Urbanization and Stream Ecology in Maryland

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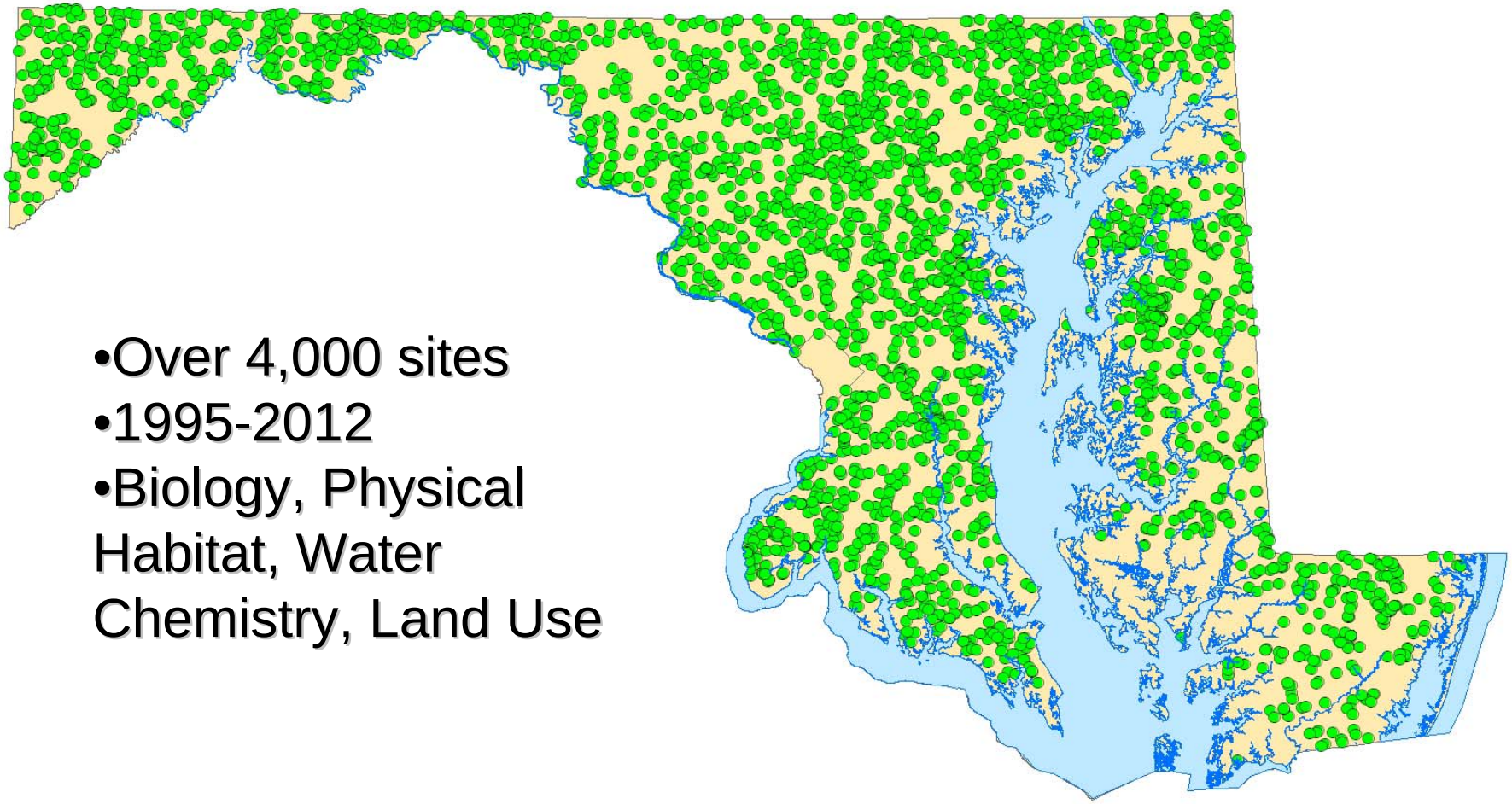
Urbanization alters habitat for living resources

Altered ecology influences state regulations

- Impaired Waters
- High Quality Waters
- Stream Designated Use
- Endangered Species

Biological Monitoring in Maryland Streams (DNR's Maryland Biological Stream Survey)

