

# Stream restorations and fish

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# Restoring fish - Difficult

- Hardest component (+ bugs) to bring back
- May not be important to restoration
  - May not be realistic or achievable
  - Success with fish may have nothing to do with the restoration
- Rough guidelines

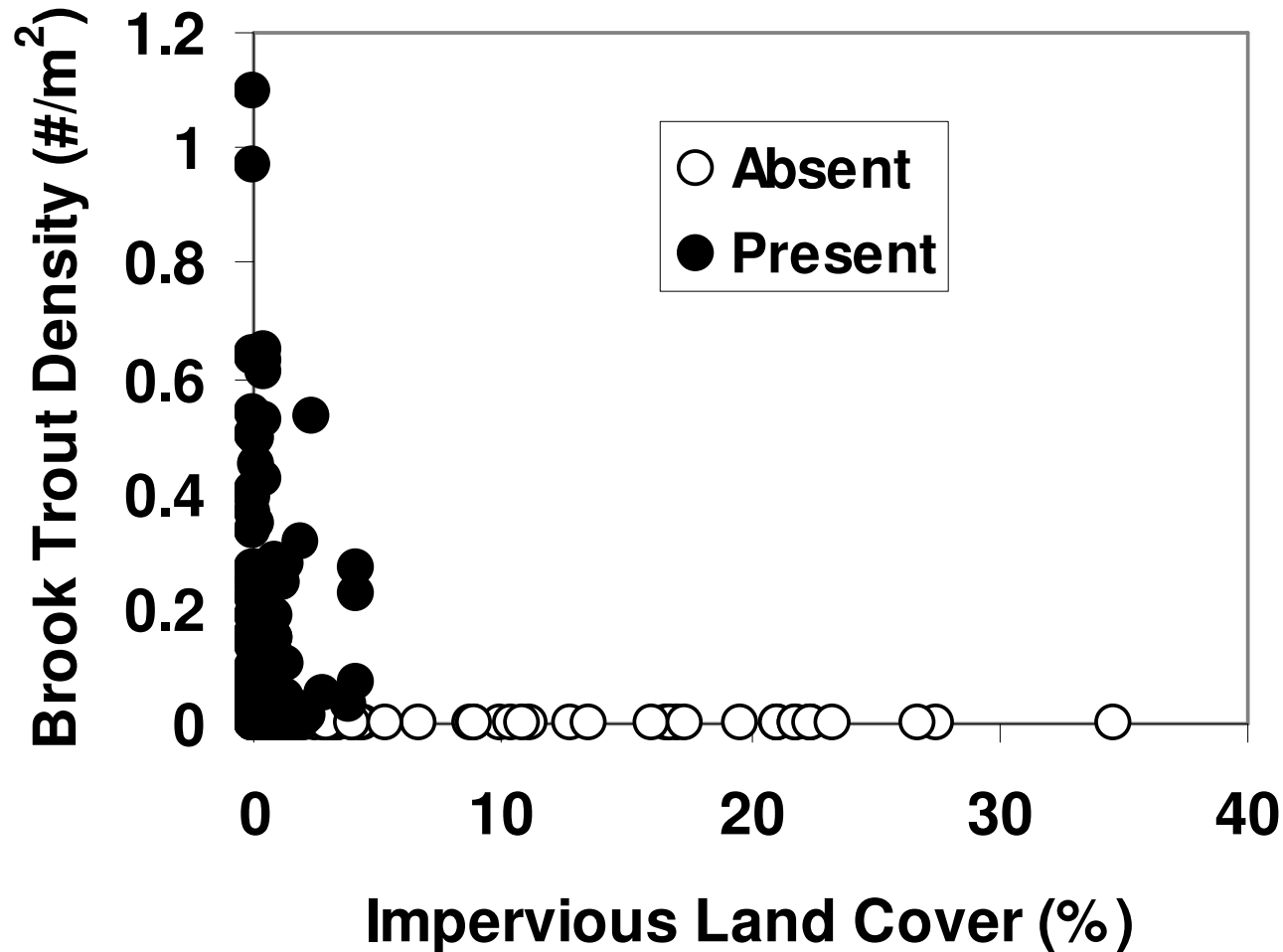


# Larger perspective

- We're often overly focused on the site
  - Missing the forest for the trees
- Bigger picture before restoration specifics



