Managing Land Use, Fish Habitat, and Estuarine Fisheries in a developing Chesapeake Bay watershed

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Maryland Fisheries Service has been looking at fish habitat, development, and fisheries dynamics in Chesapeake Bay

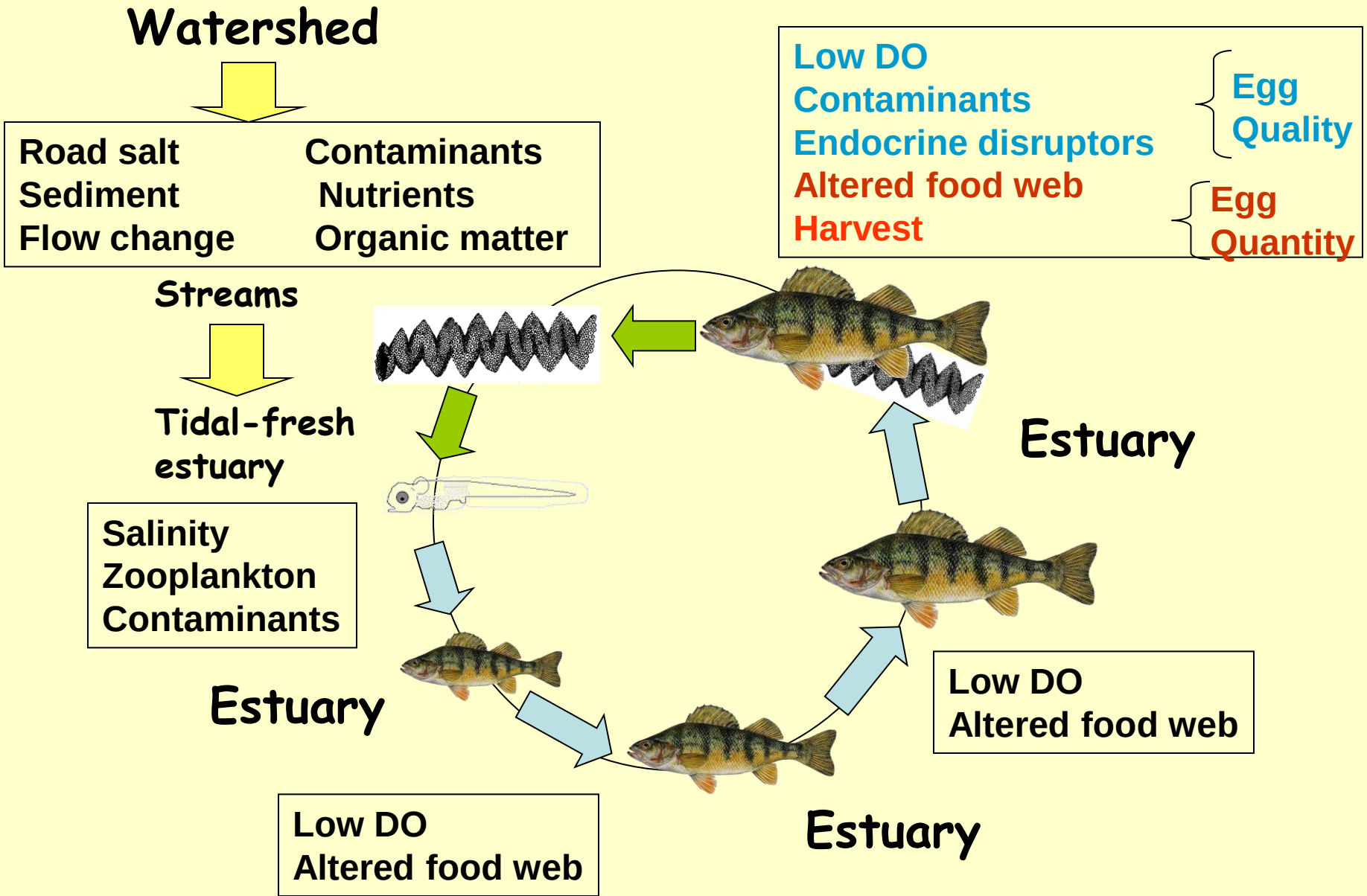
- Goals:
  - Assessments and management strategies that reflect land-use impacts
  - Guidance for planning agencies
  - Public support for watershed conservation

Why?

