The background of the slide is a photograph of a vast, flat landscape, likely a wetland or marsh, with a body of water visible in the distance under a cloudy sky. The text is overlaid on this image.

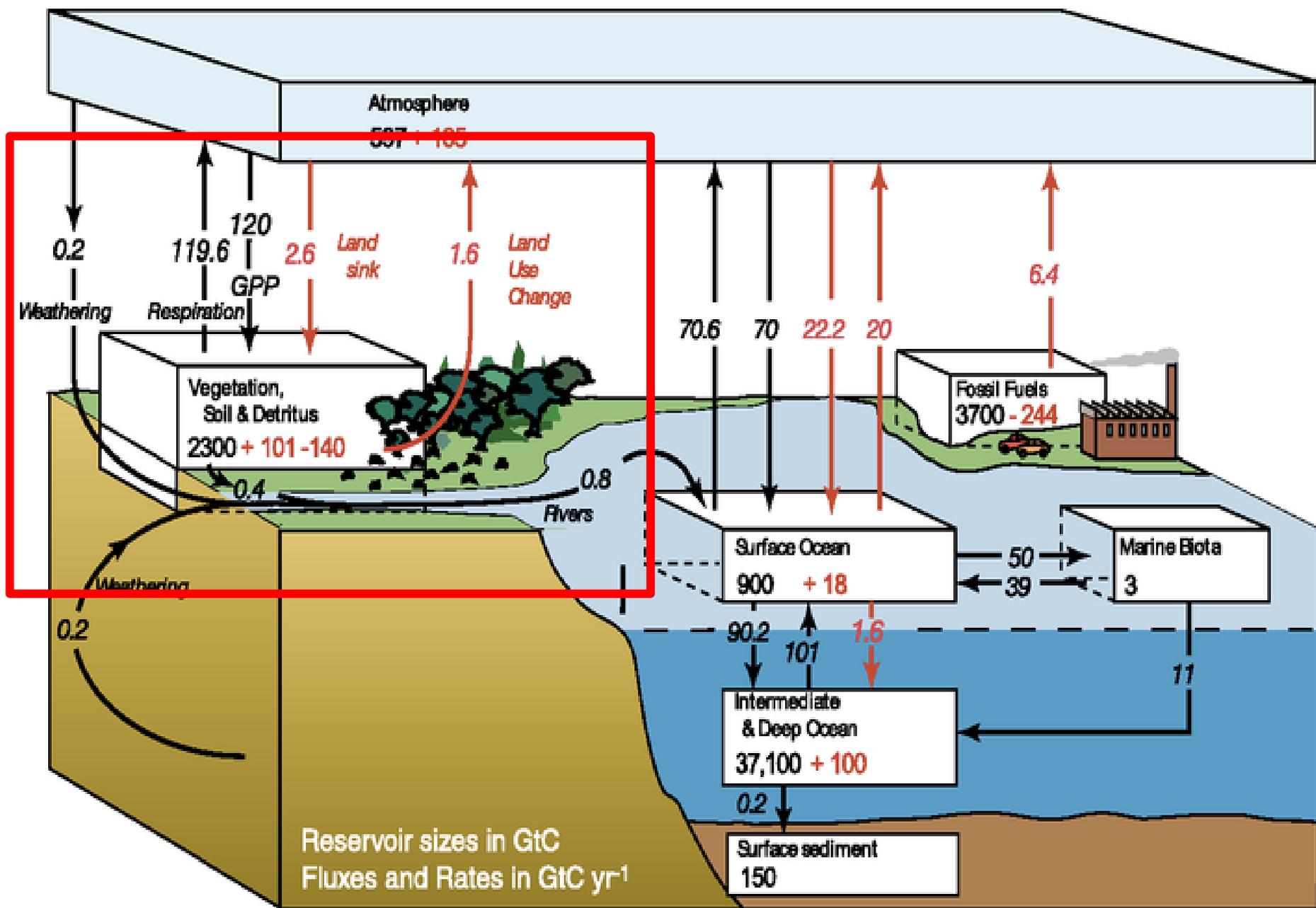
Carbon Storage and Cycling in Riparian Environments: Considerations for Lake Superior's North Shore Watershed