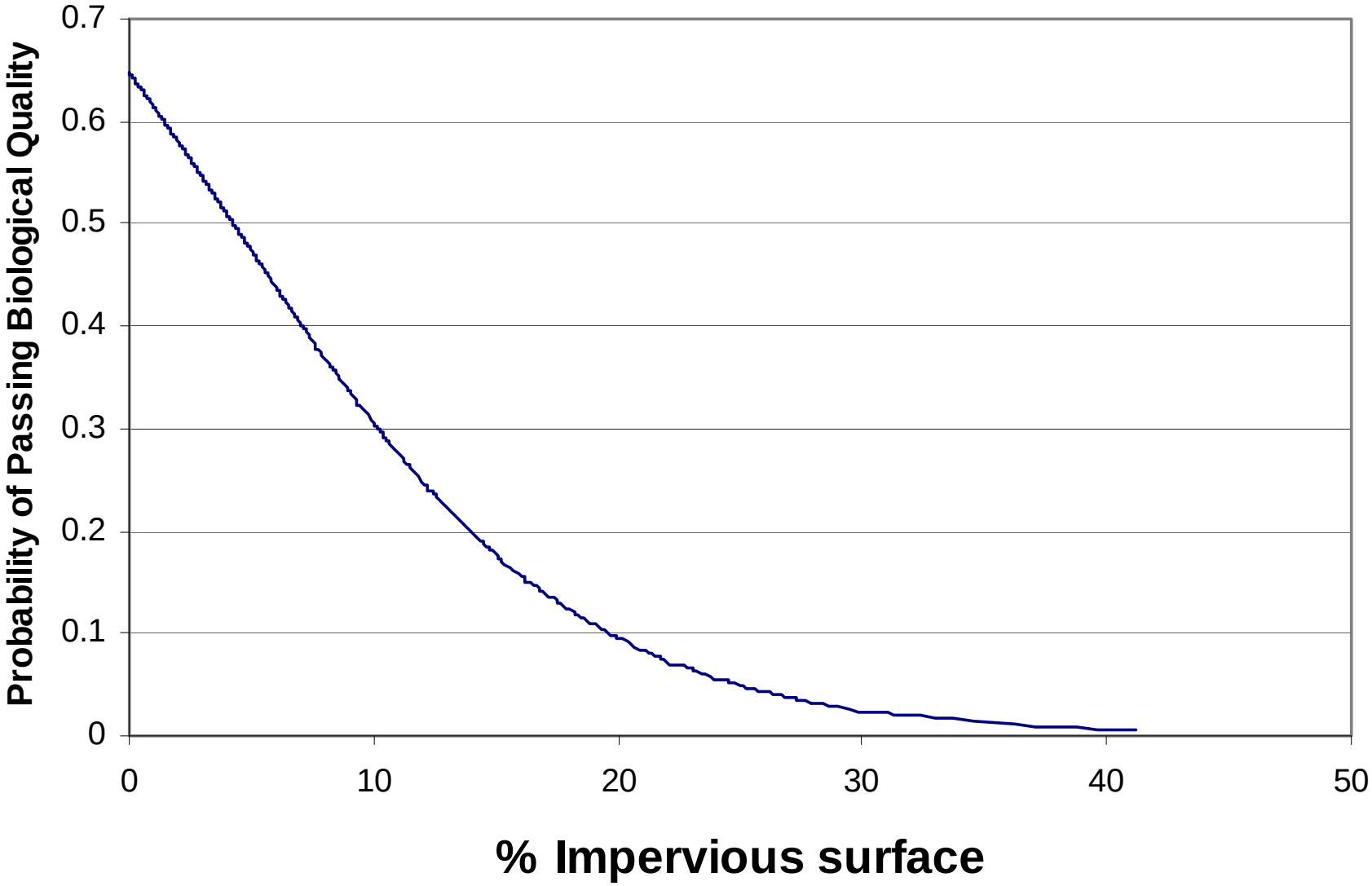


- Over 4,000 sites
- 1995-2012
- Biology, Physical Habitat, Water Chemistry, Land Use

MARYLAND DEPARTMENT OF NATURAL RESOURCES
Monitoring and Non-Tidal Assessment Division
www.dnr.maryland.gov