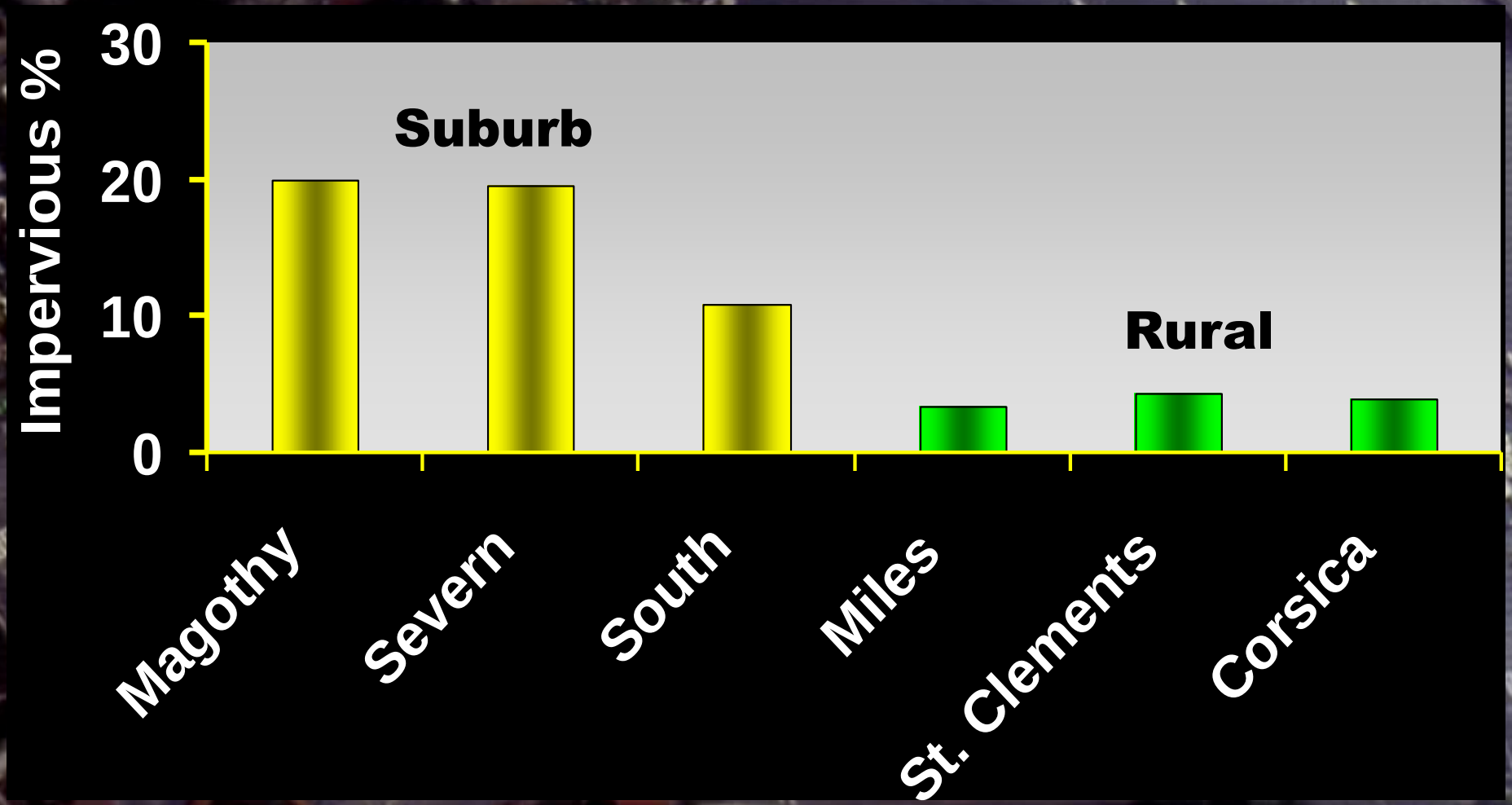
Suburbs, a "new" & major land feature, threatens aquatic habitat and fisheries

