### Garry Oak Ecosystem Stand History in Southwest British Columbia: Implications for Restoration, Management and Population Recovery



# Background

- Garry oak ecosystems "at risk"
- Most significant threat: changes in disturbance (fire suppression)



### **Restoration – Prescribed Fire**





- Restore historical fire regime
- Reduce understory fuel loads
- Deter encroachment of woody species
- Restore native vegetation



# **Objective**

Examine establishment patterns, site classification(s) and site history at three structurally different Garry oak stands in British Columbia

### Somenos Marsh

### Tumbo Cliff

### Tumbo Marsh



Deep soil Flat Small GO





Rocky Shallow soil Sloped Deep soil Flat Large GO

### **Study Sites**



# Methods

Compared Garry oak stands at 3 sites

- 1. Site Classification
  - Garry Oak Ecosystem Restoration Team classification scheme
- 2. Site History
  - Historical documents/books
  - Parks Canada literature
- 3. Establishment Pattern
  - Tree-ring analysis



# **Implication 1**

Garry oak and Douglas-fir recruitment corresponds with:

- 1. End of the Little Ice Age (LIA)
- 2. Collapse of the Indigenous populations
- 3. In some sites prior to European settlement

## **Implication 1**



Year	Event
~1845	Beginning of European establishment Vancouver Island
Prior to 1850	Collapse of Indigenous populations
~1850	End of the Little Ice Age
~1880	Beginning of European establishment Tumbo Island

# **Implication 2: Somenos Marsh**

A clear relation among Indigenous occupation, subsequent European settlement and the development of Garry oak woodlands



Indigenous land management is important in the development of many Garry oak ecosystems

# **Implication 2: Somenos Marsh**

### **Site History**

- History of Indigenous land use
- Adjacent Douglas-fir community preceded by open grass ecosystem





# **Implication 2: Somenos Marsh**



Year	Event
~1845	Beginning of European establishment
Prior to 1850	Collapse of Indigenous population

# **Implication 3: Tumbo Cliff**

Regional climate, soil conditions, and periodic fire likely drives the characteristics of dry, shallow soil Garry oak woodlands



Prescribed burning by Indigenous peoples was not likely an important contributing factor

### **Implication 3: Tumbo Cliff**





#### **Site History**

- 1886 establishment of coal mine
- Evidence of fire on "veteran" Douglas-fir trees
- No evidence of frequent disturbance

# **Implication 3: Tumbo Cliff**



- Garry oak and Douglas-fir approximately same age
- Stand distribution likely due to patterns of succession

### **Implication 4: Tumbo Marsh**

# Garry oak can establish and grow quickly when conditions are favourable





### **Implication 4: Tumbo Marsh**





#### **Site History**

- Pre-European settlement → salt marsh
- European settlement → causeway/culverts
- Conversion of salt to freshwater marsh in 1920s

# **Implication 4: Tumbo Marsh**



Establishment Year

- Garry oak and Douglas-fir recruitment occur at same time
- Conversion of salt marsh lead to Garry oak and Douglas-fir establishment
- Garry oak tolerate saturated and saline conditions better than Douglas-fir

# **Implication 5**

The combination and comparison of site level historical records, site characteristics, and dendrochronological data within the region provides a greater understanding the factors that shape the structure of these ecosystems

This information can be integrated into a restoration and fire management strategy for each site

### Somenos Marsh

- Garry oak recruitment coincides with European settlement
- Fire halted or slowed succession





#### **Management Implications**

 No management = continued succession

Savannah → Woodland → Douglas-fir forest

#### **Restoration Recommendations**

- Ideal site to re-introduce fire on a 3-7 year burn cycle
- Remove established Douglas-fir

# **Tumbo Cliff**

- No evidence of frequent disturbance
- Stand distribution likely due to patterns of succession

#### **Management Implications**

- Fire may not be necessary to maintain Garry oak ecosystem
- Cautious approach to fire



#### Restoration Recommendations

- Remove Douglas-fir prior to another burn
- Re-assess prescribed fire





# Tumbo Marsh

- Appears:
  - Old Garry oak, young Douglas-fir
  - History of fire
- Conversion of salt marsh lead to Garry oak establishment





#### **Management Implications**

- Need additional baseline data (vegetation assemblages)
- Fire  $\rightarrow$  unintended consequences
- Fire  $\rightarrow$  deter establishment of DF

#### **Restoration Recommendations**

• Fire on a 3-7 year burn cycle?

# Summary

Implication 1	GO and DF recruitment corresponds with the end of the LIA, collapse of Indigenous populations and in some sites prior to European settlement
Implication 2: Somenos Marsh	A clear relation among Indigenous occupation, European settlement and the development of GO woodland
Implication 3: Tumbo Cliff	Regional climate, soil conditions, and periodic fire likely drives the characteristics of dry, shallow soil GO woodlands
Implication 4: Tumbo Marsh	GO can establish and grow quickly when conditions are favourable
Implication 5	The information collected in this study can be integrated into a restoration and fire management strategy for each site

### Questions





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