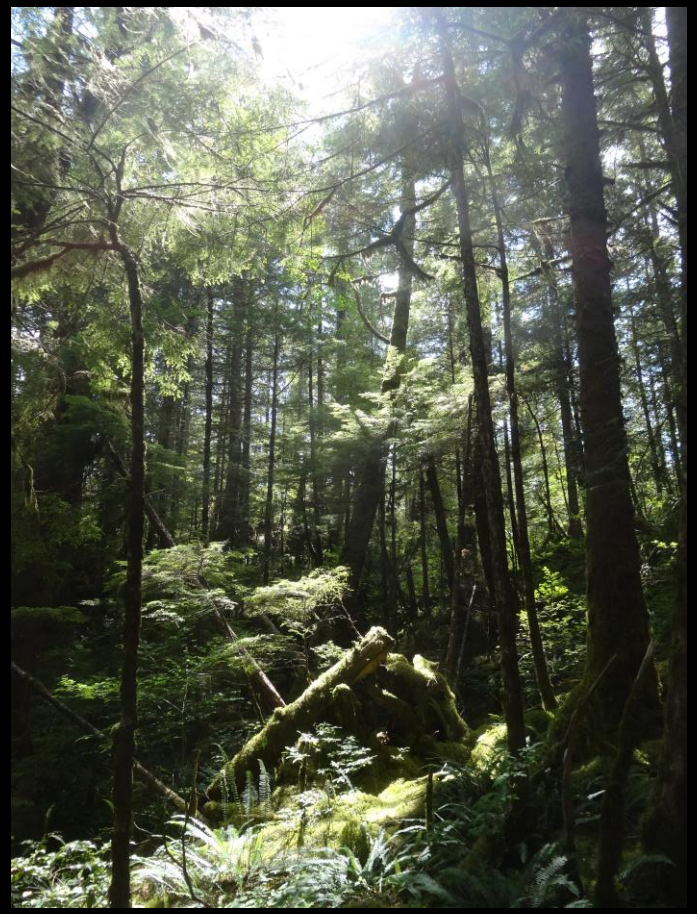
Fish, Forests, Fungi: Soils in the ‘Salmon Forests’ of British Columbia