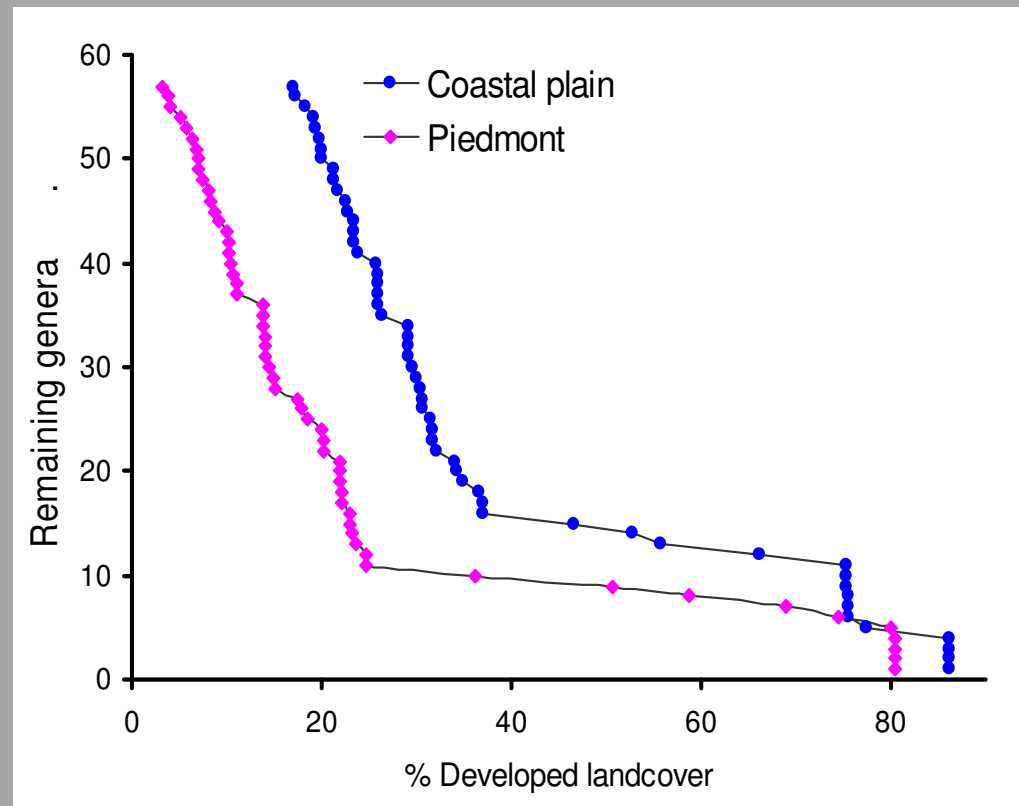
# Not everything can live everywhere





# Most biodiversity lost as watersheds urbanize

- 80% biodiversity loss at Urban > 20% Piedmont
- 70% biodiversity loss at Urban > 35% Coastal Plain
- Fish biodiversity losses are around 20%