- 1973: MD = 3.9 million & 8% urban
- 2000: MD = 5.3 million & 16% urban
- Lawns now 23% of MD's Bay watershed
- Lawns = MD's largest "crop"
- 2030: 6.7 million & ?

Fish encounter multiple development-related habitat stressors (Wheel of Misfortune)

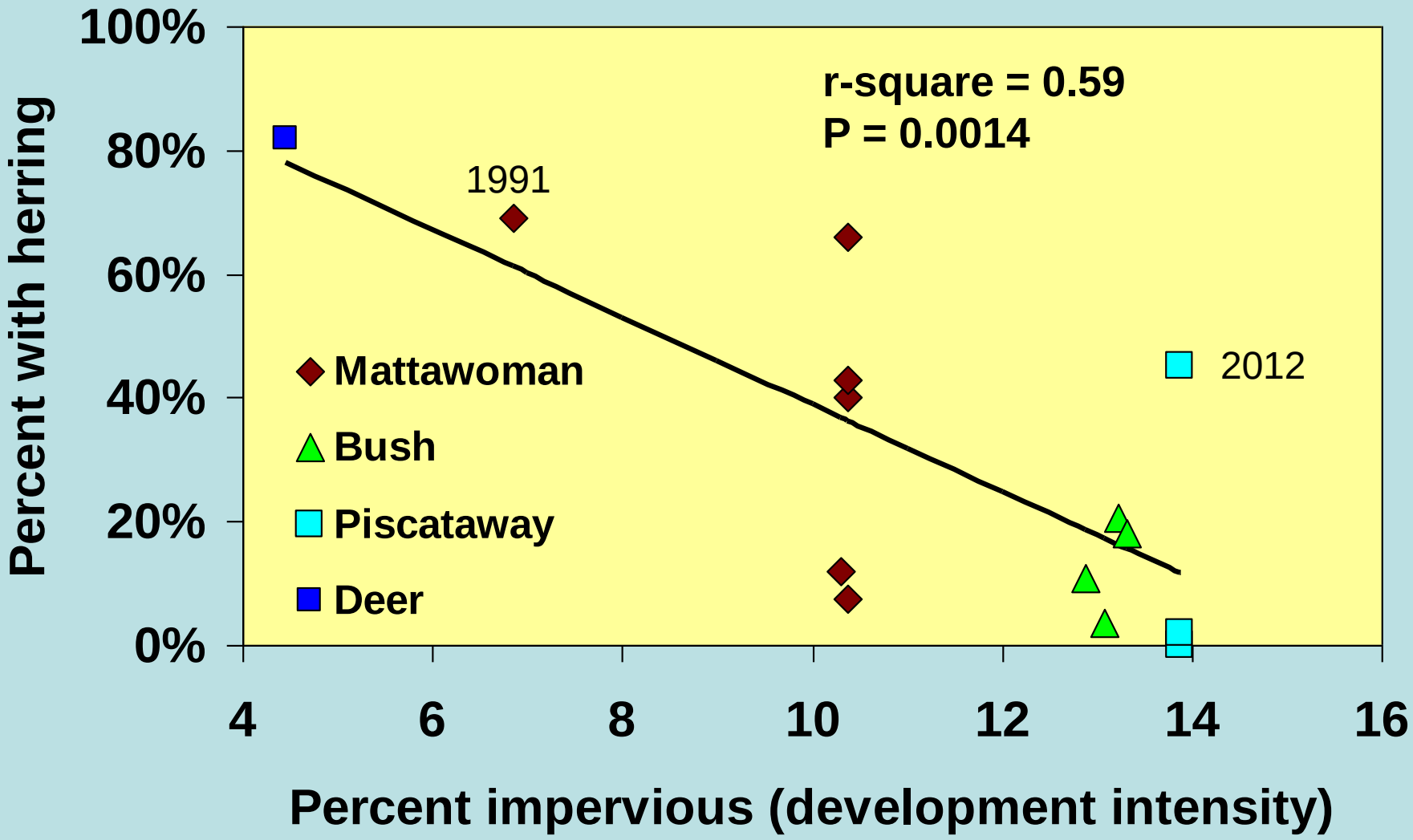


Impervious surface measures intensity of development

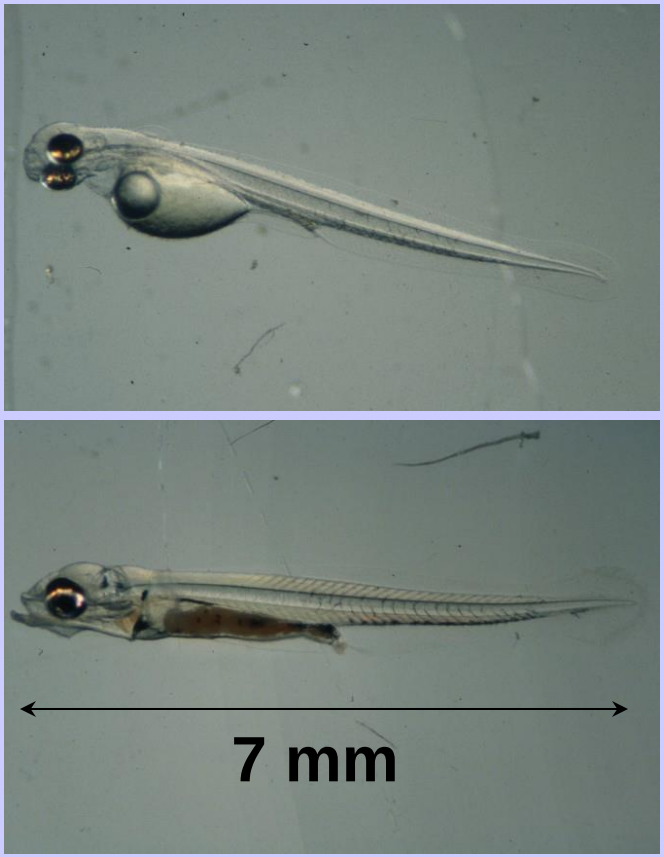



Anadromous fish stream spawning surveys during 2005-2012 explored development's effect.

