

# Why Are Natural Rivers So Important?

Robert J Naiman

University of Washington, USA

# Why Are Natural Rivers So Important?

*Hint: As highly productive ecological systems they  
provide valuable goods and services*











Me































# Technical Advances & Ecological Discoveries



Flow, Sediment & Ice Regimes

Ecological Gradients

Landscape Effects on Productivity

Long Distance Movements

Importance of Floodplain  
& Riparian Zones

Subsurface Processes &  
Controls on Water Quality

Vital Roles of Large Animals



# Four Concepts that Maintain River Productivity, and Goods & Services

Connectivity

Variability

Species Matter

Cultural Decisions



# Four Basic Concepts Maintain River Productivity

## Connectivity

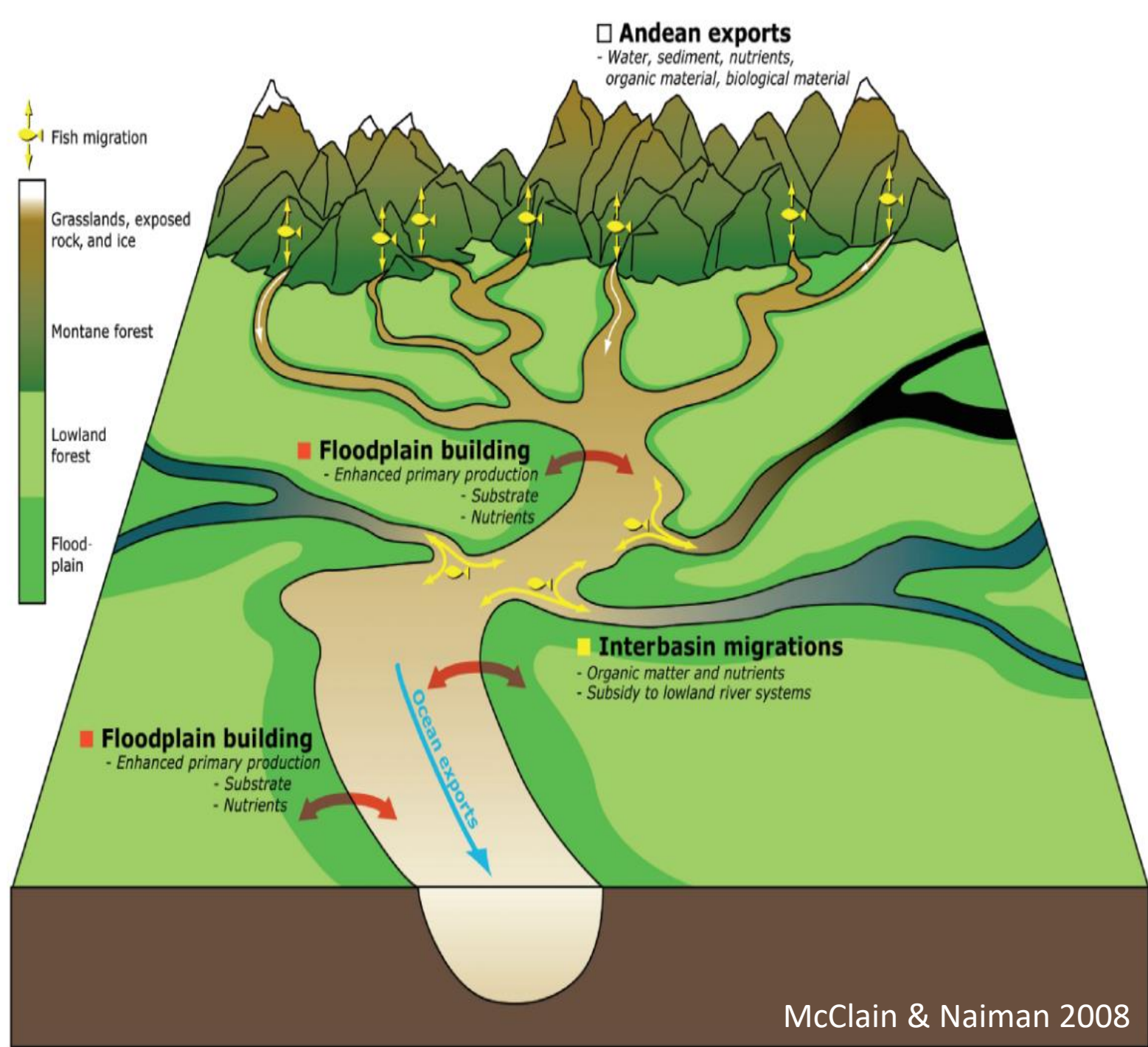
- ✓ Longitudinal
- ✓ Lateral
- ✓ Vertical



