

Changing soil characteristics during
succession in the Alaskan boreal forest:
A **L**ong **T**erm **E**cological **R**esearch project

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Introduction

- “The LTER Network was created by the National Science Foundation (NSF) in 1980 to conduct research on ecological issues that **can last decades** and span large geographical areas.”
- Original BNZ proposal (1987) indicated that soils would be sampled on a decade time structure
- The second soil profile sampling was accomplished 23 – 24 years after the first

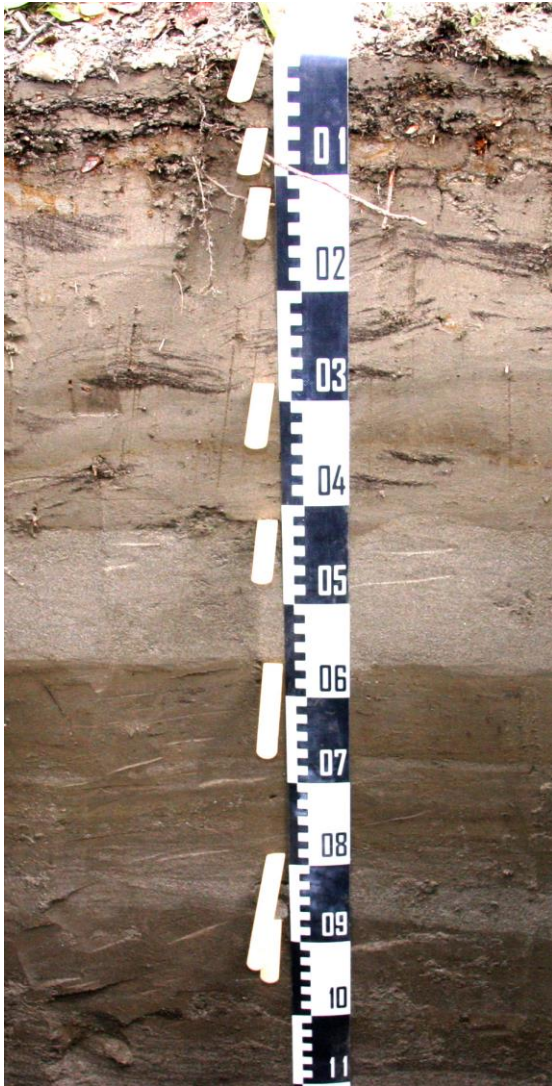
Introduction

- Soils are thought to be stable over long time periods.
- A number of recent studies have shown short-term changes in both physical and chemical properties in soil profiles (Tugel, et al. 2005, Lawrence, et al. 2013)

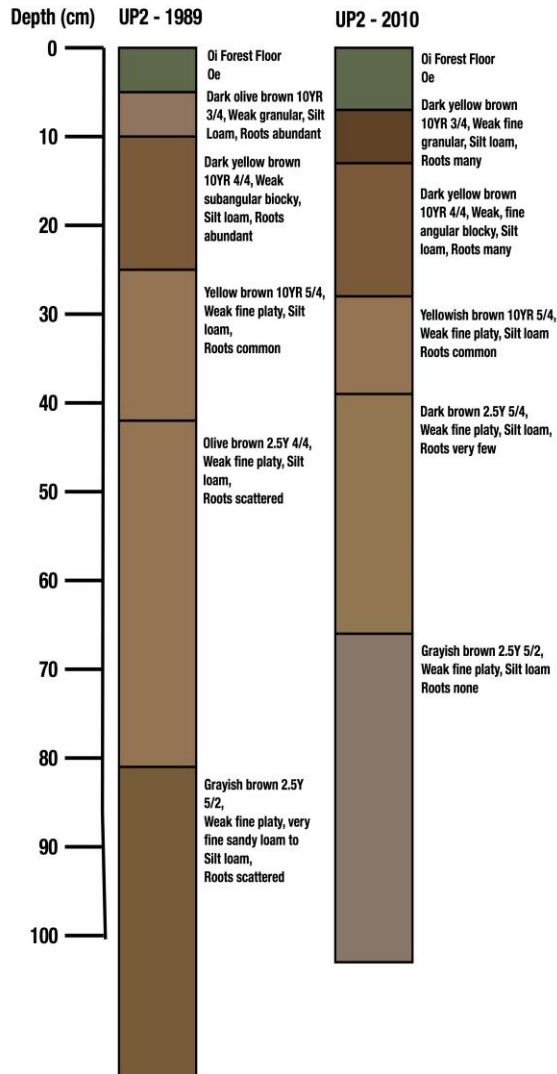
Methods

- All methods were consistent between sampling periods
- One major difference was the personnel actually performing the soil profile descriptions
 - First (1988/89) – Ted Dyrness & Keith Van Cleve
 - Second (2010/11) – David Valentine & John Yarie

