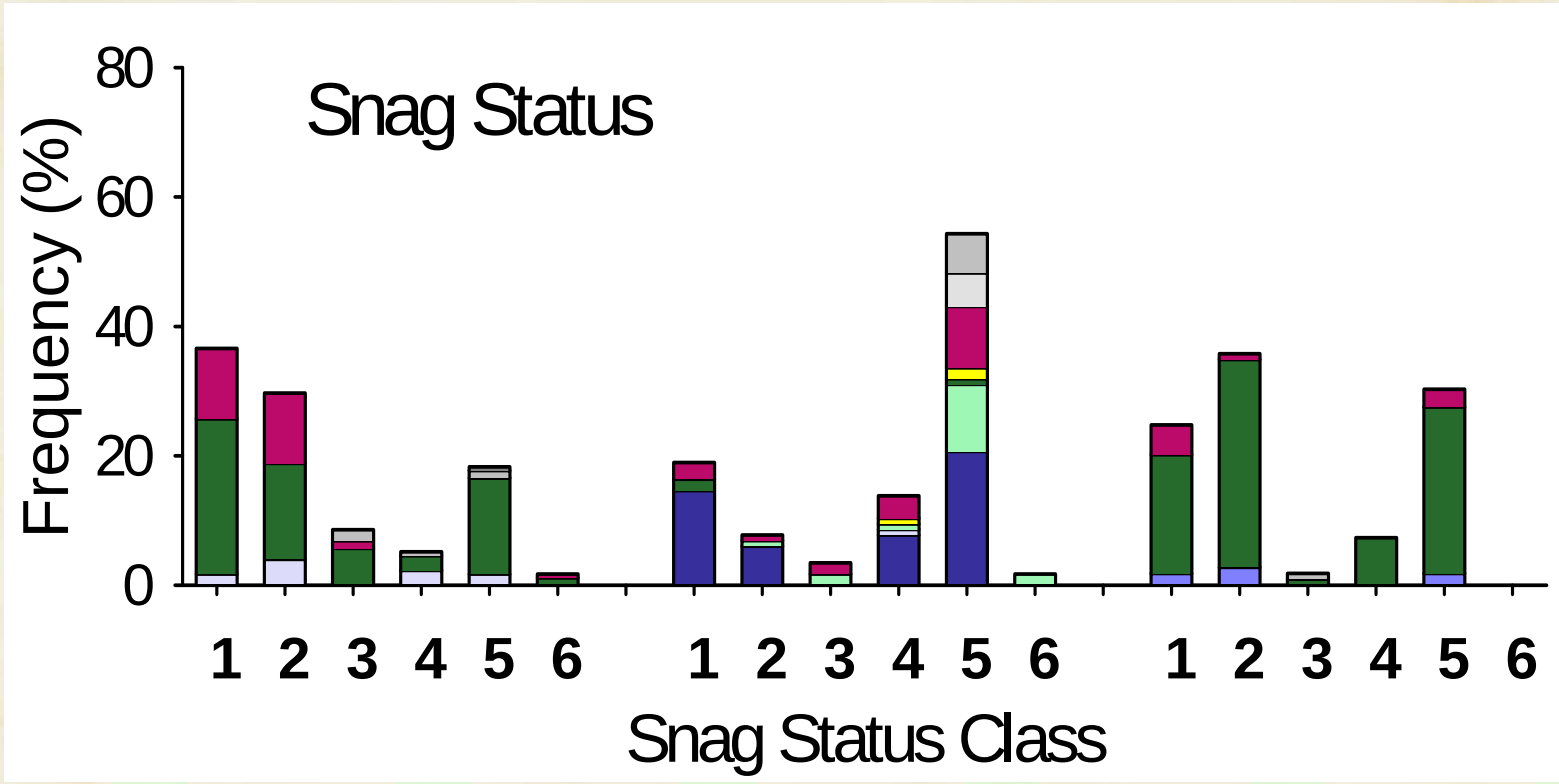
**XERIC** **MESIC** **HYDRIC**


Diameter & Height
Age, Height & Diameter
Xeric
EL
JP
BS
WC
Mesic
BF
WB
WS
BS
WC
Hydric
EL
BS
WC
Height (m)
DBH (cm)
Age (years)
0
5
10
15
20
25
30
35
40
50
100
150
200
250
300