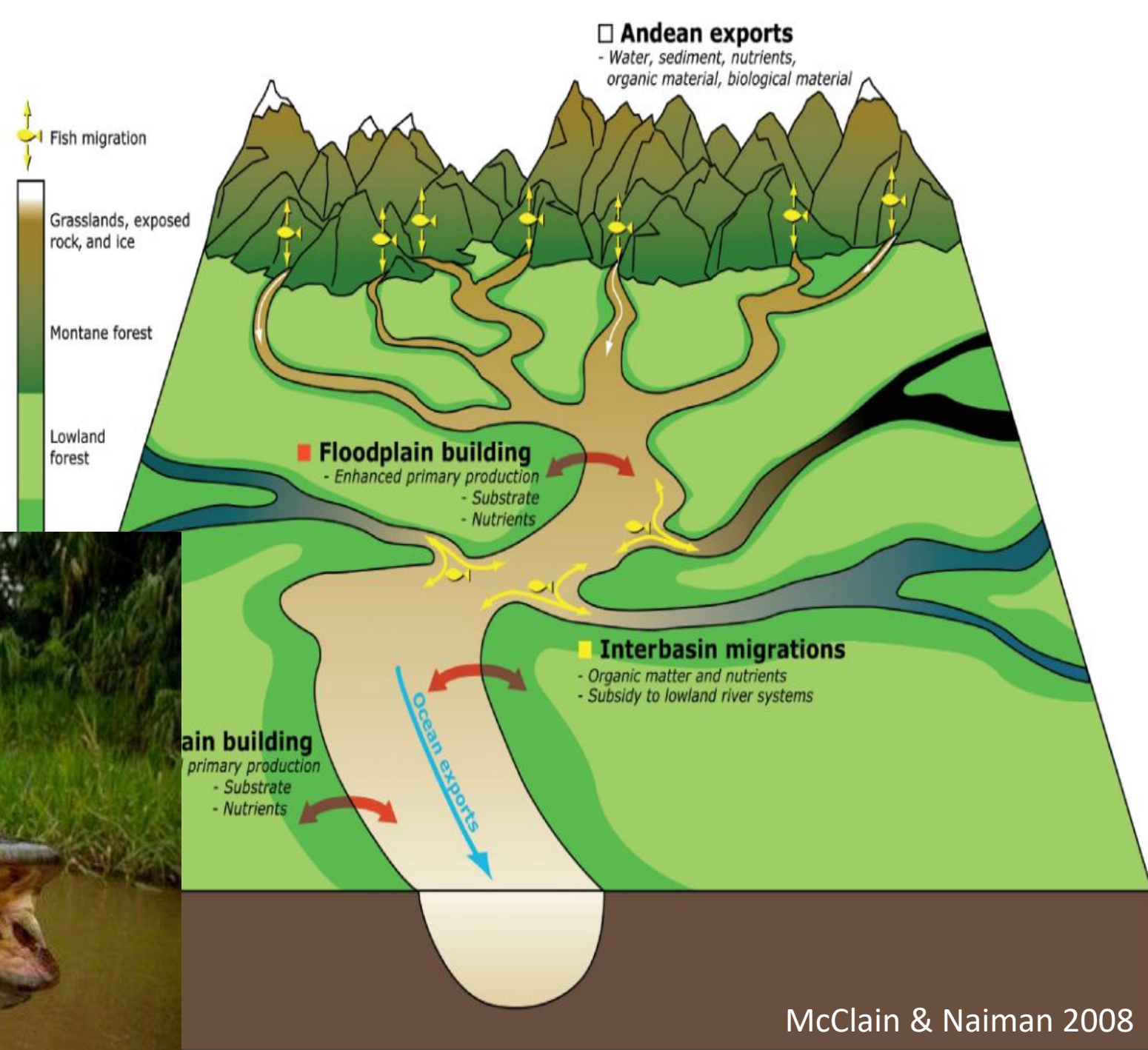
# Longitudinal Connectivity: The Amazon



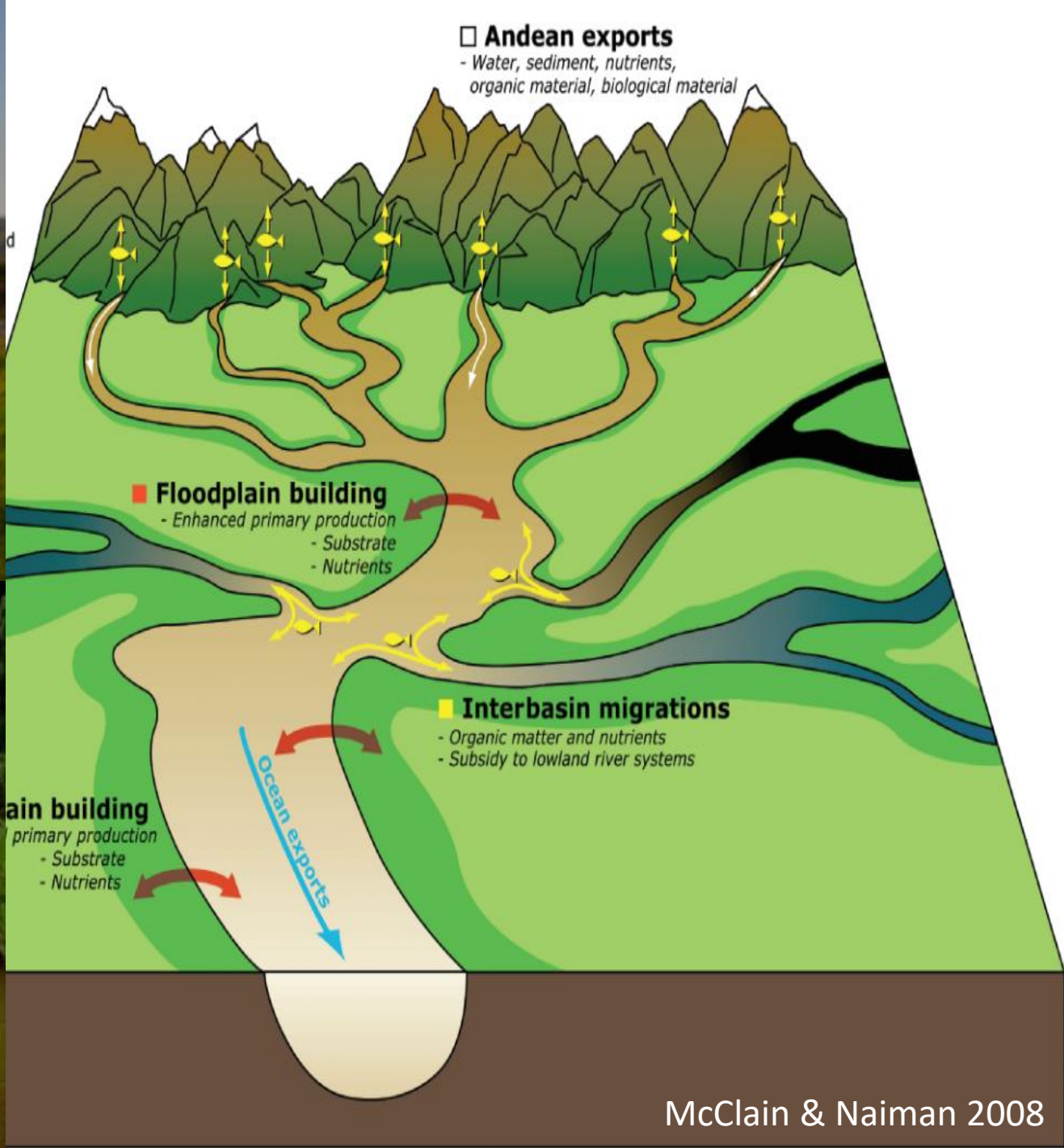












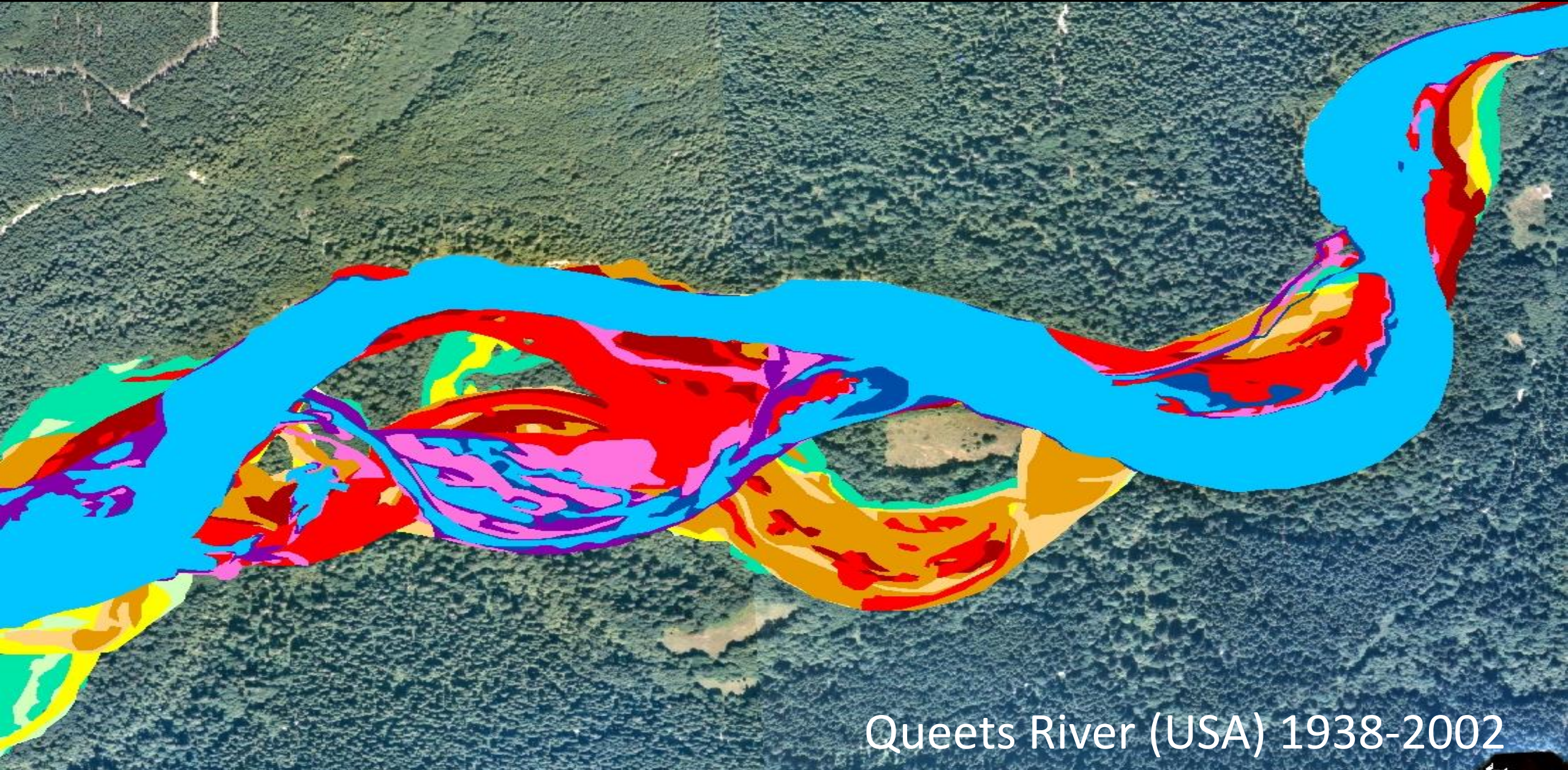


# Lateral Connectivity: Floodplain