

Legislation and the need  
to define reference condition:  
a North American perspective





# Legislation

## United States

Endangered Species Act

- Species specific
- Localized listings

Clean Water Act

- More holistic
- Applied to all rivers

## European Union

Habitats Directive

- Species specific
- Localized listings

Water Framework Directive

- More holistic
- Applied to all rivers

# Purposes of US Legislation

- Endangered Species Act:  
... conserve ecosystems upon which listed species depend”
- Clean Water Act:  
... restore and maintain the physical, chemical, and biological integrity of the nation’s waters

# Endangered Species Act

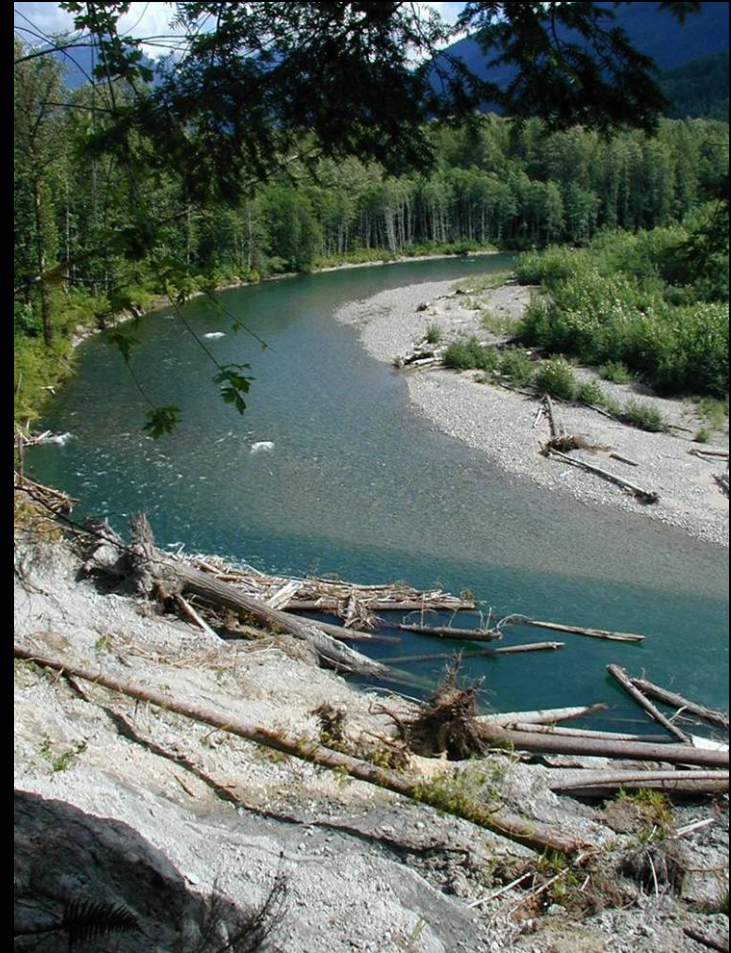
- Administered by federal agencies
- Requires recovery of a species, and is implemented with limited regulatory authority
- No explicit requirement for habitat standards
- Reference condition helps understand
  - why a species has declined
  - habitat restoration potential

# Clean Water Act

- Administered by individual states
- Commonly implemented through water quality standards set by the states
- Biological integrity an important metric
- Reference condition used to judge the health of the system

# Questions in common

- What's the status of a reach?
  - Excellent, pristine, undisturbed
  - Good, fair, natural, semi-natural
  - Poor, degraded, pathetic
- What should our restoration targets be?
  - Full restoration, partial restoration, habitat creation
  - Important to know what's possible



## Some basic challenges

- Lack of analogues and historical data for some channel types
- Within-reach spatial variation complicates development of metrics
- Constant physical change complicates definition of reference condition























# Lack of analogues and historical data?

- No reference data exist for incised channels throughout the western US
- Stratigraphy is difficult to interpret