| Snag Density | Xeric | Mesic | Hydric |
|---|---|---|---|
| **Balsam Fir** | - | 285 | - |
| **East. Larch** | - | - | 23 |
| **Jack Pine** | 32 | 5 | - |
| **White Spruce** | - | 90 | - |
| **Black Spruce** | 209 | 15 | 305 |
| **Balsam Poplar** | - | 15 | - |
| **White Cedar** | 78 | 105 | 30 |
| **Unidentified** | 13 | 65 | 3 |
| **Total** | **333** | **580** | **362** |

| CWD Volume | Xeric | Mesic | Hydric |
|---|---|---|---|
| Wagner ($m^3$/ha) | 17.9 | 68.6 | 4.81 |
| Wagner ($m^3$/ha) | 23.3 | 87.0 | 14.12 |
| Wagner ($m^3$/ha) | 17.2 | | |

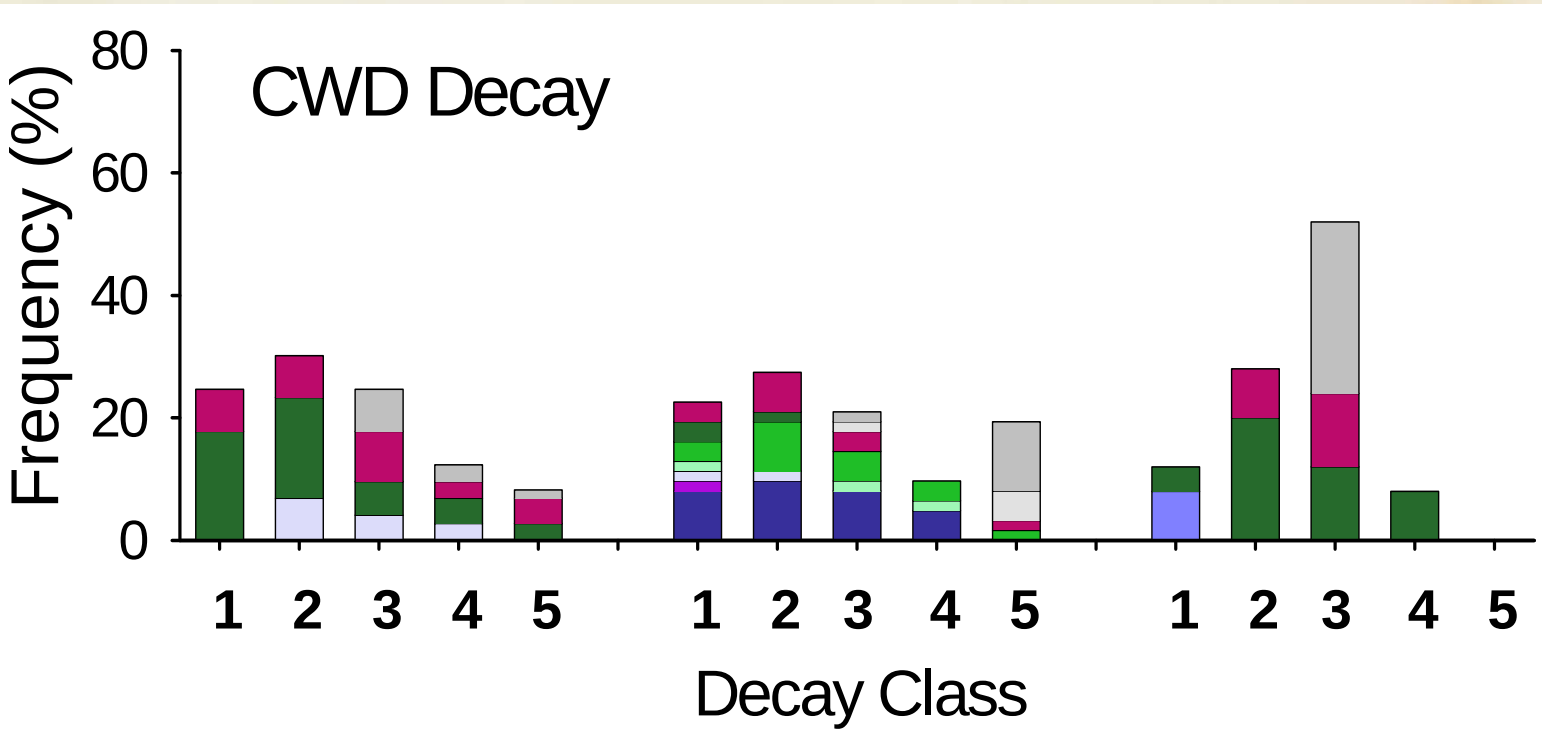
**XERIC** **MESIC** **HYDRIC**

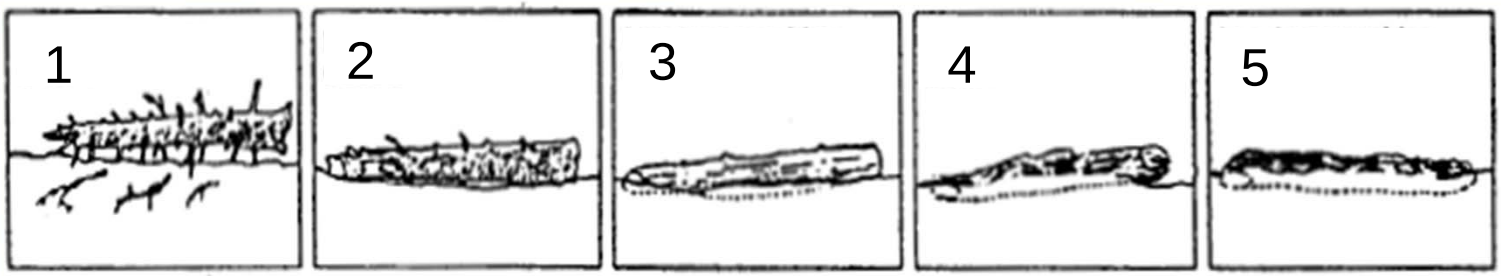



1 2 3 4 5 6

(Source: www.fmf.ca)

**XERIC** **MESIC** **HYDRIC**




| | | | | | |
|---|---|---|---|---|---|
| **Wood texture** | intact, hard | intact, hard-decaying | hard, large pieces | small blocky pieces | small pieces, soft |
| **Bark and twigs** | twigs, bark present | partial bark | trace of bark | absent | absent |

(Source: http://ilmbwww.gov.bc.ca)