and Riparian Zones





# Lateral Connectivity: Floodplain and Riparian Zones



Queets River (USA) 1938-2002



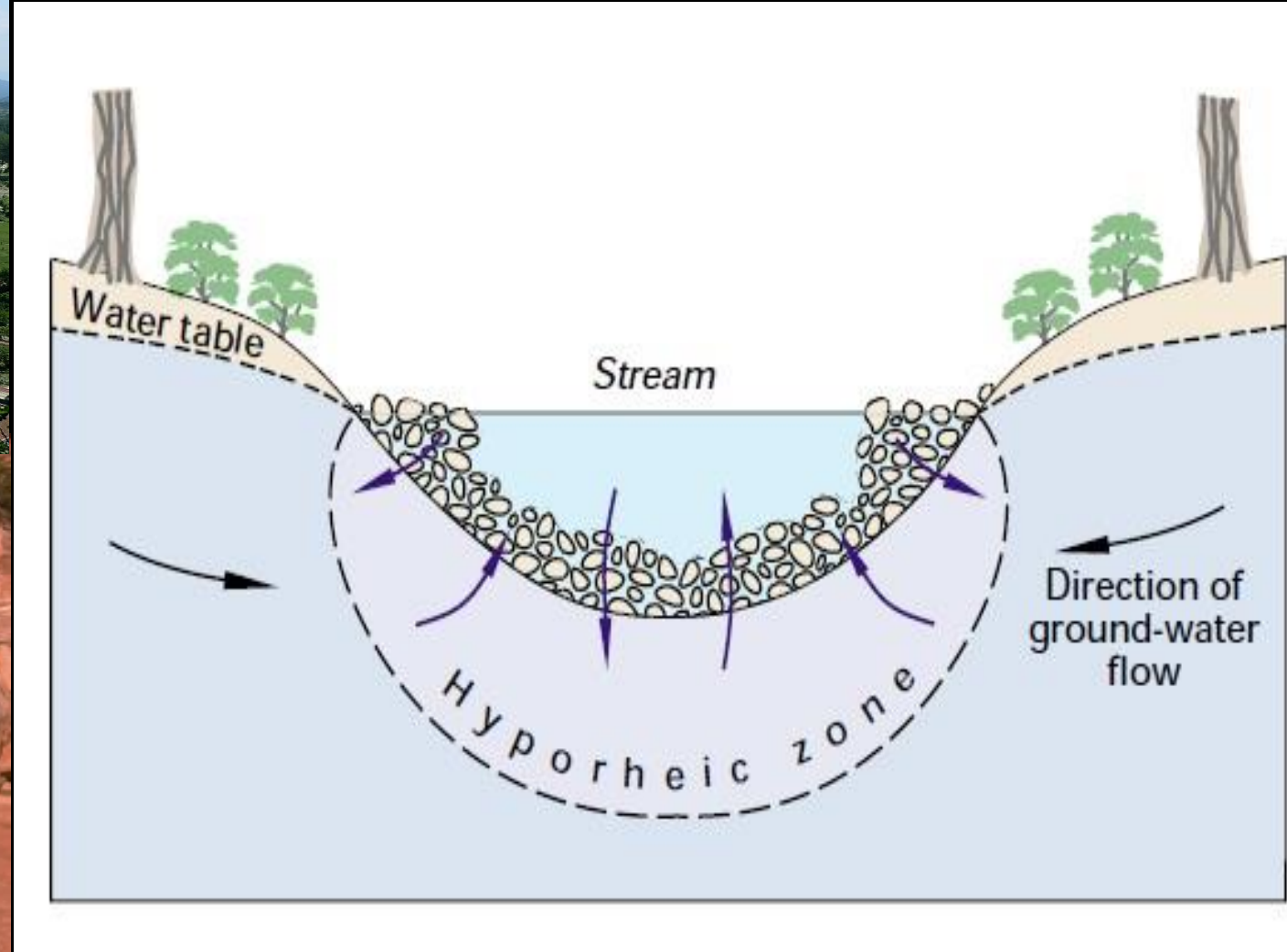
# Lateral Connectivity: Floodplain and Riparian Zones