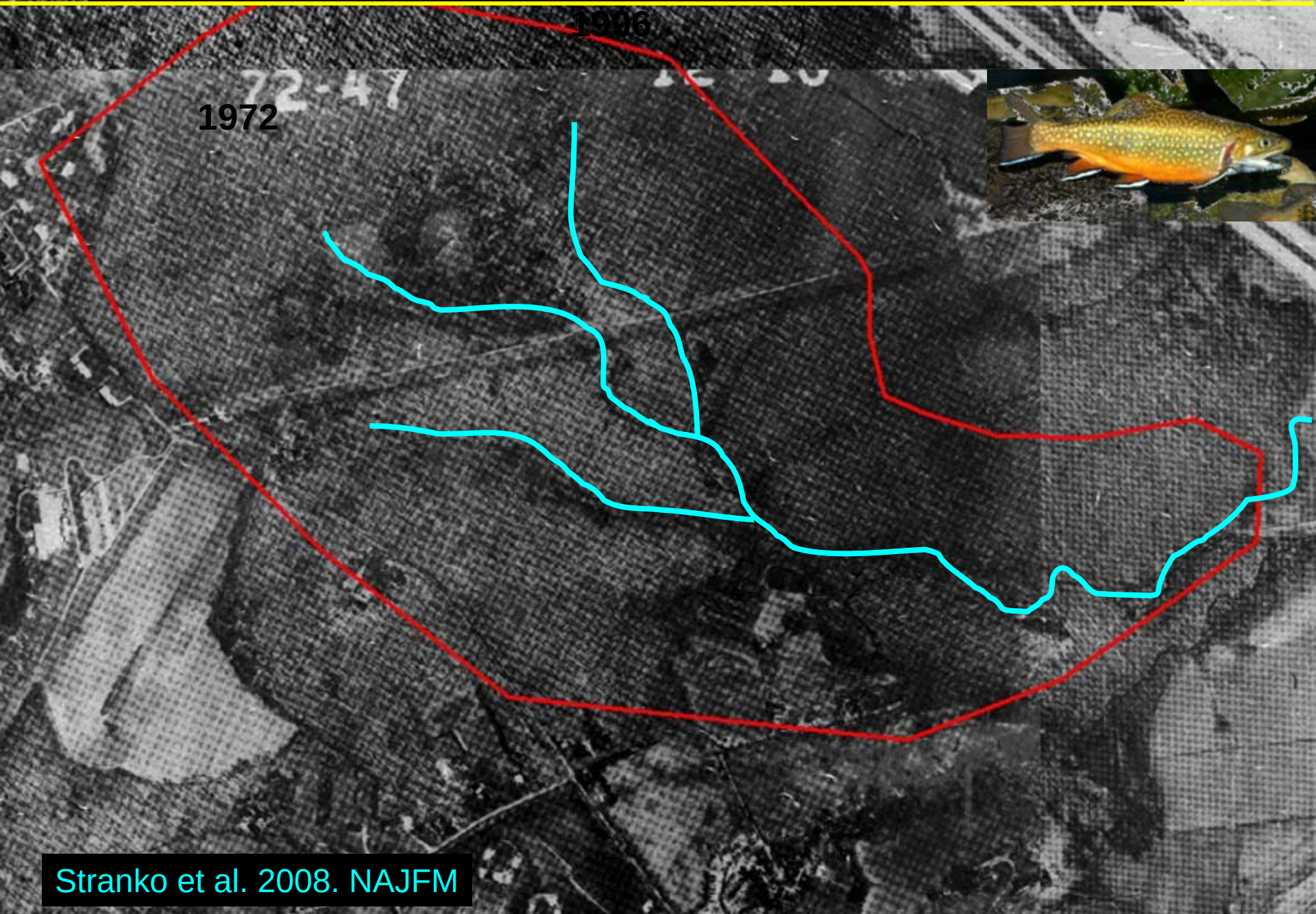
Maryland Biological Stream Survey

Streams in Urban Watersheds are Biologically Impaired



Volstad et al. 2003

Brook Trout Urbanization Example

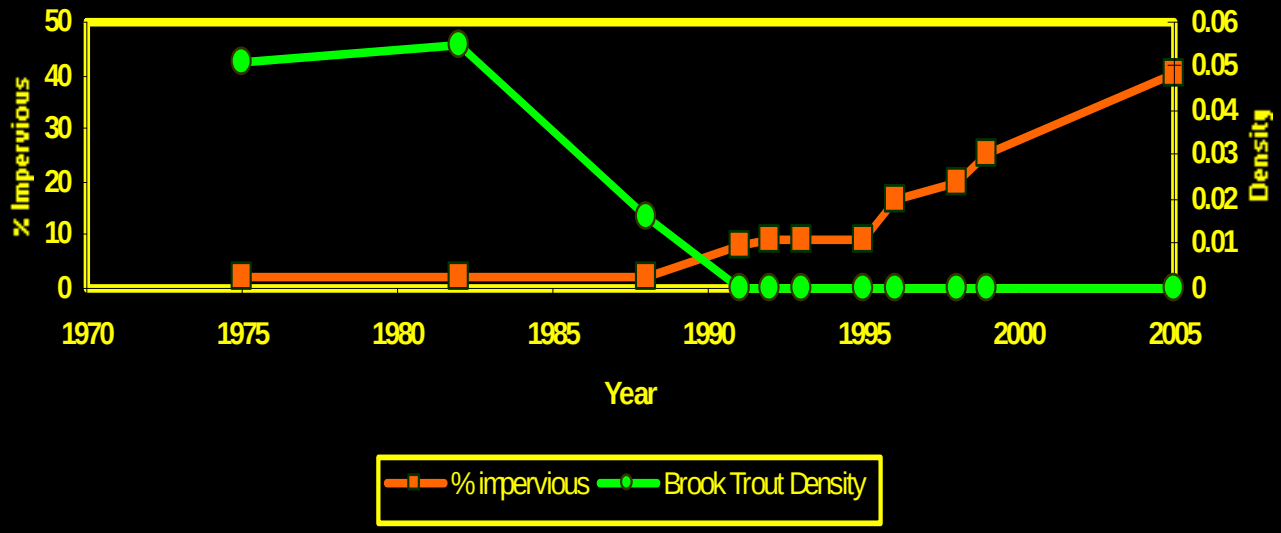


Stranko et al. 2008. NAJFM

Brook Trout Urbanization Example

1996

1972



Stranko et al. 2008. NAJFM

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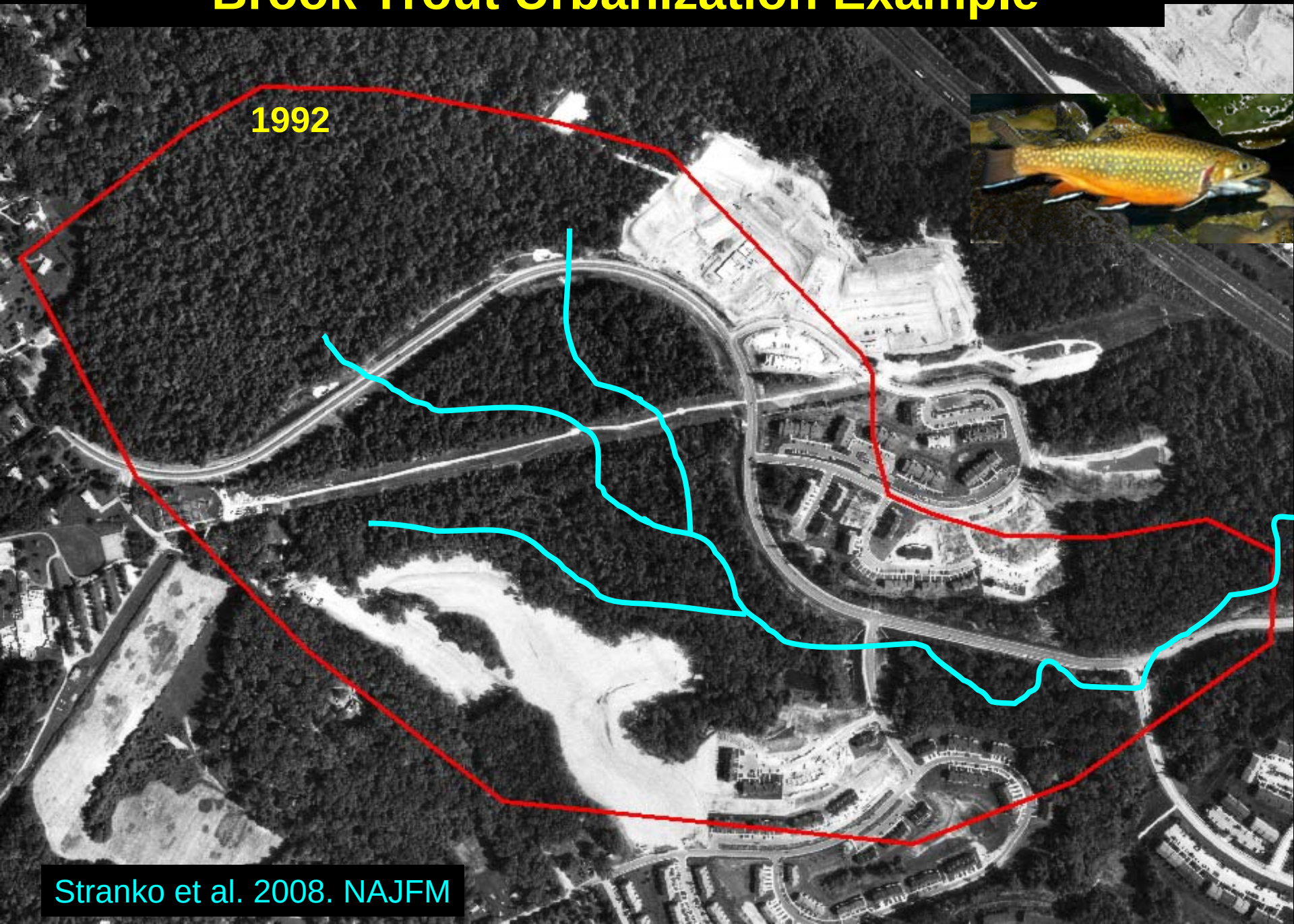

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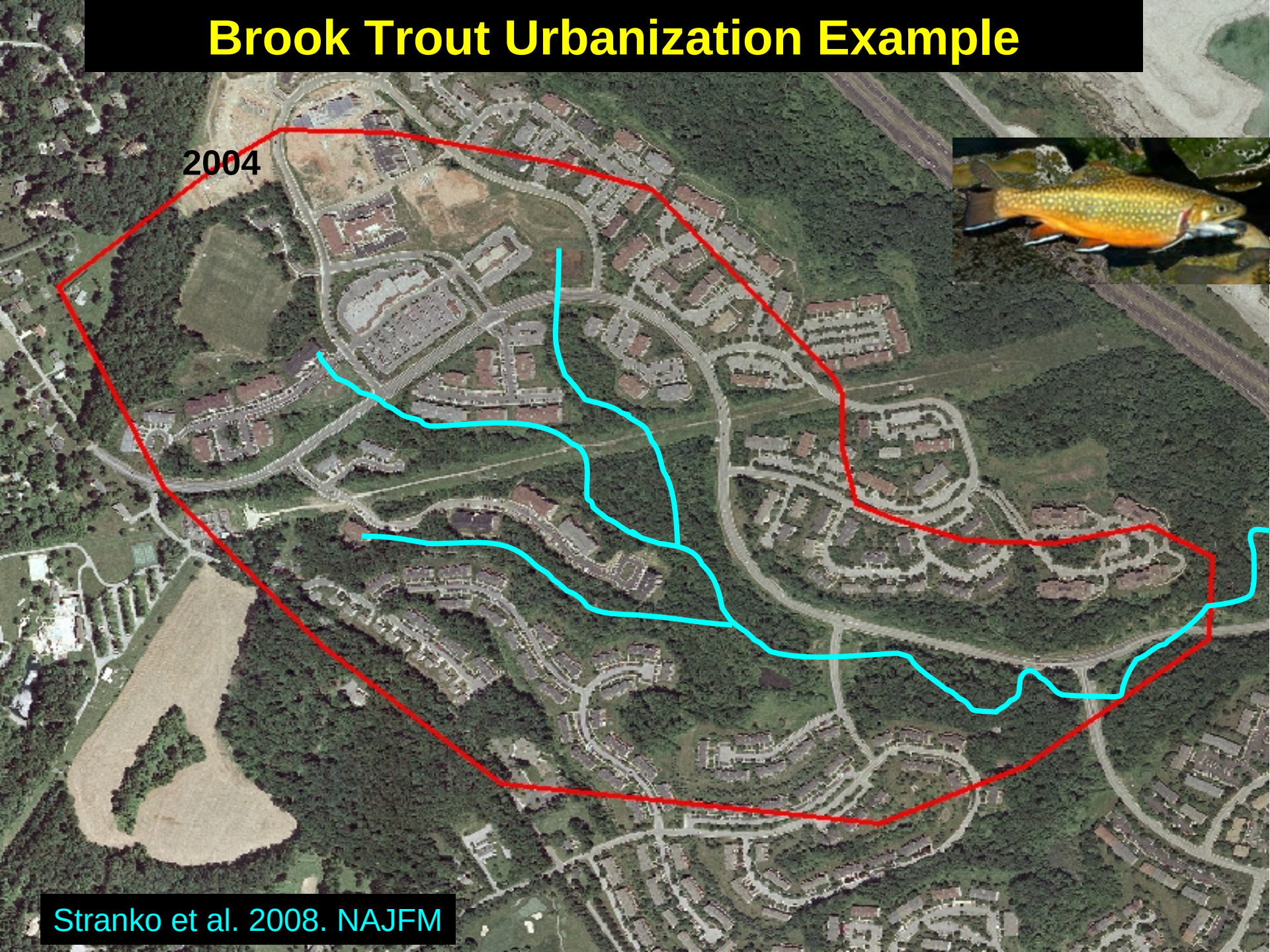