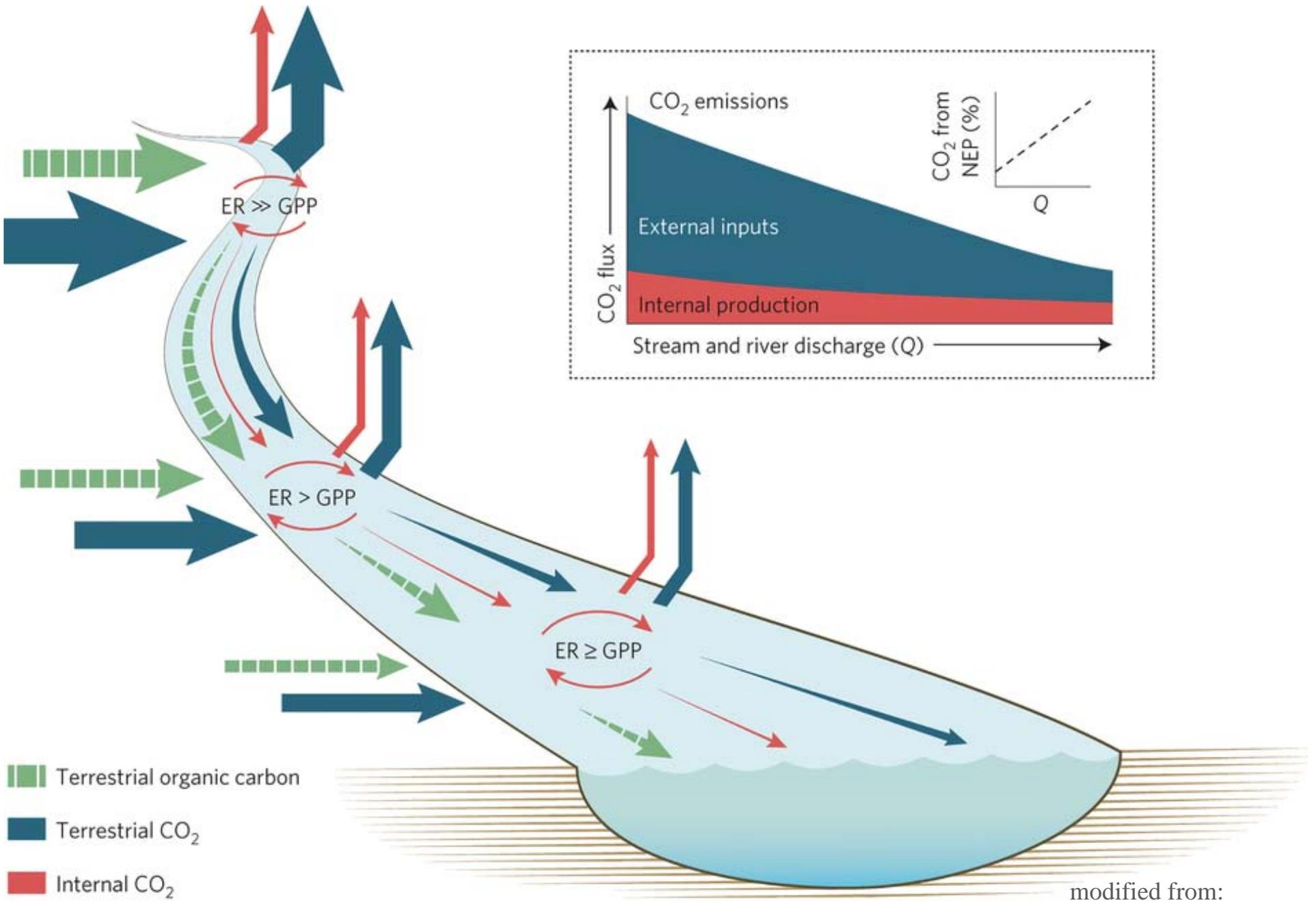
Kathryn M. Schreiner
Assistant Professor

Large Lakes Observatory
Department of Chemistry and Biochemistry
University of Minnesota Duluth

Talk Outline

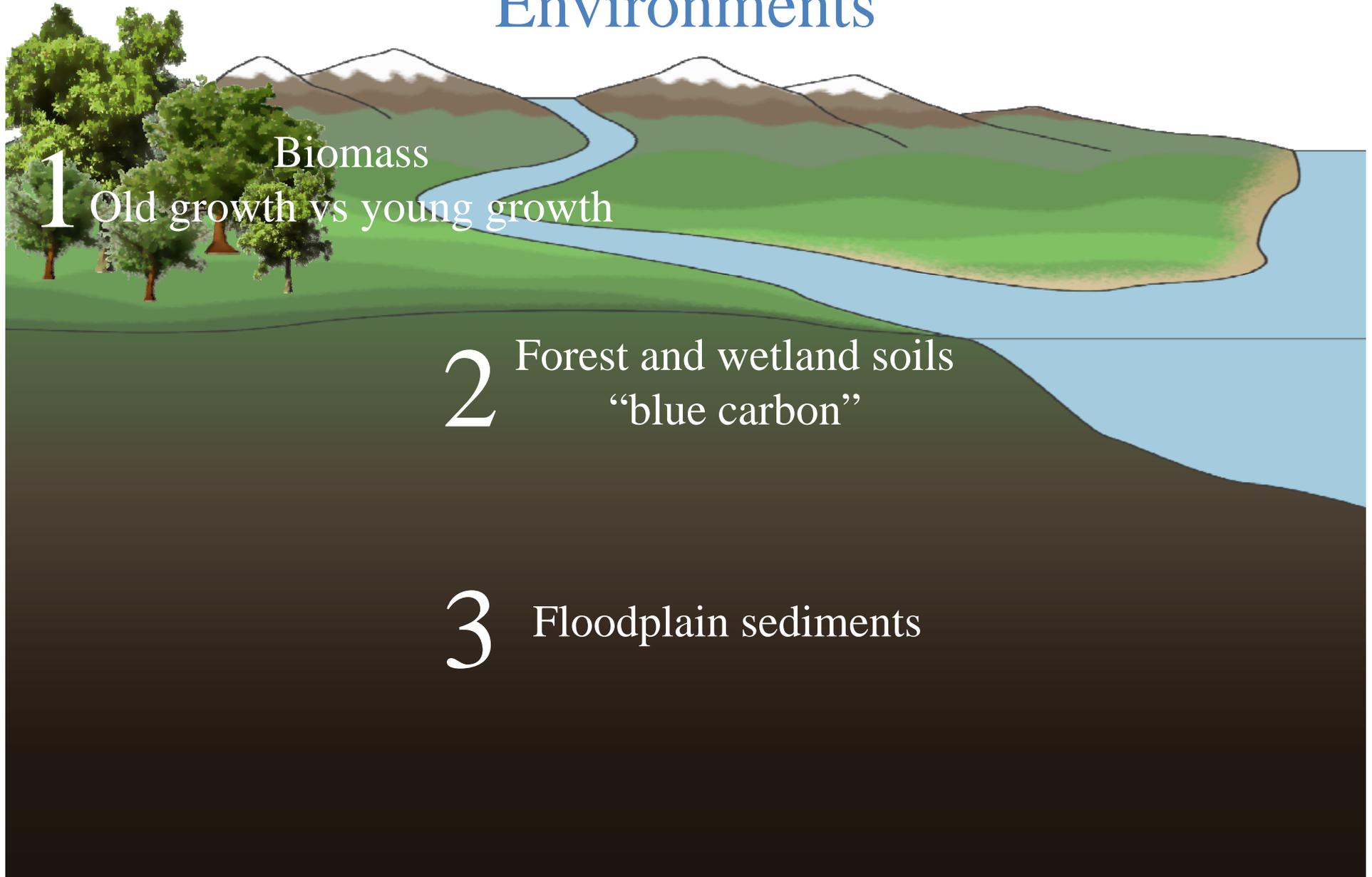
- What are the important carbon stores in riparian environments?
- How is this carbon processed within rivers and streams, and what is delivered to aquatic environments? How does this differ between environments?
- How do humans impact these carbon stores, and how can we manage them?