**265 YEARS**



# Vertical Connectivity: The Hyporheic (Subsurface) Zone





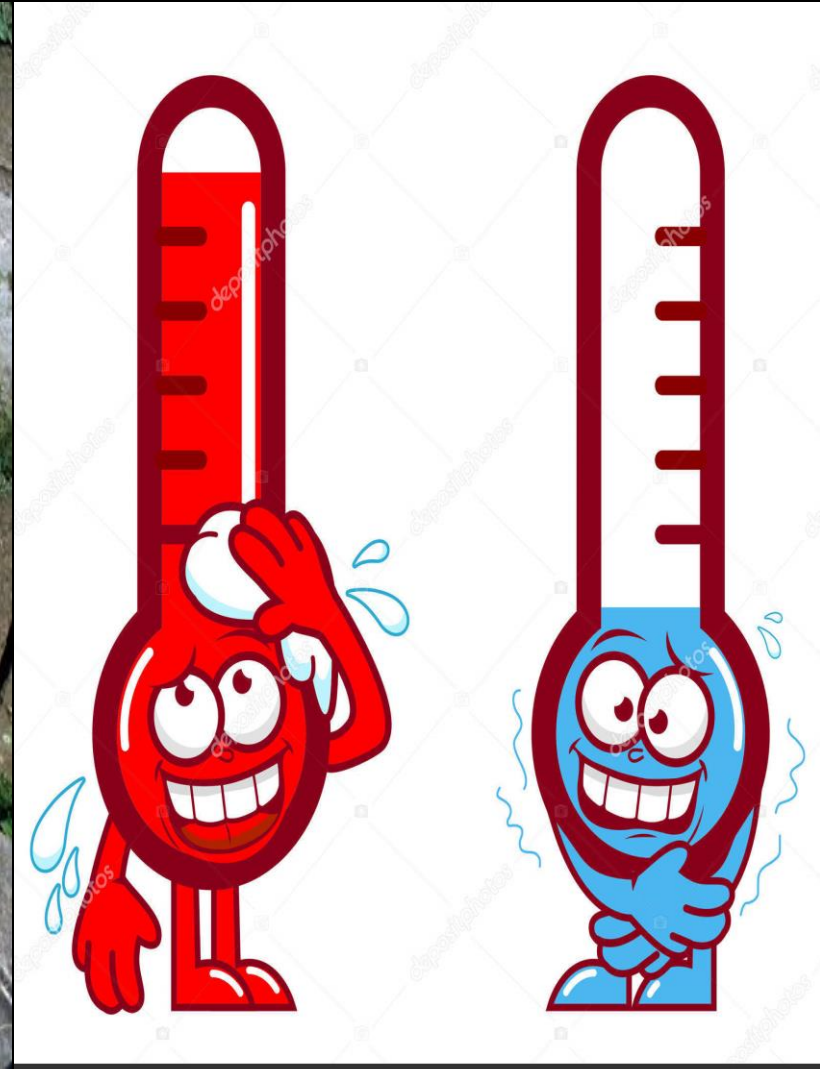
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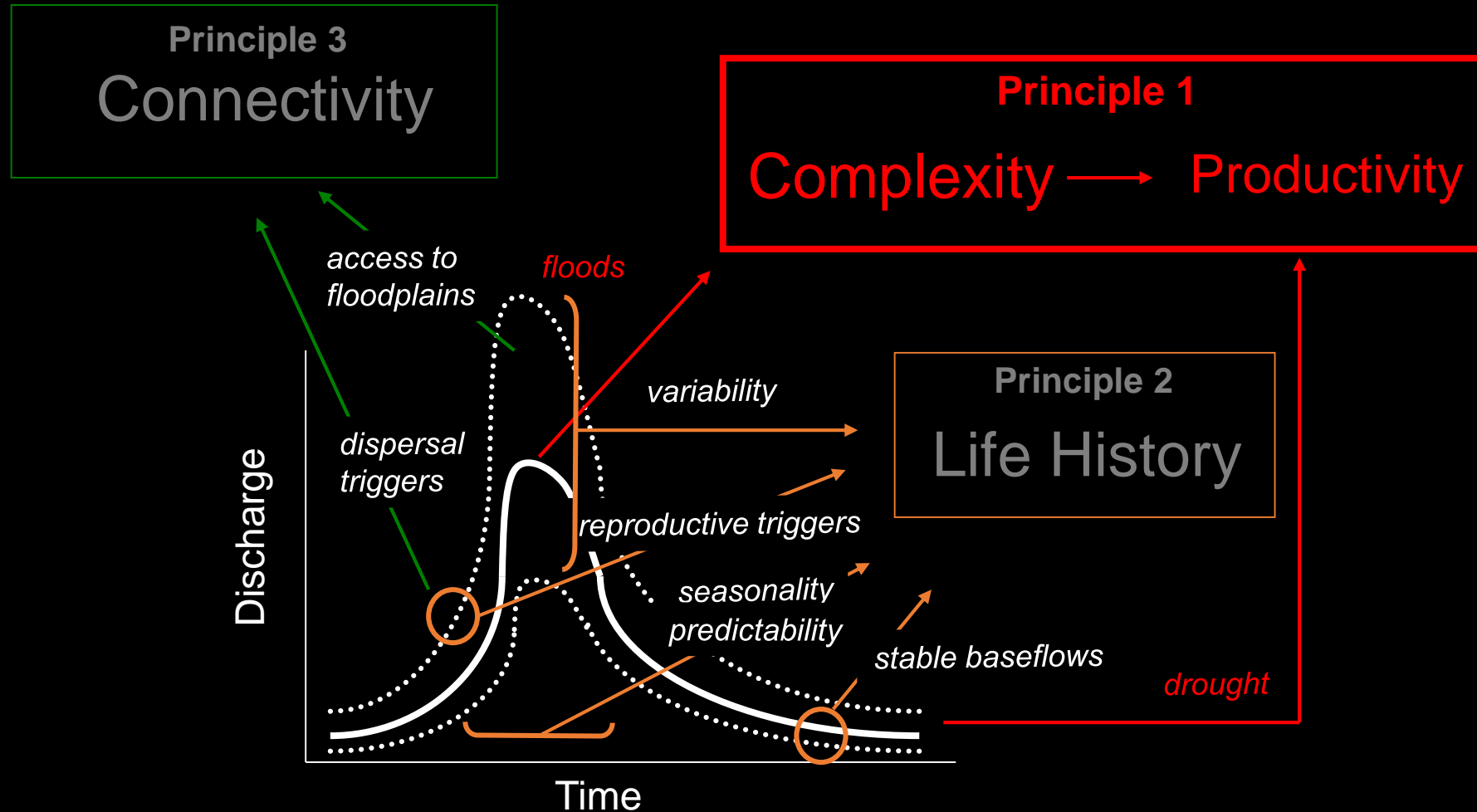
# Variability is Natural, and Necessary