Stranko et al. 2008. NAJFM

Most rare, threatened and endangered species are only found in streams with very low impervious land cover (<5%)

Dwarf wedgemussel (*Alasmidonta heterodon*)

Blackbanded sunfish (*Enneacanthus chaetedon*)

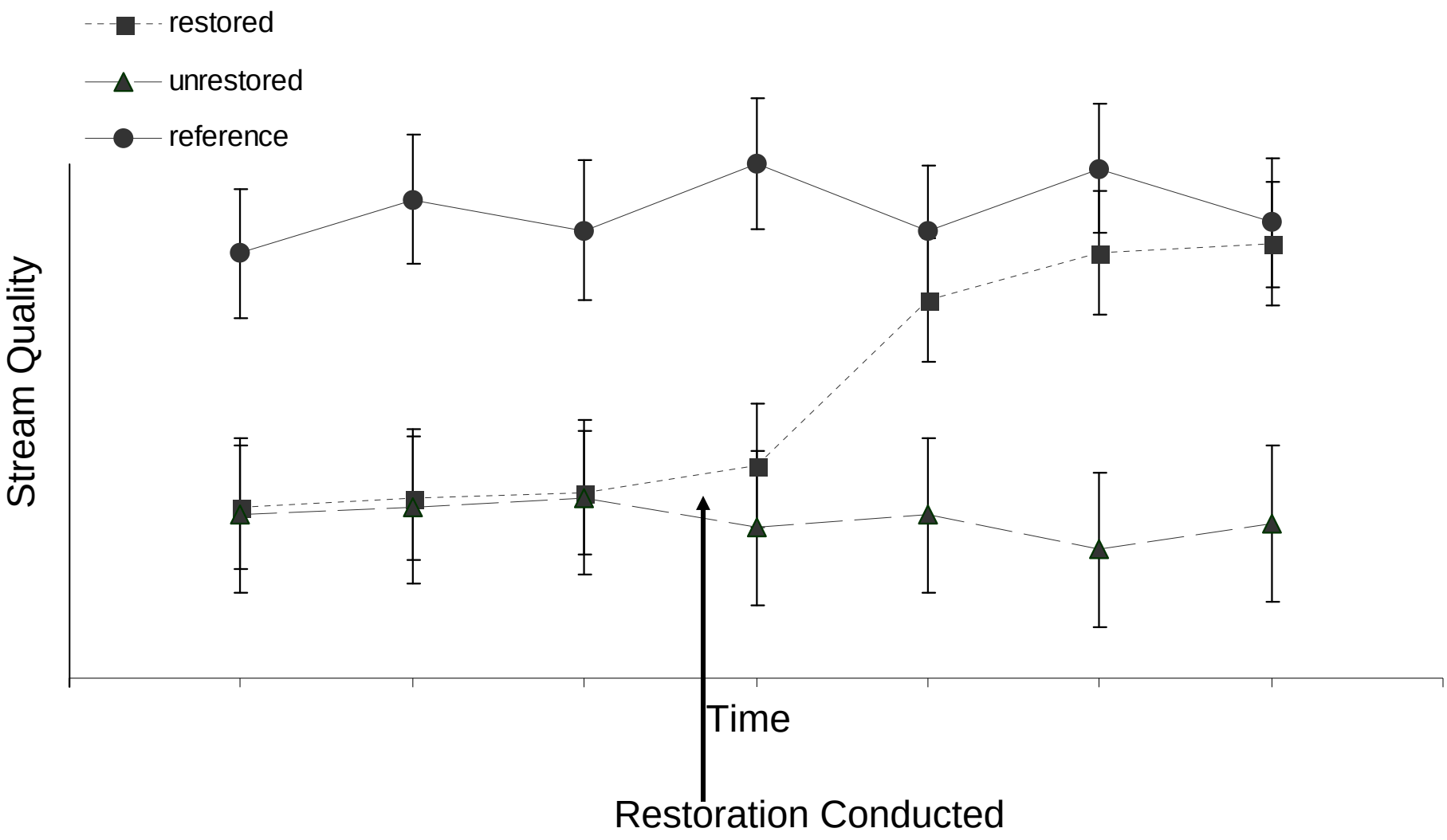
Tiger salamander (*Ambystoma tigrinum*)

Bog turtle (*Glyptemys muhlenbergii*)

