

Emerging Riparian Perspectives & Challenges in the Pacific Coastal Ecoregion of North America

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Riparian Zones are Complex Biophysical Mosaics



Photo: R. Van Pelt, Queets River

Coastal Rainforest Historically Dominated by Large Trees







How is the Large Wood Produced?



Today's Topics

Production Dynamics of Riparian Trees

Geomorphic Processes & Surfaces

Temporal Trends in Density, Biomass & Production

Tree Production at the Floodplain Scale

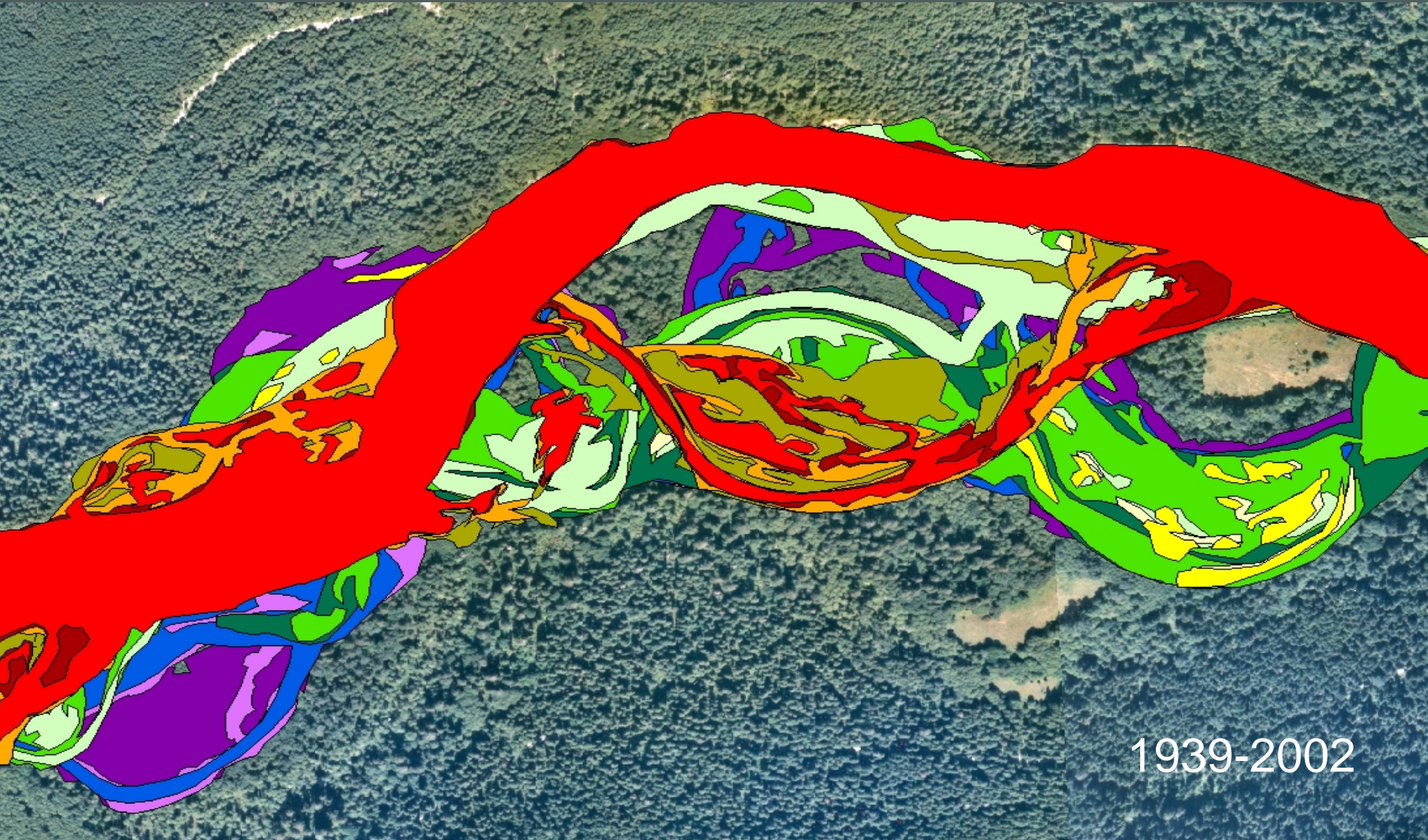
Possible Drivers of Tree Production

Upland Alder & Riparian Soils

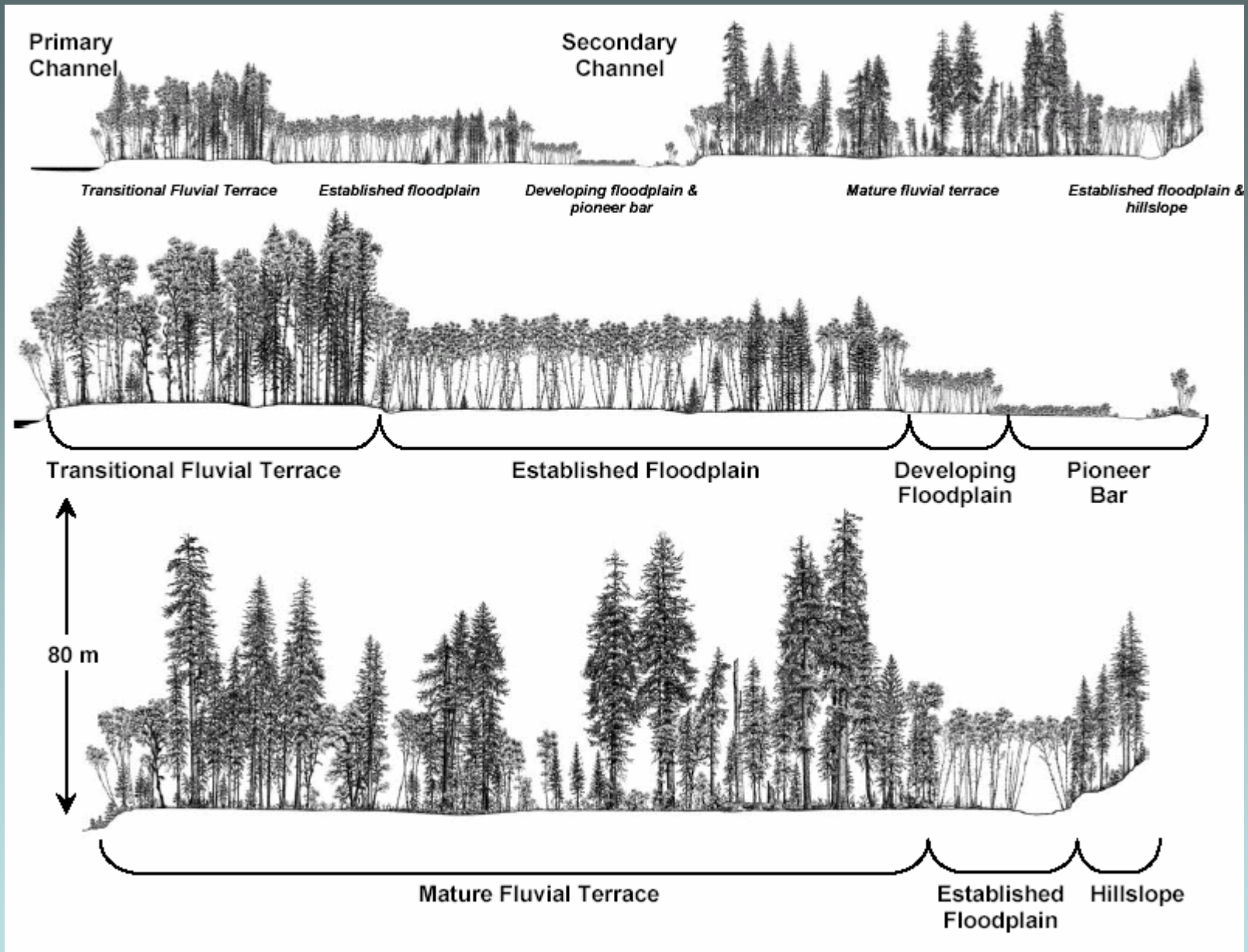
Role of Epiphytes

Role of Marine-Derived Nutrients – Salmon

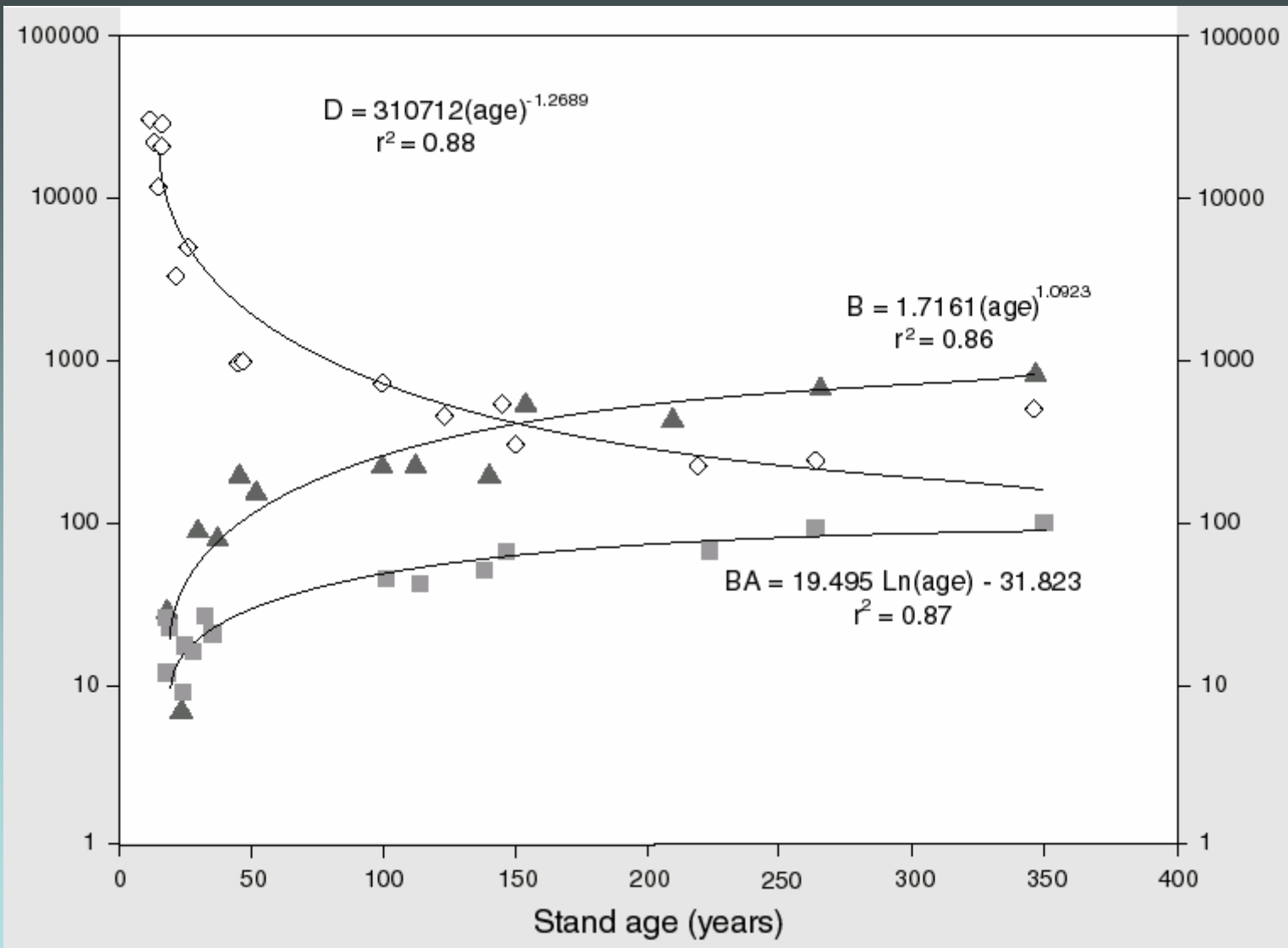
Channel Meandering -- Queets



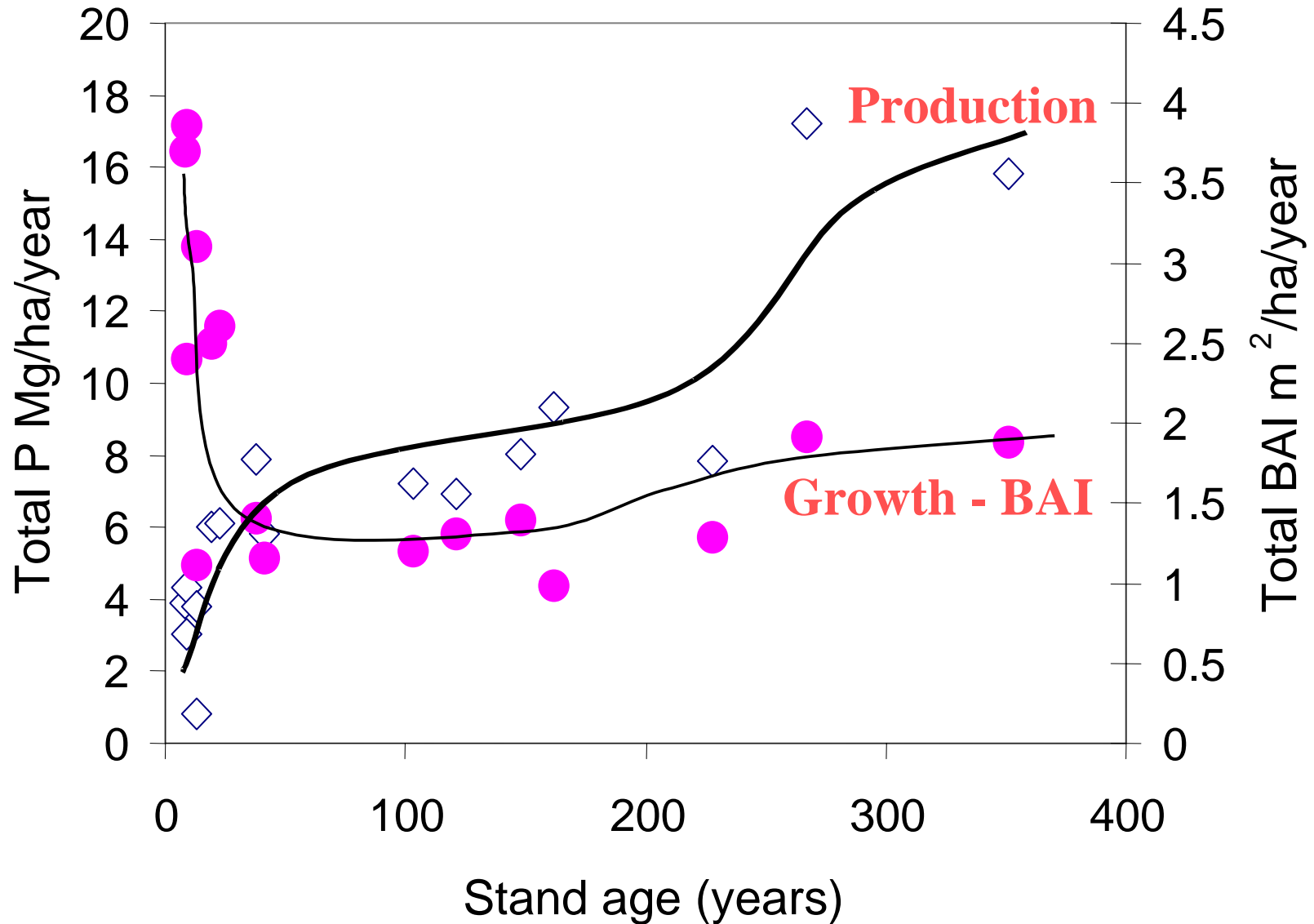
1939-2002

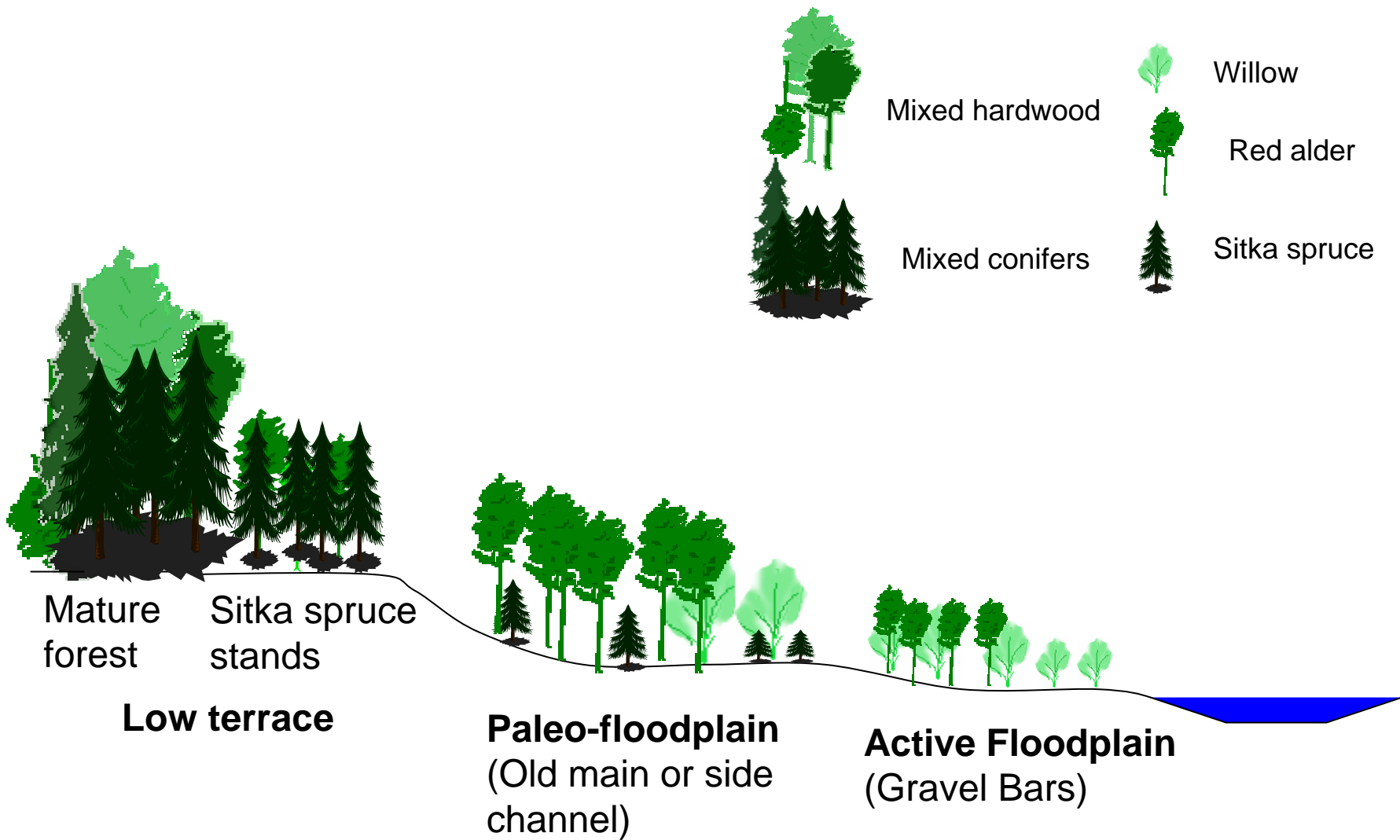


Tree Density & Biomass



Tree Growth & Production





Physical Templates in the Queets River Floodplain

Tree Production: Floodplain Scale

- Total Area 57 km² over 77 km
- Total Stem Production 28,764 Mg/year
- | Template | Area | Production |
|-------------------|------|------------|
| Active Floodplain | 8% | 5% |
| Paleo-Floodplain | 16% | 14% |
| Low Terrace | 63% | 81% |

Relative Roles of Upland Alder, Soils and Atmospherically- and Marine-derived Nutrients



Photo: R Naiman



Photo: K Bartz

The Role of Epiphytes?