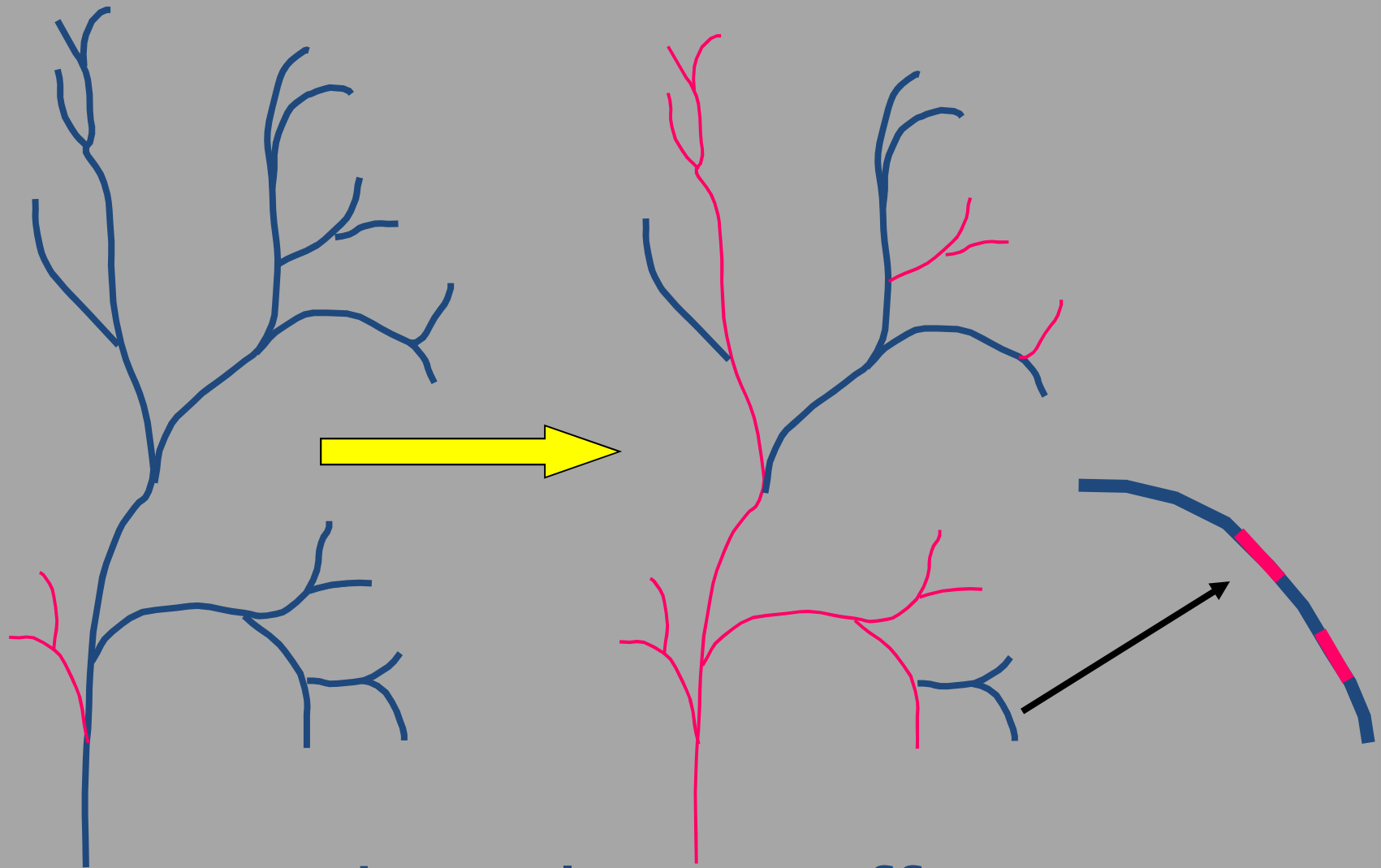
# Species requirements

- Not everything can live everywhere
- Dispersal/space
- Connectivity
  - Lack of movement barriers