Land cover estimates from the National Land Cover Data Set

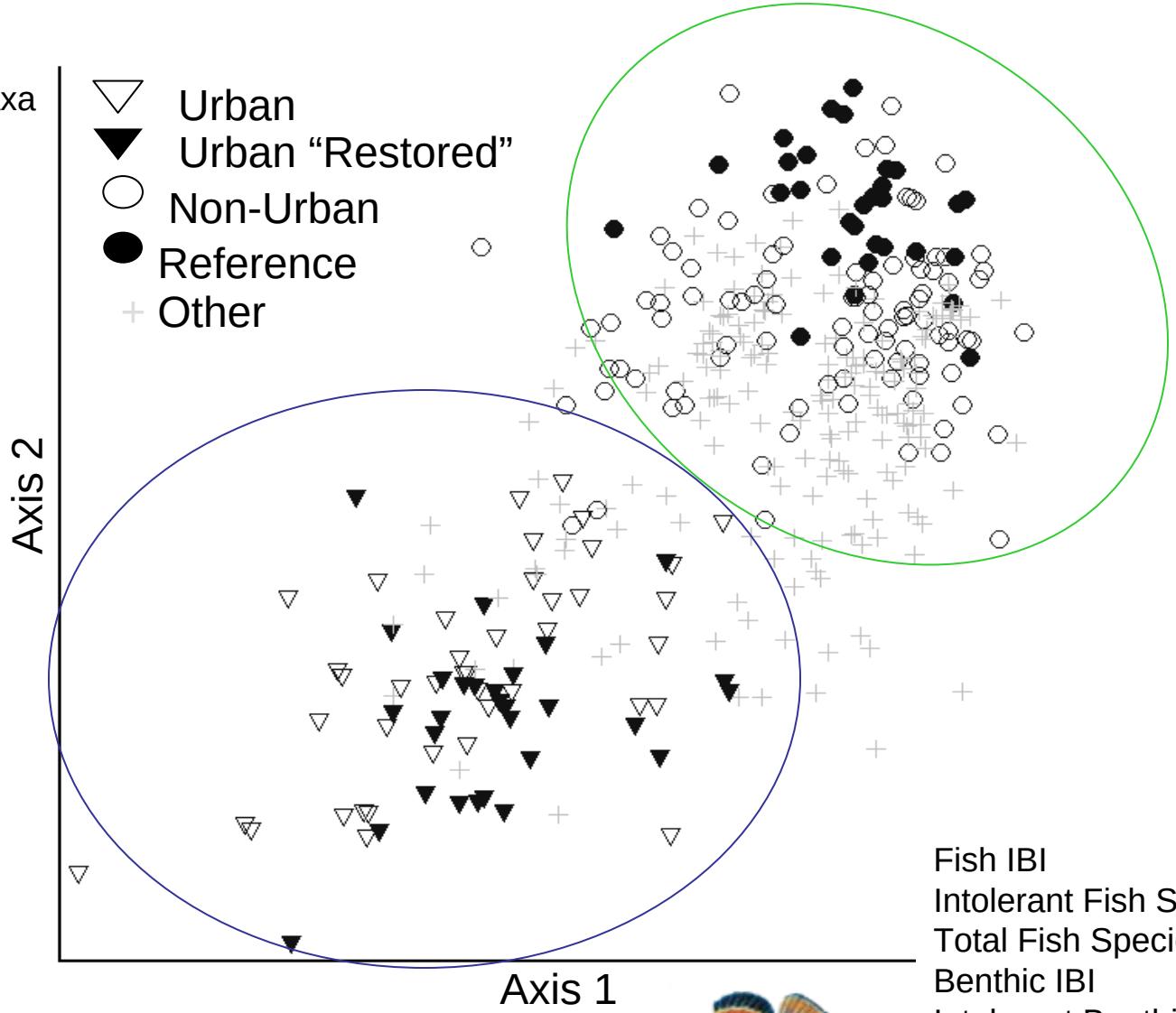
Urban Stream Restoration?

Hypothetical Graph of Restoration Expectation



“Restored” and Reference Streams

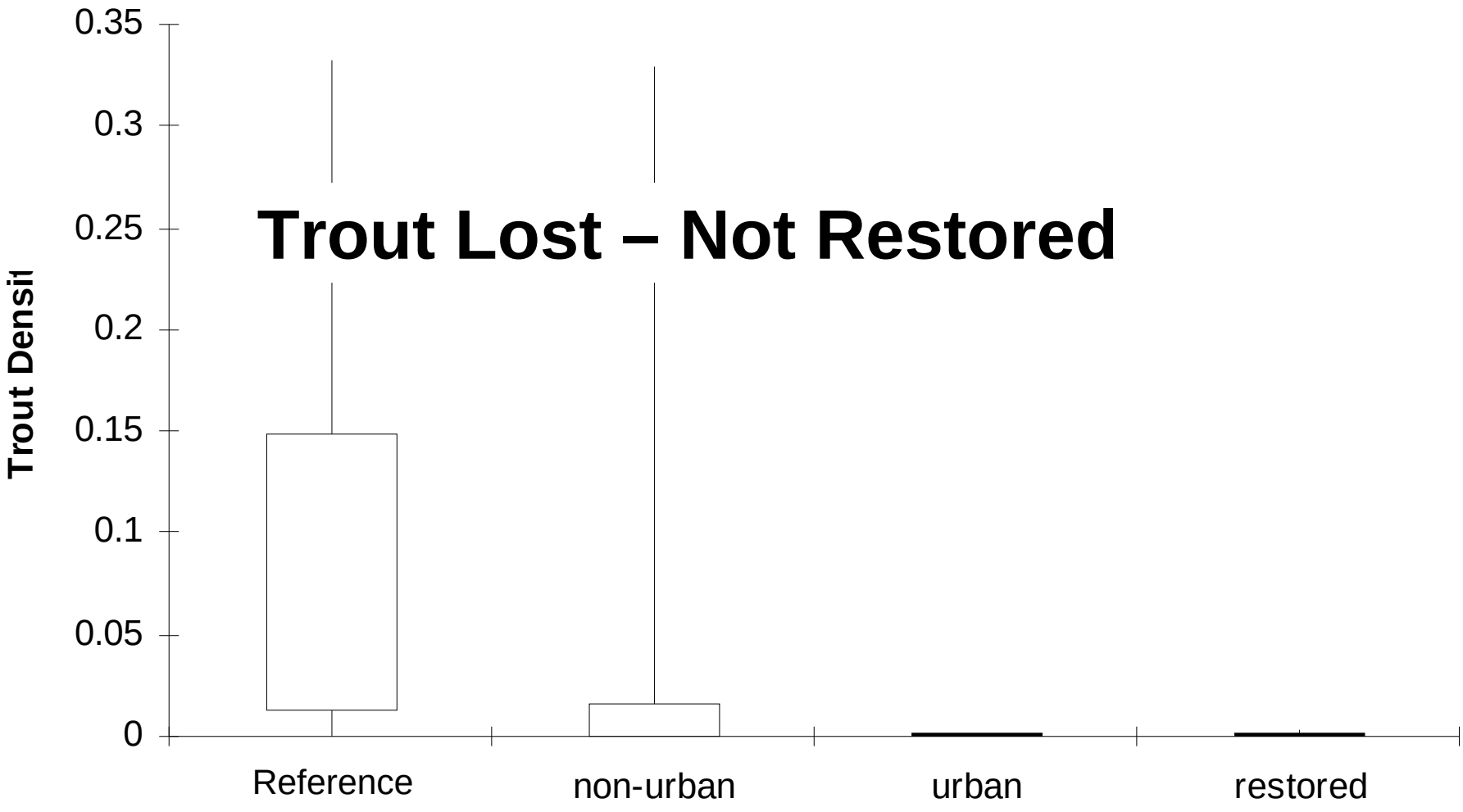
Benthic IBI
Intolerant Benthic Taxa
Total Benthic Taxa
Mayfly Taxa
Stonefly Taxa
Trout Density



Fish IBI
Intolerant Fish Species
Total Fish Species
Benthic IBI
Intolerant Benthic Taxa
Total Benthic Taxa
Mayfly Taxa