## Floods, Drought & Temperature



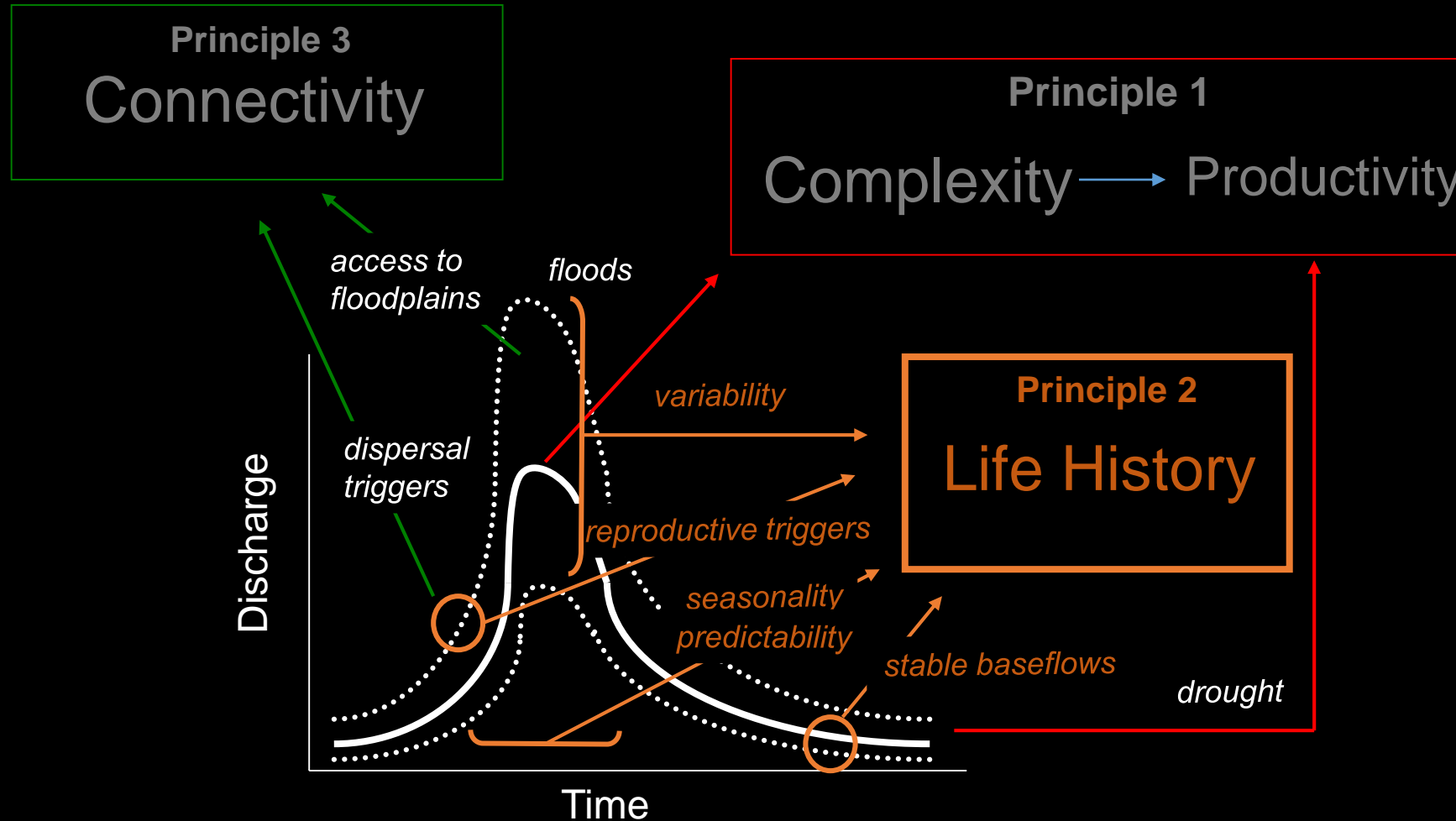


# Importance of Natural Flow Regimes



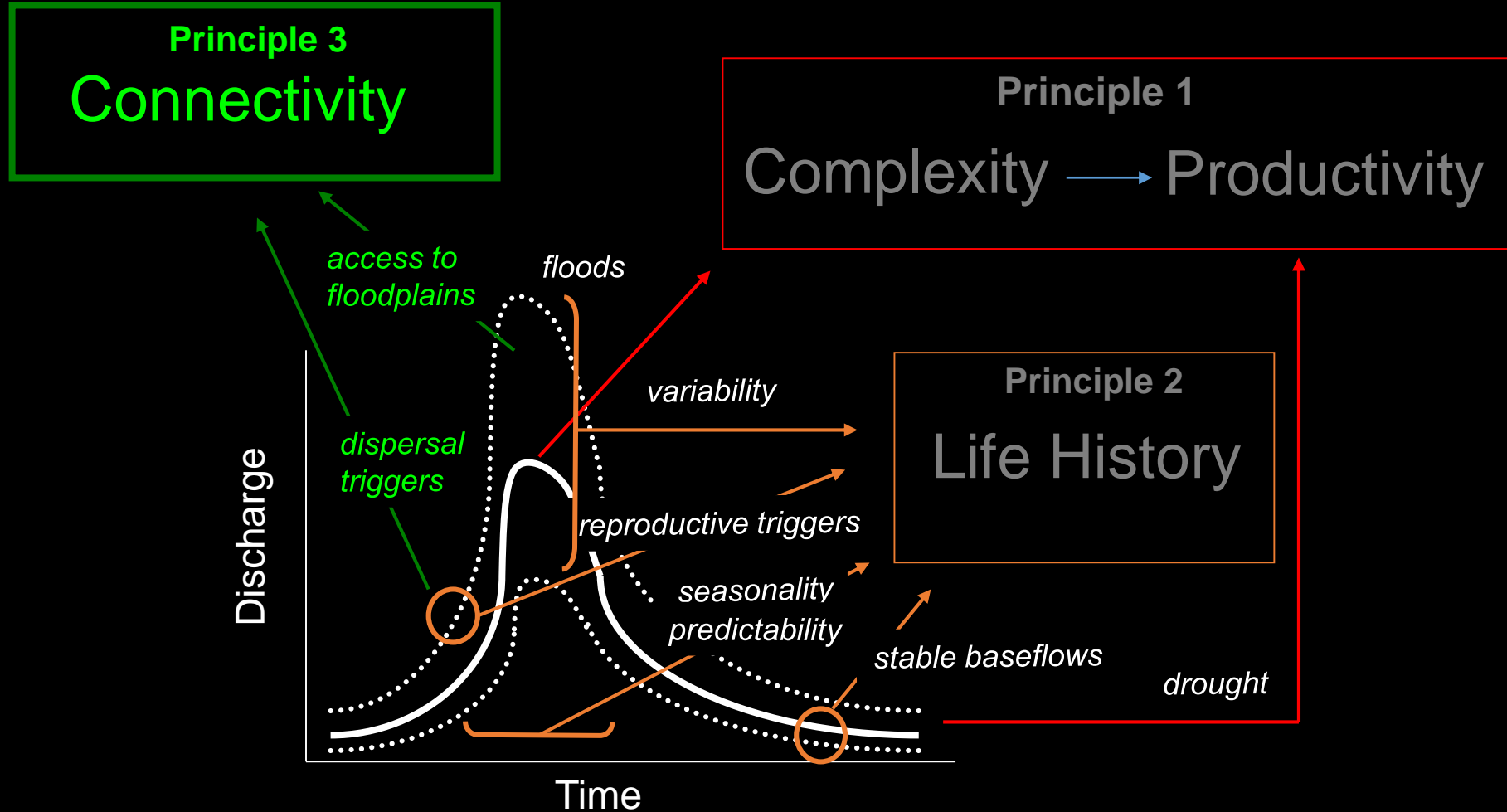


# Importance of Natural Flow Regimes





# Importance of Natural Flow Regimes





# Variability in Temperature





# Species Matter





# Species Matter: Bears, Salmon and Trees

## IMPACTS ON TEMPERATE RIPARIAN FORESTS

Overstory: ↑ growth rate

Understory: ↑ diversity and cover

Bartz and Naiman 2005

Helfield and Naiman 2006





# Species Matter: Bears, Salmon and Trees

## IMPACTS ON TEMPERATE RIPARIAN FORESTS

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Understory: ↑ diversity and cover