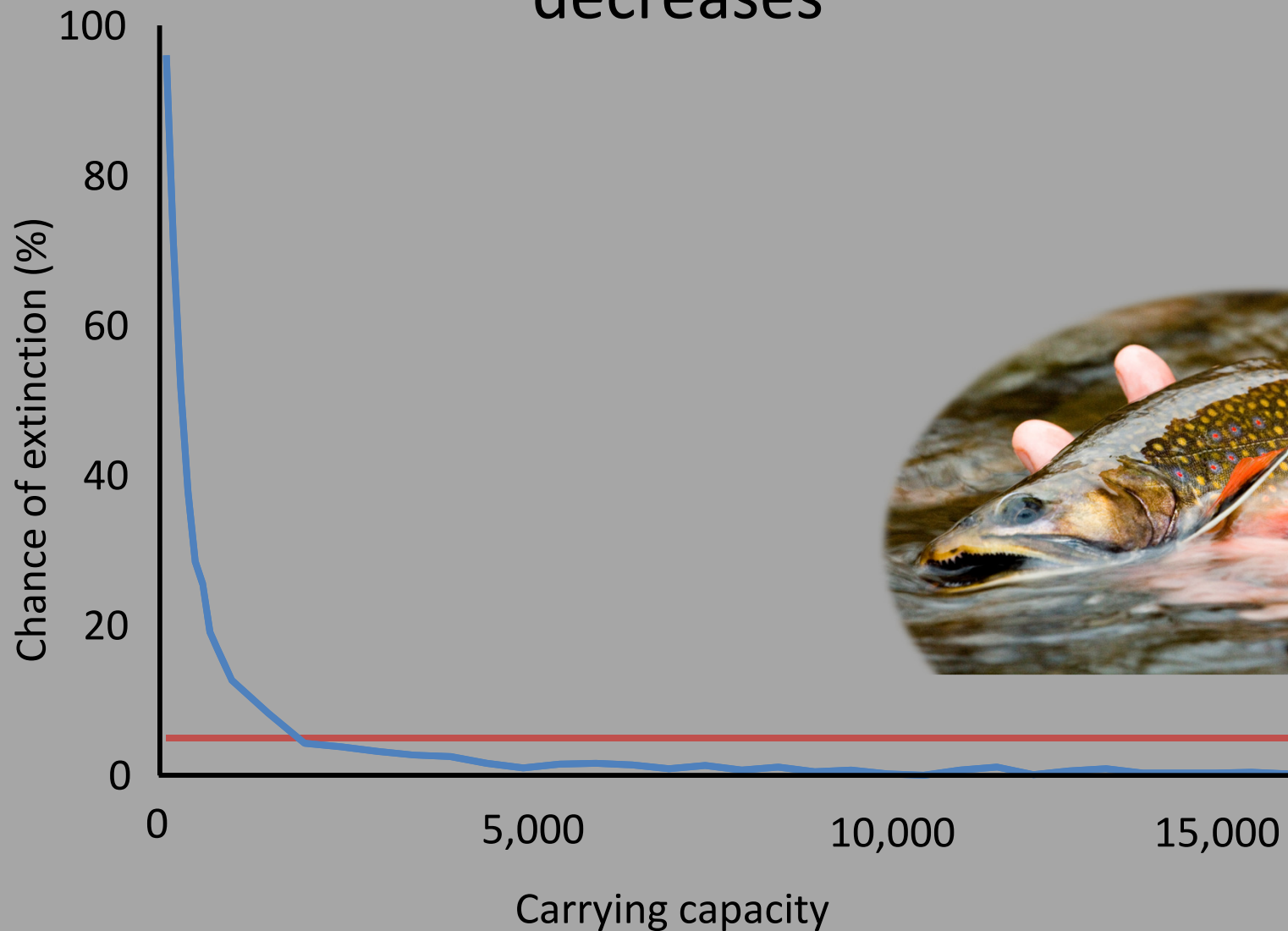
Photograph by Matt Sell

# Fragmentation & Persistence



Land use legacy effects

Extinction risk increases dramatically as  
population size OR available SPACE  
decreases