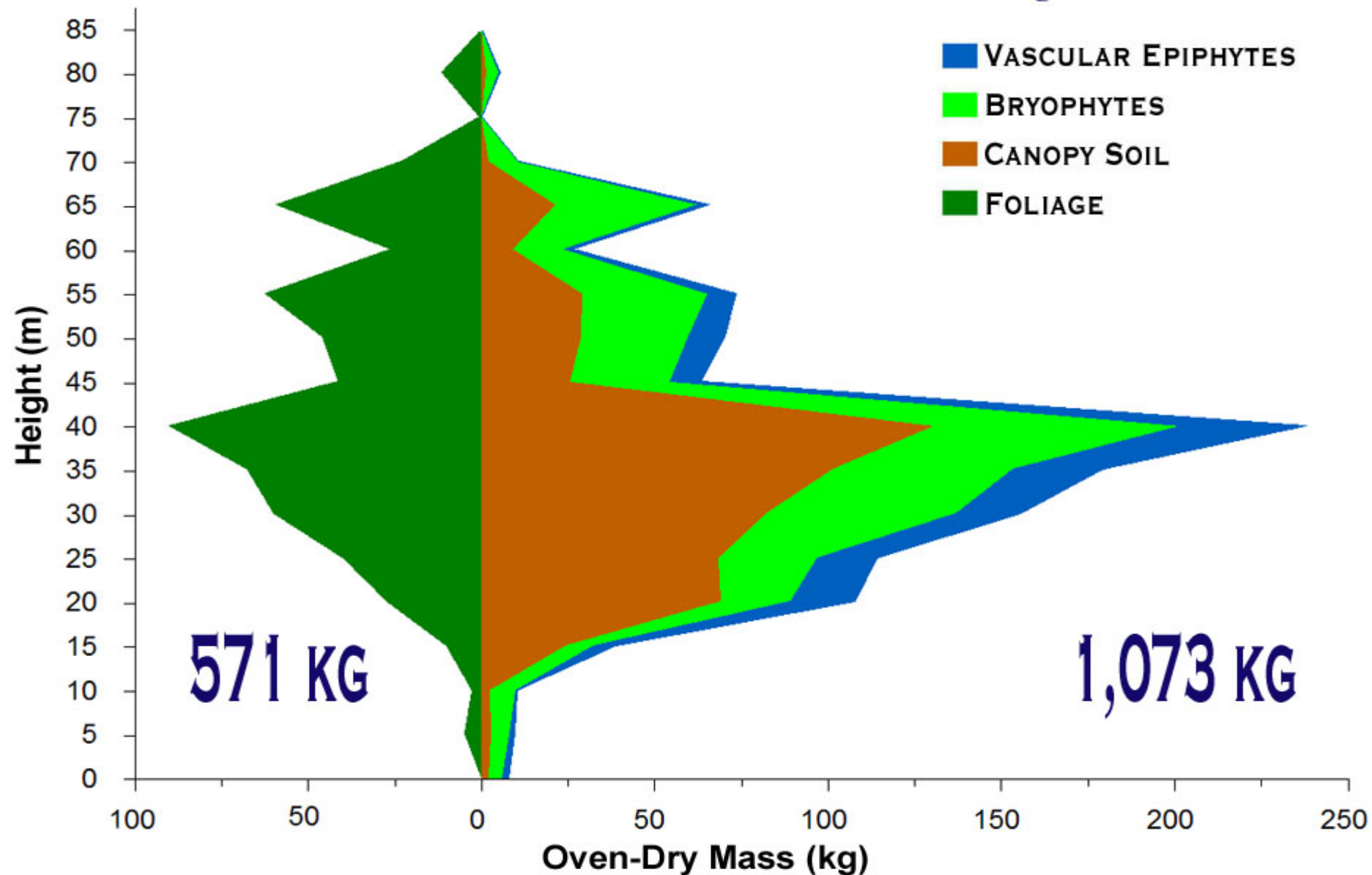


Micronutrients in Fog & Precipitation



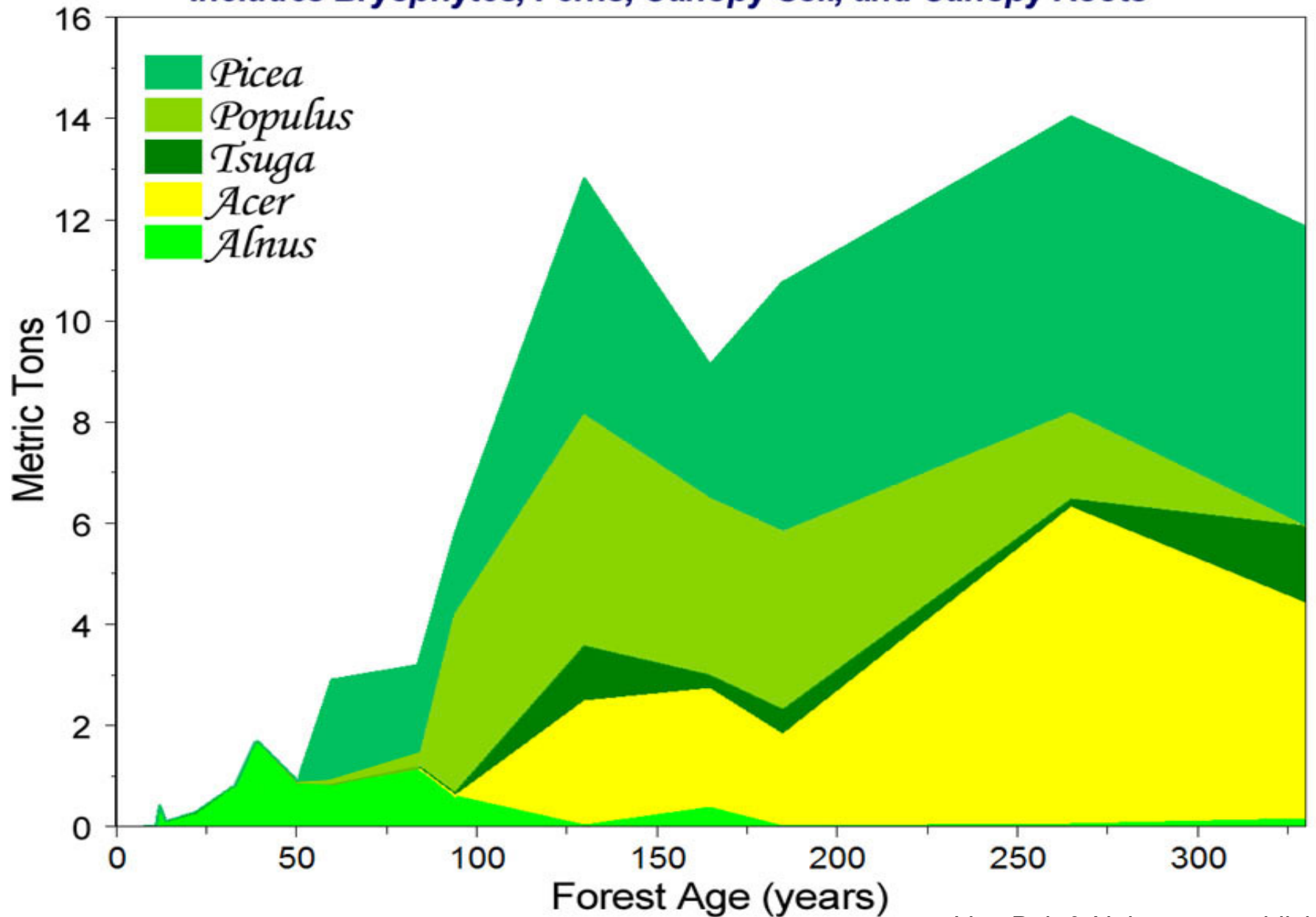
Picea sitchensis

Tree 009
Stand Age 330 Years



Epiphytic Biomass Over Time

Includes Bryophytes, Ferns, Canopy Soil, and Canopy Roots



Marine-Derived Nutrients - Salmon



Five species of Pacific salmon (*Oncorhynchus*) transfer marine-derived nutrients to fresh water utilizing three unique life history traits –

- 1. They are anadromous**
- 2. They return to their natal streams to spawn**
- 3. And they are semelparous (die after spawning once)**

More than 95% of the body mass of Pacific salmon is accumulated from the marine environment



Central Question

How do marine-derived nutrients, carried in the bodies of spawning Pacific salmon, affect riparian soils and plants?



Growth rates of Sitka spruce within 25 m of streams with and without spawning salmon

| Growth Parameter | Sites with Salmon | Sites w/o Salmon |
|--|-------------------|------------------|
| Basal area growth (cm ² /yr ± 1 SE) | 22.9 ± 3.1 | 6.4 ± 1.8 |
| dbh ¹ (cm ± 1 SE) at 100 years | 54 ± 3.5 | 29 ± 3.8 |
| Years (± 1 SE) to attain 50 cm dbh | 86 ± 10.1 | 307 ± 68 |