Dr. Allen Larocque
TEACH webinar 2
May 19th, 2022

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Glenn Bartley

Glenn Bartley

Timothy Knepp

Glenn Bartley

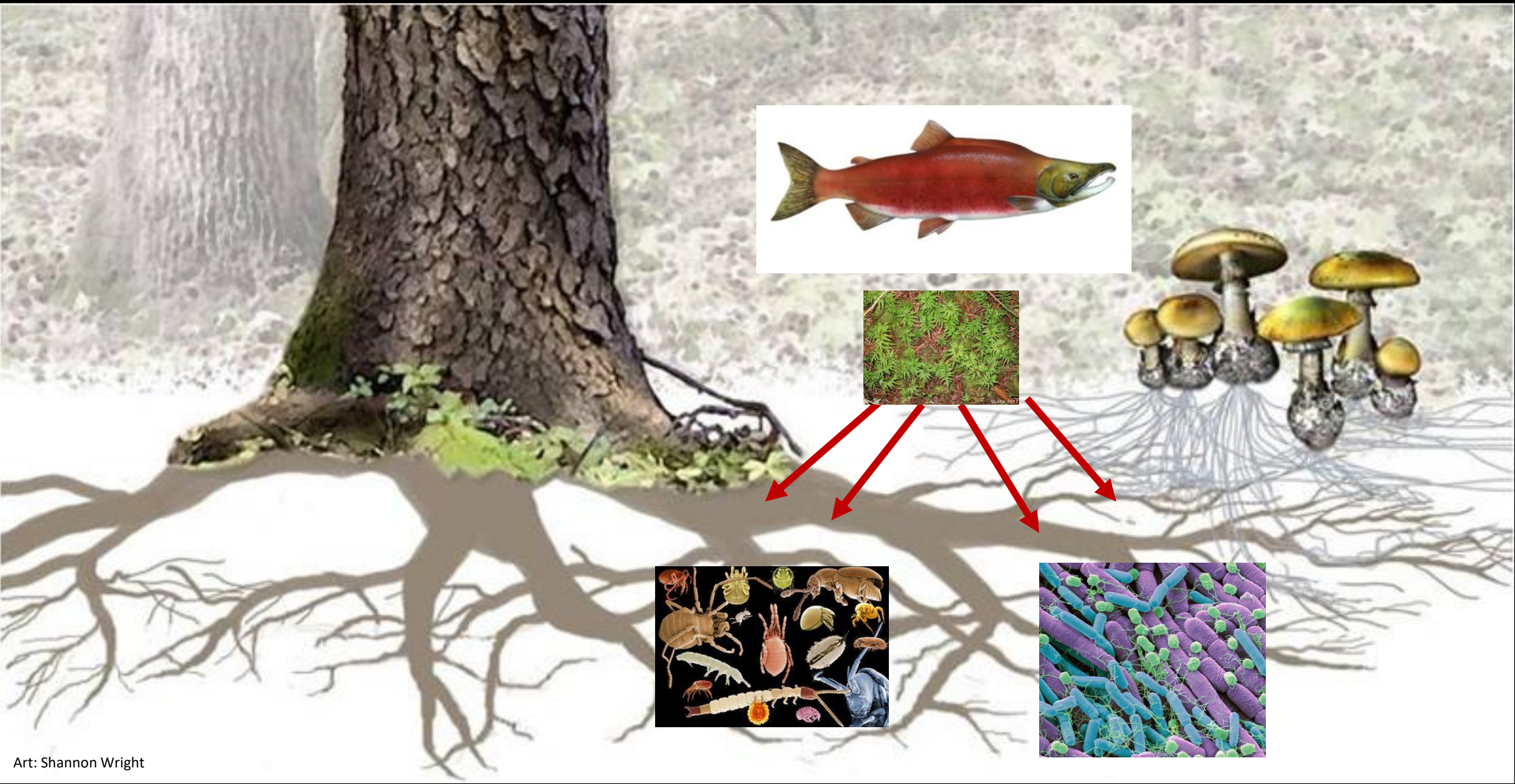
Timothy Knepp

Glenn Bartley

Timothy Knepp


20
40
60
80
1

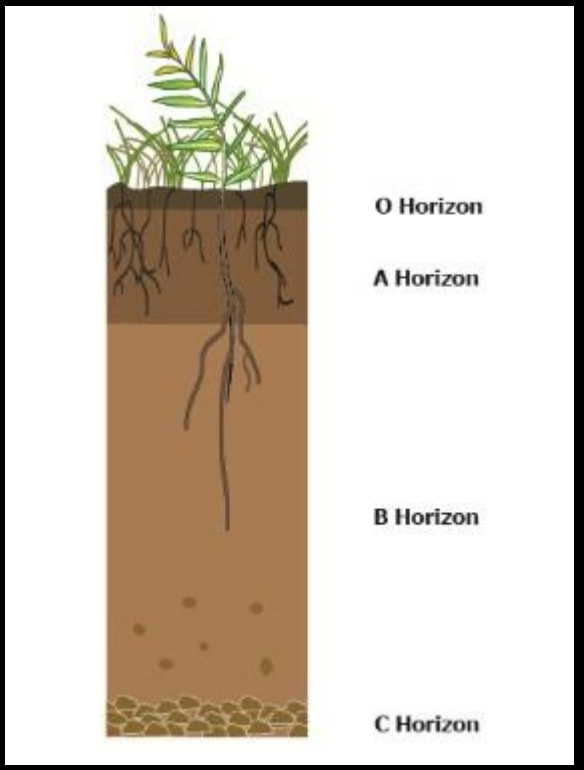
Q: What about the soil?