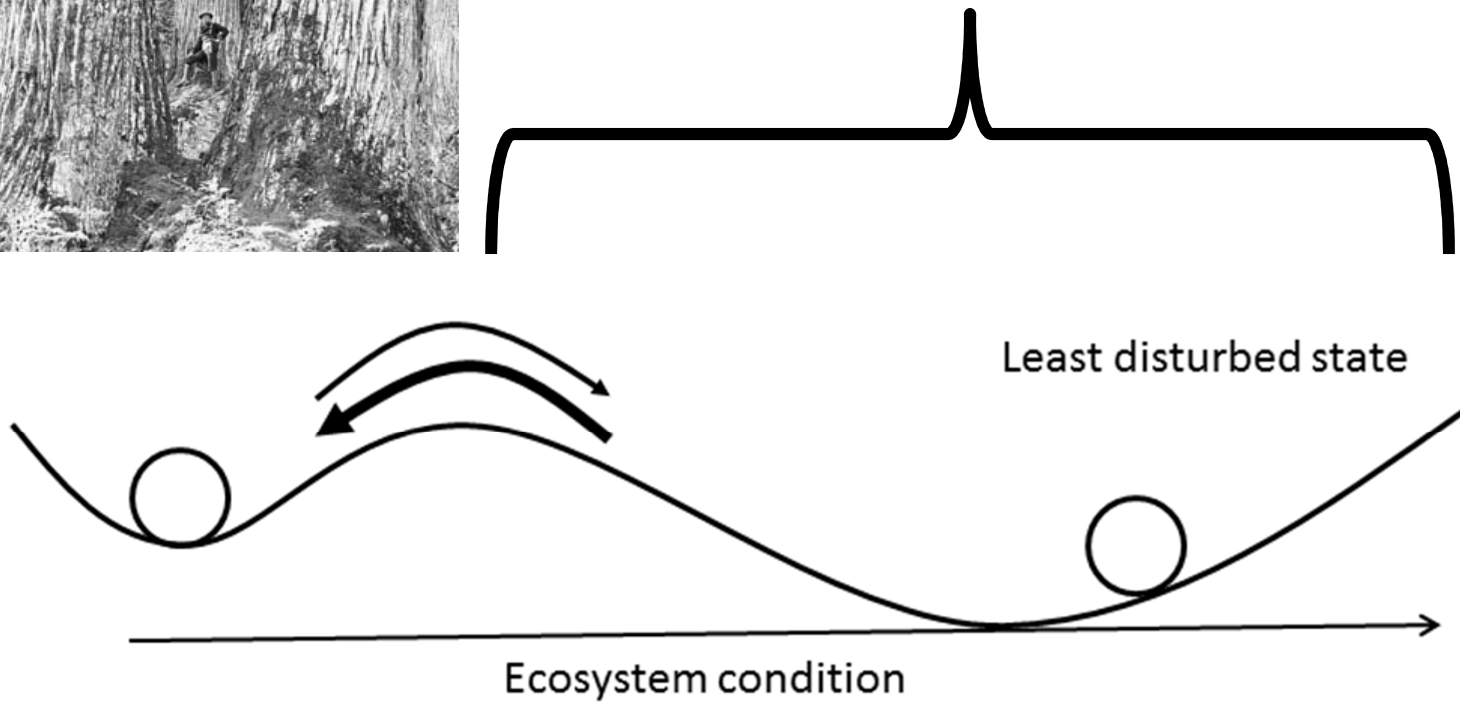


# Resilience and stability

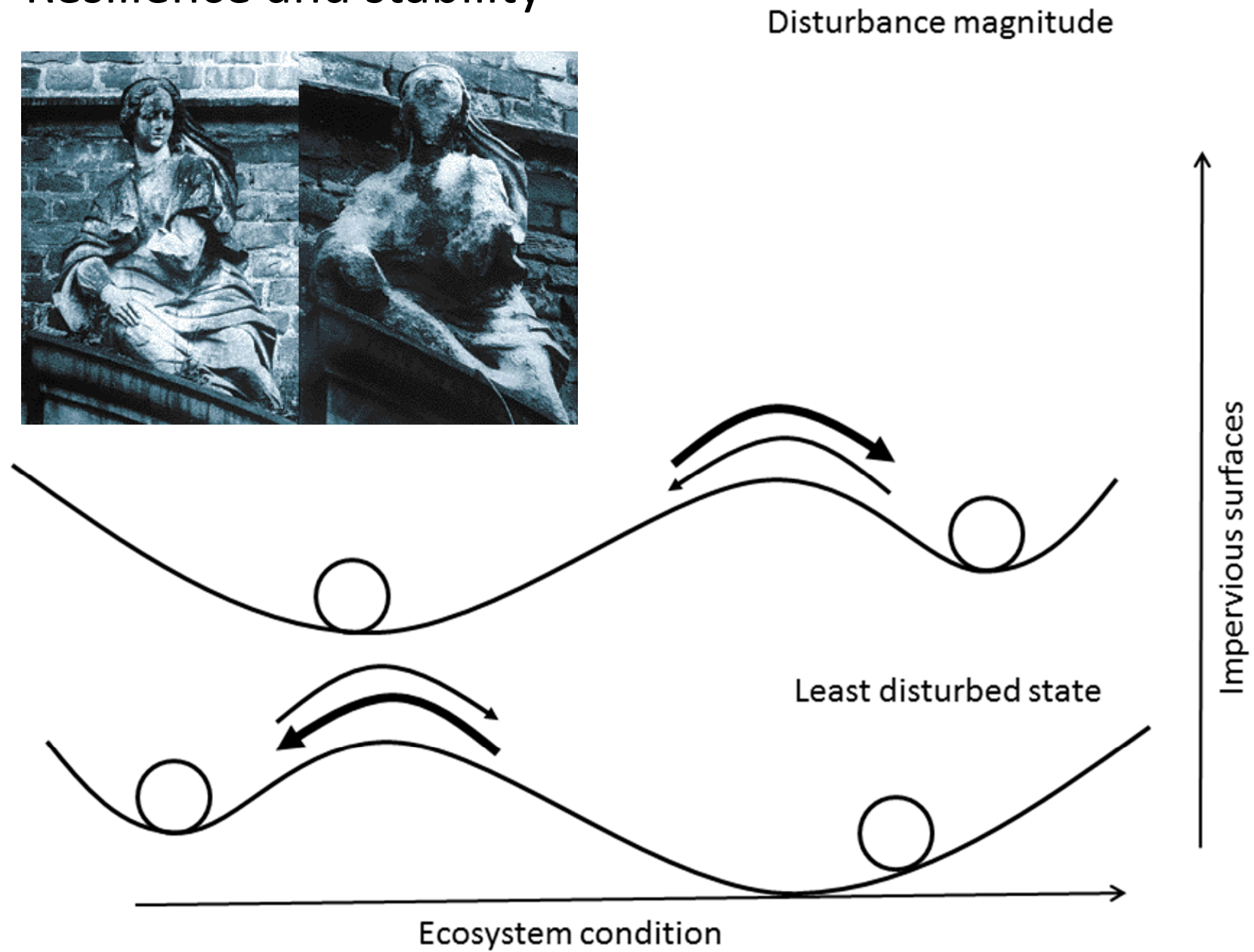
Disturbance magnitude



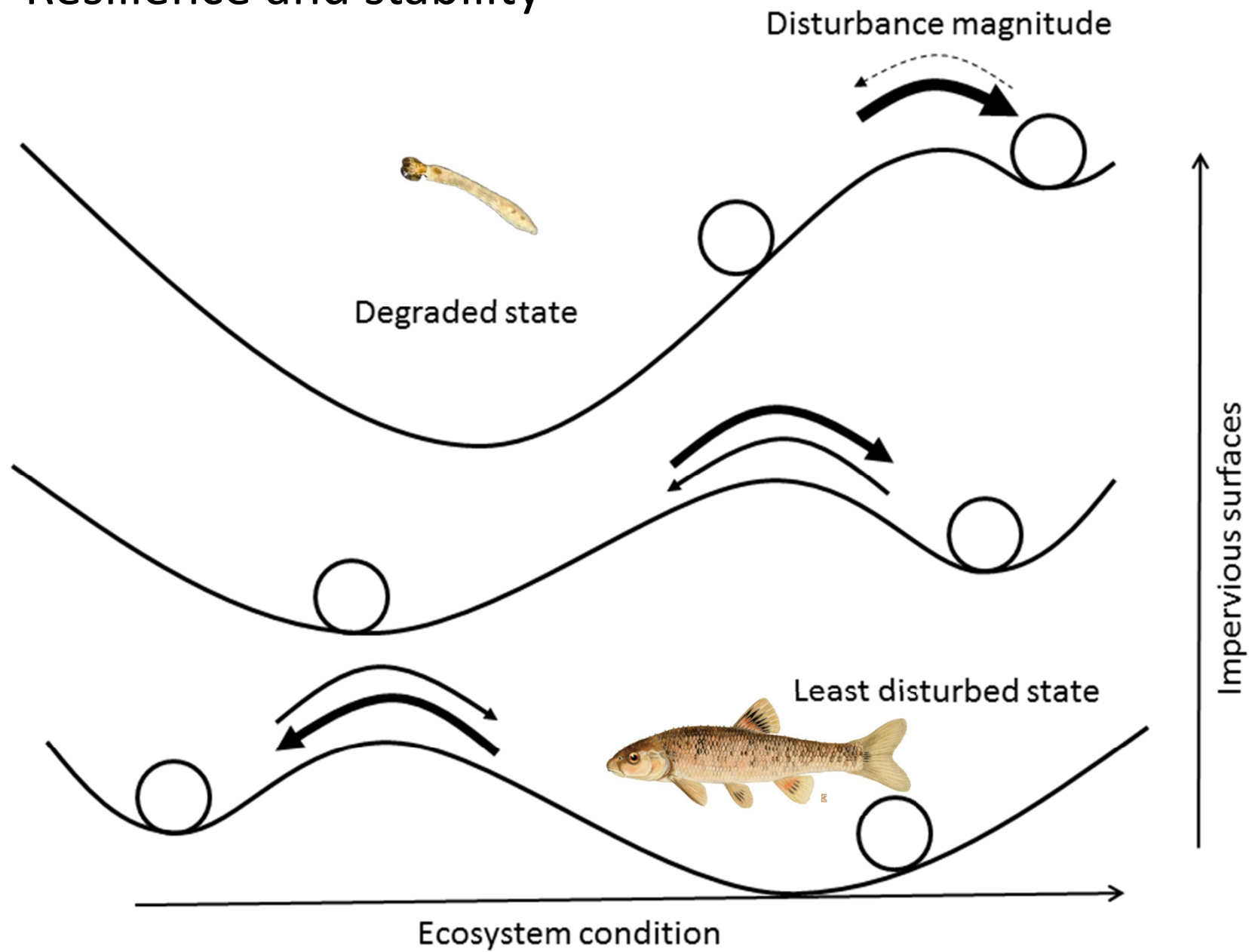
Resilience



# Resilience and stability



# Resilience and stability



# Why do they disappear?



- Physiological limits
  - Chemicals (Cl, metals, etc.), temperature
- Failed reproduction
  - Chemicals, hydrology, geomorphology, temperature
- Habitat loss
- Small populations, Limited stream lengths
- Stress and cumulative effects