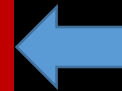
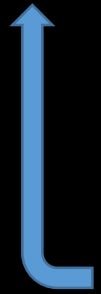
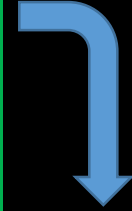
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Helfield and Naiman 2006



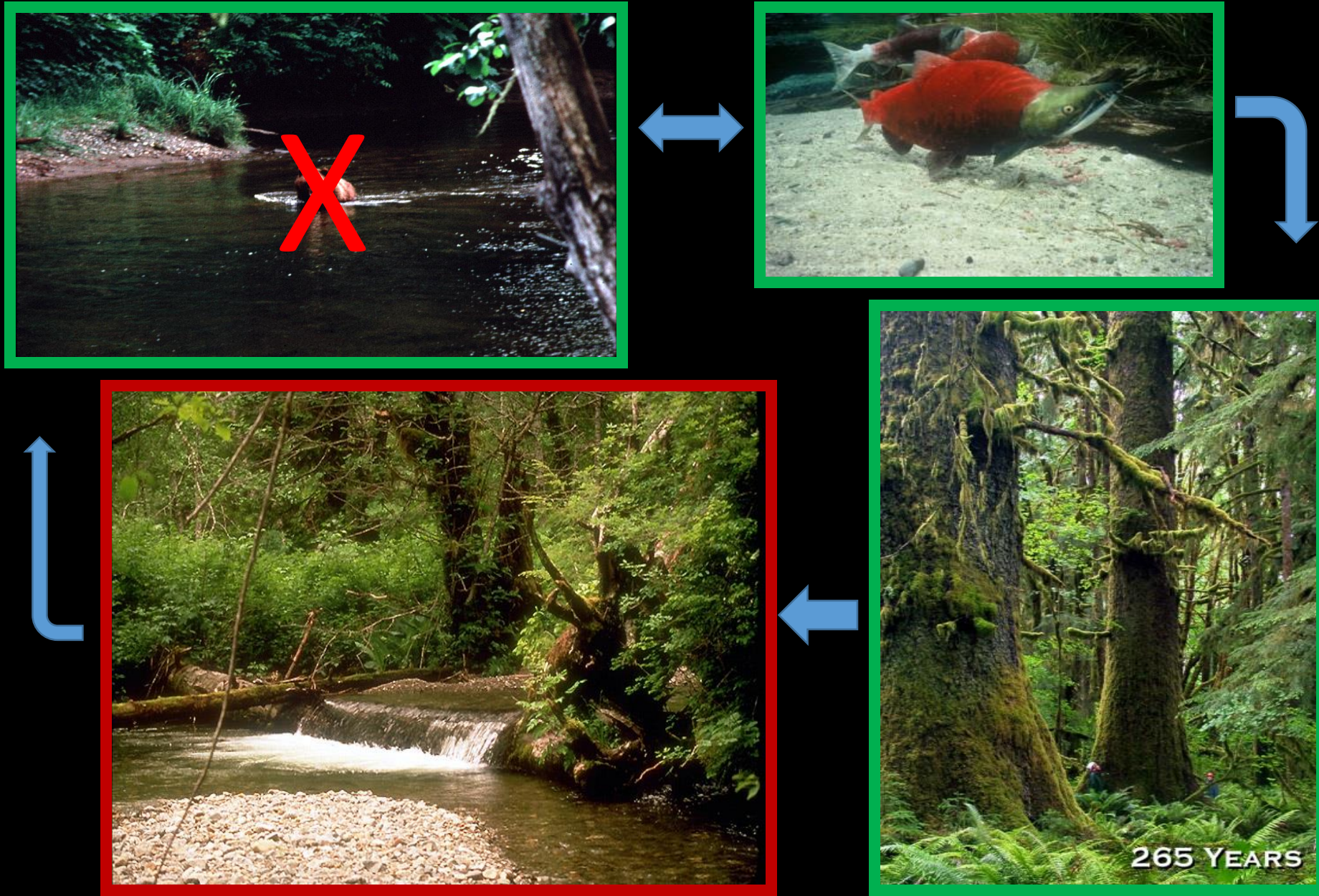