FP1B and UP3B soil pits (2011/10)



Average Site Profiles – UP2

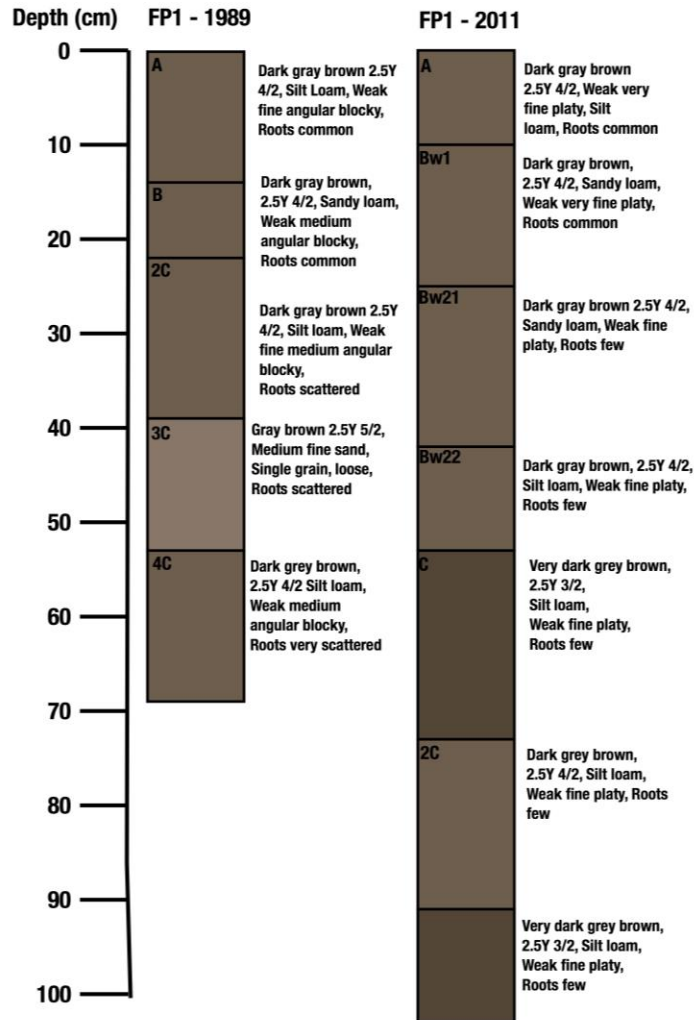


Same number of layers

Layer characteristics (color, texture, structure) very similar

Depth of layers a major difference; related to scientist and color differences tied to moisture content of sample

Average Site Profiles – FP1



Two new layers present in 2011 compared to 1989

Layer characteristics (color, texture, structure) very similar

Differences in layer depth

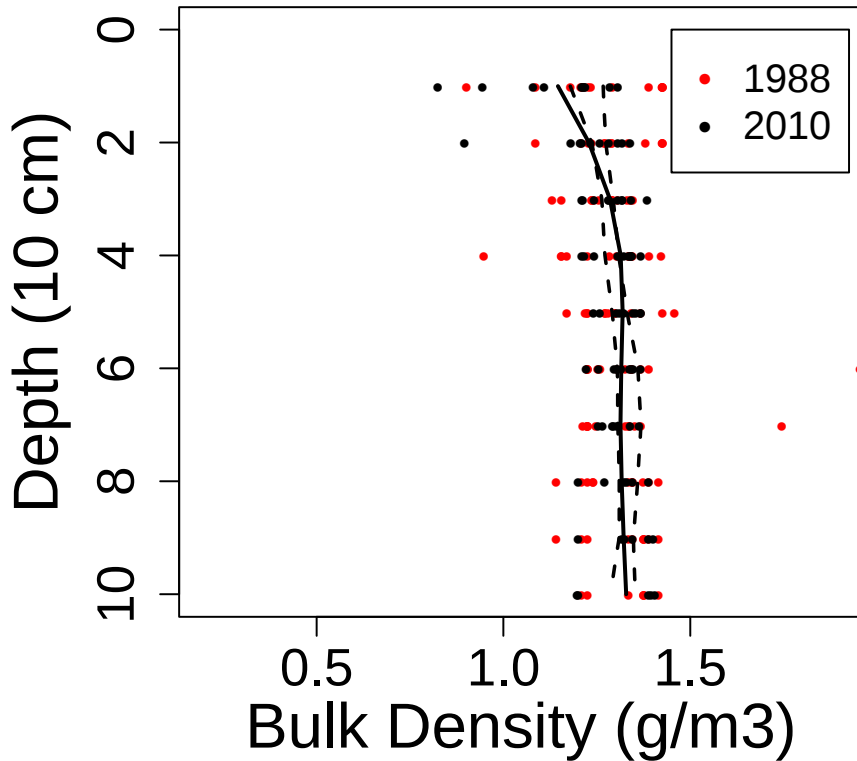
Flooding major cause of change on this early primary successional site