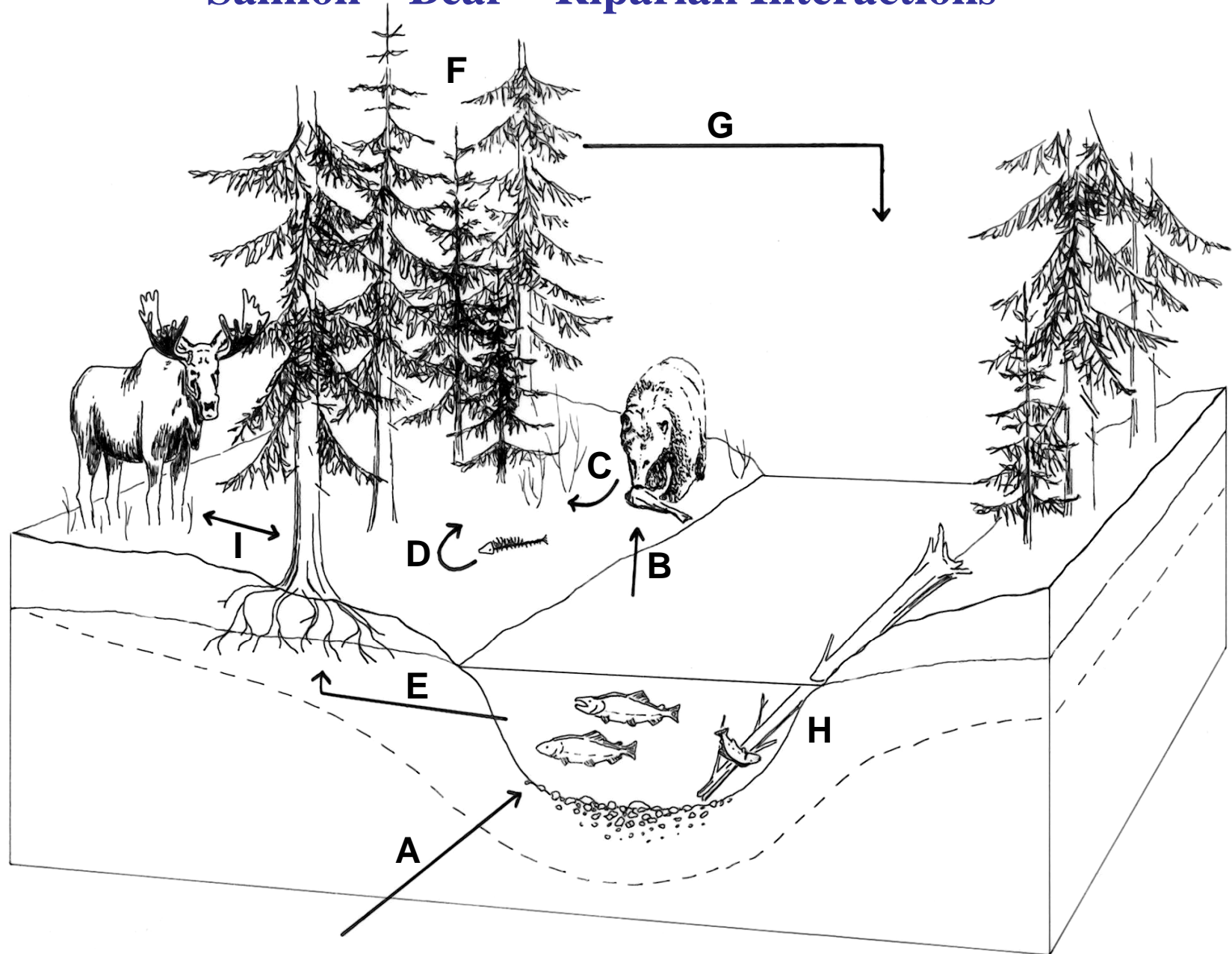
1) Diameter at breast height (cm)