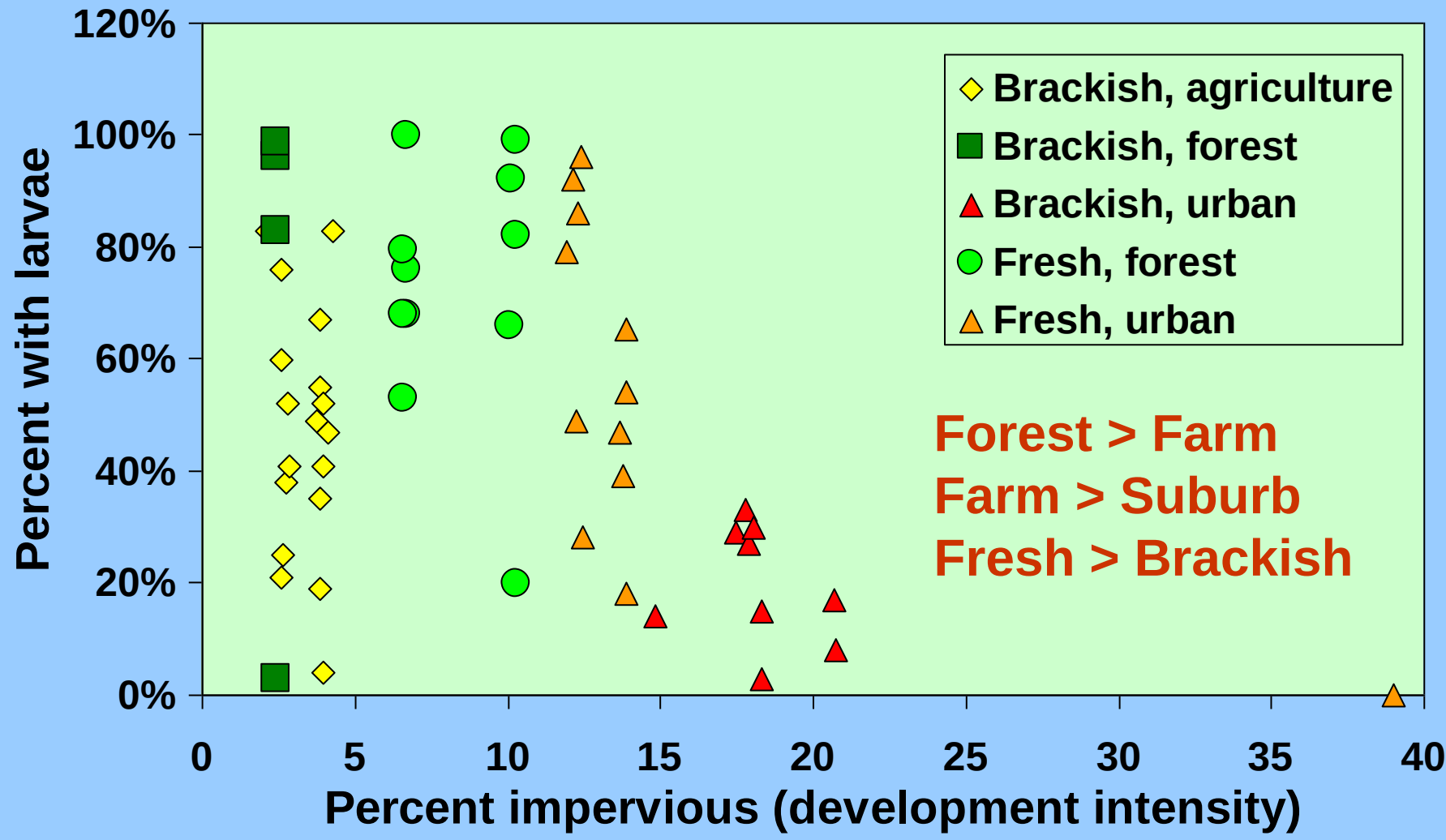
Percent of stream samples with herring eggs and larvae falls with impervious surface



Estuarine yellow perch larvae were sampled with plankton nets towed from boats



Percent of plankton tows with yellow perch larvae vs impervious surface with salinity class & dominant land cover