Potential Changes in Soil Characteristics

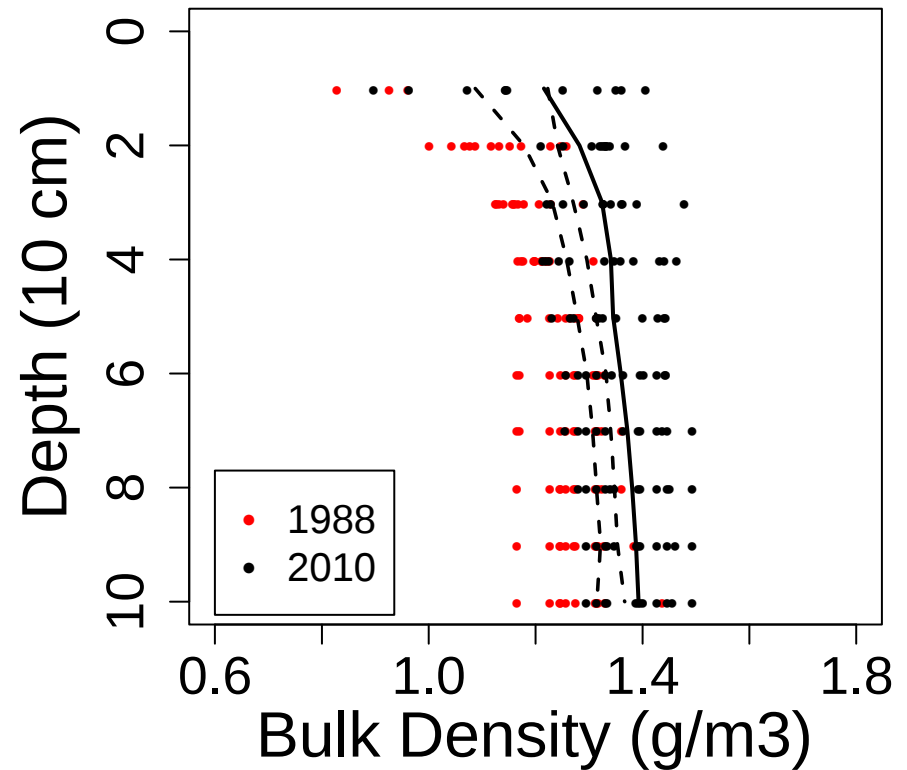
- Vertical structure of characteristic through the profile
- Total characteristic value for profile at individual sites (FP1, FP2, etc.)
- Successional chronosequence changes between sample years (1988/89 vs 2010/11)
- Successional time sequence across total data set

