



DENDROCHRONOLOGY ACROSS BORDERS: DEVELOPING A NETWORK OF *QUERCUS* *GARRYANA* TREE-RING CHRONOLOGIES FOR THE PACIFIC NORTHWEST

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CONSERVATION WITHOUT BORDERS: Working Across Boundaries to Restore Prairie and Oak Communities

Acknowledgements



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SAN JUAN COUNTY
LAND BANK



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Outline

1. Background

- The problem, why does it matter, goals and objectives

2. Methods

- Dendrochronology (Tree-ring science)
- Field and Laboratory
- Study Areas

3. Results and Discussion

4. Summary

Background: The fate of oak habitat?

44% Agriculture
30% Forest
14% Other natural vegetation
8% Built features
4% Unknown

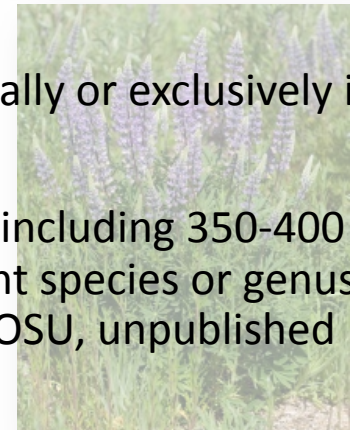
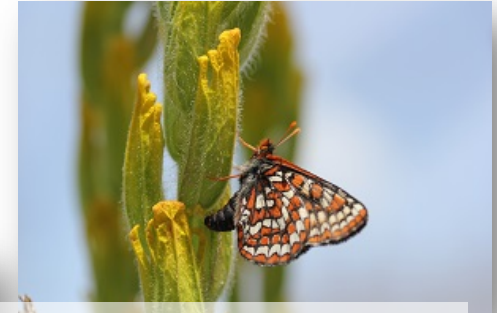
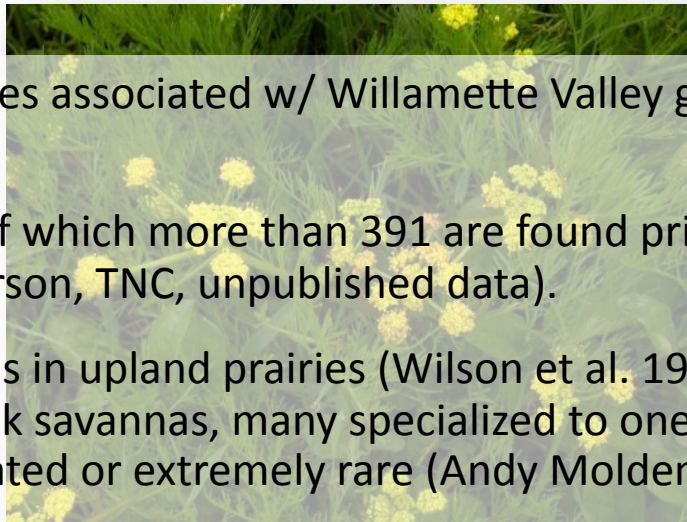


2-10% remains, 90-95% on private land

Background: Why does it matter?

Willamette Valley oak savanna & woodland:

- >95 native vertebrate species associated w/ Willamette Valley grasslands (Veseley and Rosenberg 2010)
- >714 native plant species of which more than 391 are found principally or exclusively in grassland habitats (Ed Alverson, TNC, unpublished data).
- >1100 species of arthropods in upland prairies (Wilson et al. 1998), including 350-400 species of native bees in oak savannas, many specialized to one plant species or genus. Today 80% are likely extirpated or extremely rare (Andy Moldenke, OSU, unpublished data).
- Six federally-listed plant and insect species (USFWS 2010).
- High cultural value and significance – recreational, aesthetic, spiritual



Background: Goals and Objectives

Goal: Continue building a knowledge base for oak habitat conservation and restoration planning

- Response of oak to present and past disturbance, both natural and anthropogenic, e.g. fire history, growth suppression and release
- GIS mapping of oak habitats and trajectories of change, e.g. historic stand reconstruction (pre-settlement)

Current Objective:

- Create a network of site-specific Garry oak tree-ring chronologies for the Pacific Northwest

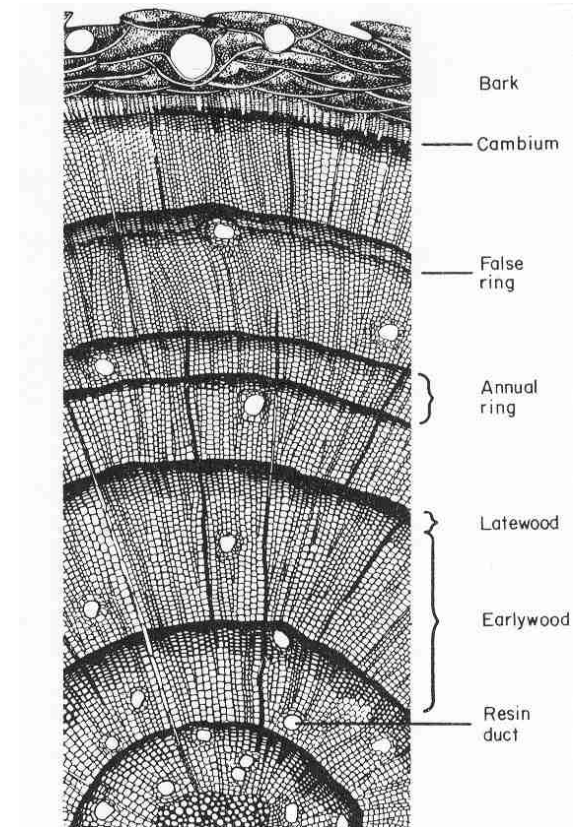
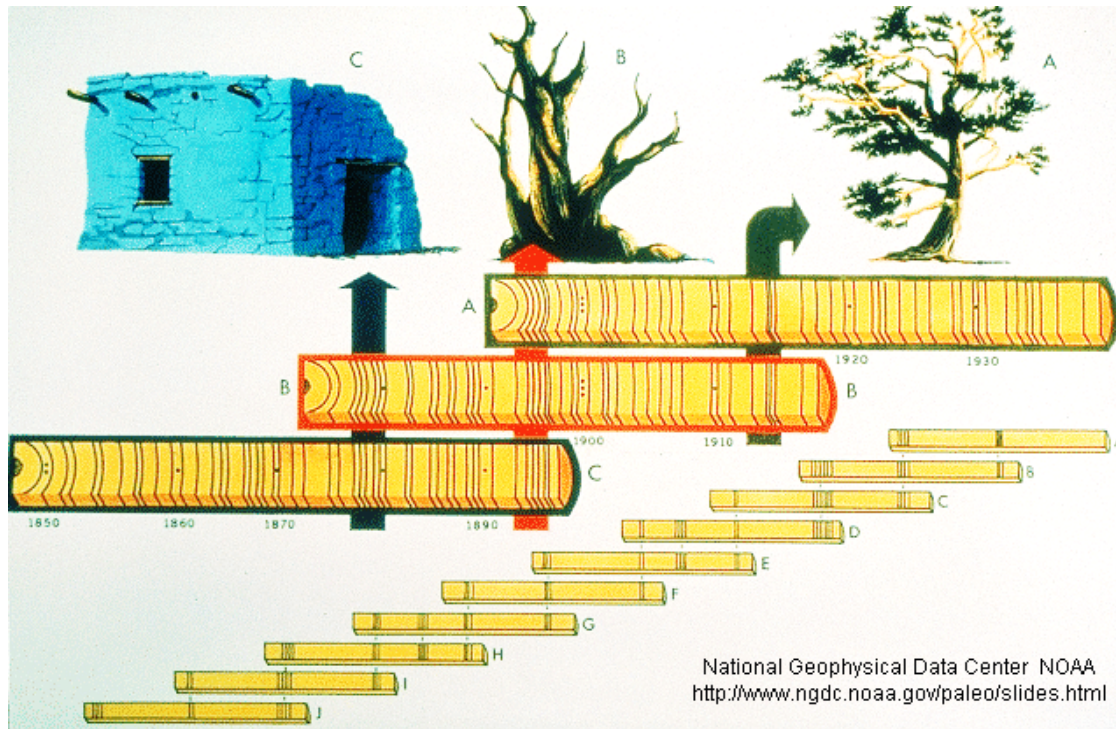
Methods