# What can be restored?

- Less degradation = better response
  - Habitat enhancement
  - Bank stabilization in otherwise 'healthy' streams
- Fewer stressors = better response
  - Acid Mine Drainage, cattle exclosures
  - Point source eutrophication
- No physiological thresholds exceeded





# What impedes restorations?

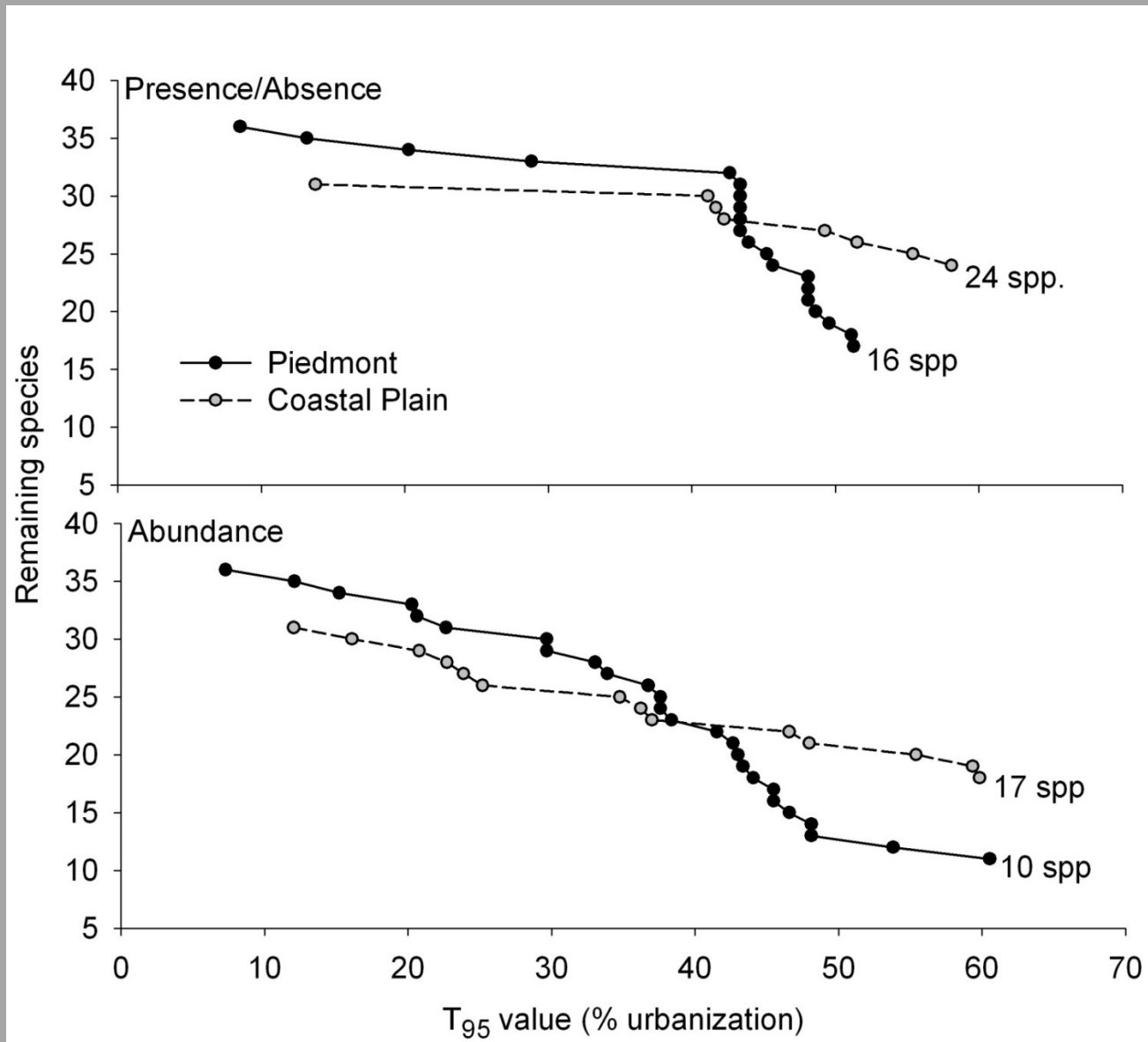
- Physiological exceedances
  - E.g., temperature, salts, chronic/toxic chemicals
- Permanent alterations to the landscape
  - Impervious surfaces and urbanization
- Some things cannot be mitigated
  - No evidence of reach-scale restoration improving watershed-scale issues