Vertical Distribution Soil Profile Bulk Density

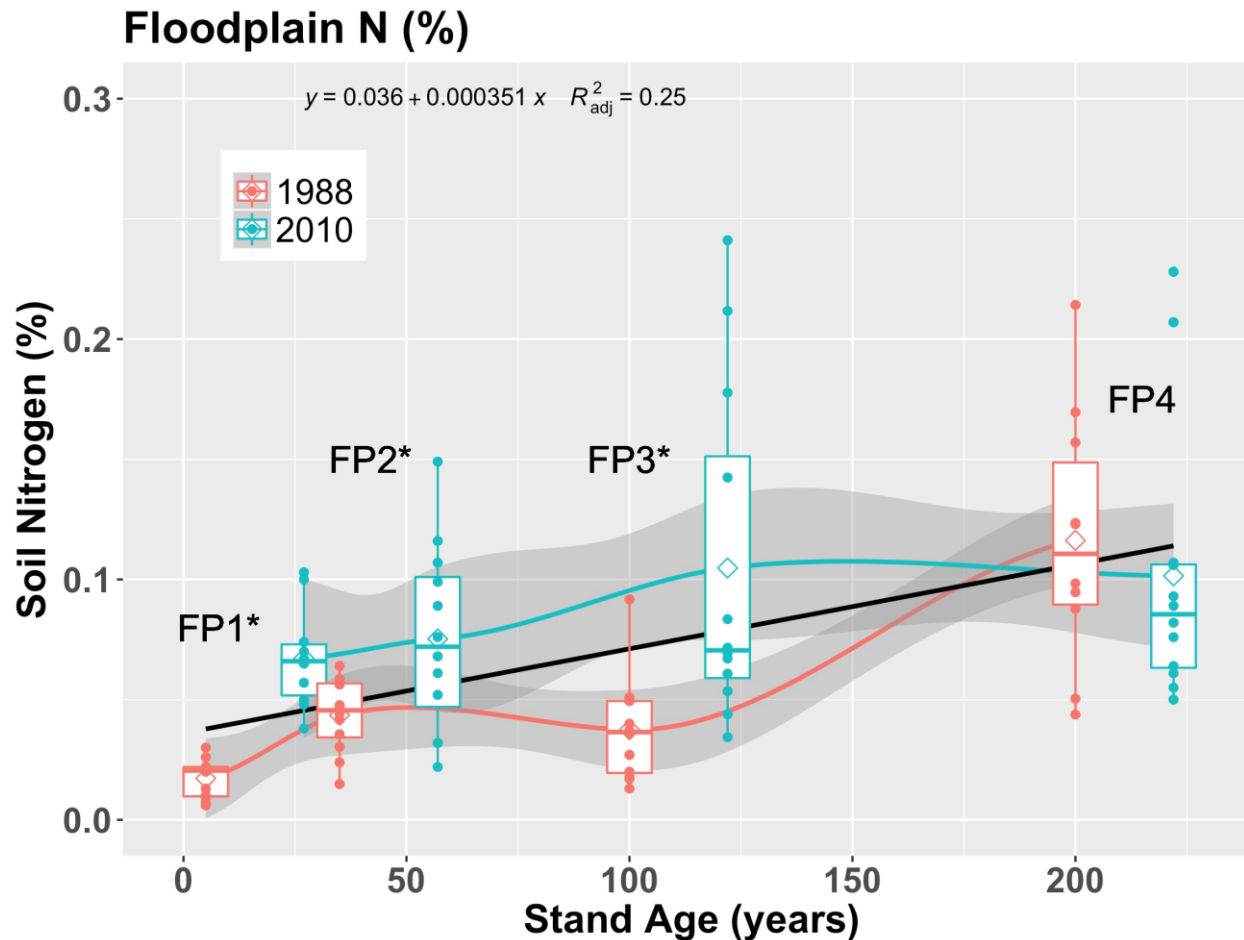
FP1



UP1



Site, Chronosequences, Time Series Floodplain – Nitrogen Concentration



Significant differences:

Site: FP1, FP2, FP3

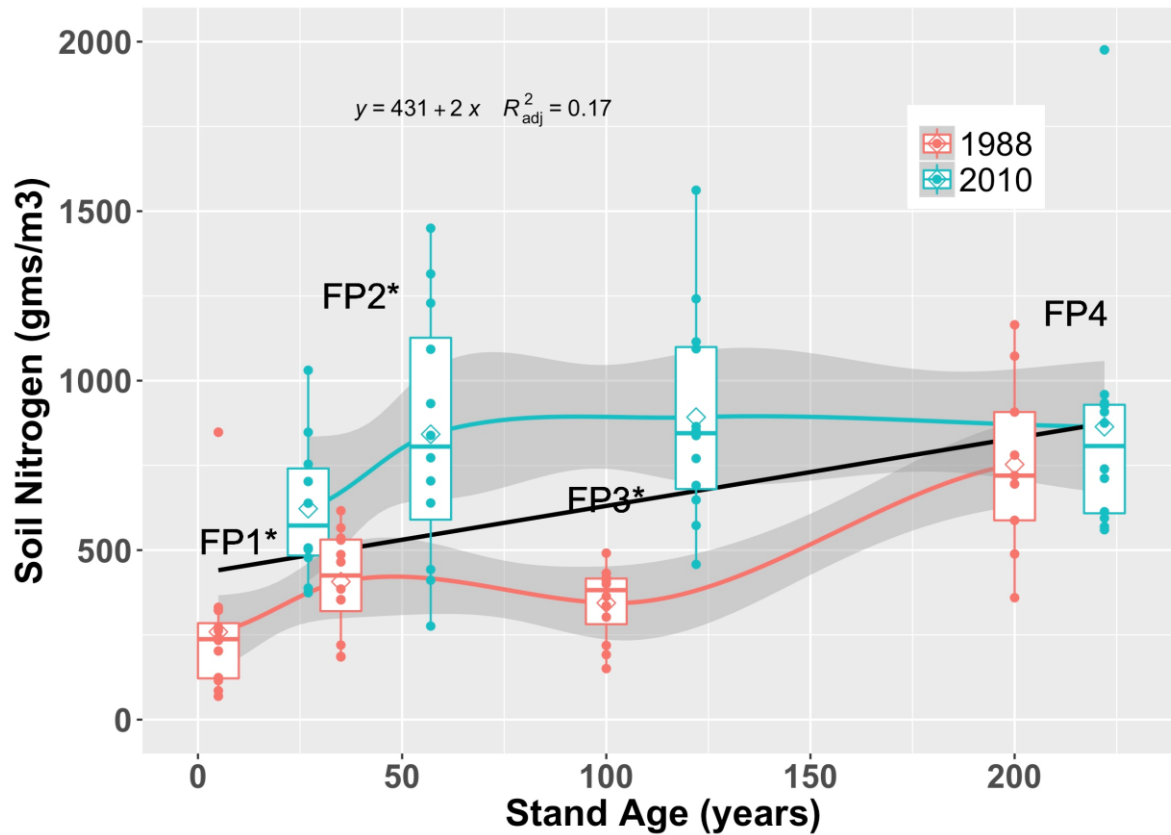
Chronosequences: FP3

Time Series: Increasing

Site, Chronosequences, Time Series

Floodplain – Nitrogen Content

Floodplain Nitrogen



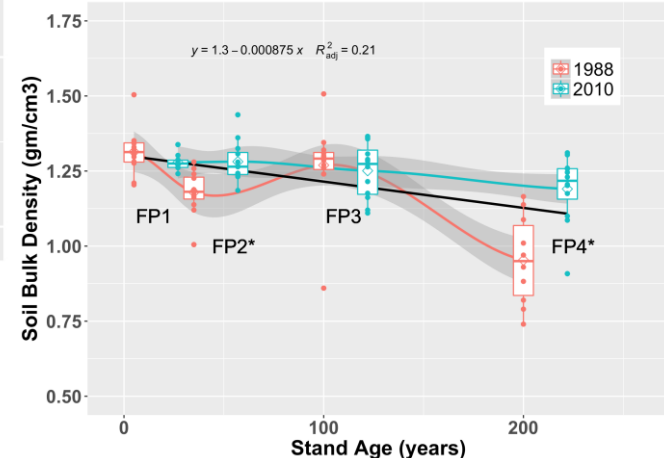
Significant differences:

Site: FP1, FP2, FP3

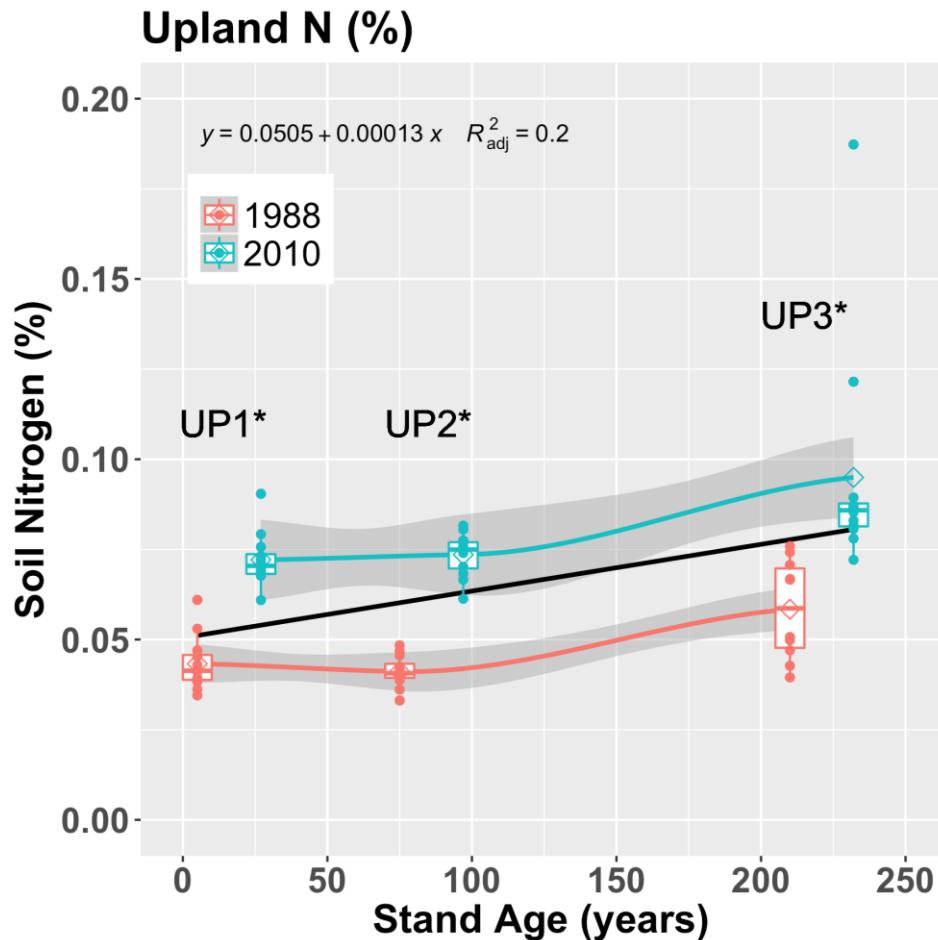
Chronosequences:
different until year 175
approximately

Time Series: Increasing

Floodplain Bulk Density



Site, Chronosequences, Time Series Upland – Nitrogen Concentration



Significant differences:

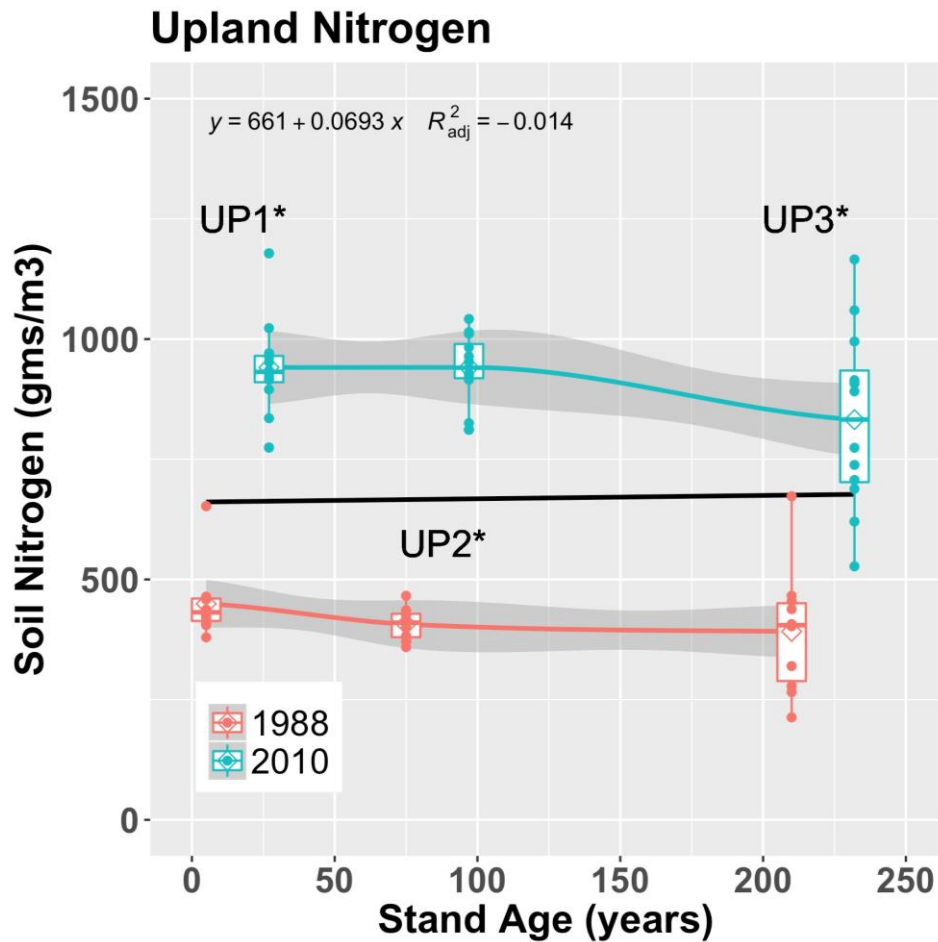
Site: UP1, UP2, UP3

Chronosequences: different

Time Series: Increasing
concentration - (average
between two chronosequences)