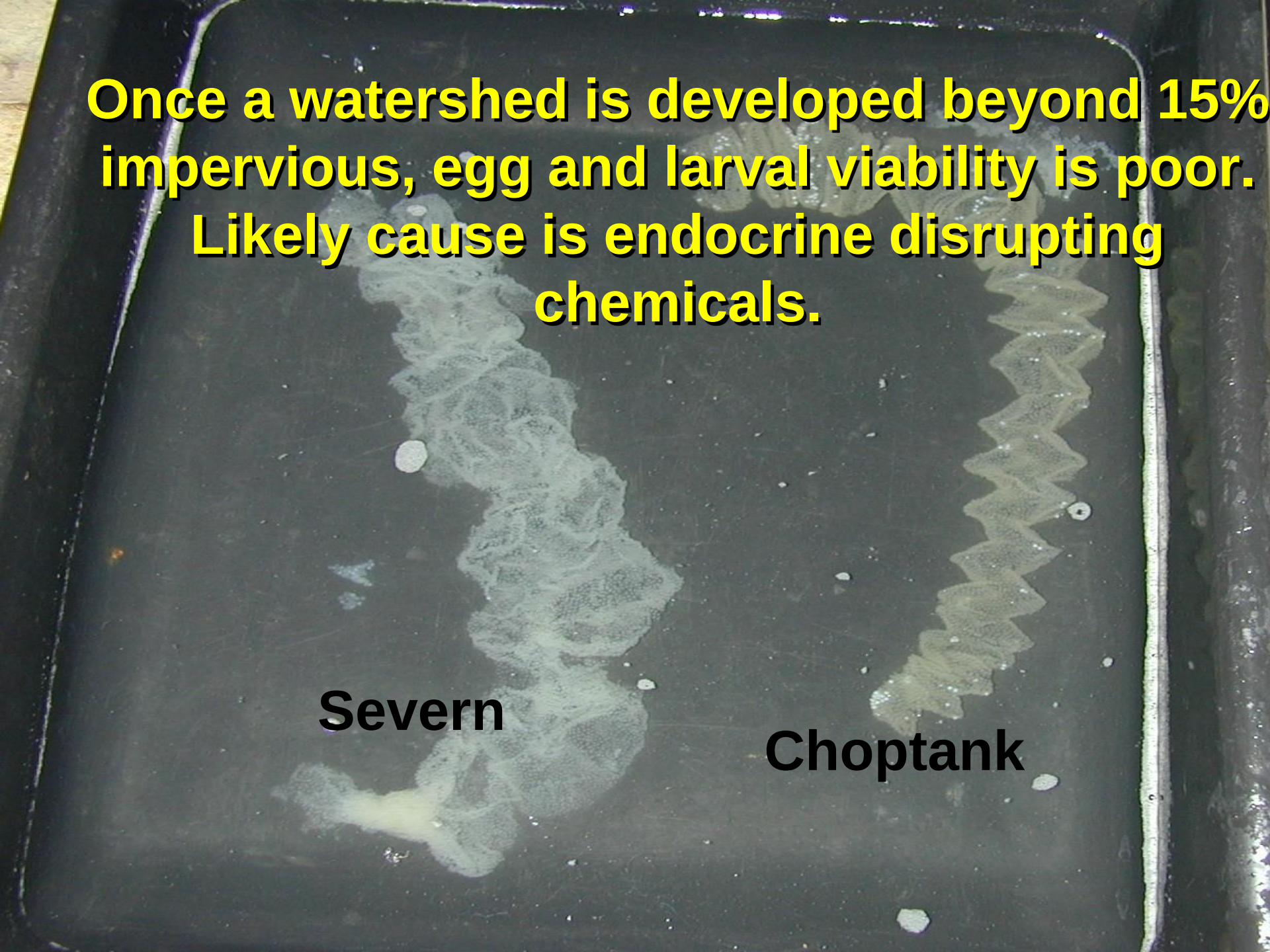
Larval first feeding: correlations of larval feeding, development, and suspended detritus indices

	Development level	Mean feeding success on zooplankton
Mean feeding success on zooplankton	r = -0.58 P = 0.02	
Proportion no detritus	r = 0.75 P = 0.01	r = -0.64 P = 0.05