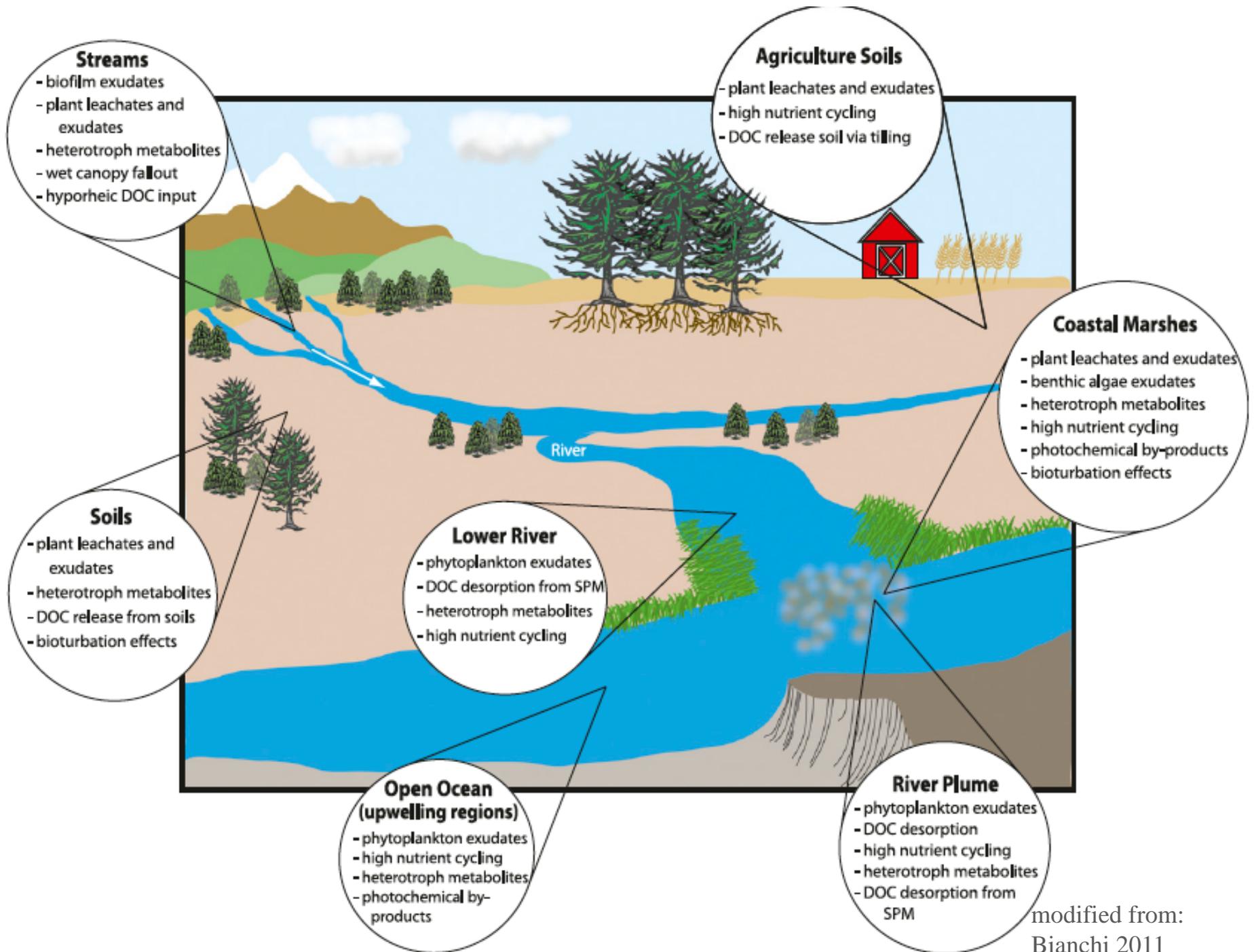




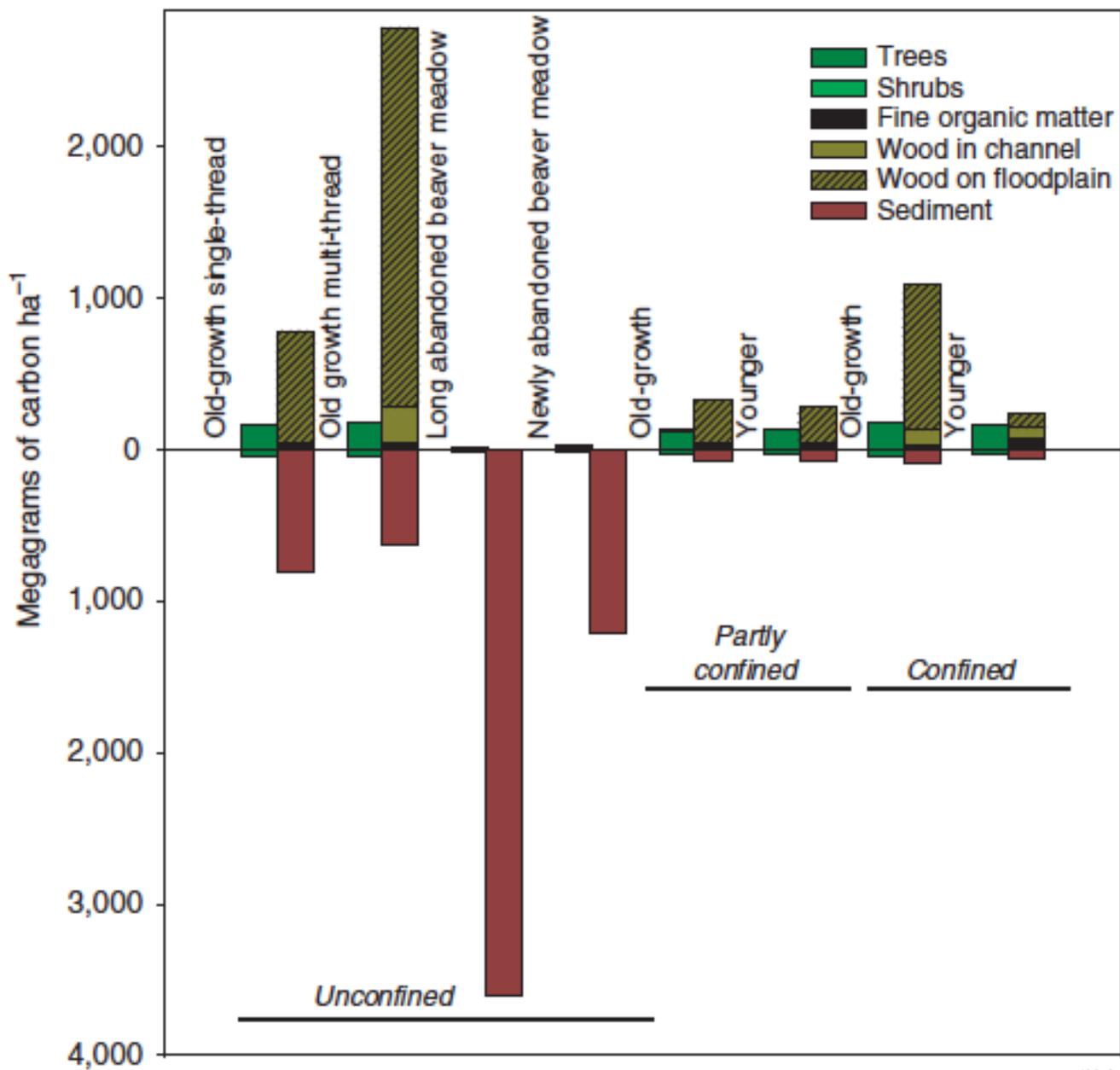
modified from:
Hotchkiss et al 2015

Long-term stores of OC in Riparian Environments





modified from:
Bianchi 2011



modified from:
Wohl et al 2012

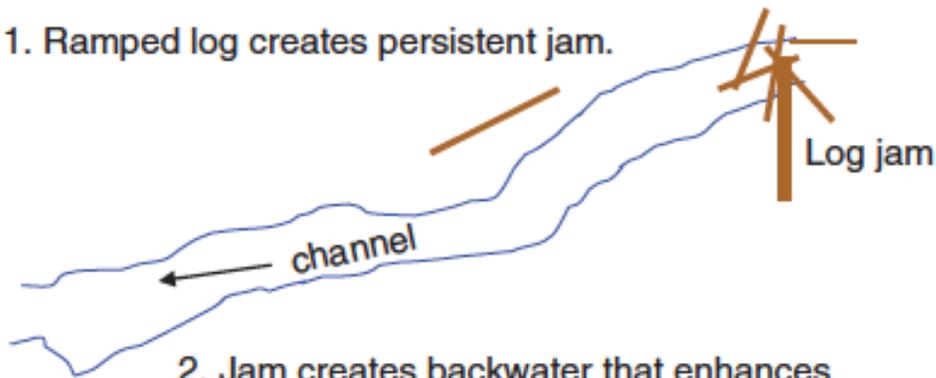
What impacts these carbon stores?

- **Natural river alterations:** beaver dams, log jams, channel switching
- **Anthropogenic river alterations:**
 - Direct: channelizing, wetland drainage
 - Indirect: climate change, vegetation change, shoreline changes