Dendrochronology

dendron = tree

chronos = time

logos = word = the science of



Principle of crossdating

In the Field

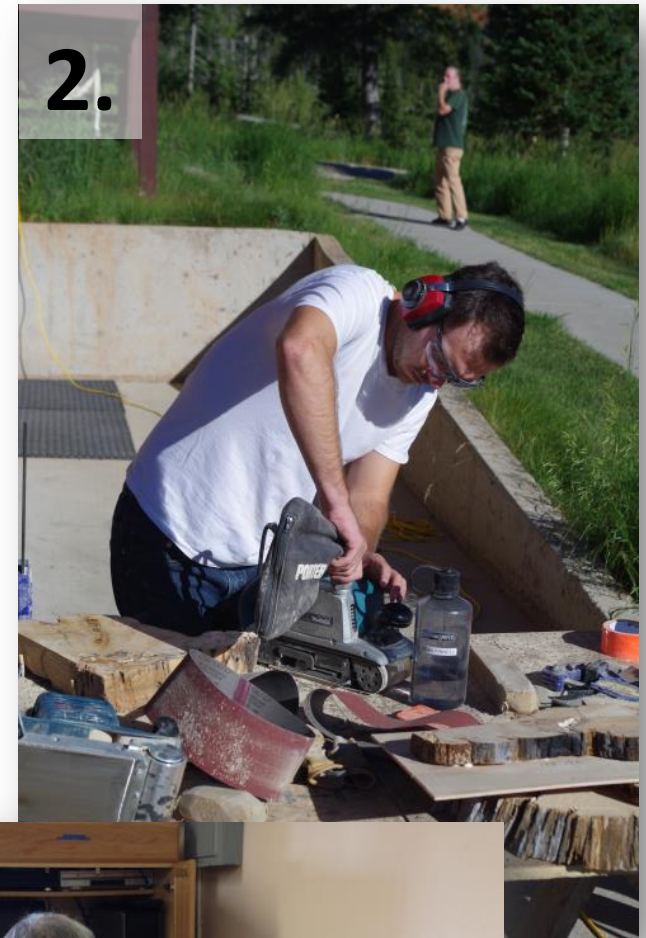
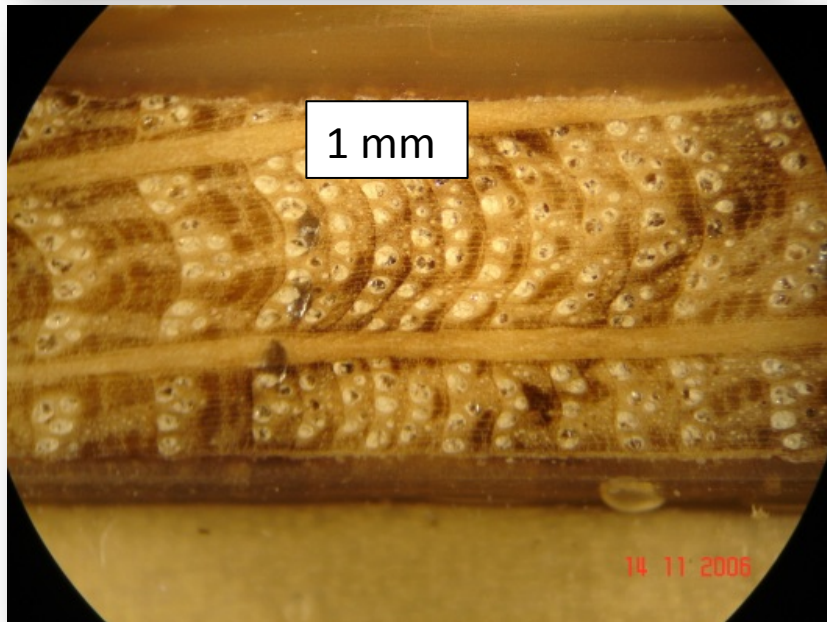


5.15 mm increment cores

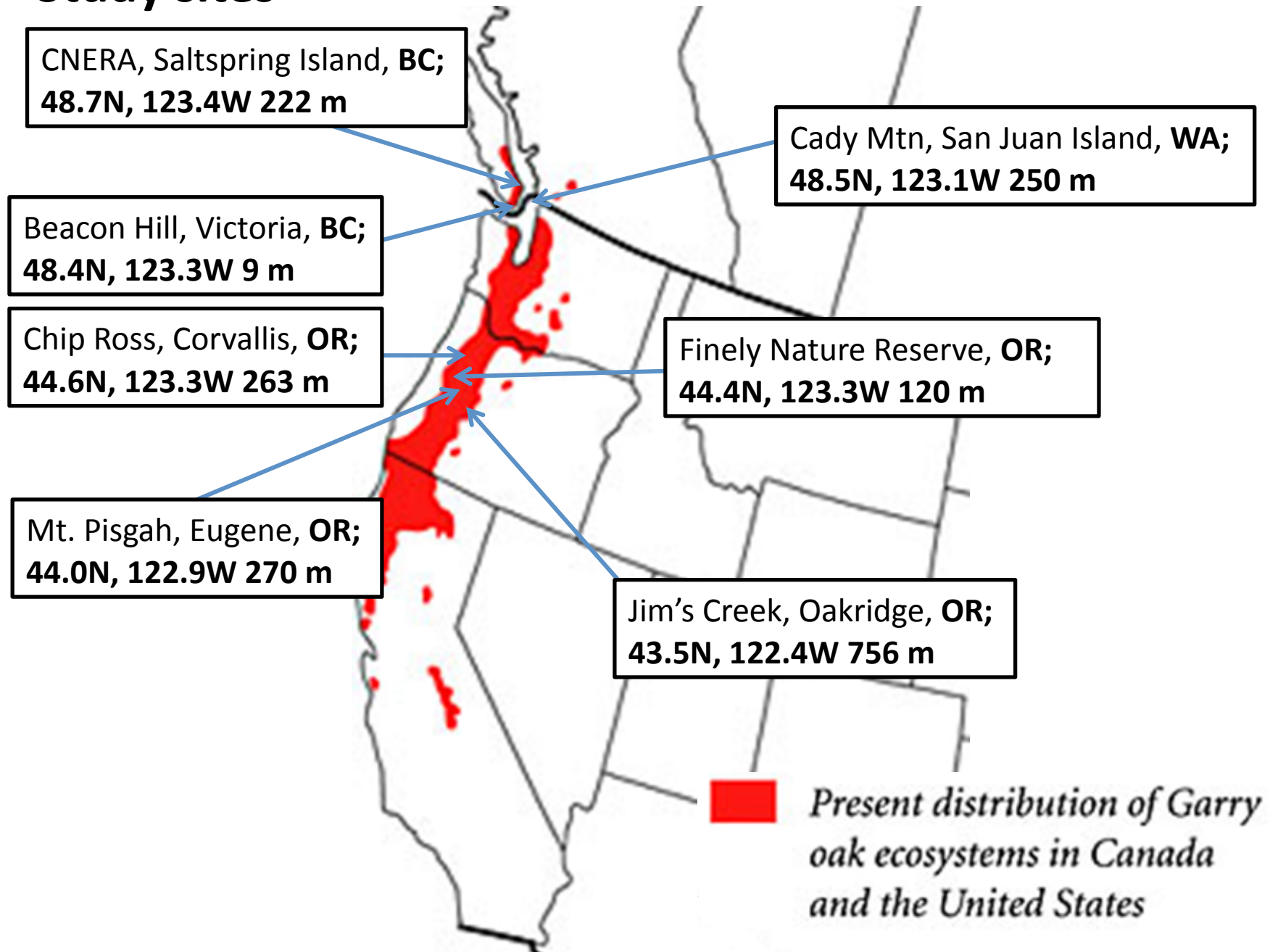
Opportunistic sampling of
cross-sections from dead
trees