Site, Chronosequences, Time Series

Upland – Nitrogen Content

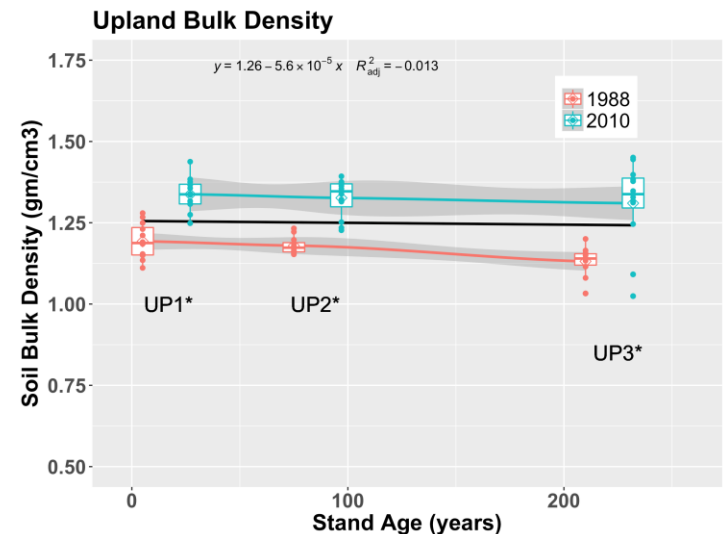


Significant differences:

Site: UP1, UP2, UP3

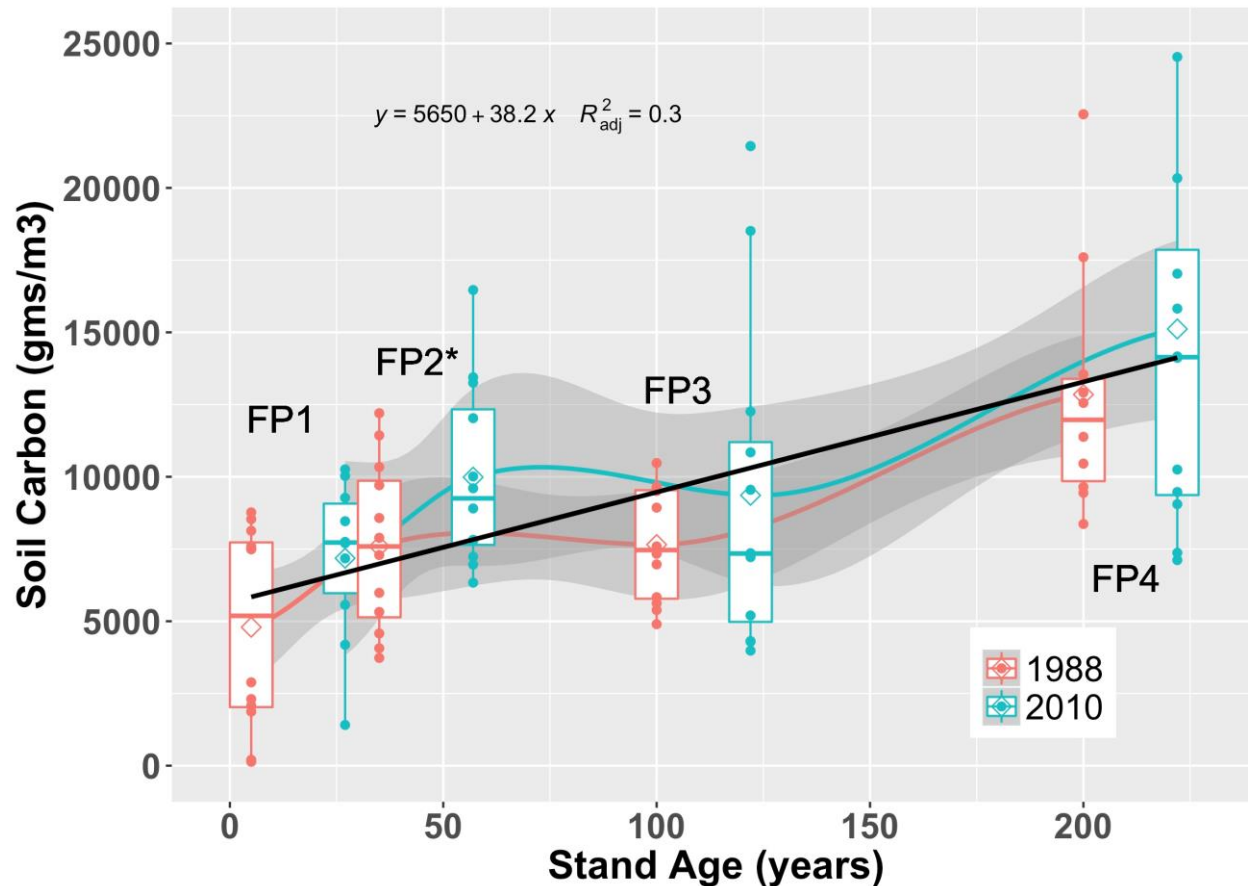
Chronosequences: different

Time Series: No change -
(average between two
chronosequences)



Site, Chronosequences, Time Series Floodplain – Carbon Content

Floodplain Carbon



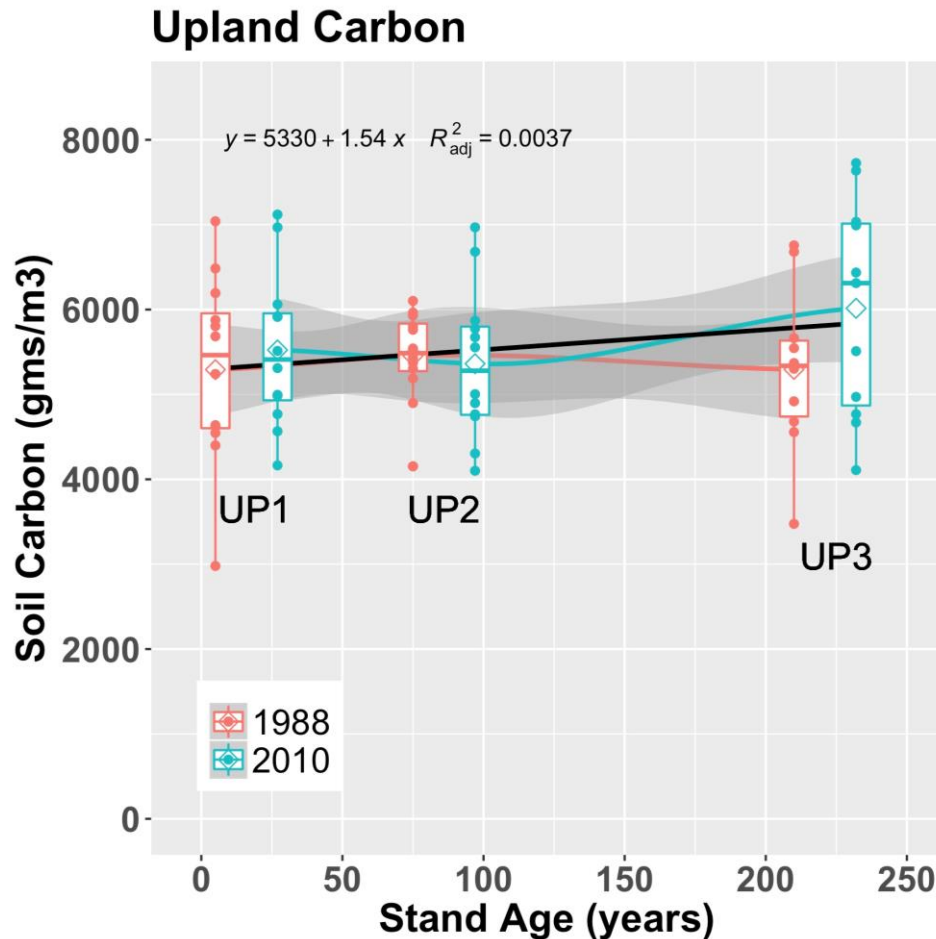
Significant differences:

Site: FP2

Chronosequences: equal

Time Series: Increasing

Site, Chronosequences, Time Series Upland Carbon - Content



Significant differences:

Site: None

Chronosequences: equal

Time Series: Slowly Increasing

Conclusions

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