Helfield & Naiman 2001

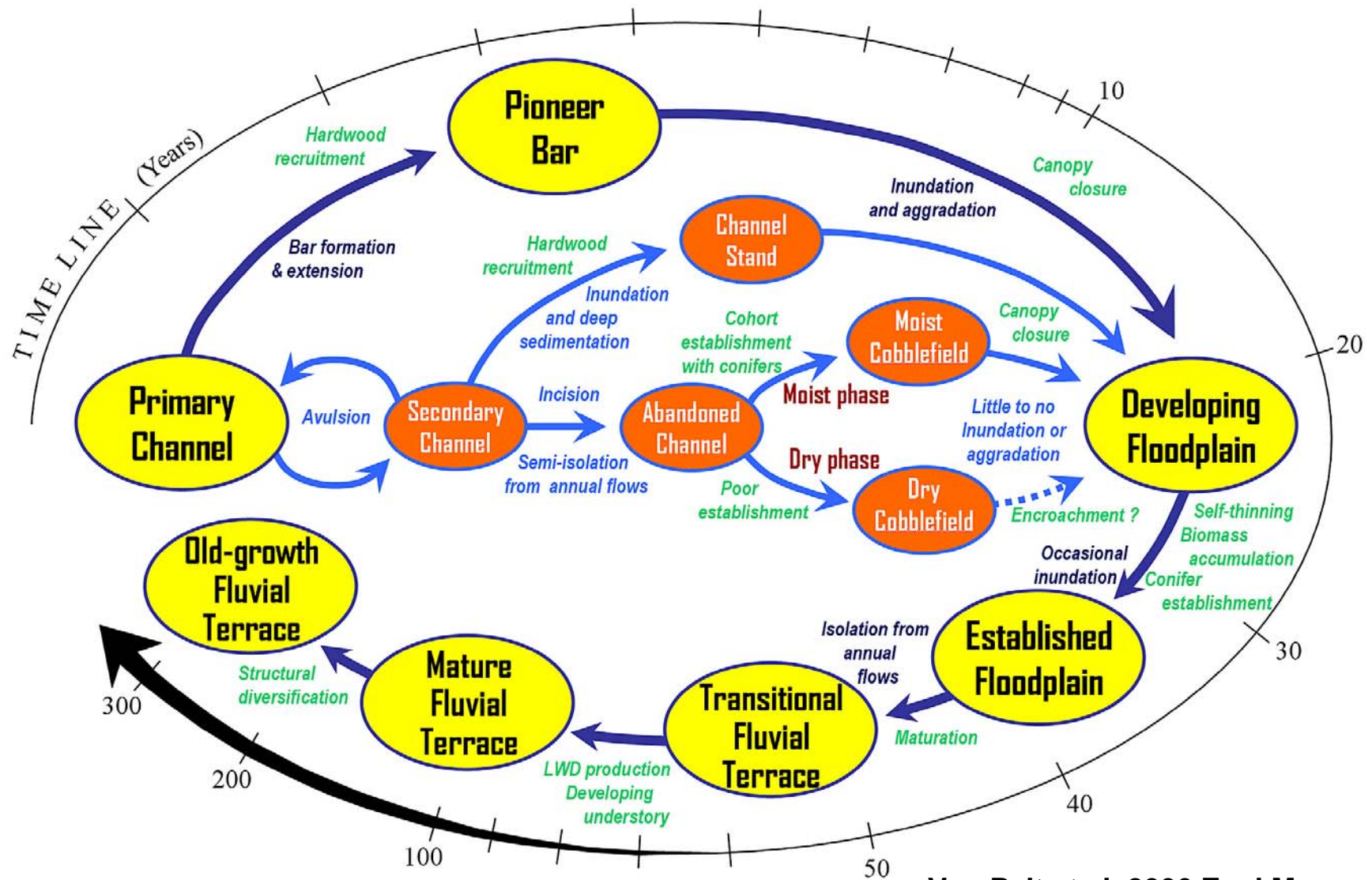
'Keystone' Interactions are Essential



Salmon – Bear – Riparian Interactions



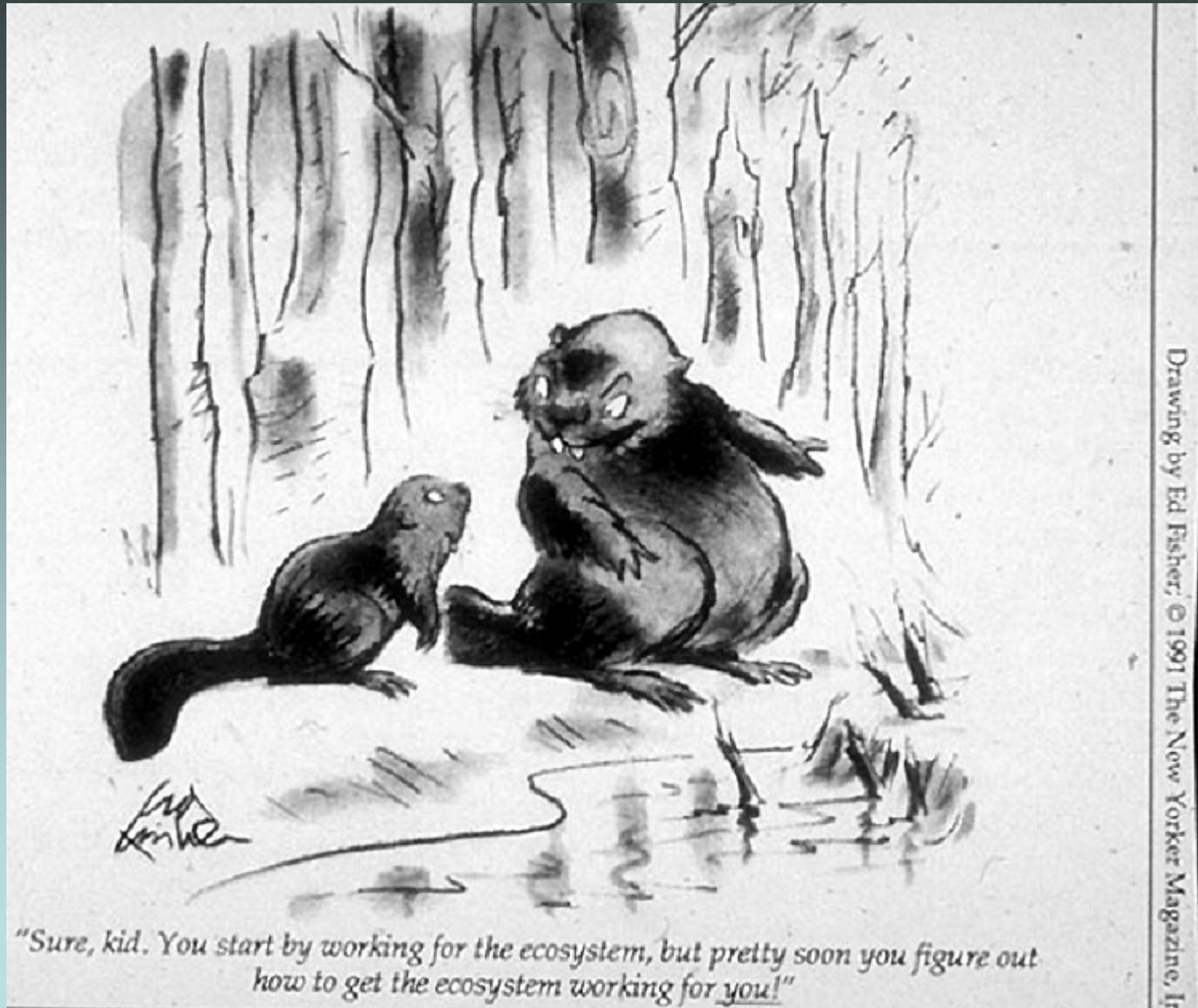
Modeling Riparian Biocomplexity



Take Home Messages

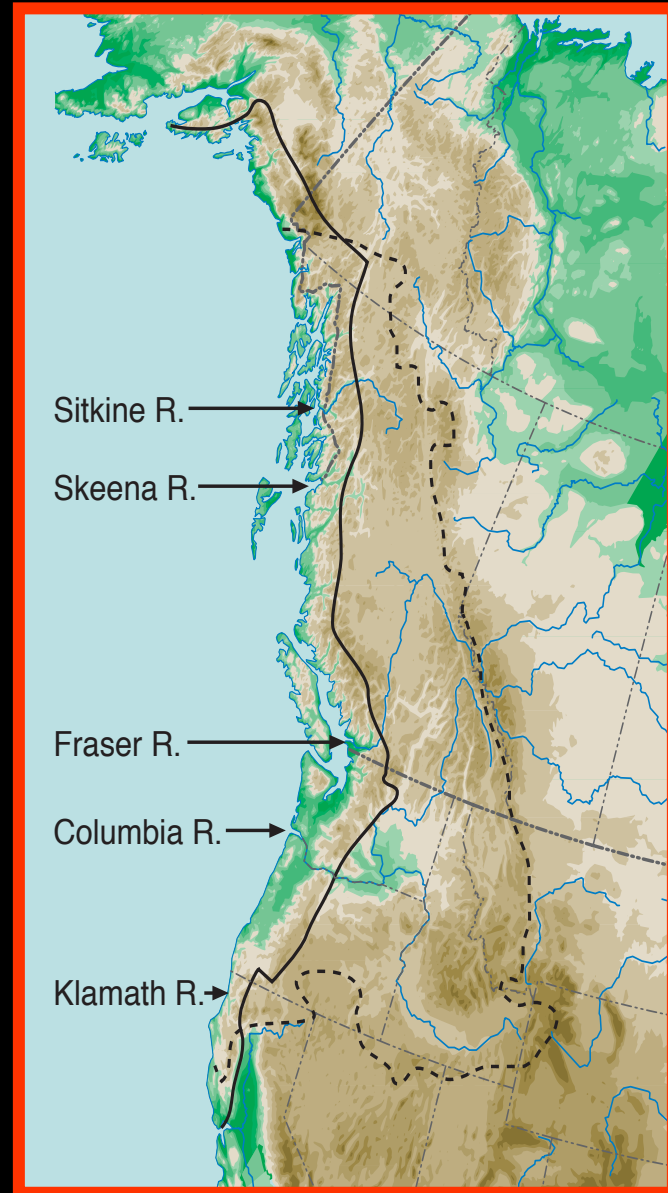
- The biophysical complexity (heterogeneity) of riparia underpins their long-term vitality