# Expectations



# What is realistic?



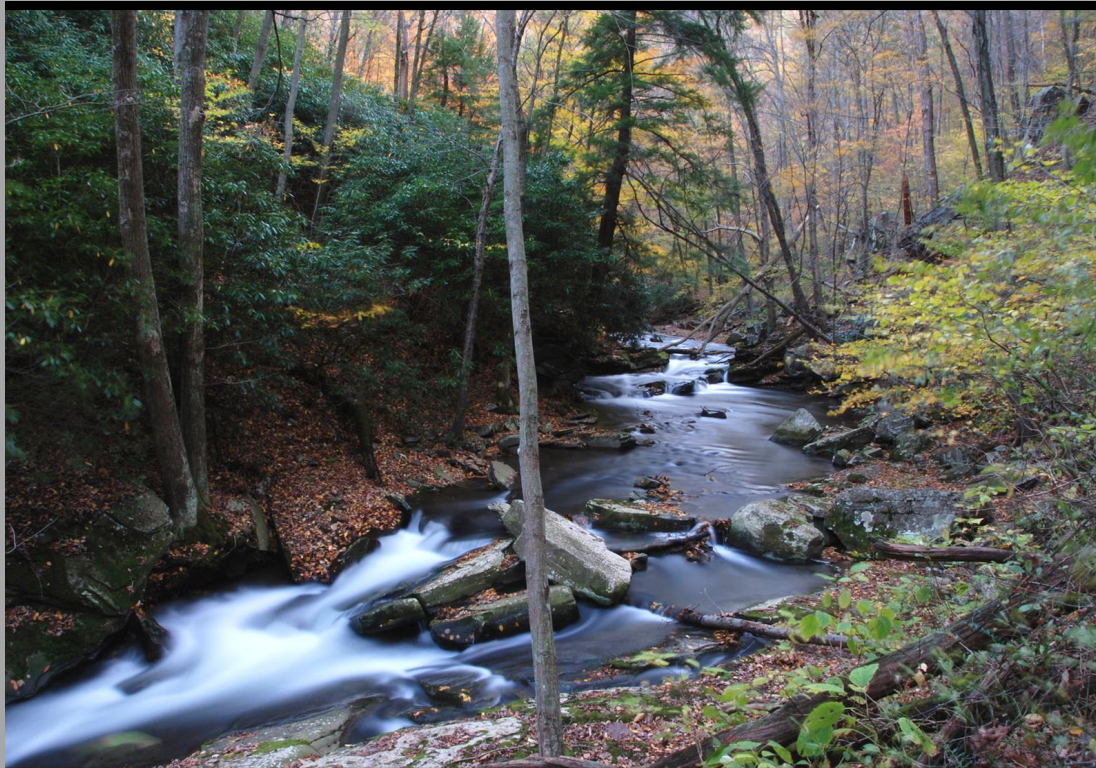
# What works?

- Catchment conditions trump restoration actions
  - Failure to address larger factors will limit restoration success
  - Habitat heterogeneity often good after restorations
- Energy dissipation
  - Floodplain connection, Sediment deposition
  - Wood additions/structures: depositional areas
- Keep runoff out of stream
  - Actions outside of stream corridor
- Intact riparian



# Research needs

- Identify environmental limits of species
  - Sets realistic expectations
- Environmental or dispersal limitations



Middle Fork of the Savage River



# Hilderbrand Translation Slides

# What does this mean for me?

- Watershed and water quality condition are important in determining the success of local habitat improvements if conducting stream restoration focused on fish.
- Understanding detailed stressor thresholds (and how they can or cannot be addressed) for many water quality and physical habitat factors and specific species is important in determining realistic expectations (more science is needed on this).
- Factors such as blockages to re-colonization, the extent of areas available to species, and the species available for re-colonization in the watershed are also important in determining fish recovery potential.
- Biological improvements appear to be extremely challenging (probably unrealistic) in most highly urbanized watersheds.