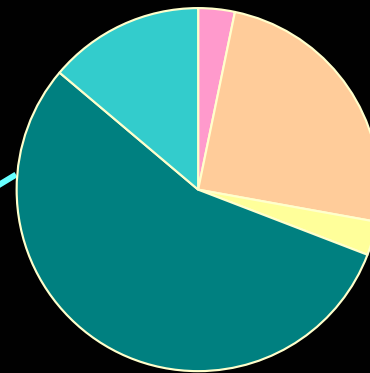


Most rivers are hydromorphologically diverse





# Most rivers are multi-thread



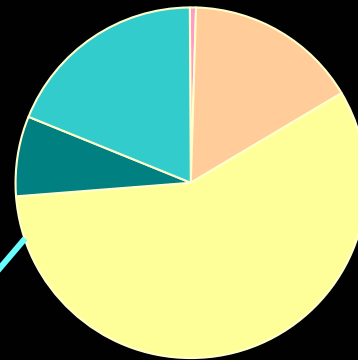
- bkw pool
- scr pool
- glide
- lg riffle
- hg riffle

Young scroll bar channel



Riffle dominated

# Most rivers are multi-thread



- bkw pool
- scr pool
- glide
- lg riffle
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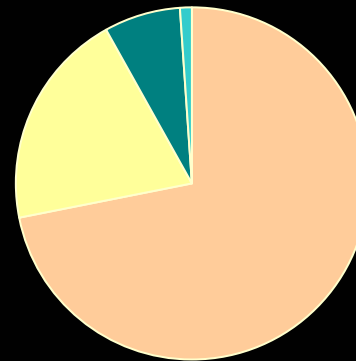
Young abandoned main stem