In the Lab



Study sites



Results and Discussion

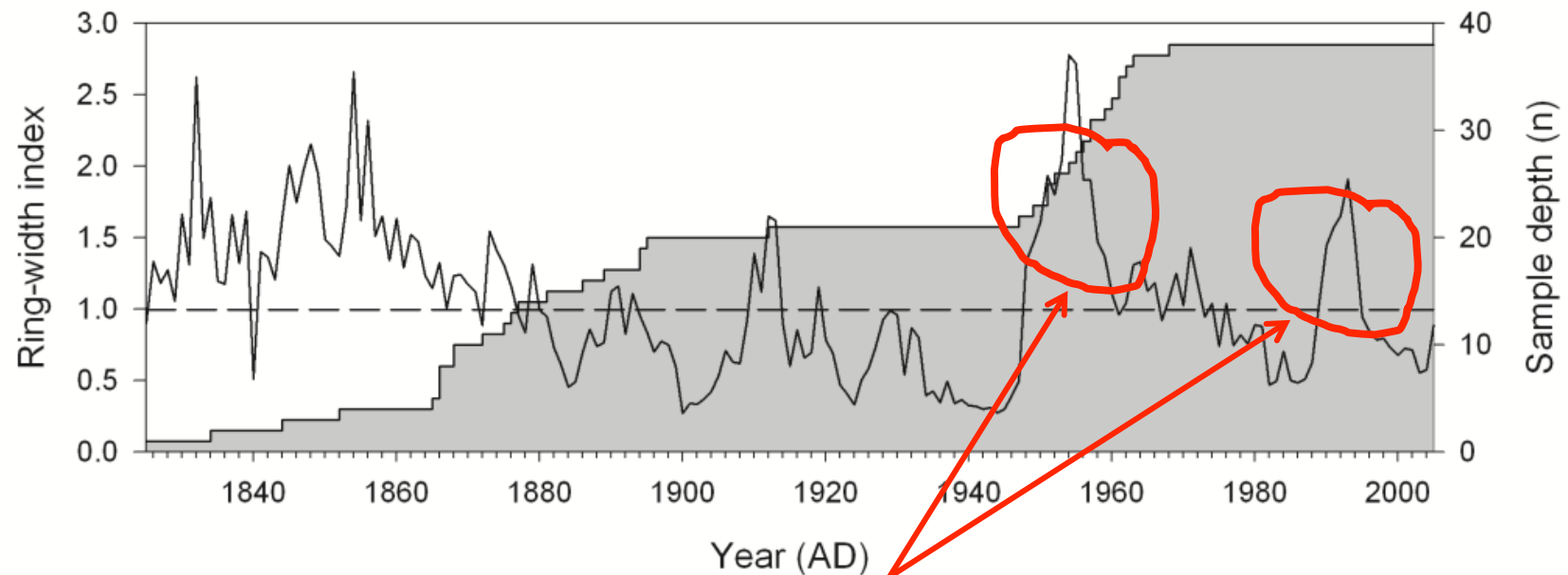
TREE-RING RESEARCH, Vol. 68(1), 2012, pp. 51–58

RESEARCH REPORT

DENDROCHRONOLOGICAL POTENTIAL OF *QUERCUS GARRYANA*, SALTSPRING ISLAND, BRITISH COLUMBIA

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V2Y 1Y1, Canada



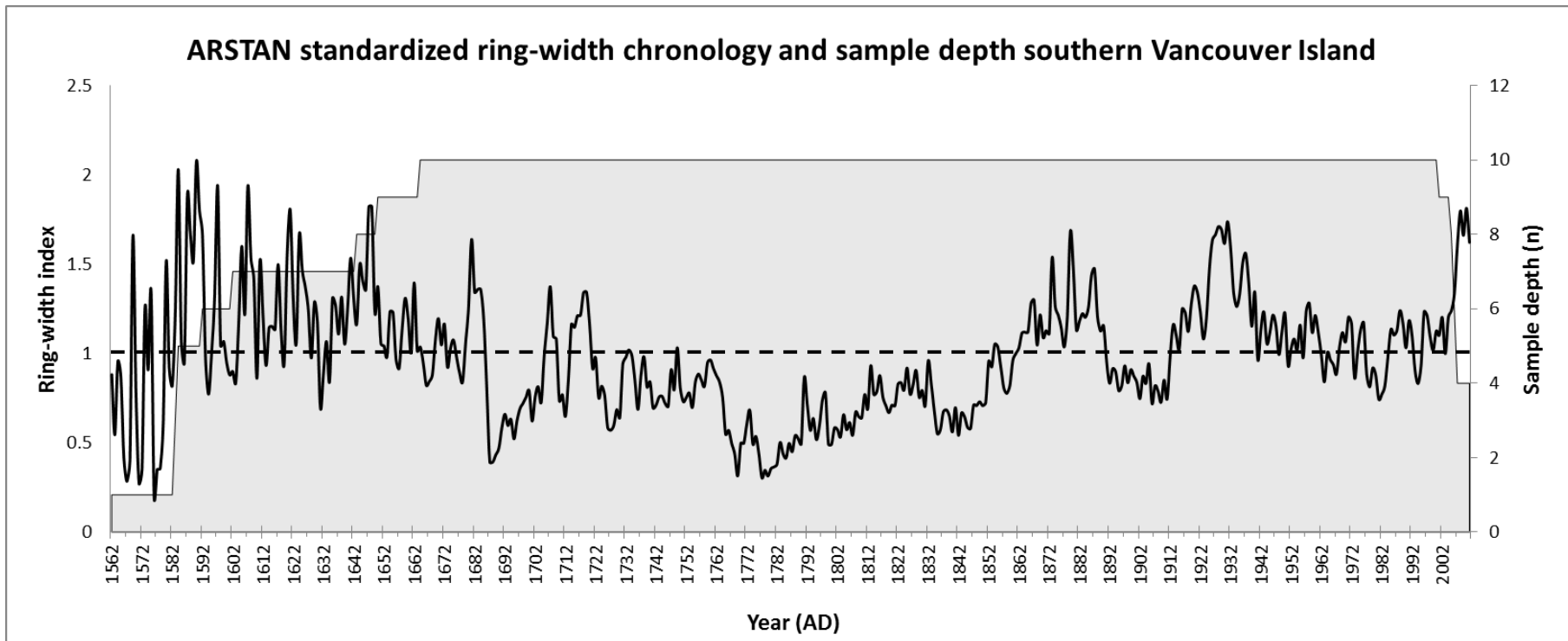
Episodic growth release from overtopping by Douglas-fir