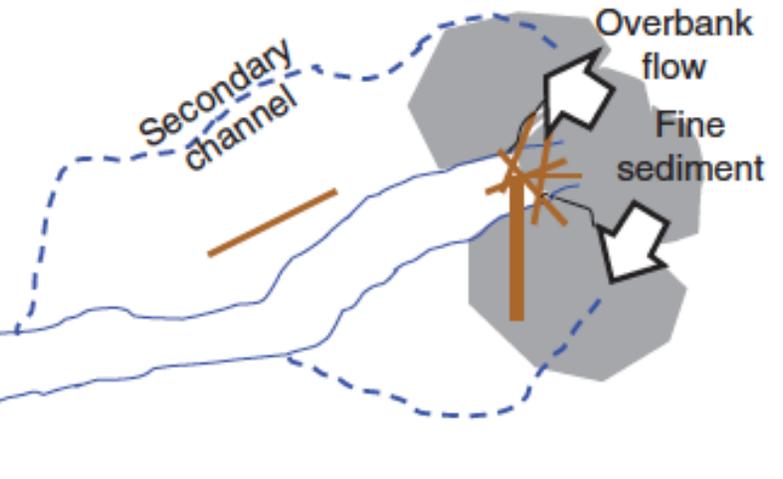
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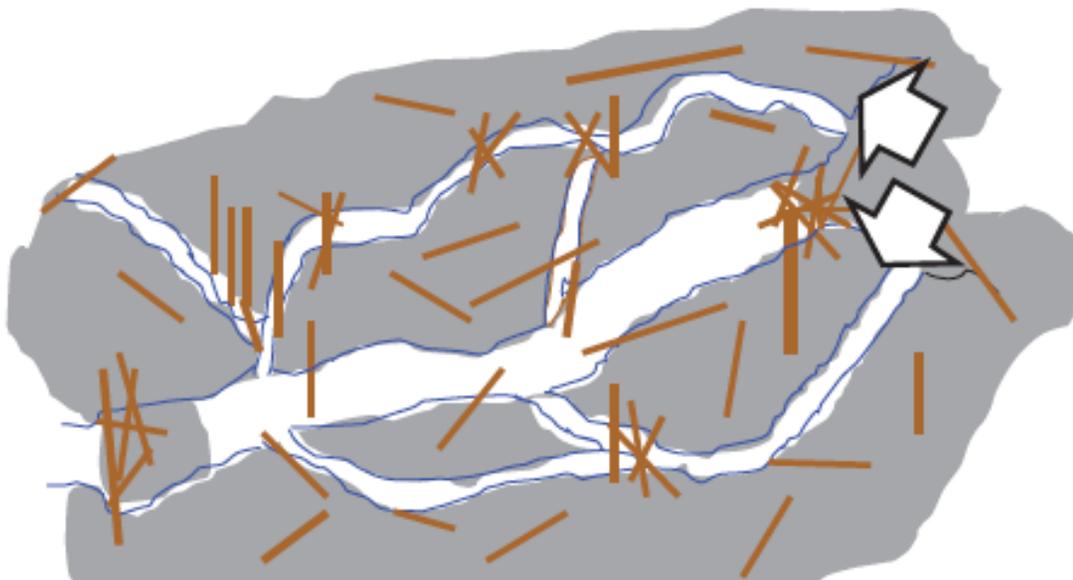
1. Ramped log creates persistent jam.



2. Jam creates backwater that enhances overbank flooding, deposition of fine sediment and organic matter (gray shading), and formation of secondary channels.



3. Wood retained in secondary channels creates more jams, backwaters, overbank flow and deposition of fine sediment, and organic matter: floodplain gradually accumulates thicker sequence of organic-rich sediment and wood as a result of greater extent and duration of shallow overbank flows.