Mixed riffle and pool



# Most rivers are multi-thread



- pool
- glide
- lg riffle
- hg riffle

Old abandoned main stem



# Temporal variation



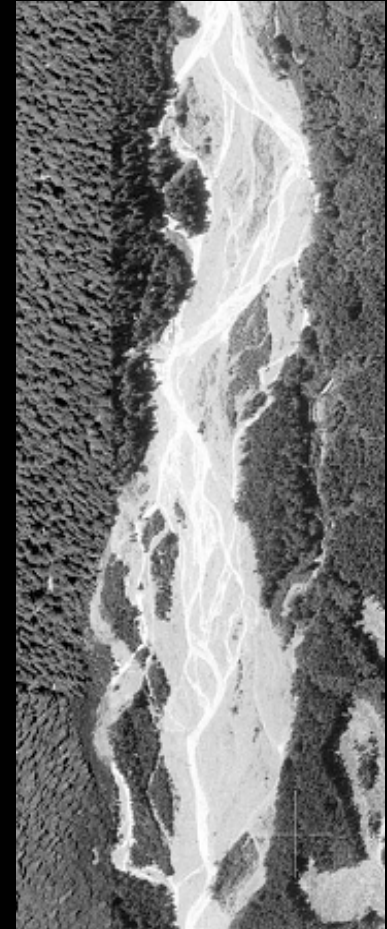
Straight



Meandering



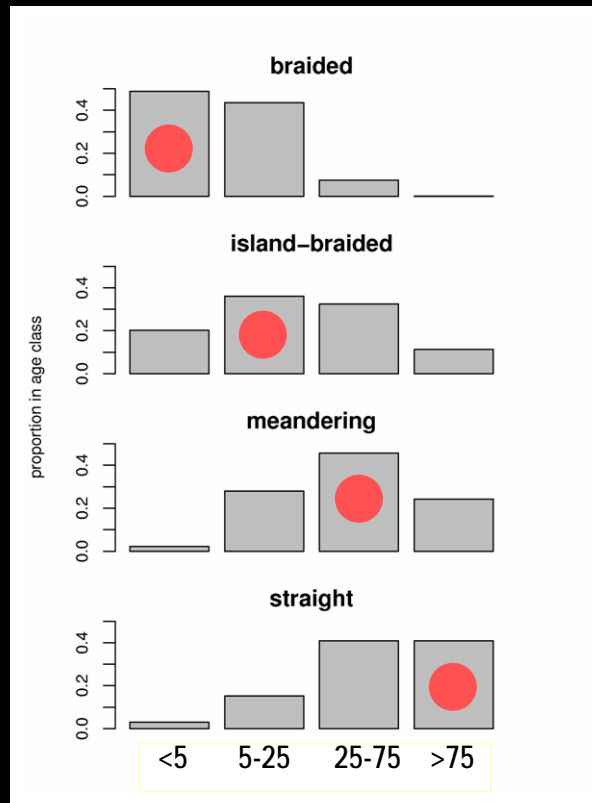
Island Braided



Braided

Increasing lateral migration rate

# River-floodplain dynamics



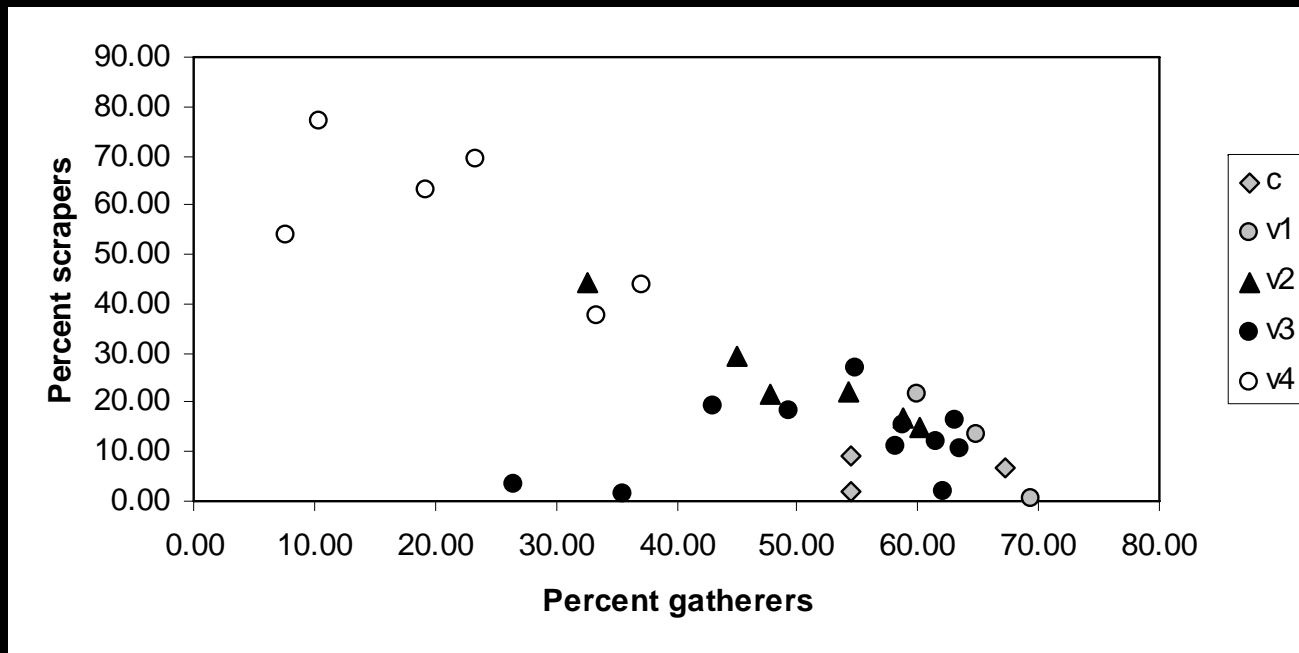
Increasing age

- Generally pattern stable
- Relatively constant floodplain age distributions through time



# Biological response

## ■ Invertebrate community variation





## Key questions

- What's the right scale for defining reference condition?
- What are the key metrics for reach-level reference condition?
- How do we define reference condition for constantly changing systems?