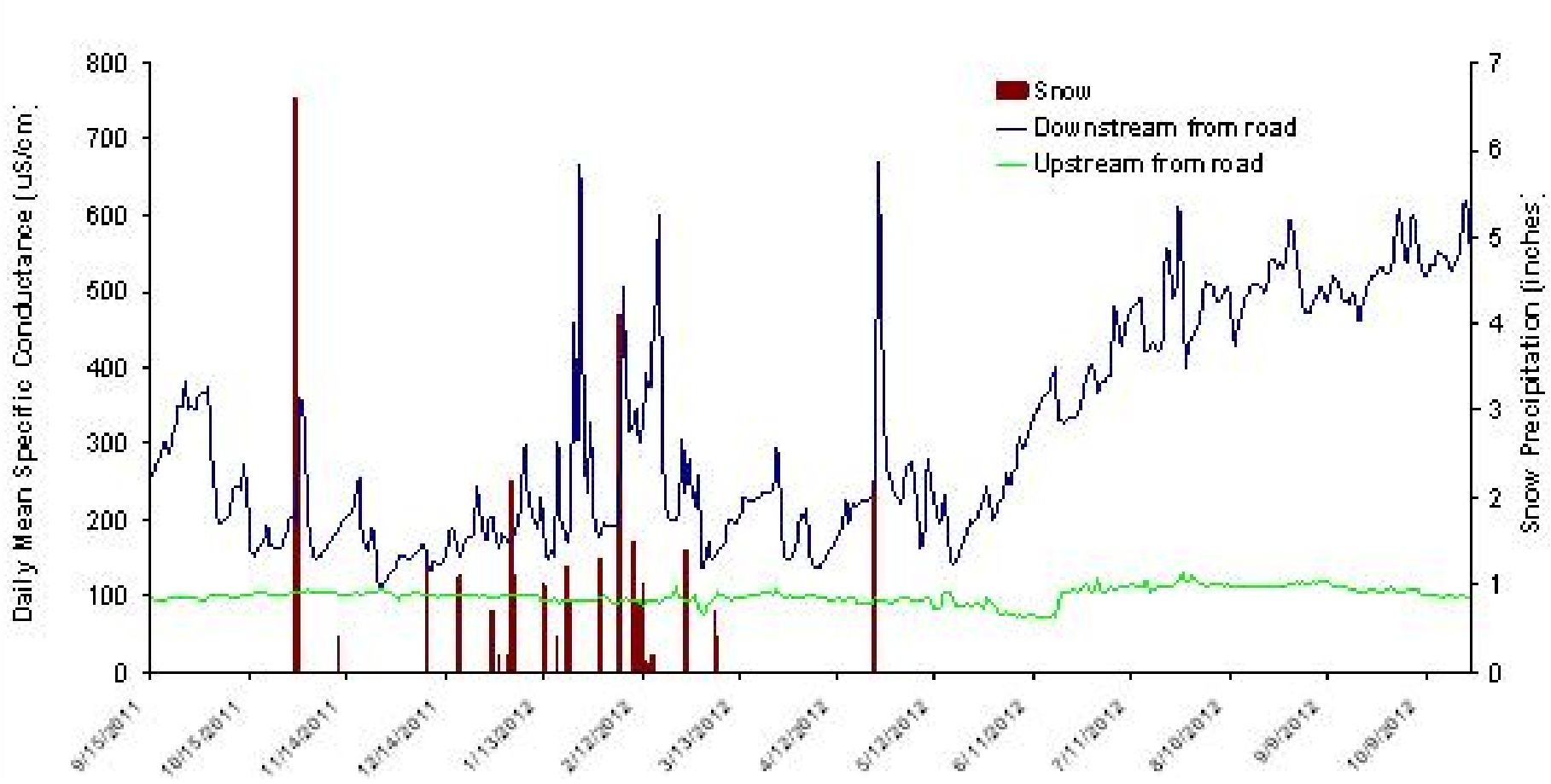
Stranko et al. 2011. Restoration Ecology

Trout Data from Restored and Reference Streams

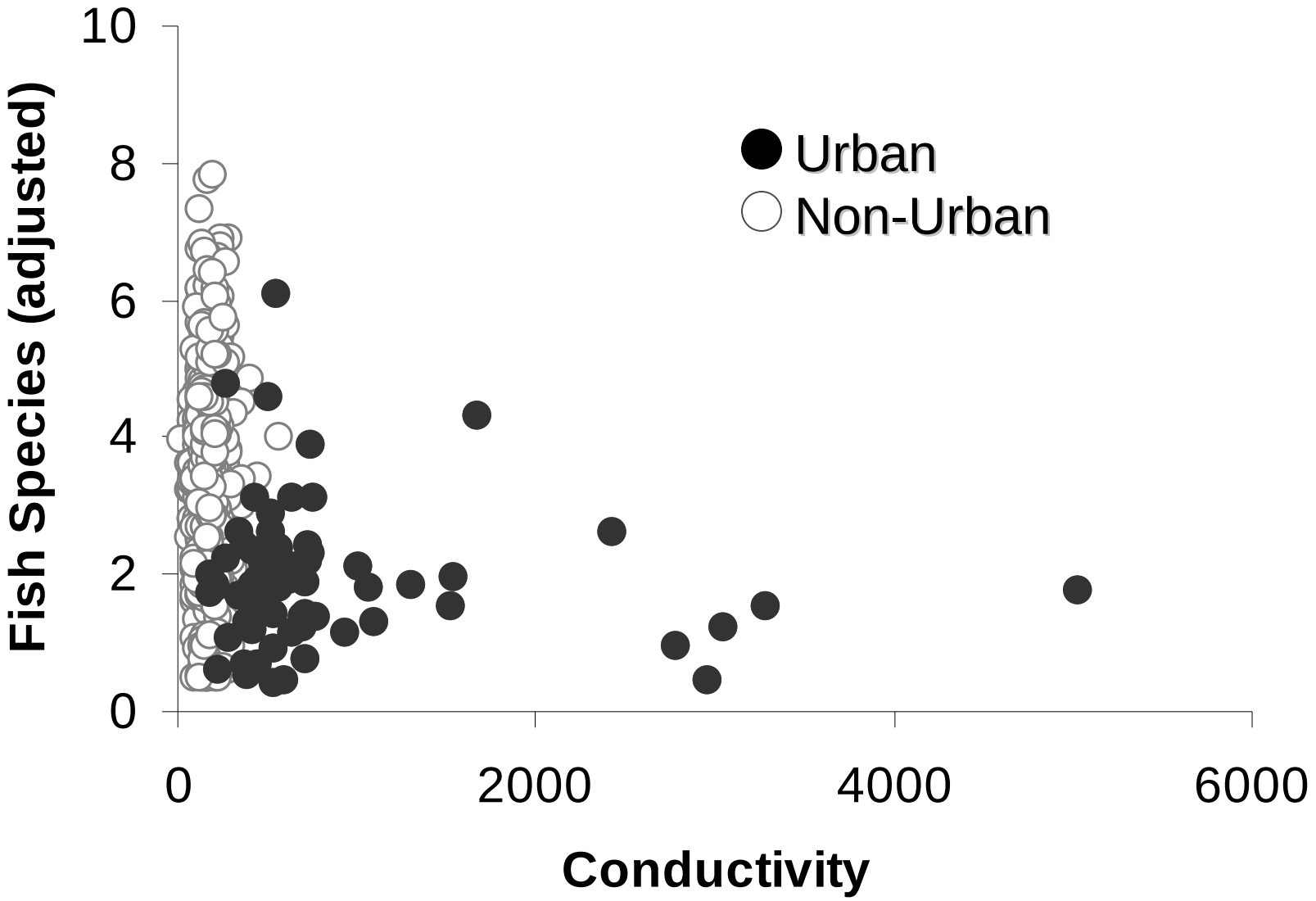


How Many Things Need to be Fixed?