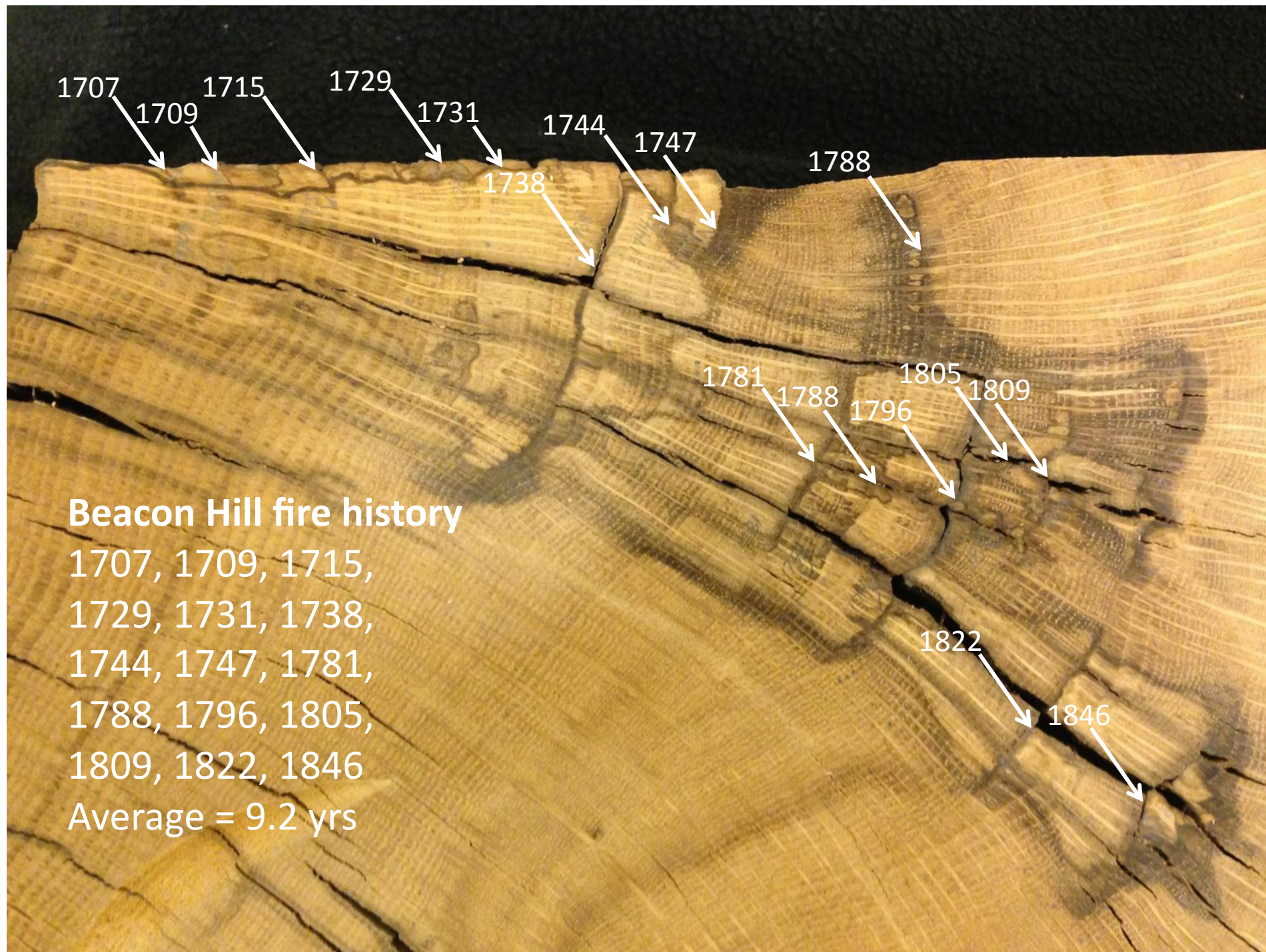
Results and Discussion

PART 7: DESCRIPTIVE STATISTICS:

Seq	Series	Interval	No. Years	No. Segmt	No. Flags	Corr with Master	//---- Mean msmt
1	BD12803A	1584 2011	428	17	7	.431	.79
2	BD12803B	1584 2011	428	17	6	.393	.73
3	BD12803C	1583 2011	429	17	5	.479	1.01
4	BD12803D	1583 2011	429	17	1	.510	1.08
5	BD12801A	1602 2004	403	16	2	.474	.96
6	BD12801B	1592 2005	414	17	2	.464	1.08
7	BD12801C	1562 2005	444	17	3	.467	.96
8	BD12802A	1643 2006	364	15	2	.477	.87
9	BD12802B	1650 2000	351	14	4	.421	.97
10	BD12802C	1664 2006	343	14	1	.461	1.23
Total or mean:			4033	161	33	.458	.96

Extending chronologies with
non-living samples





Results and Discussion

```
*****
*C* Number of dated series      43 *C*
*O* Master series 1679 2006   328 yrs *O*
*F* Total rings in all series   6515 *F*
*E* Total dated rings checked   6472 *E*
*C* Series intercorrelation     .547 *C*
*H* Average mean sensitivity     .203 *H*
*A* Segments, possible problems  19 *A*
*** Mean length of series      151.5 ***
*****
```

Chip Ross
(CR)

Marker rings: 1680, 1705-06, 1722,
1741, 1762, 1864, 1934, 1938

```
*****
*C* Number of dated series      28 *C*
*O* Master series 1701 2007   307 yrs *O*
*F* Total rings in all series   4822 *F*
*E* Total dated rings checked   4816 *E*
*C* Series intercorrelation     .516 *C*
*H* Average mean sensitivity     .223 *H*
*A* Segments, possible problems  18 *A*
*** Mean length of series      172.2 ***
*****
```

Finley NR
(FNR)

Marker rings: 1705-06, 1712, 1799-1800,
1804, 1828, 1881, 1894, 1918, 1978

```
*****
*C* Number of dated series      29 *C*
*O* Master series 1637 2012   376 yrs *O*
*F* Total rings in all series   5269 *F*
*E* Total dated rings checked   5264 *E*
*C* Series intercorrelation     .545 *C*
*H* Average mean sensitivity     .216 *H*
*A* Segments, possible problems  14 *A*
*** Mean length of series      181.7 ***
*****
```

Jim's Creek
(JC)