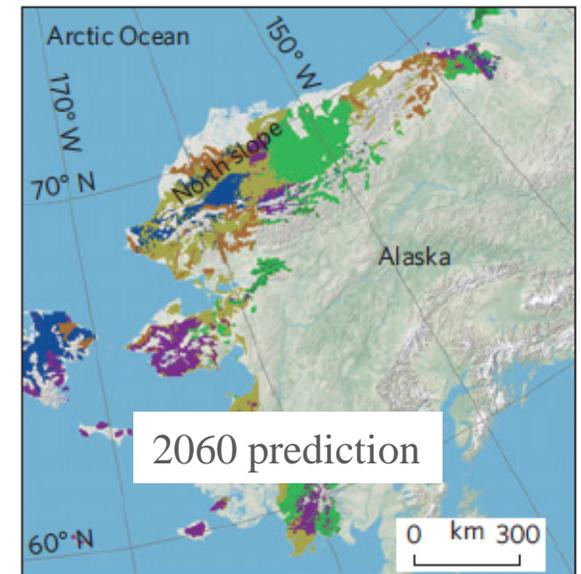
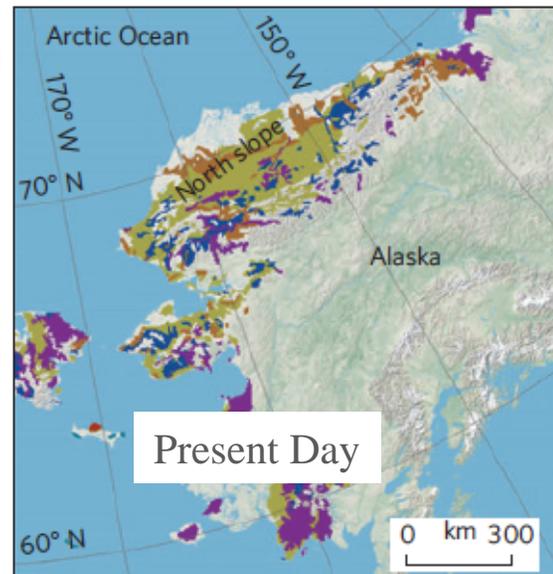
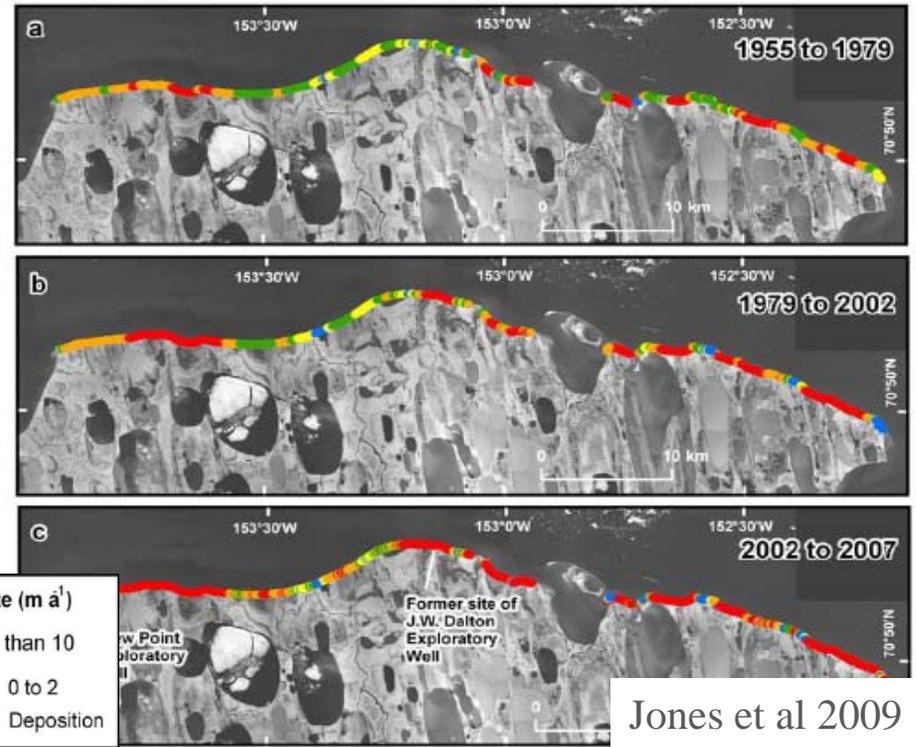
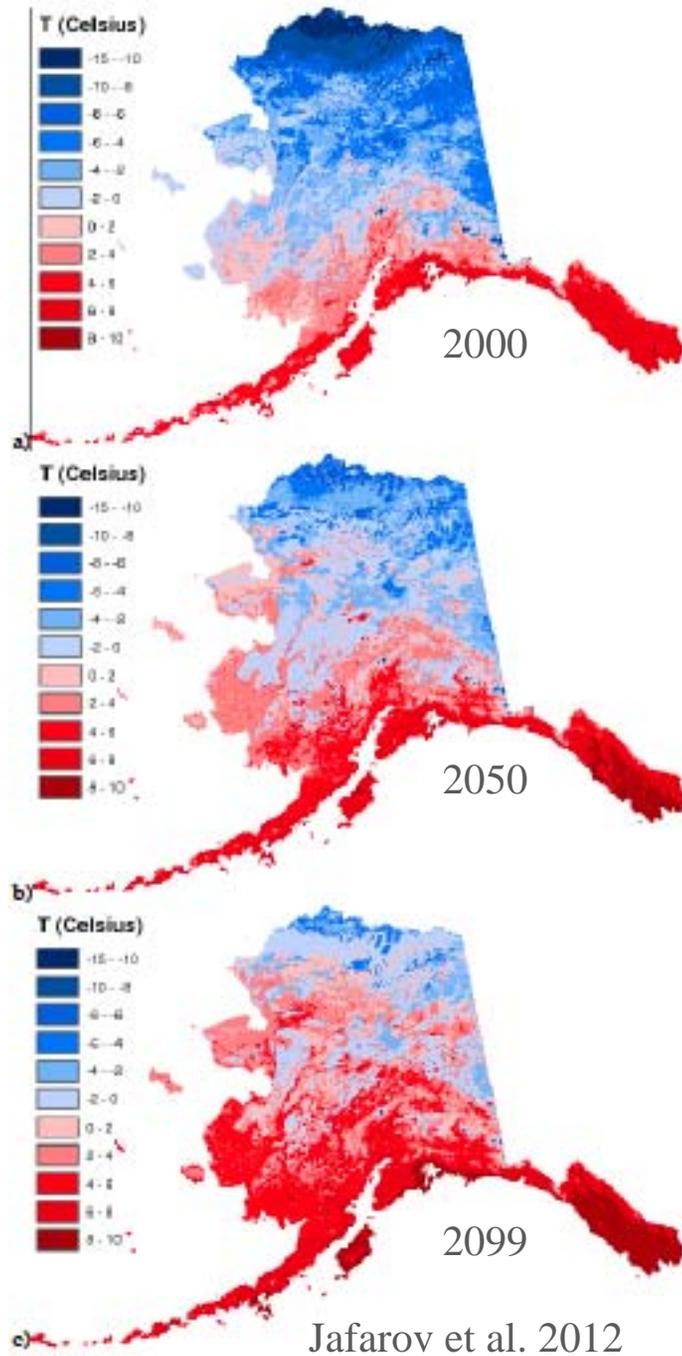