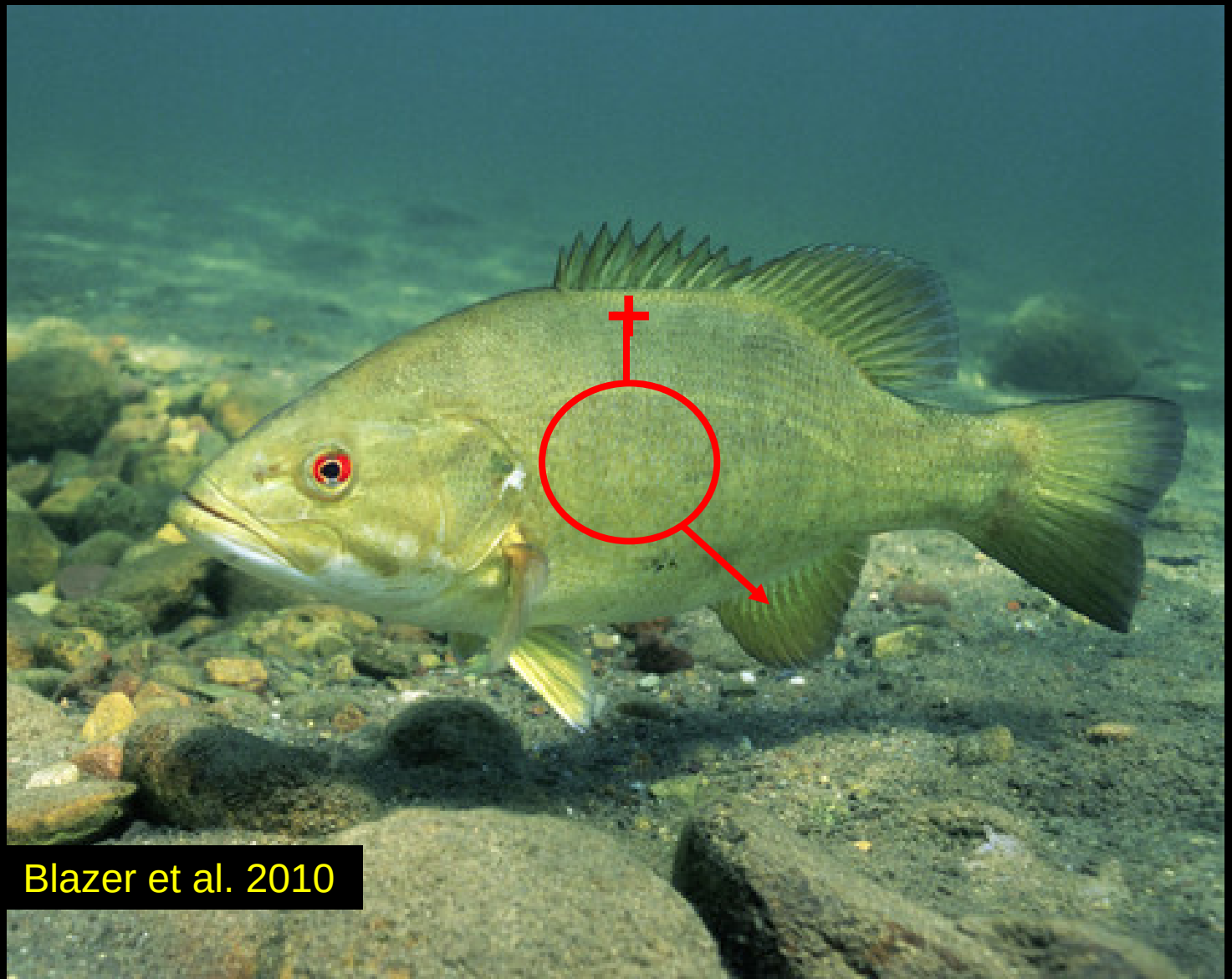
Road Salt?