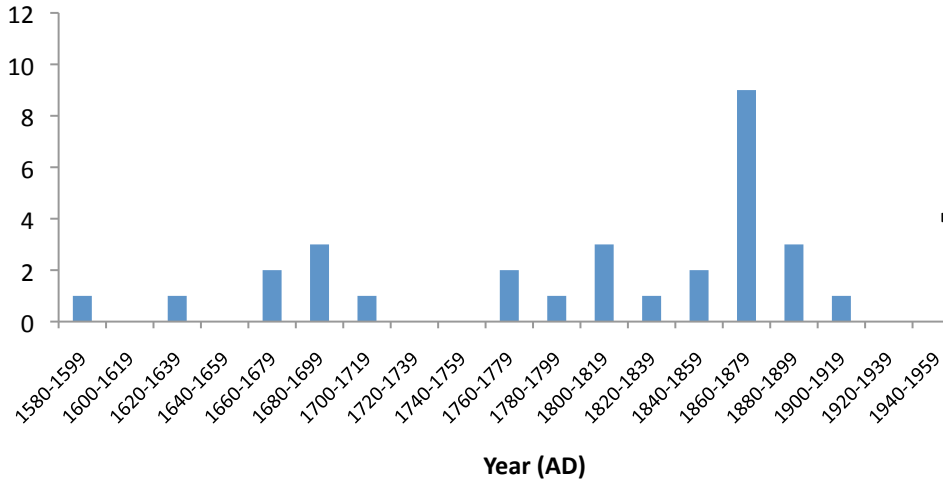
Marker rings: 1641, 1658, 1674, 1705-06,
1741, 1800, 1849, 1909, 1945, 1977-78

```
*****
*C* Number of dated series      36 *C*
*O* Master series 1704 2006   303 yrs *O*
*F* Total rings in all series   5117 *F*
*E* Total dated rings checked   5037 *E*
*C* Series intercorrelation     .508 *C*
*H* Average mean sensitivity     .254 *H*
*A* Segments, possible problems  16 *A*
*** Mean length of series      142.1 ***
*****
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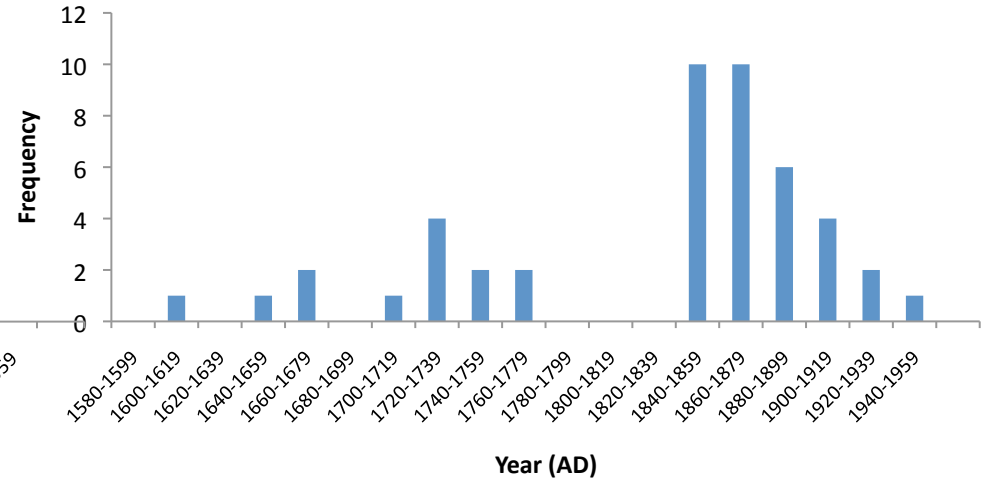
Mt. Pisgah
(MP)

Marker rings: 1706, 1712, 1739-40-41,
1763, 1777, 1829-30, 1847, 1896, 1918

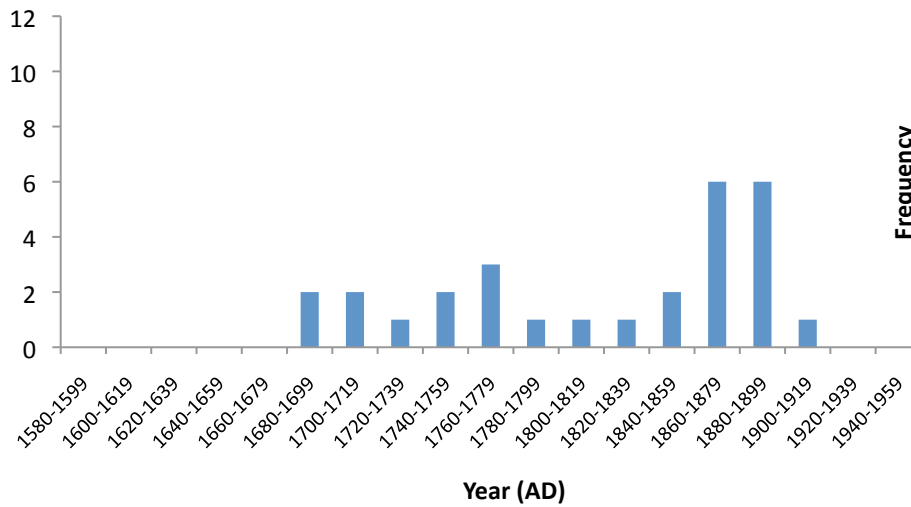