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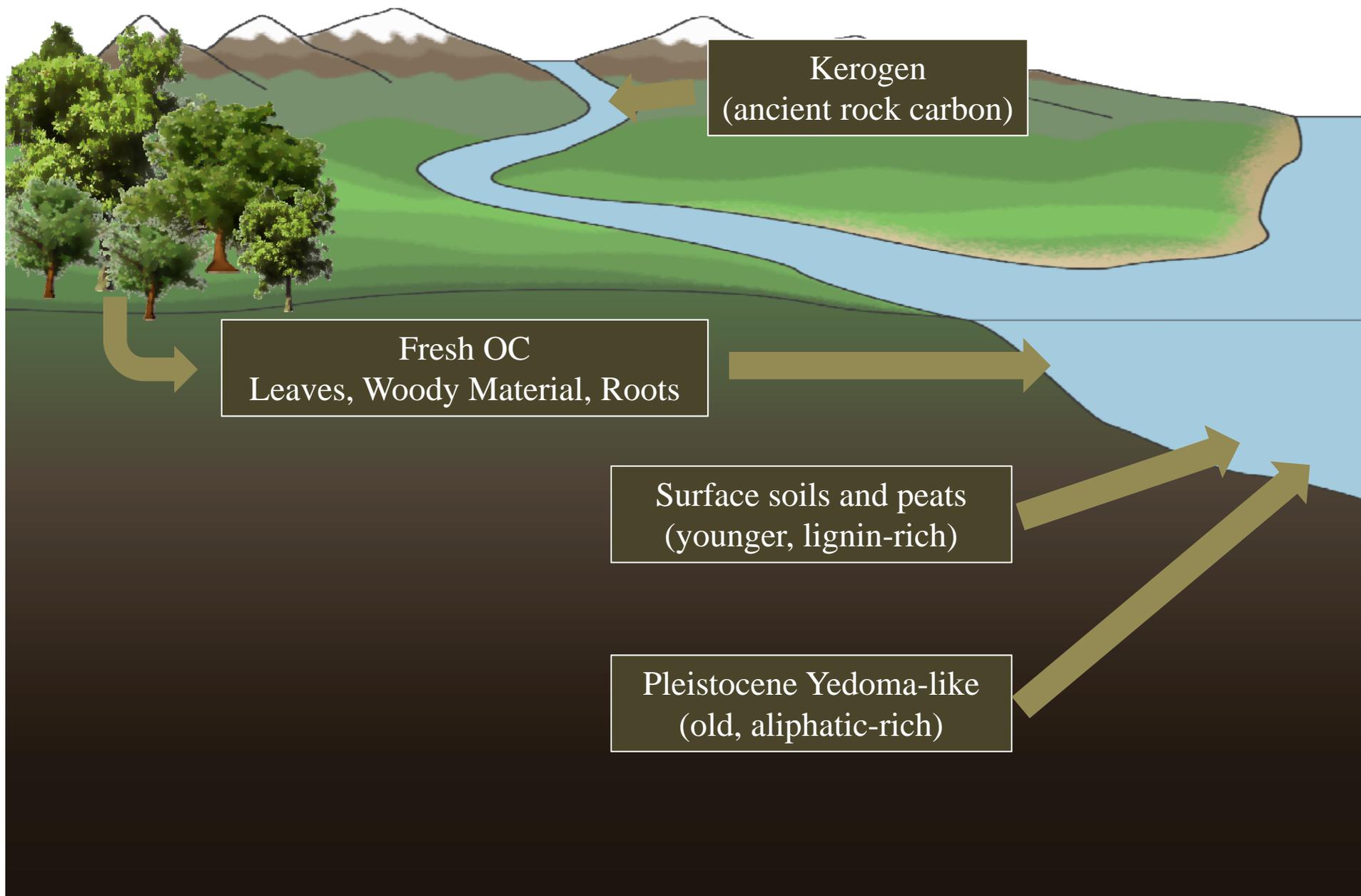
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Pearson et al. 2013