- The 'low' terraces are important sources of LW and harbor massive amounts of epiphytes
- Effective management depends on a strong *understanding* the biophysical complexity as well as interactions with uplands, rivers, ocean, and atmosphere

Thank You!



END

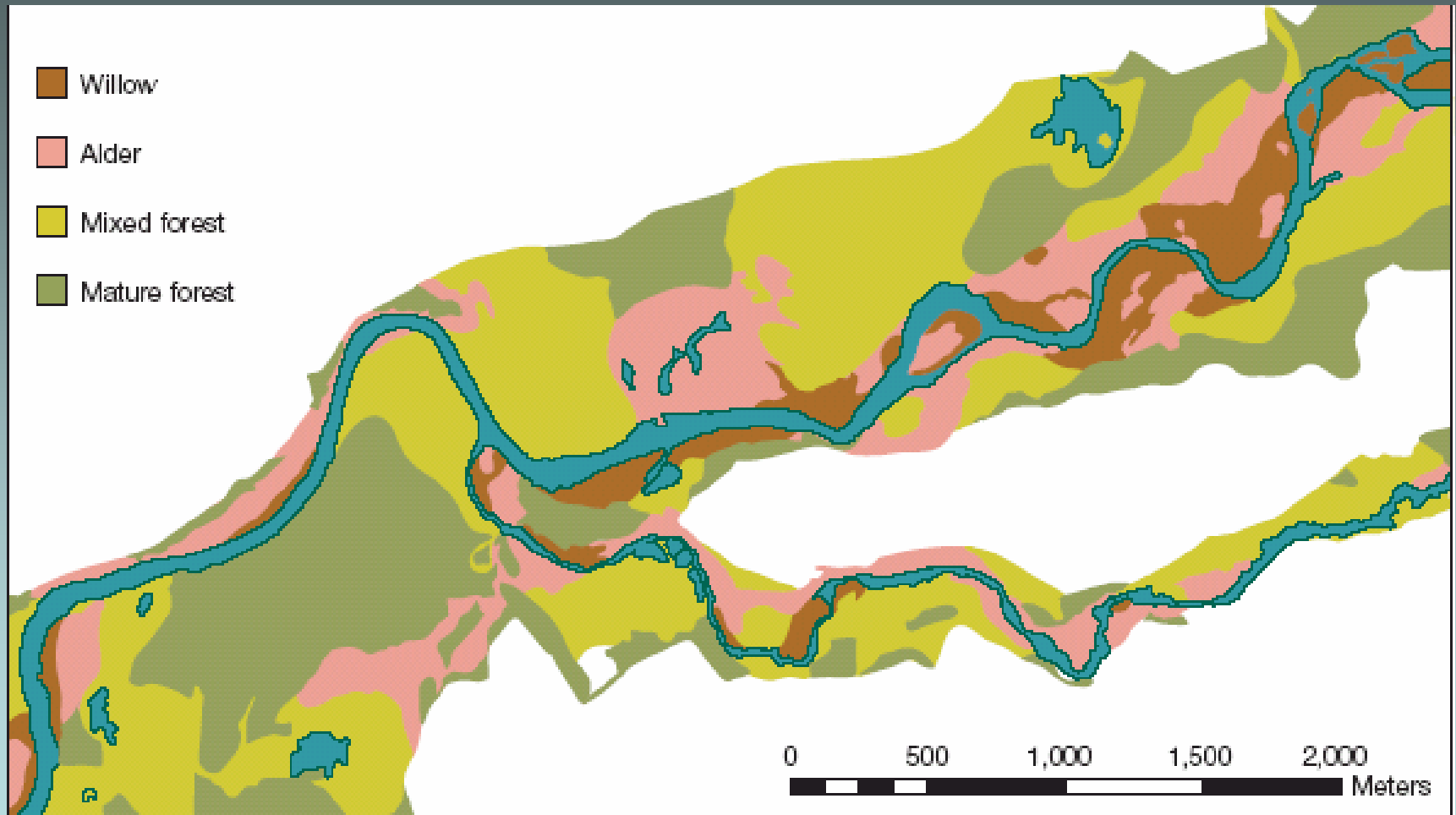
Pacific Coastal Ecoregion



Queets River Floodplain, Washington



Geomorphic Templates – Queets River Flood Plain









Photos: K Bartz