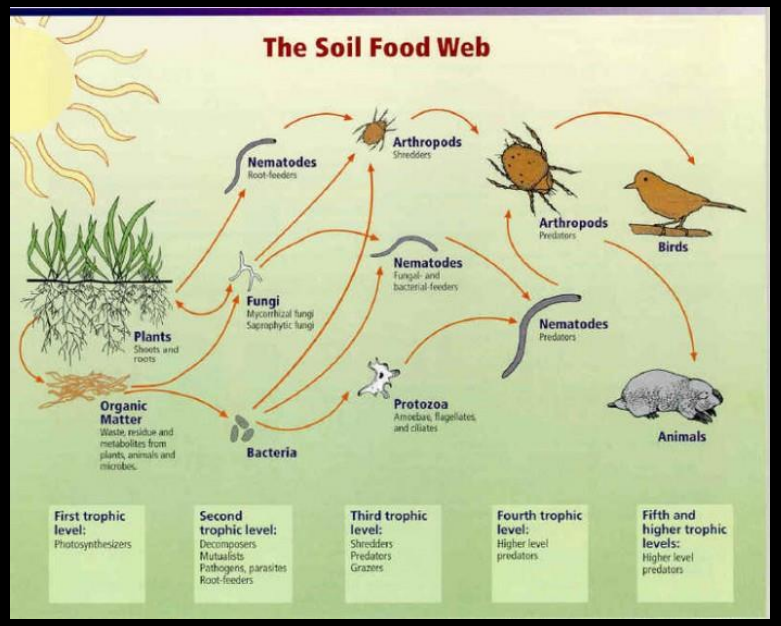


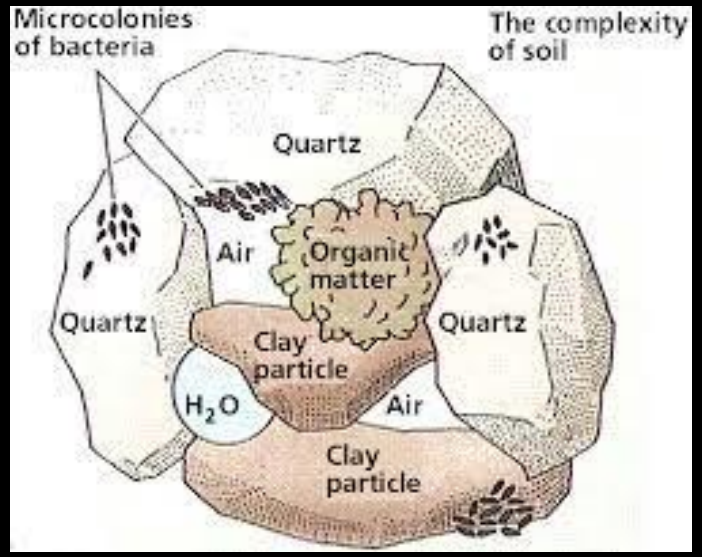
Art: Shannon Wright

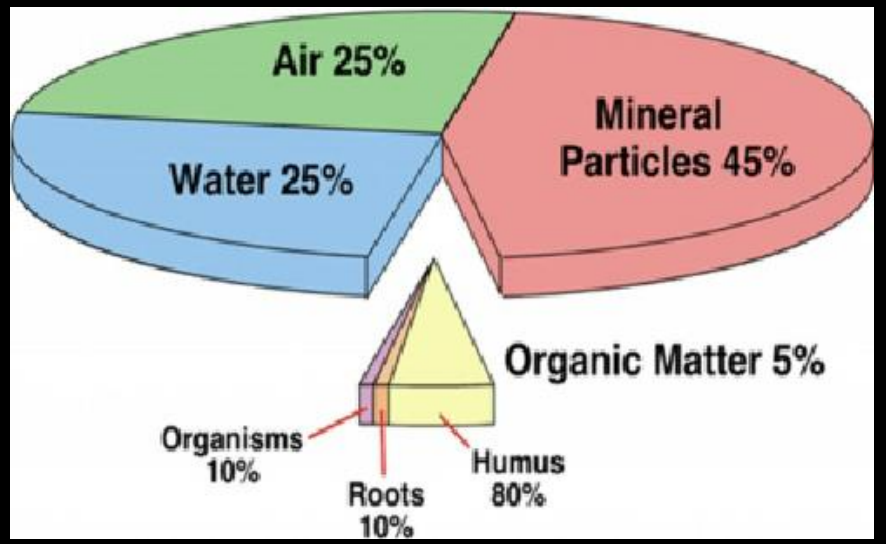
But: soils are perhaps the most complex and diverse ecosystems on Earth…..

1. Many phases (solid, liquid, gas)
2. Many chemical components
3. Many physical textures, mixtures, etc.
4. Different pore sizes (liquid and gas permeability)
5. Diverse PH and redox states
6. And then there's all the biology…..
7. AND this all changes through time (hourly, daily, seasonally, decades and centuries….)
8. AND this all changes with the environment.