Age structure (JC)



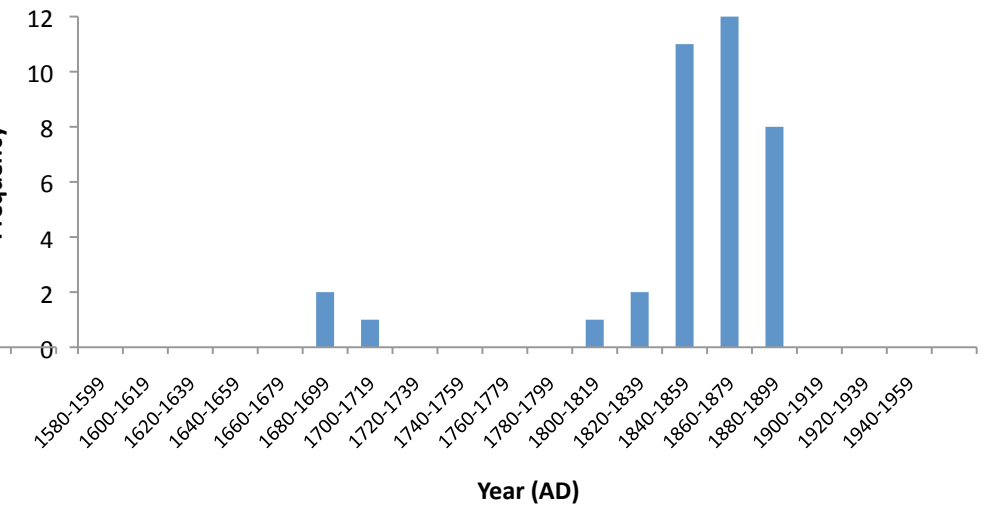
Age Structure (CR)



Age structure (FNR)

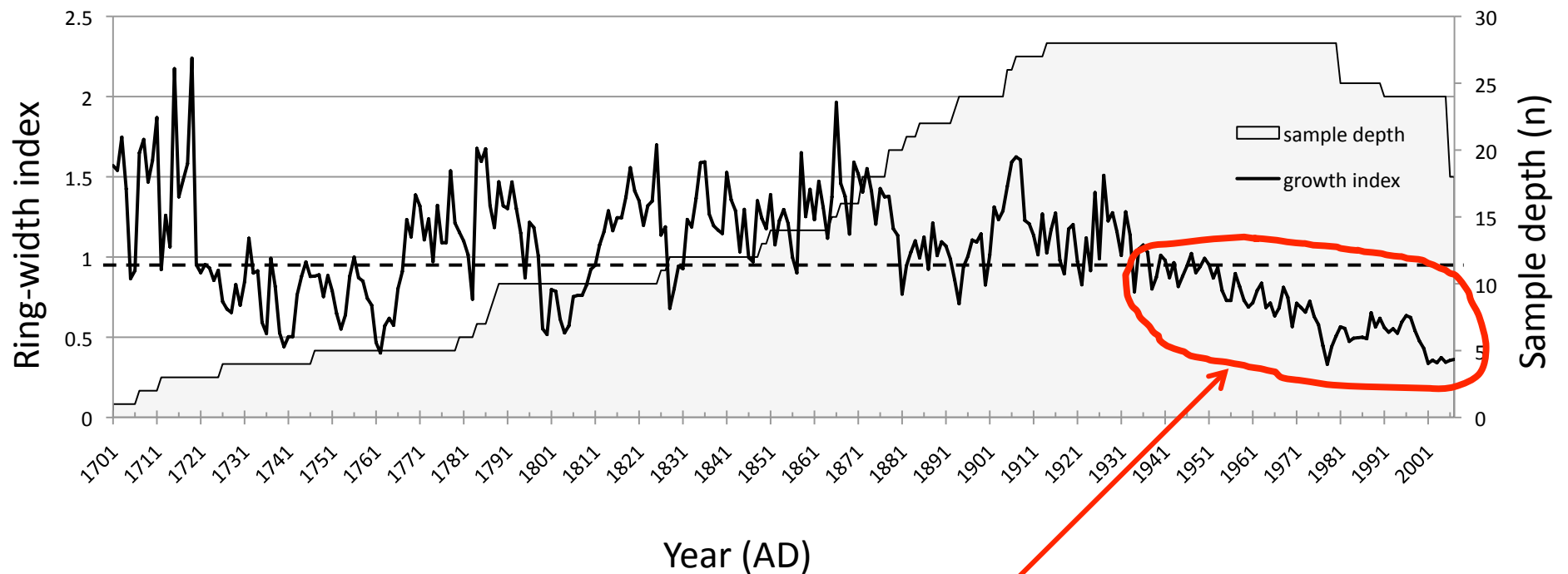


Age structure (MP)



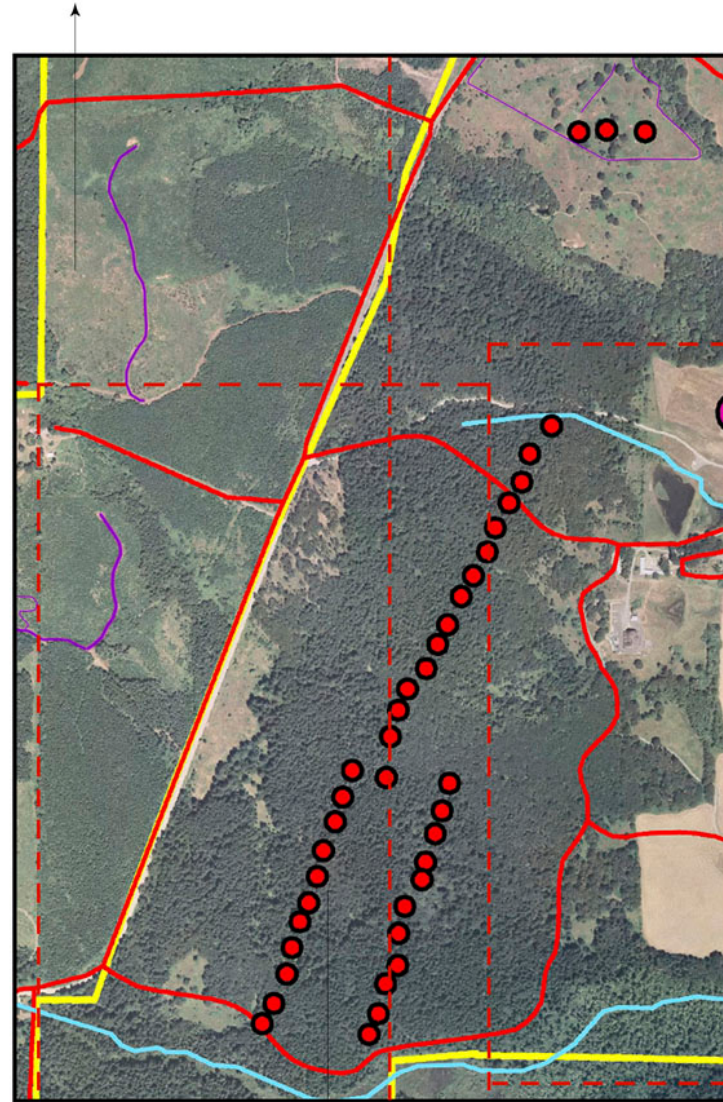
Results and Discussion

Standardized ring-width index and sample depth for FNR



**Stand-wide growth suppression
due to overtopping by Douglas-fir**

1944

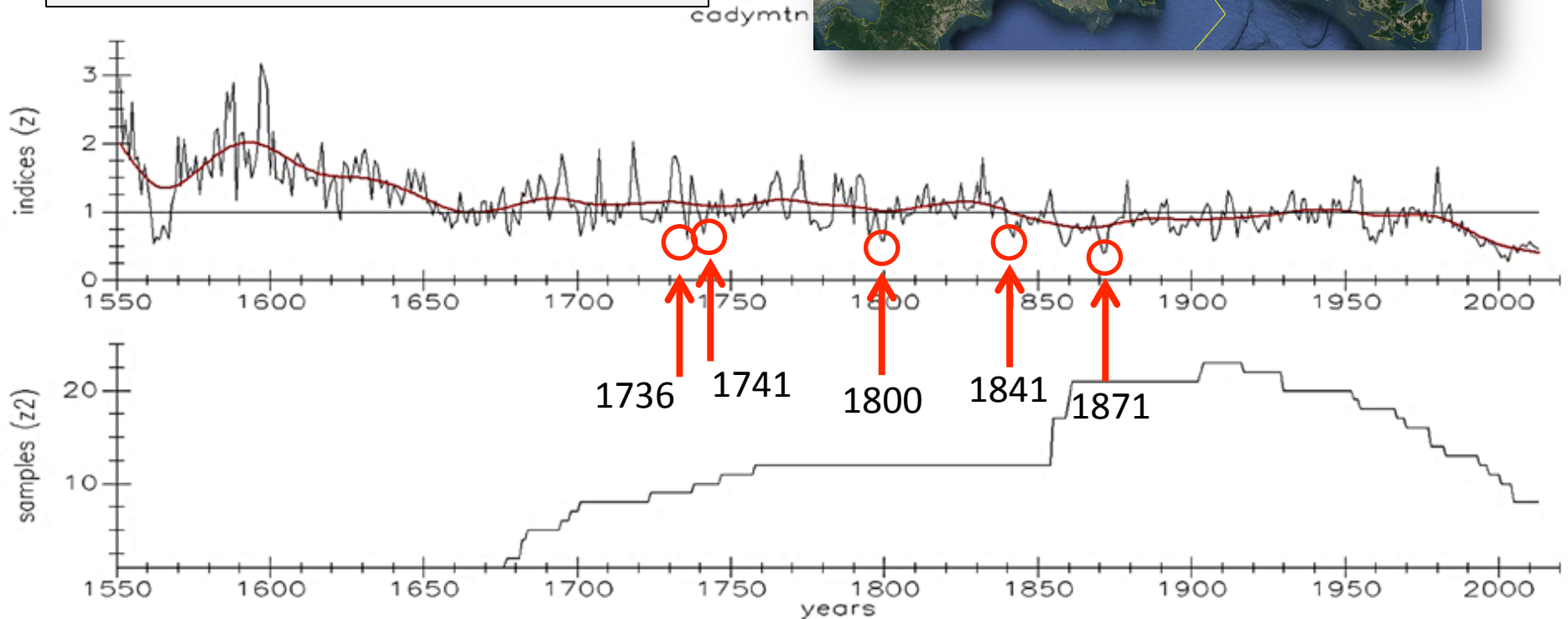


Historical landscape level change at Finley Nature Reserve – oak prairie/savanna – douglas-fir woodland

Results and Discussion

Marker rings: observed 560 km south at Jim's Creek!

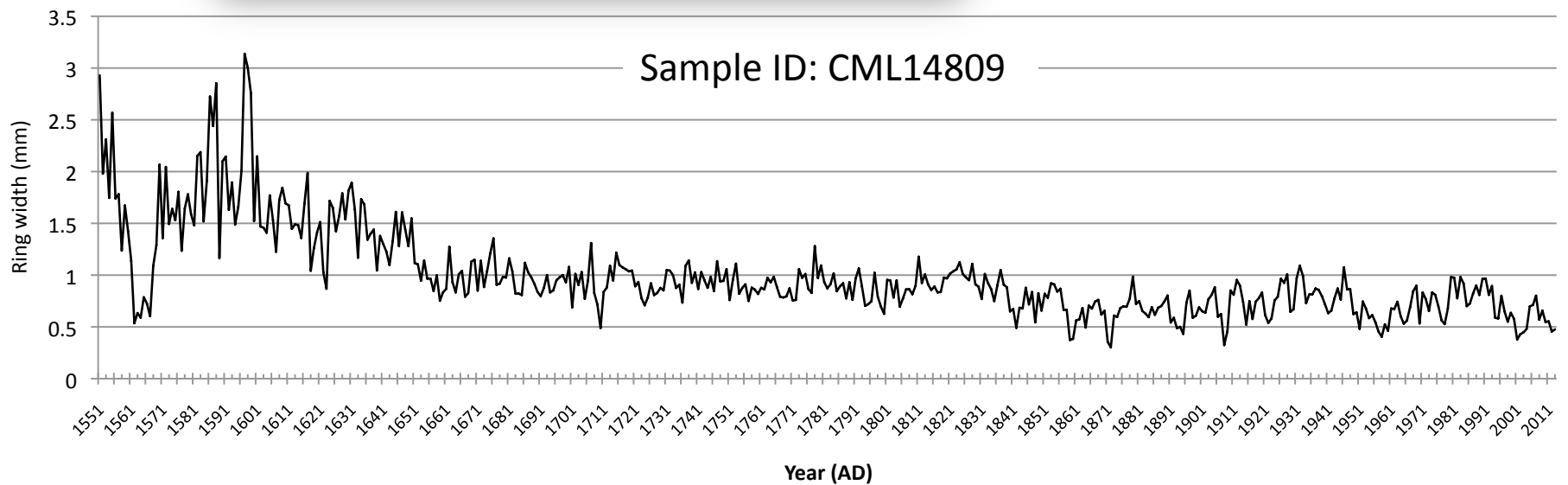
**Cady Mountain Preserve,
San Juan Island, WA**