# Species Matter: An Example of Ecological Complexity



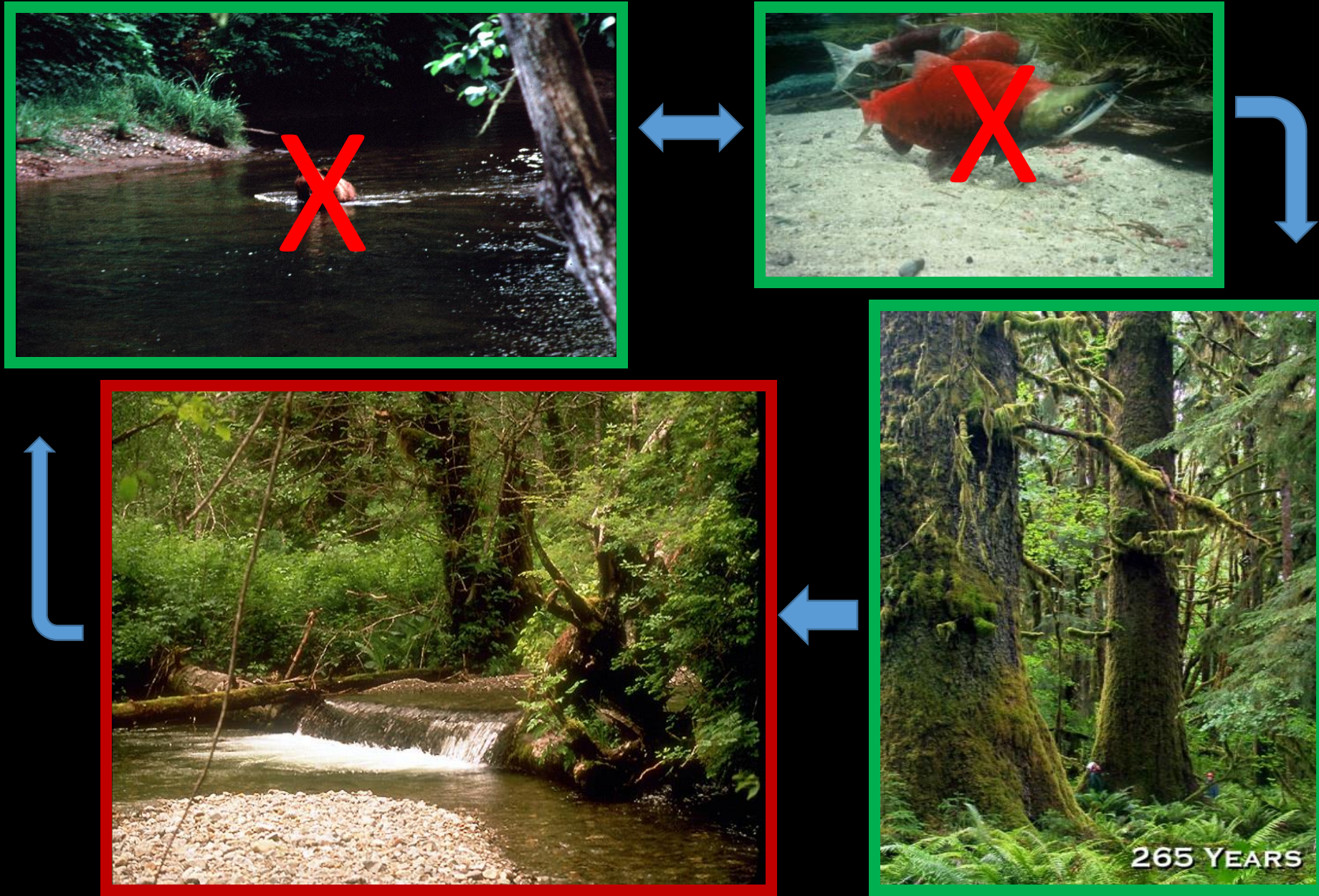


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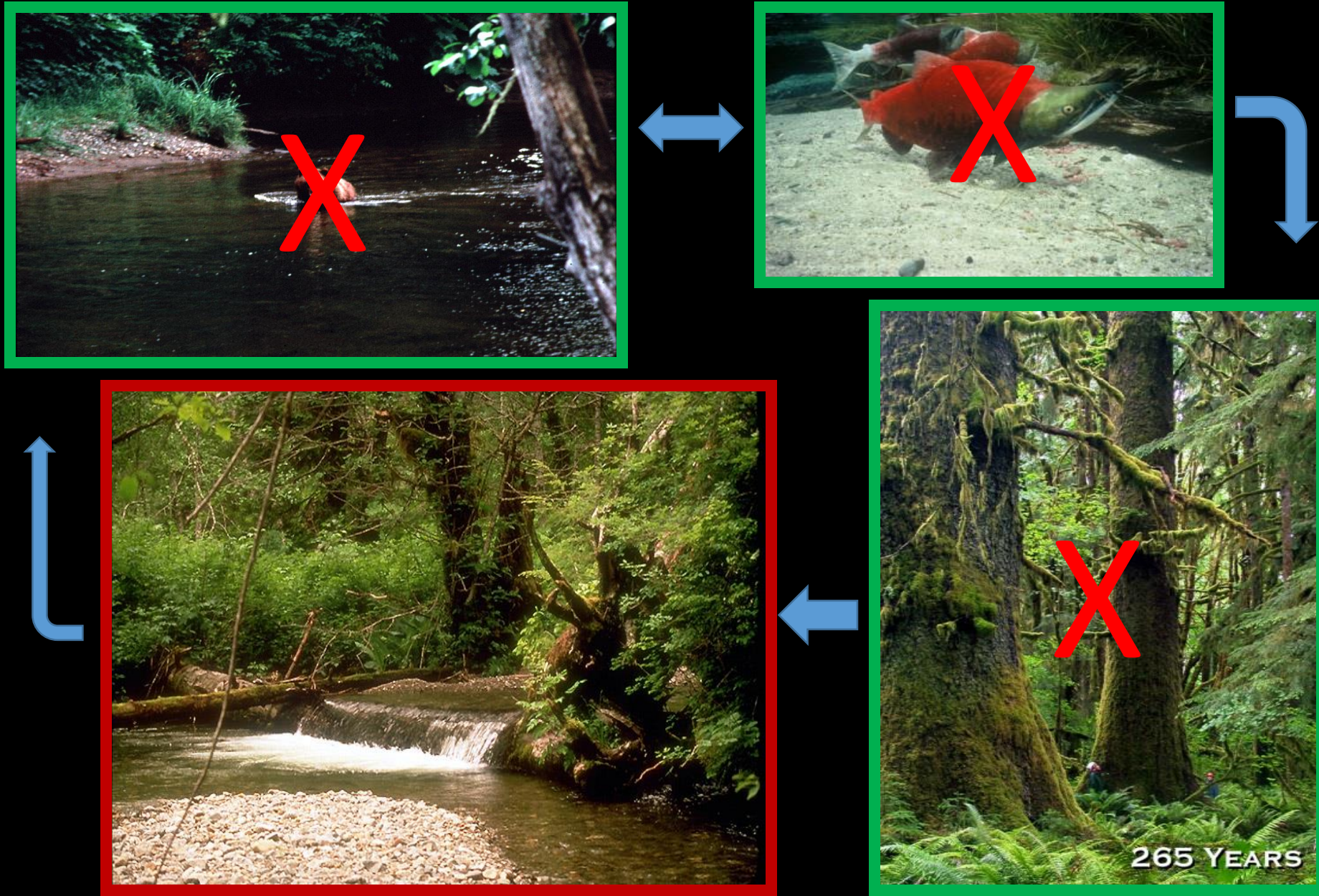


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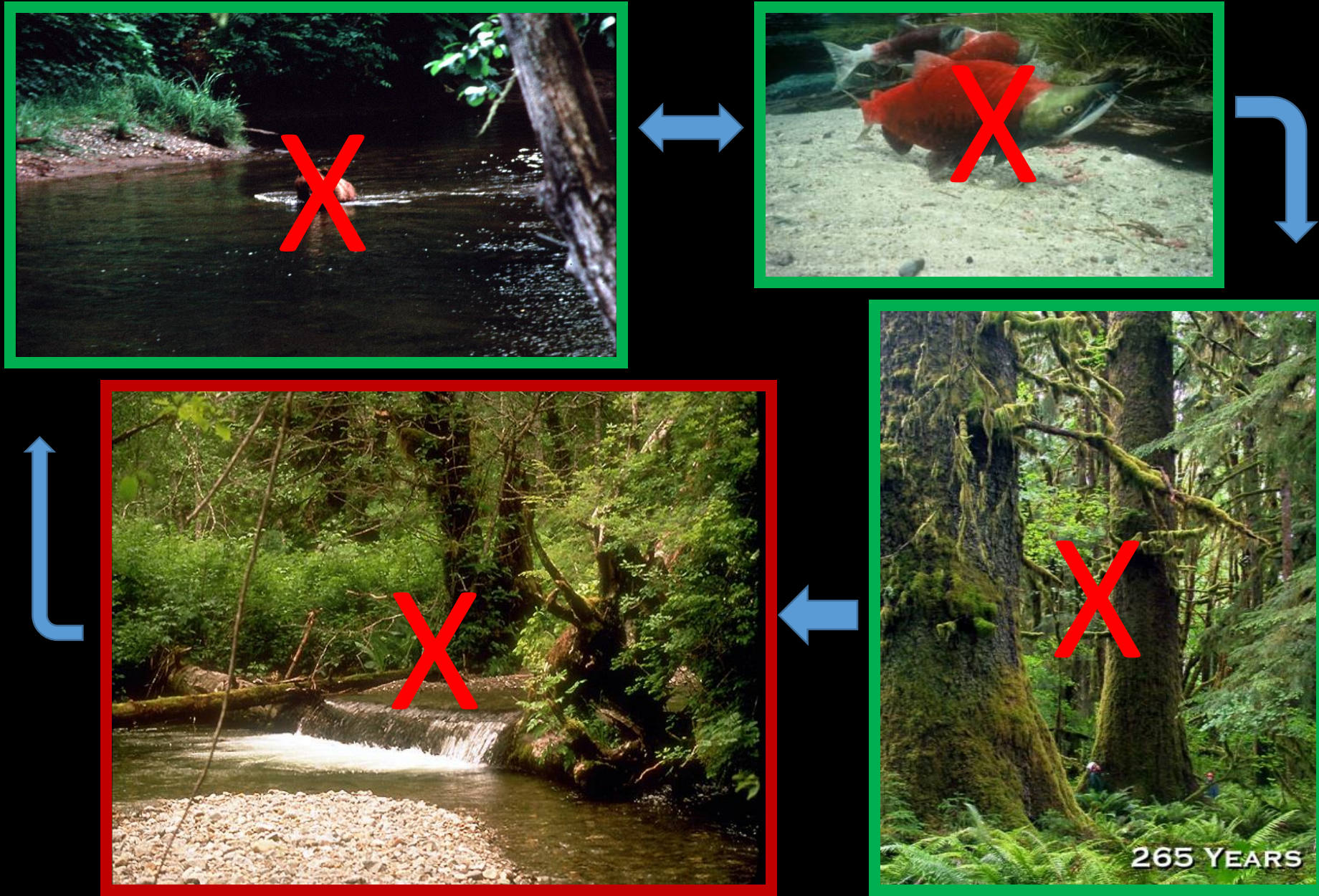