Hebeloma sp.









~ 3165 unique species (DNA)

Q: How do salmon change things ‘in the soil’?

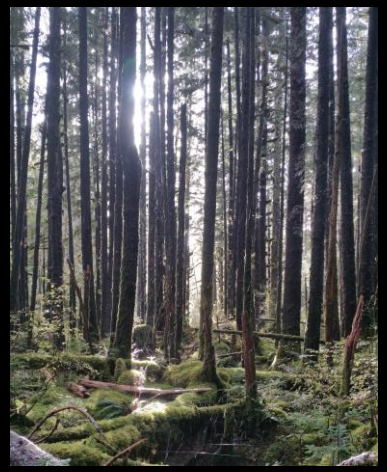
1. Salmon nutrients are absorbed by fungi
2. Salmon nutrients change plant/soil communities
3. Salmon nutrients increase soil fungal diversity

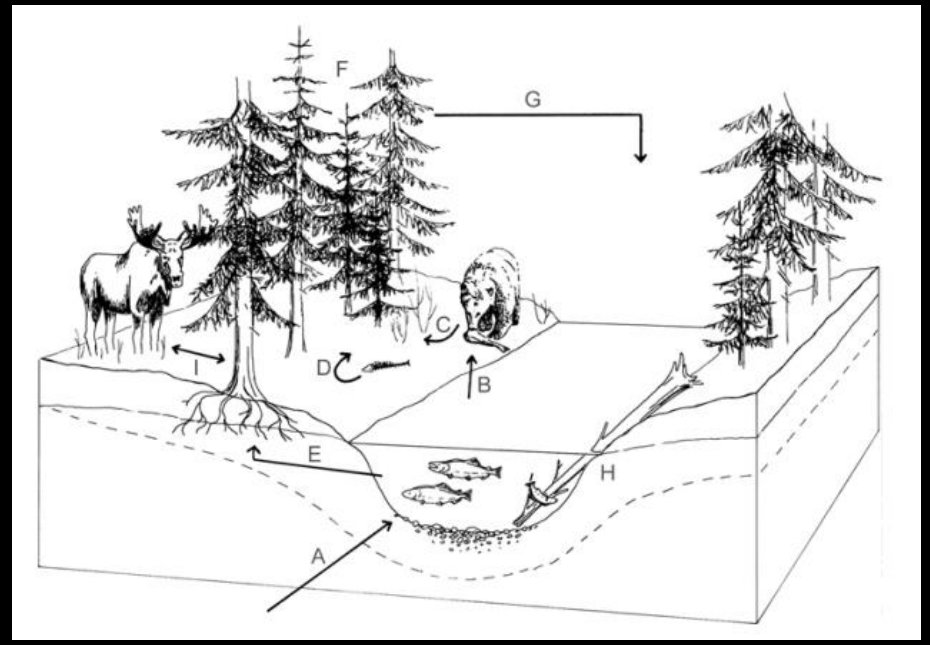
- Higher ^{15}N relative to terrestrial sources (enriched)

- Higher ^{15}N relative to terrestrial sources (enriched)