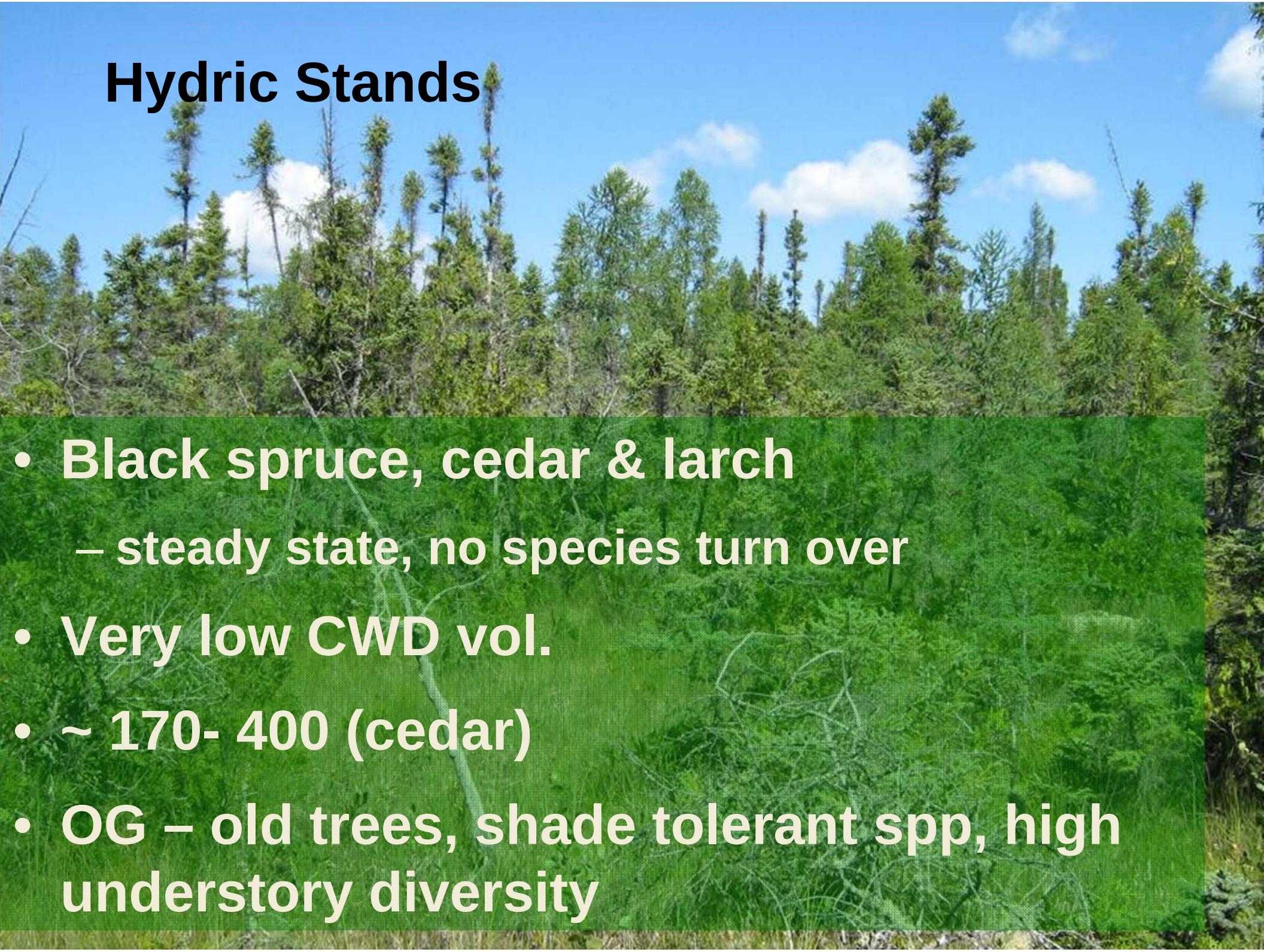
# Xeric

- Cedar, black spruce & jack pine
  - increasing shade tolerant species
    - jack pine turning over to cedar and black spruce
- Lowest tree & snag density
- Low CWD vol.
- ~ 180-230 years (cedar)
- OG – old trees, long lived shade tolerant spp

# Mesic Stands

- Balsam fir, cedar, white/black spruce & balsam poplar
  - increasing shade tolerant species
    - white spruce and hardwoods turning over to balsam fir, cedar & black spruce
- ~85-260 (cedar)
- OG – uneven age structure, large trees and high vol. deadwood

# Hydric Stands



- Black spruce, cedar & larch
  - steady state, no species turn over
- Very low CWD vol.
- ~ 170- 400 (cedar)
- OG – old trees, shade tolerant spp, high understory diversity

# Disjunct Old-Growth Cedar Stands

- Three successional pathways
  - substrate, drainage, elevation, slope and pH
- Differ in tree size, density, composition, & deadwood
  - vary with stand dynamics more than age
- Need flexible, regional definitions of OG
  - OGI based on nat. variation, eco zone & site type
- Unique in location, spp composition, age
  - house rare species, unique habitat
  - stresses their value for conservation

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