Detritus supply and feeding success decline with development

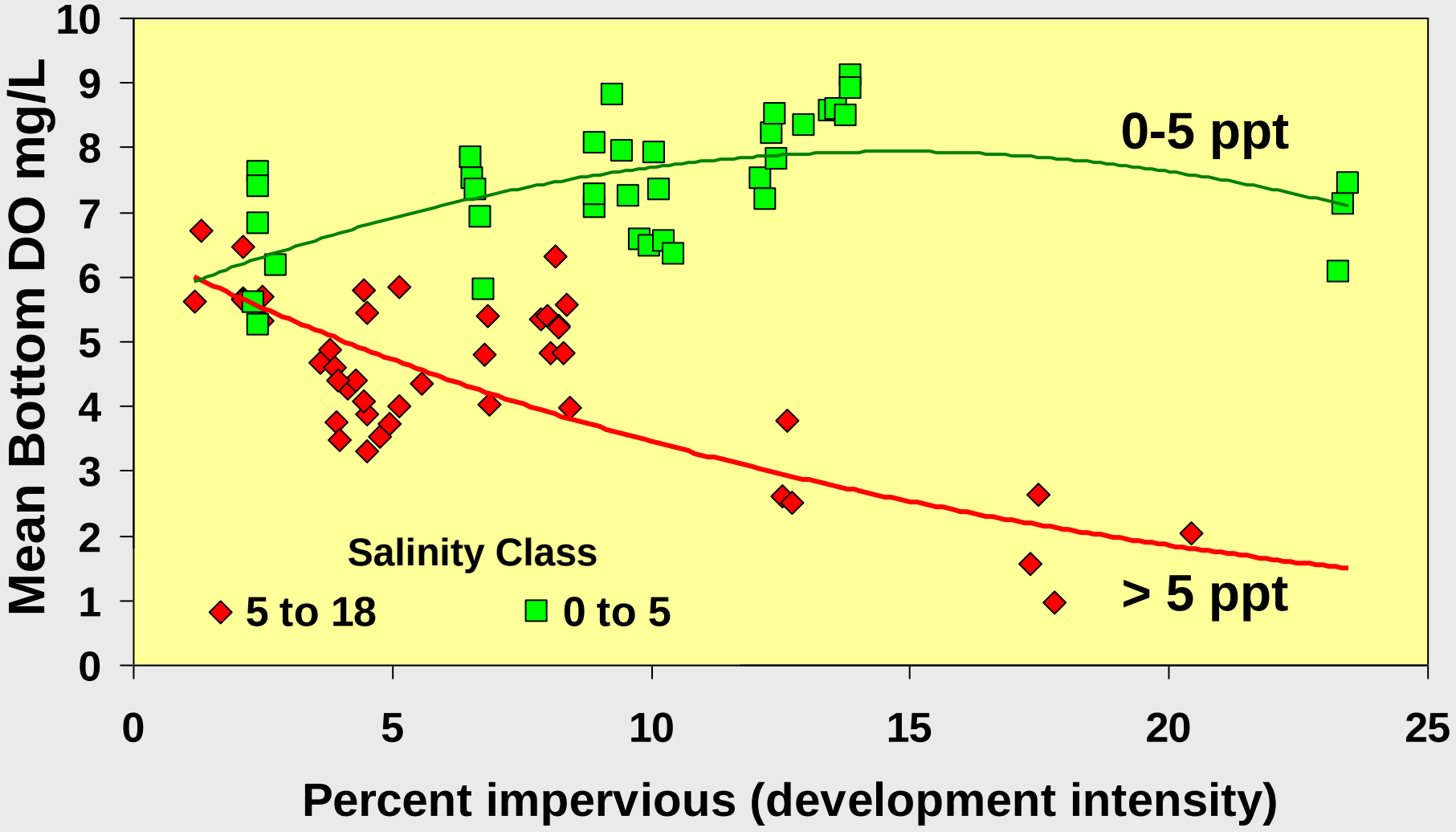
Natural connections allowing flow of organic matter from land to stream to estuary…

…that benefit estuary zooplankton production and larval feeding disappear or disconnect