Results and Discussion



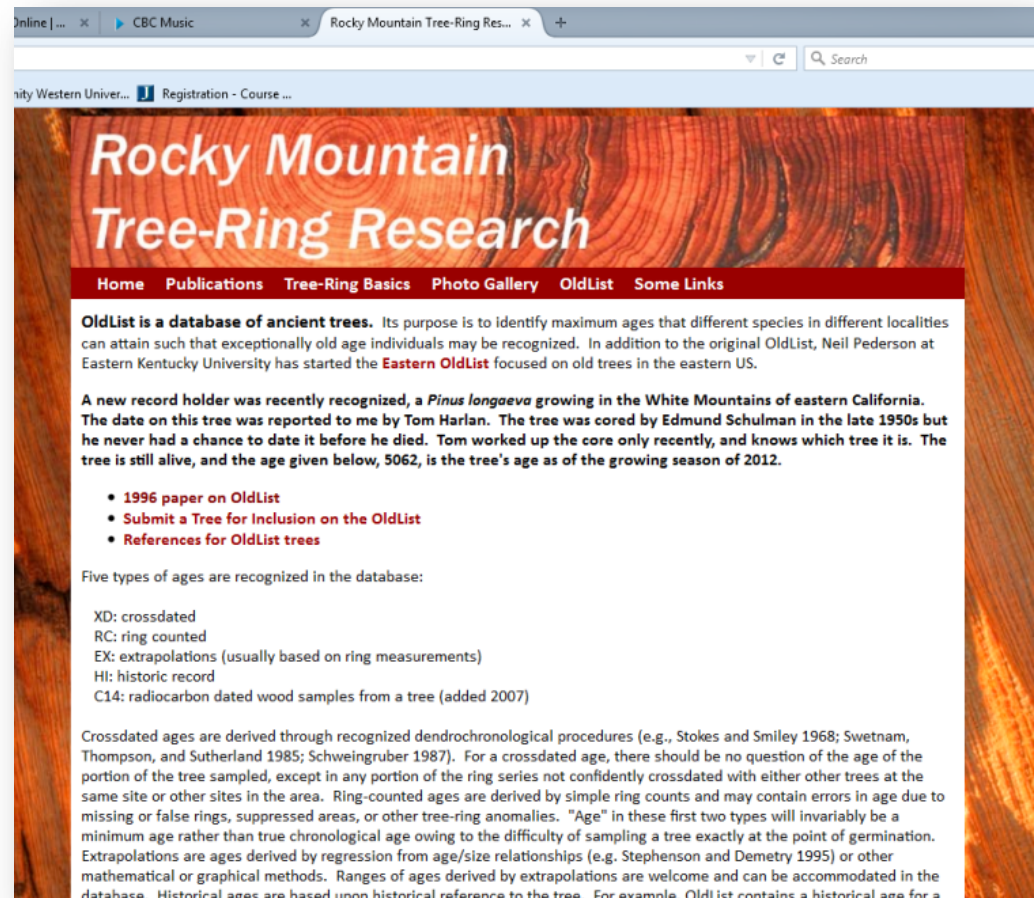
**World Record:
465 years at
coring height!**



Results and Discussion

Oldest living *Quercus garryana* tree in the world!?

Species	Age
<i>Quercus robur</i>	930 RC
<i>Quercus petraea</i>	866 RC
<i>Quercus garryana</i>	465 XD, RC
<i>Quercus alba</i>	407 XD
<i>Quercus gambelii</i>	406 XD
<i>Quercus stellata</i>	373 XD
<i>Quercus rubra</i>	326 XD



<http://www.rmtrr.org/oldlist.htm>

Summary

- Possible to crossdate Garry oak making it a valuable source of dendroecological data
- Significant radial growth response (suppression/release)
- Possible to create crossdated fire scar chronologies