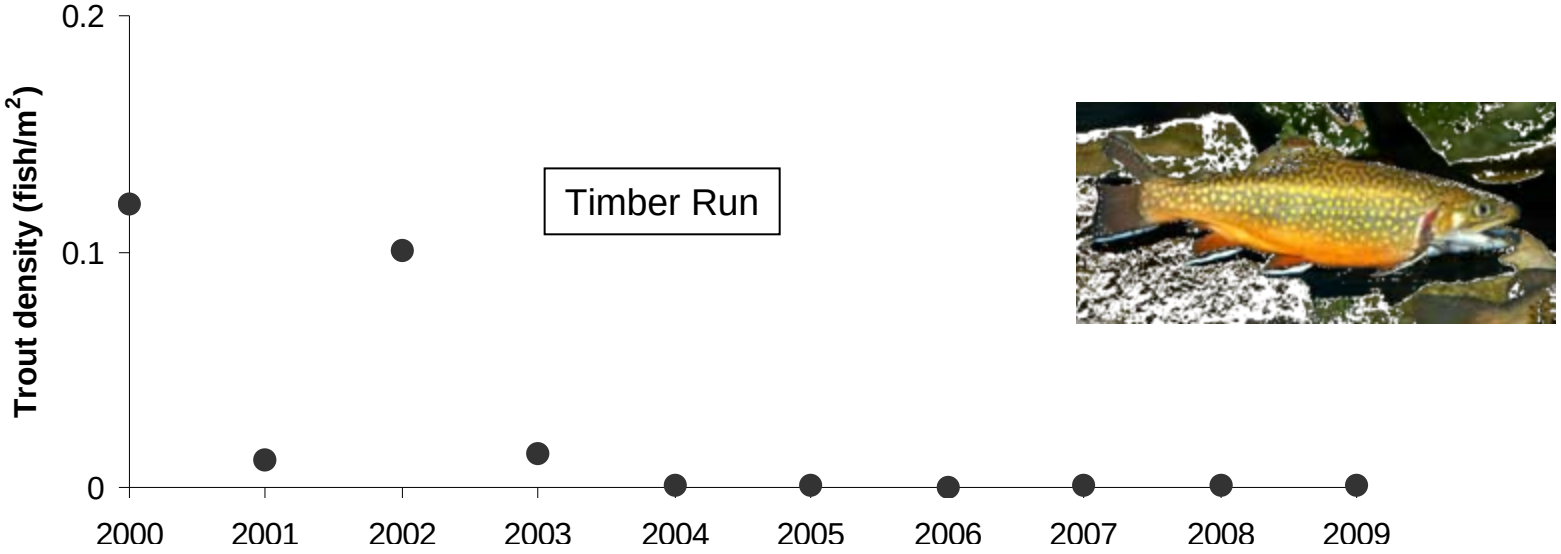
Conductivity Influences Stream Fish

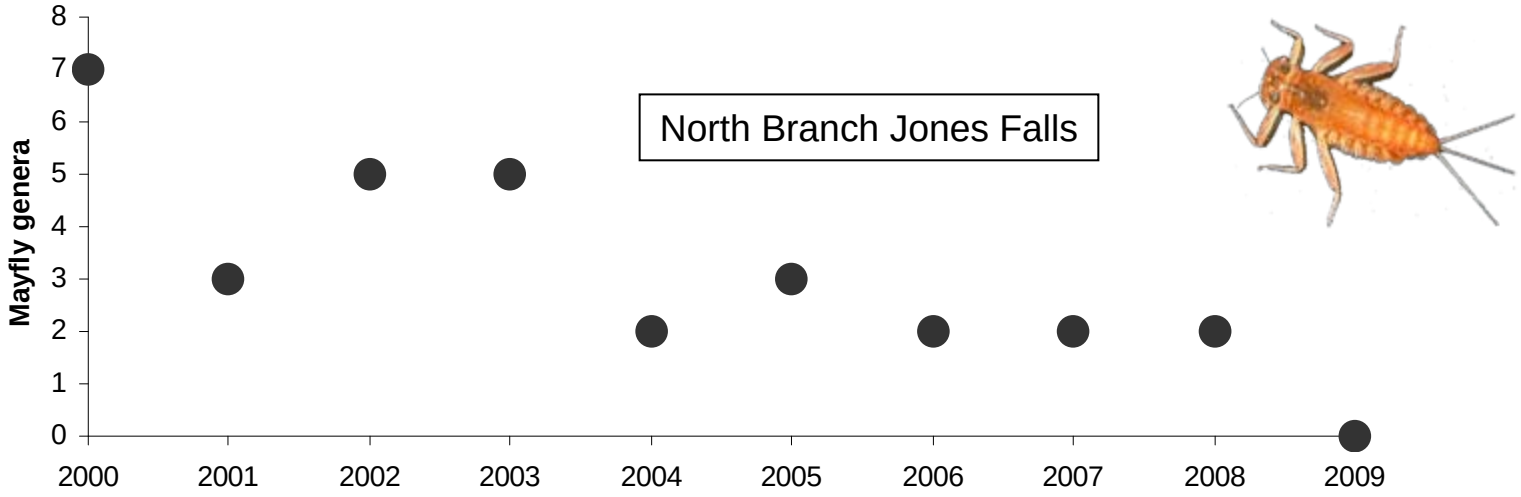


Small changes can make a big difference

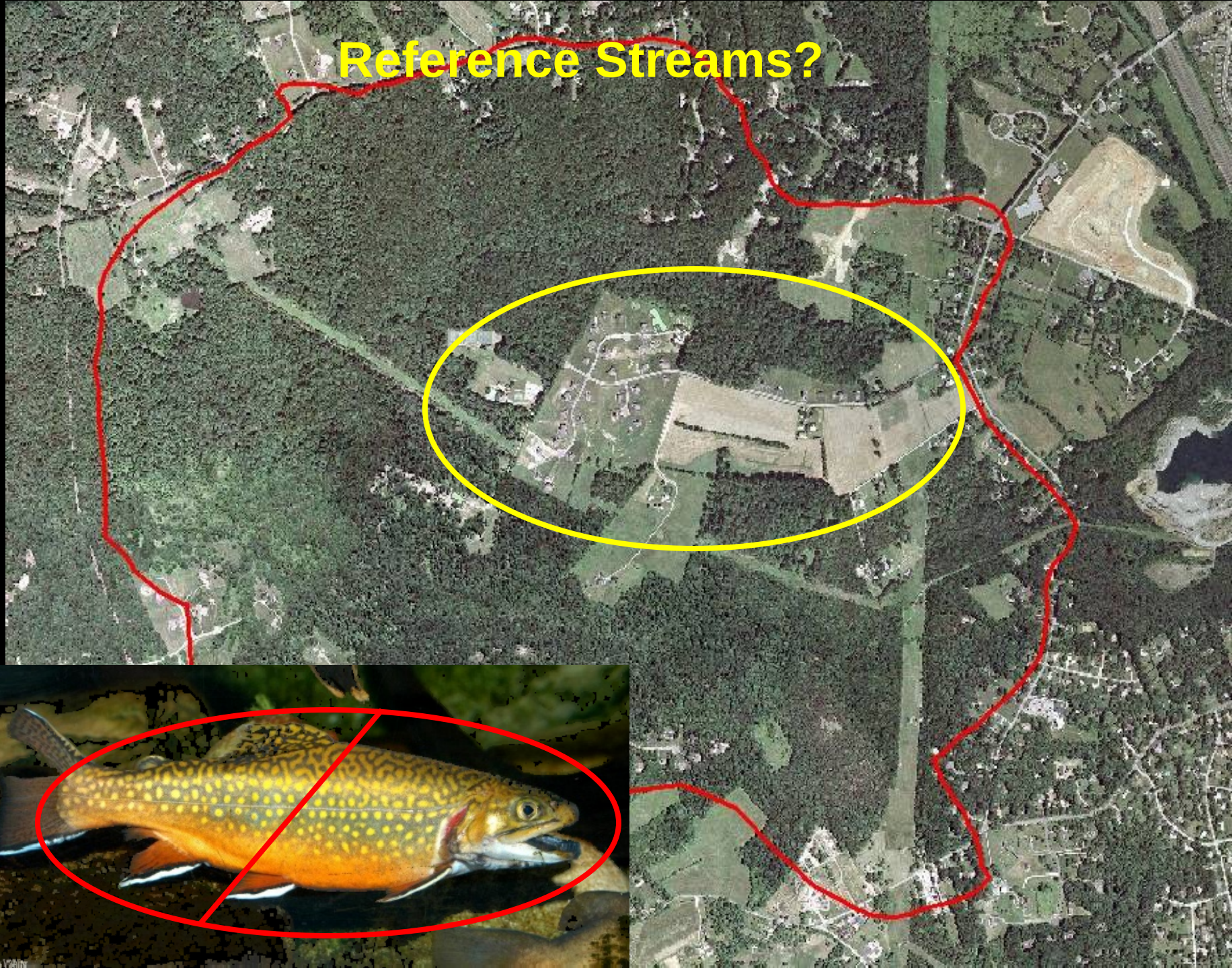


Reference Site Declines in Stream Species





Reference Streams?



Summary

1. Stream ecology is altered at low levels of urbanization

2. Altered ecology influences state regulations (e.g., Impaired Waters, Designated Use, Endangered Species)

3. Many potential causes for alterations make restoring and protecting urban streams difficult

4. Unsuccessful restoration and protection has resulted in ecological declines of urban streams

5. Scientific literature showing successful restoration or protection of urban stream ecology?