Predators
- Bears
- Wolves
- Mink
- River otter
- …

Shrub layer
- Salmonberry
- *Vaccinium sp.*
- False azalea
- …





Meso & “Mini” predators
- Wrens
- …

Tree layer
- Cedar
- Sitka Sprice
- Hemlock
- Amabilis Fir

Herbaceous layer
- Ferns
- False-lily-of-the-valley
- Foamflower
- …

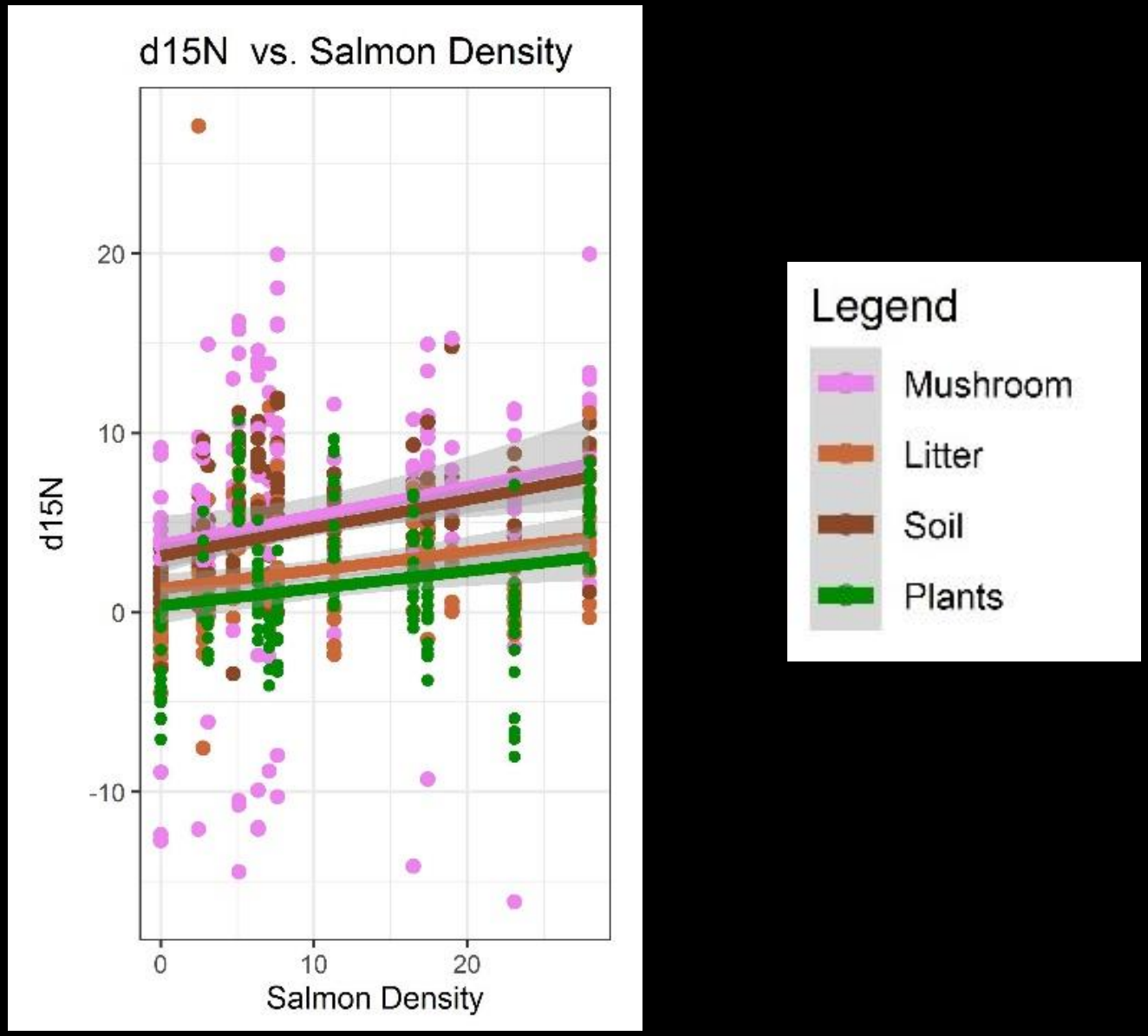
Insects
- Beetles
- Flies
- Wasps

Moss layer
- Moss
- Liverwort
- …

“Abiotic”
- Soil
- Watercolumn
- Hyporrheic zone
- …

Q: What about mushrooms?

1. ^{15}N from salmon are ‘in the mushrooms’



2. Salmon change plant communities

Bogs

- Shore pine

- All the bog plants

‘Conifer’ forest

- [

- Sitka spruce
- Amabilis fir
- Hemlock

- Blueberry + huckleberry
- Salal
- False azalea

‘Broadleaf’ forest

- Cedar
- Bigleaf maple
- Red alder

- Salmonberry
- Devil’s club

A ‘continuum’ of BC coastal forests:

Bogs

‘Conifer’ forest

‘Broadleaf’ forest

Acidic

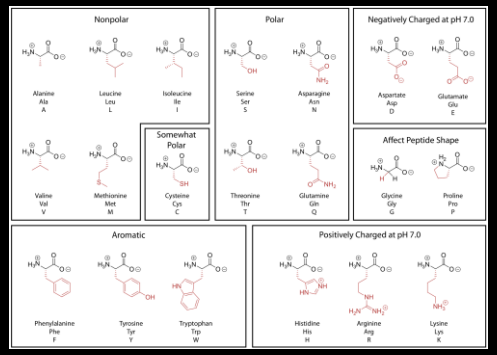
Neutral/ basic

Soil PH

A ‘continuum’ of BC coastal forests:

Bogs

- Amino acids



‘Conifer’ forest

- Ammonium

NH_4^+

‘Broadleaf’ forest

- Nitrate

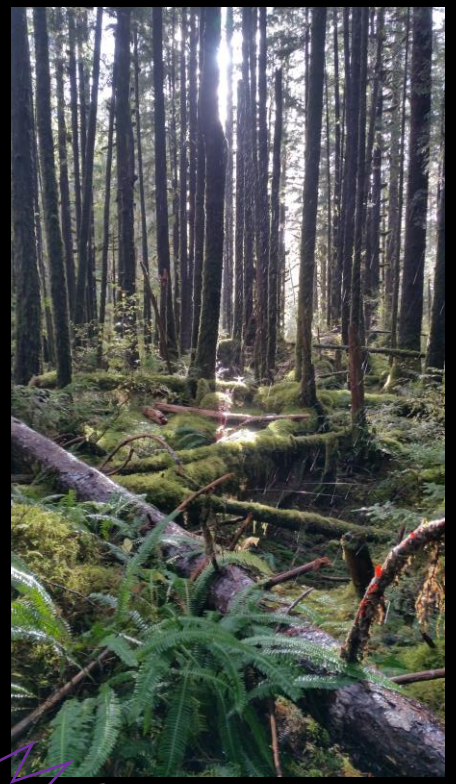
NO_3^-

Soil nitrogen redox state

A ‘continuum’ of BC coastal forests:

Bogs

‘Conifer’ forest



‘Broadleaf’ forest

Ericoid

Ectomycorrhiza

Arbutoid

Orchid

Arbuscular

Mycorrhizal Fungi Community

A ‘continuum’ of BC coastal forests:

Bogs

‘Conifer’ forest

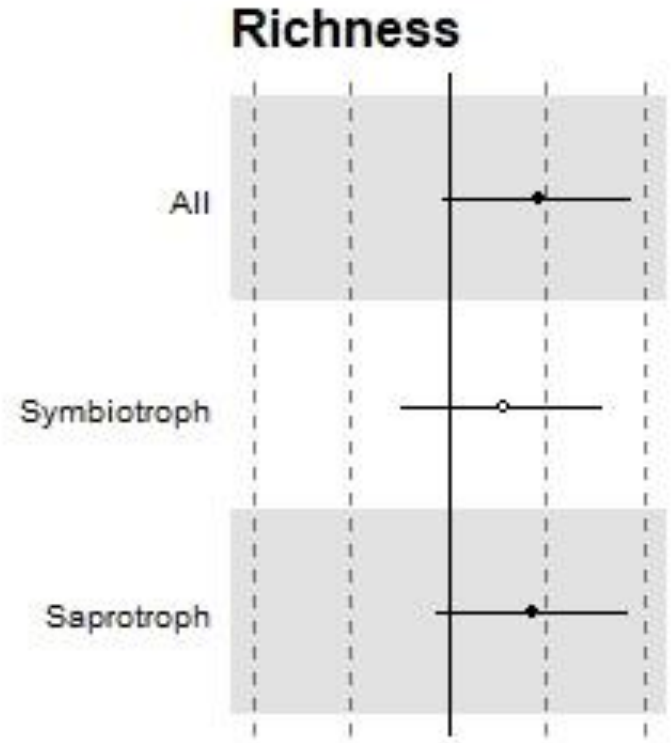
‘Broadleaf’ forest

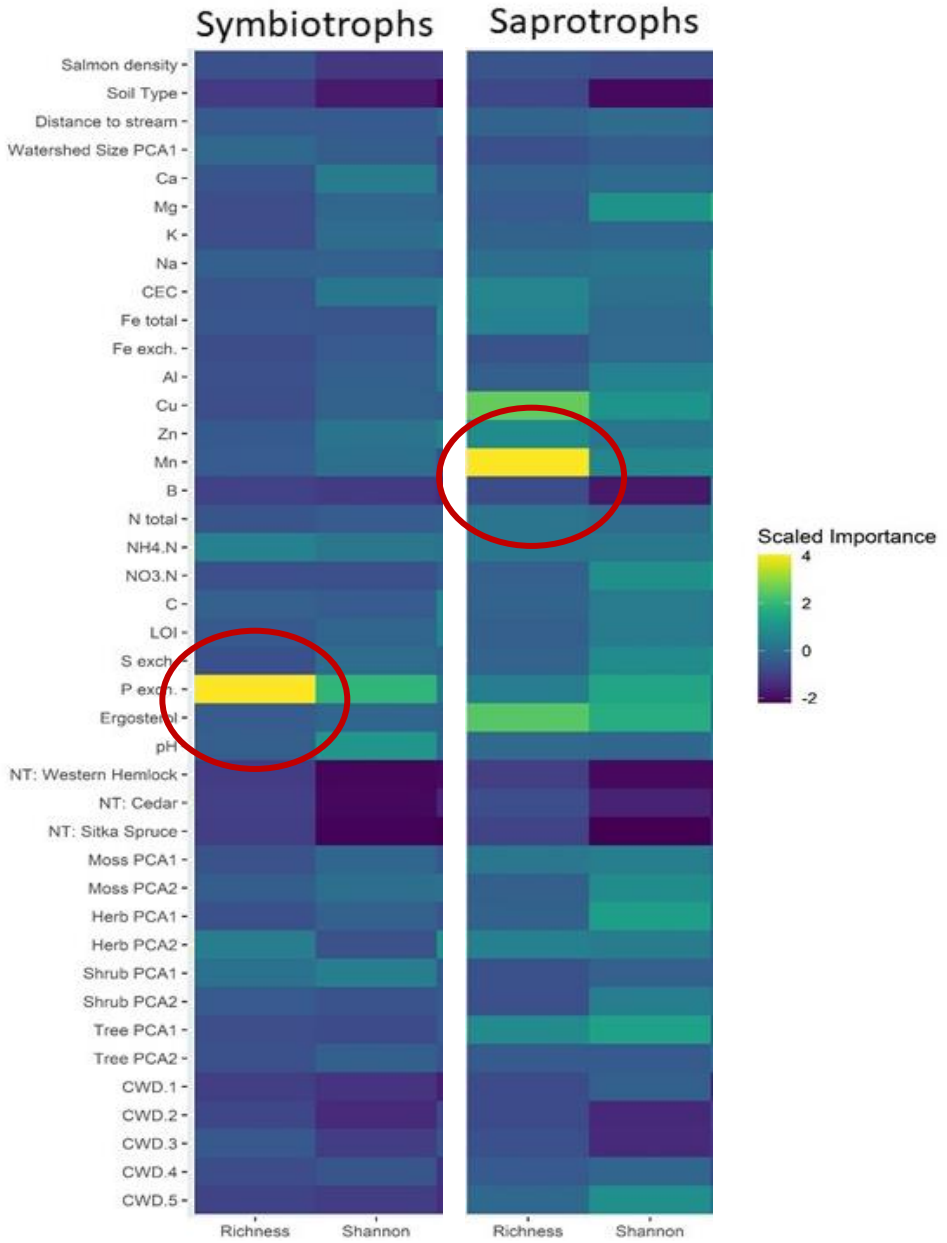
No salmon

Lots of salmon

Increasing Salmon

3. Salmon increase soil fungal diversity





*Random forest model (machine learning)


Price Island
Dowager Island
Spiller Channel
Yeo Island
Lady Douglas Island
Farquhar Peak
Chatfield Island
Cunningham Island
Dufferin Island
Athlone Island
King Island
Bella Bella
Shearwater
Denny Island
Stryker Island
Campbell Island
Hunter Island
Goose Island
Namu
Hakai Protected Area
Google

Heiltsuk Nation

UBC TerreWEB Mitacs BRINKMAN GROUP

Donner Canadian Foundation

Simard Lab (UBC), Reynolds Lab (SFU)

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Thesis title: **“Fish, Forests, Fungi: Soils in the ‘Salmon Forests’ of British Columbia”** (not available at UBC library yet, but you can find it at www.allenlarocque.com)