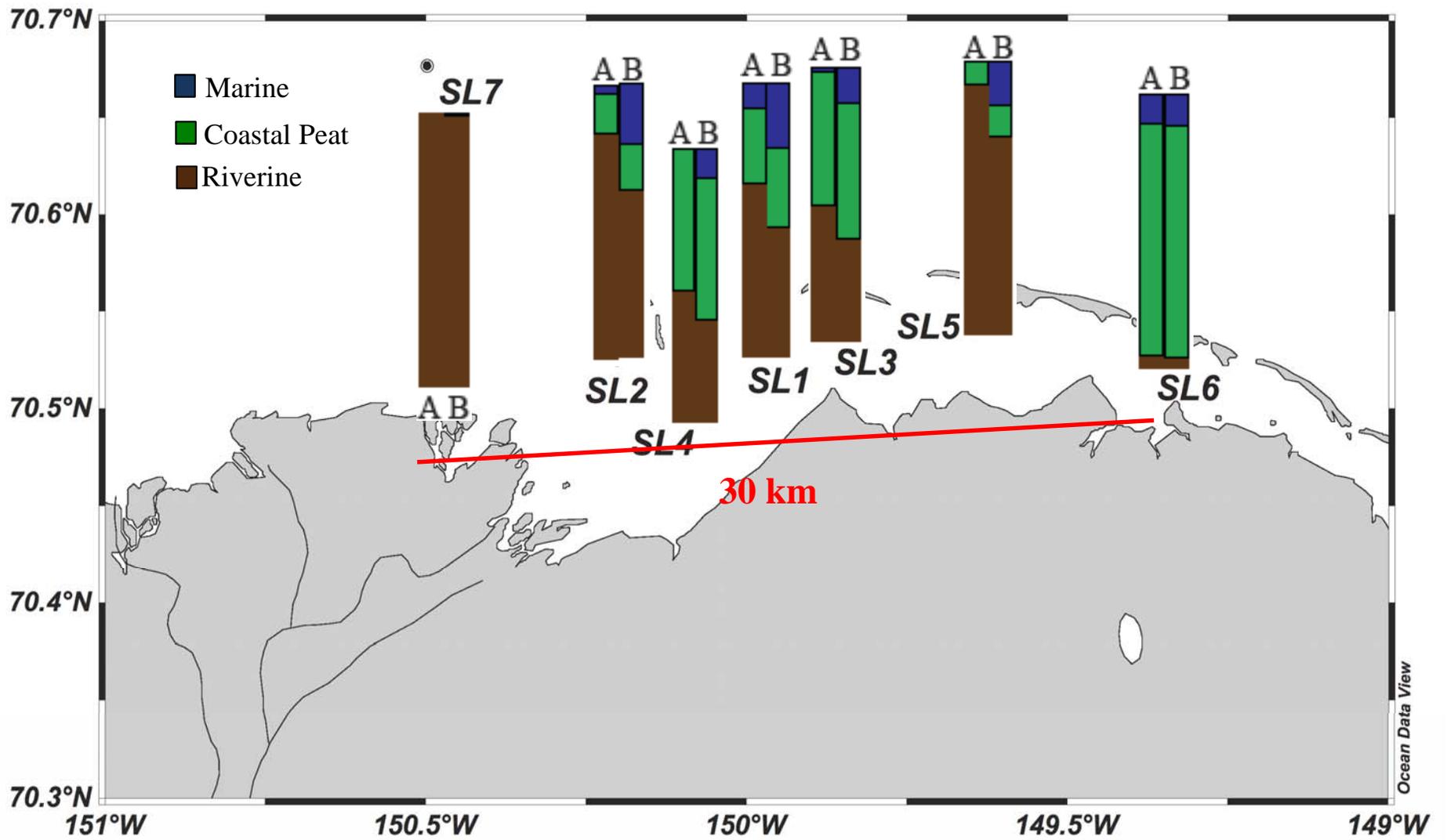


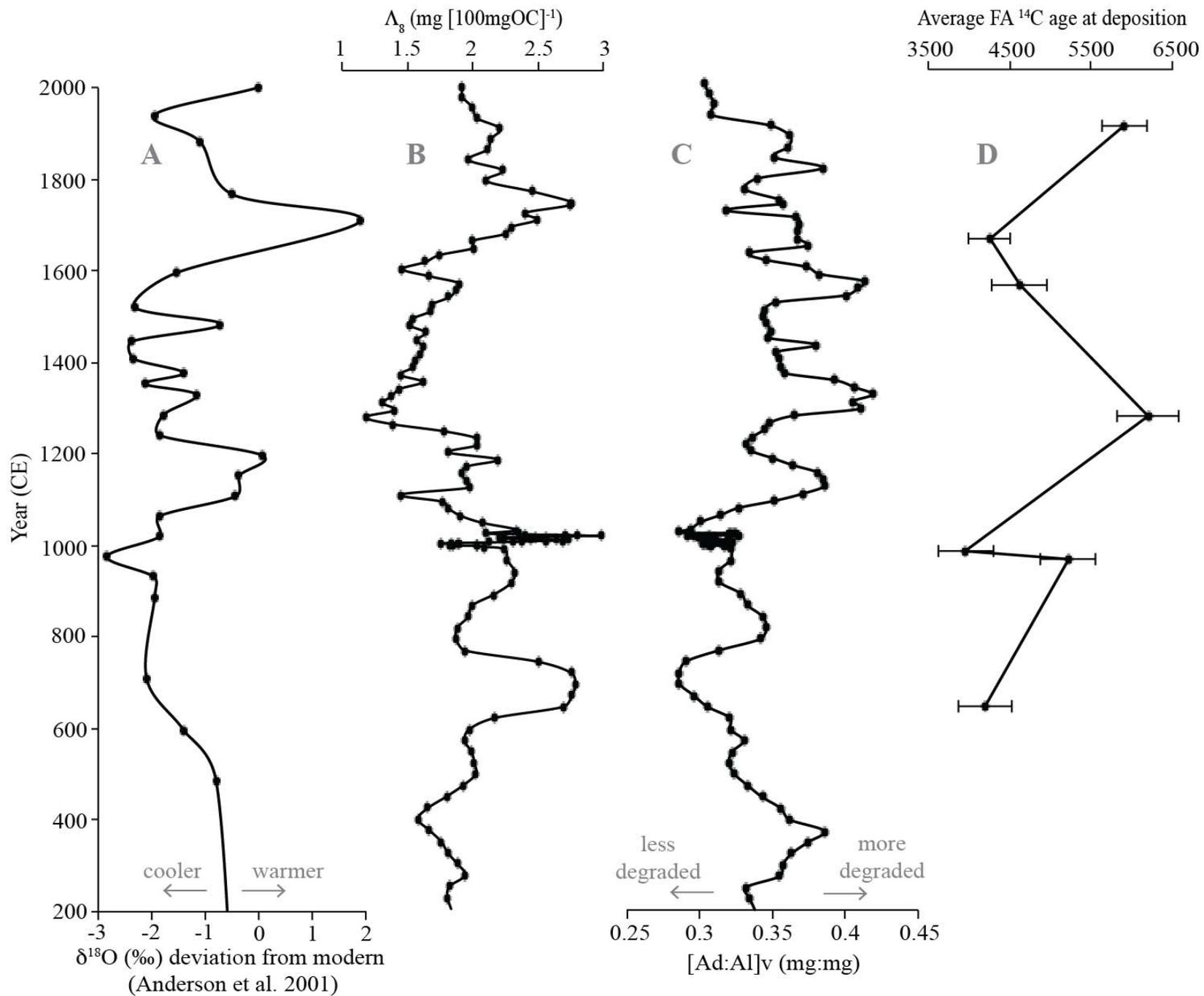
Determining the Source of POC

POC source is determined through a mixture of bulk analyses (like $\delta^{13}\text{C}$ and $\Delta^{14}\text{C}$) and compound-specific *biomarker* analyses

Biomarker: A single compound indicative of a single source, resistant to degradation and long-lived in soils and sediments.

Examples: Lignin-phenols and long-chain fatty acids (both indicative of terrestrial vegetation and soil).





Important Questions for North Shore Carbon Management

- Current management plan calls for analysis of old growth vs young growth forested land – what are the C storage estimates in each ecosystem?
- How big are soil C stores (forest soils and wetland soils) on the north shore?
- What is the current export of sediment and C from north shore streams?
- What is the historical export of sediment and C from north shore streams?
- How are future environmental changes likely to impact C stores and C delivery?

Questions?