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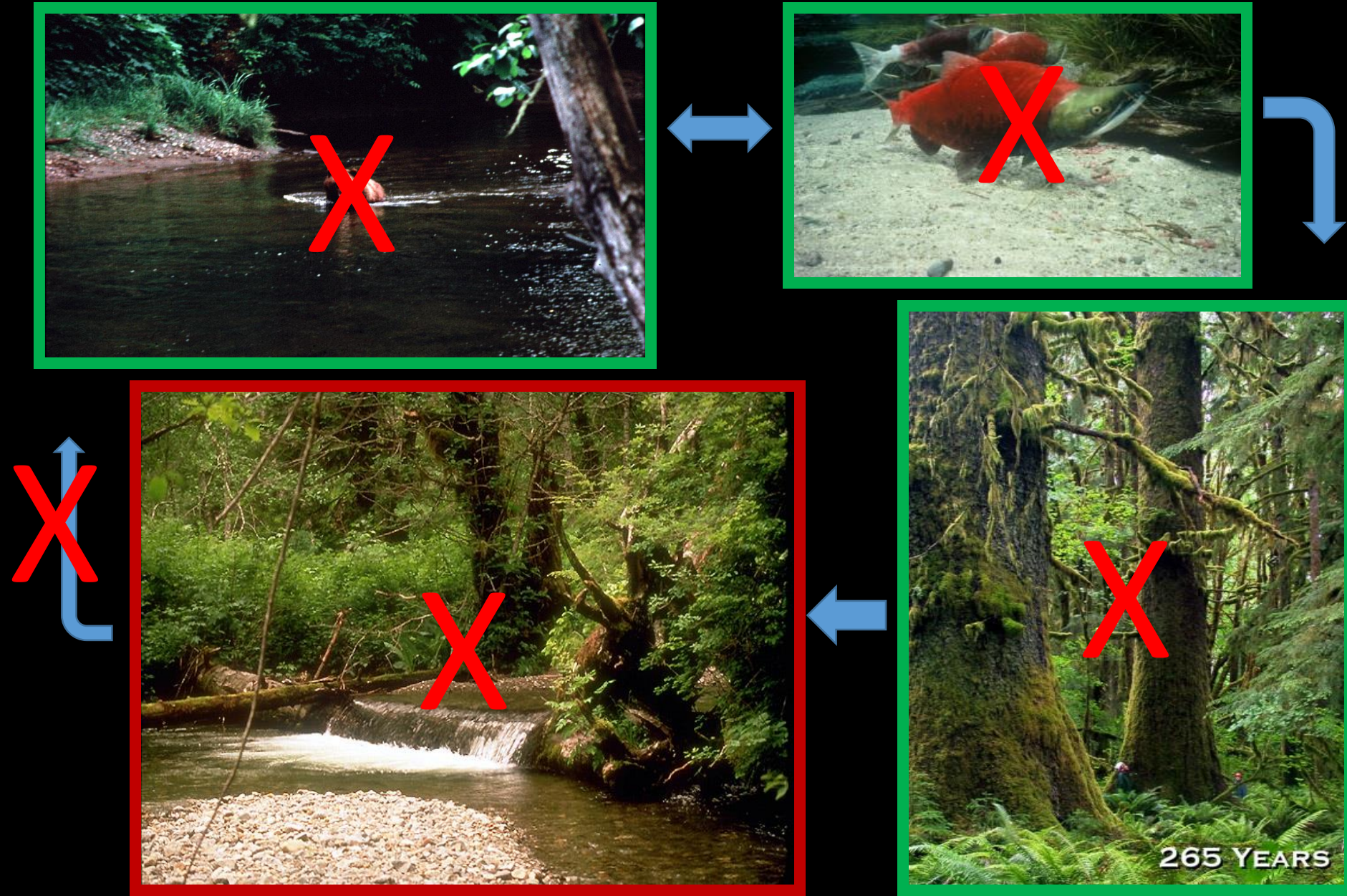


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# Cultural Decisions

Contemporary  
rivers, and their  
catchments, are as  
much social  
products as they are  
ecological entities –  
A manifestation of  
“culture”



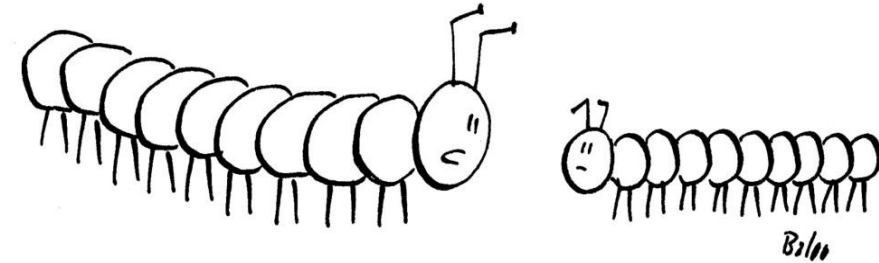


# Cultural Decisions Profoundly Affect Productivity





# Effective Cultural Decisions are Community Based



"Strength and speed are useful, son, but coordination is *crucial*!"





# Quiz On River Concepts

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# Quiz On River Concepts

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# Quiz On River Concepts

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# Quiz On River Concepts

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# Quiz On River Concepts

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# Quiz On River Principles

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# Quiz On River Concepts

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# Quiz On River Concepts

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# Quiz Answers

A. Connectivity

B. Variability

C. Species Matter

D. Cultural Decisions

*Collectively, the underpinnings of productivity and the goods and services rivers provide for societies*



# Thank You! Faleminderit!



Columbia River, USA & Canada