- Strong common radial-growth signal (some region-wide marker rings)
- Identify and mapping of legacy oak habitats

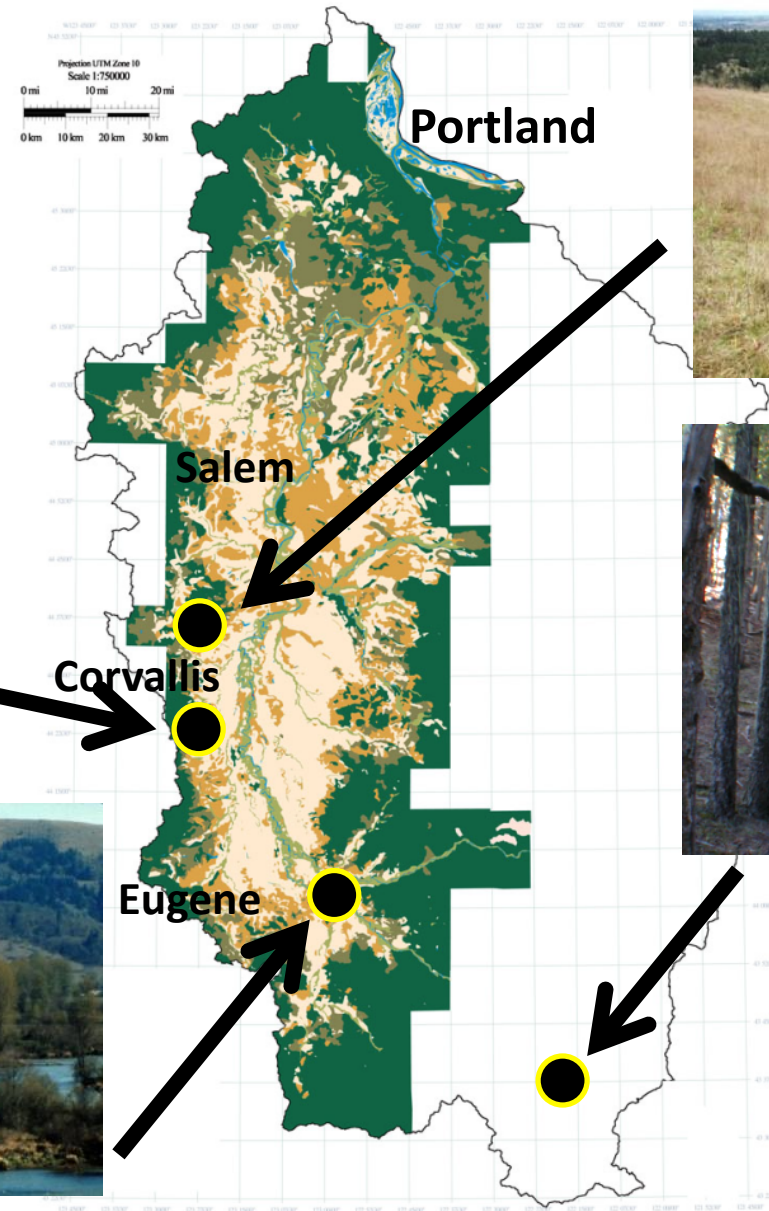
A photograph of a large, ancient-looking tree with thick, gnarled branches covered in vibrant green moss. The tree is set in a sun-dappled forest with other trees and foliage in the background. The lighting creates strong highlights and shadows, emphasizing the texture of the bark and the lushness of the moss.

Questions?

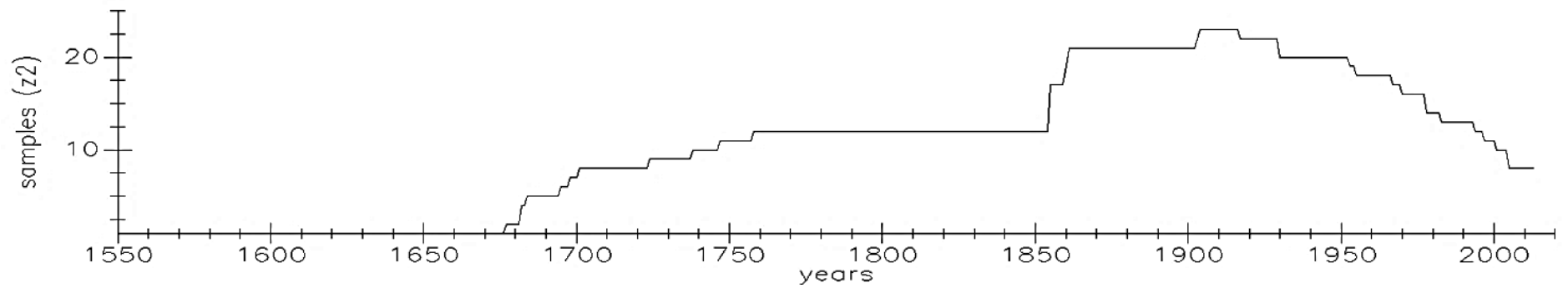
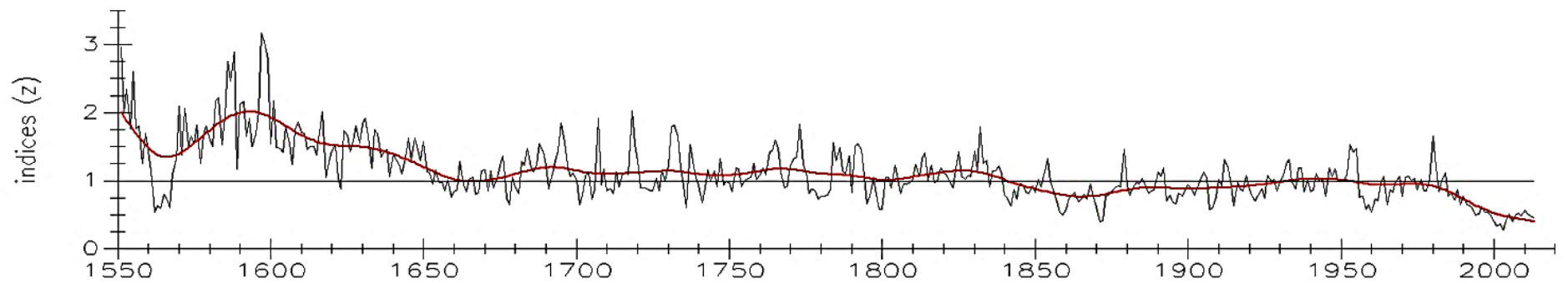
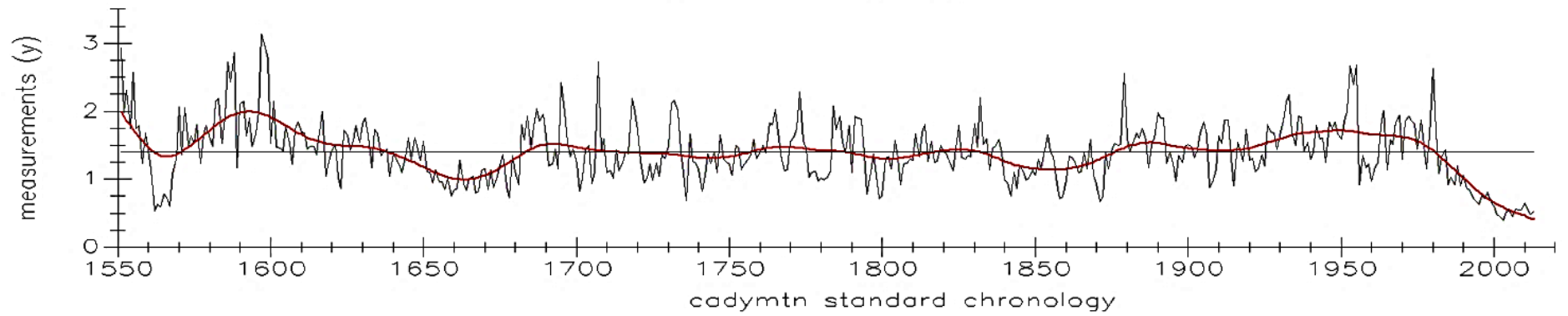
davidj@twu.ca



Study Areas



cadymtn raw ring width chronology



Cady Mtn 1941