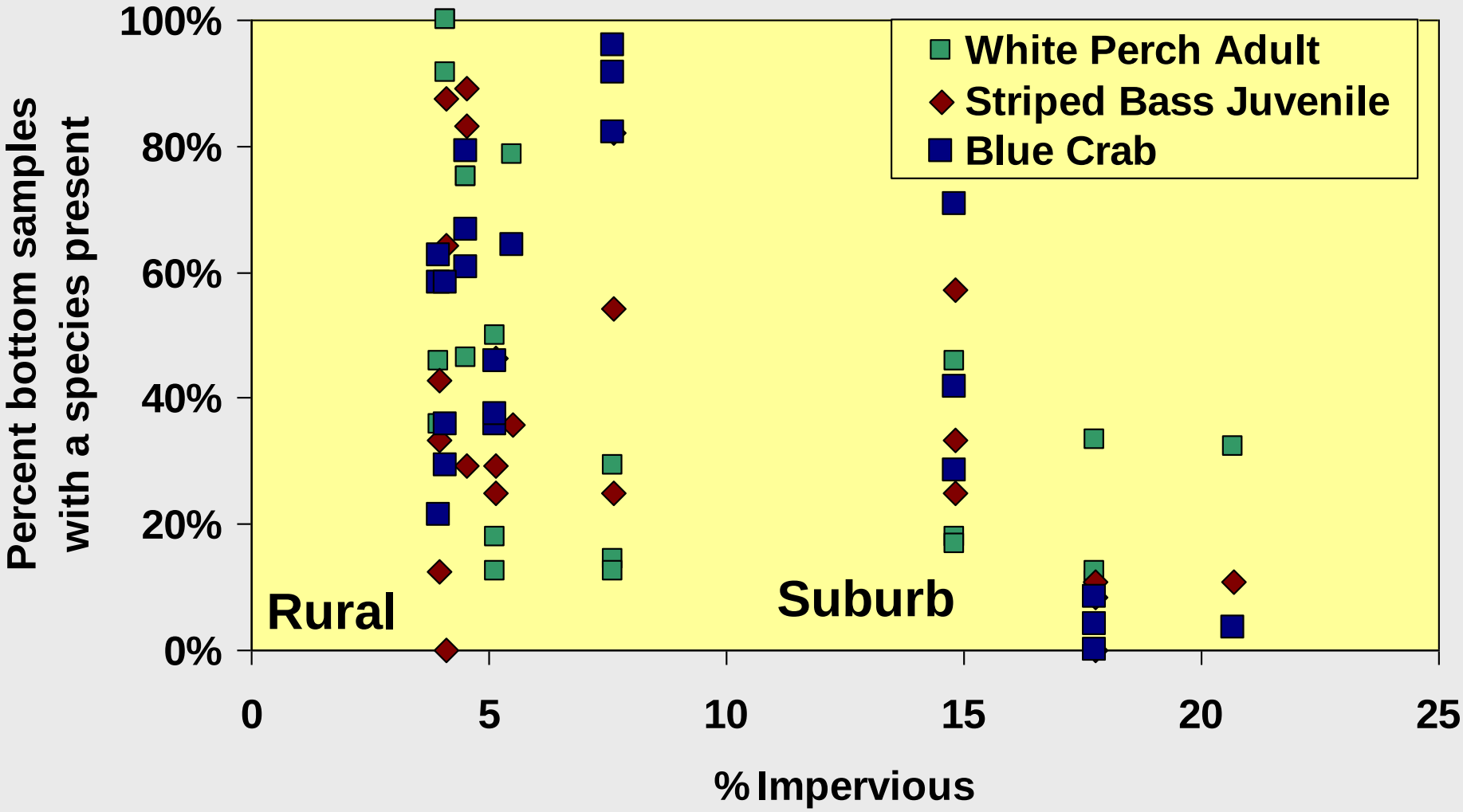

Once a watershed is developed beyond 15% impervious, egg and larval viability is poor. Likely cause is endocrine disrupting chemicals.
Severn
Choptank

Summer estuarine habitat: habitat occupation and dissolved oxygen

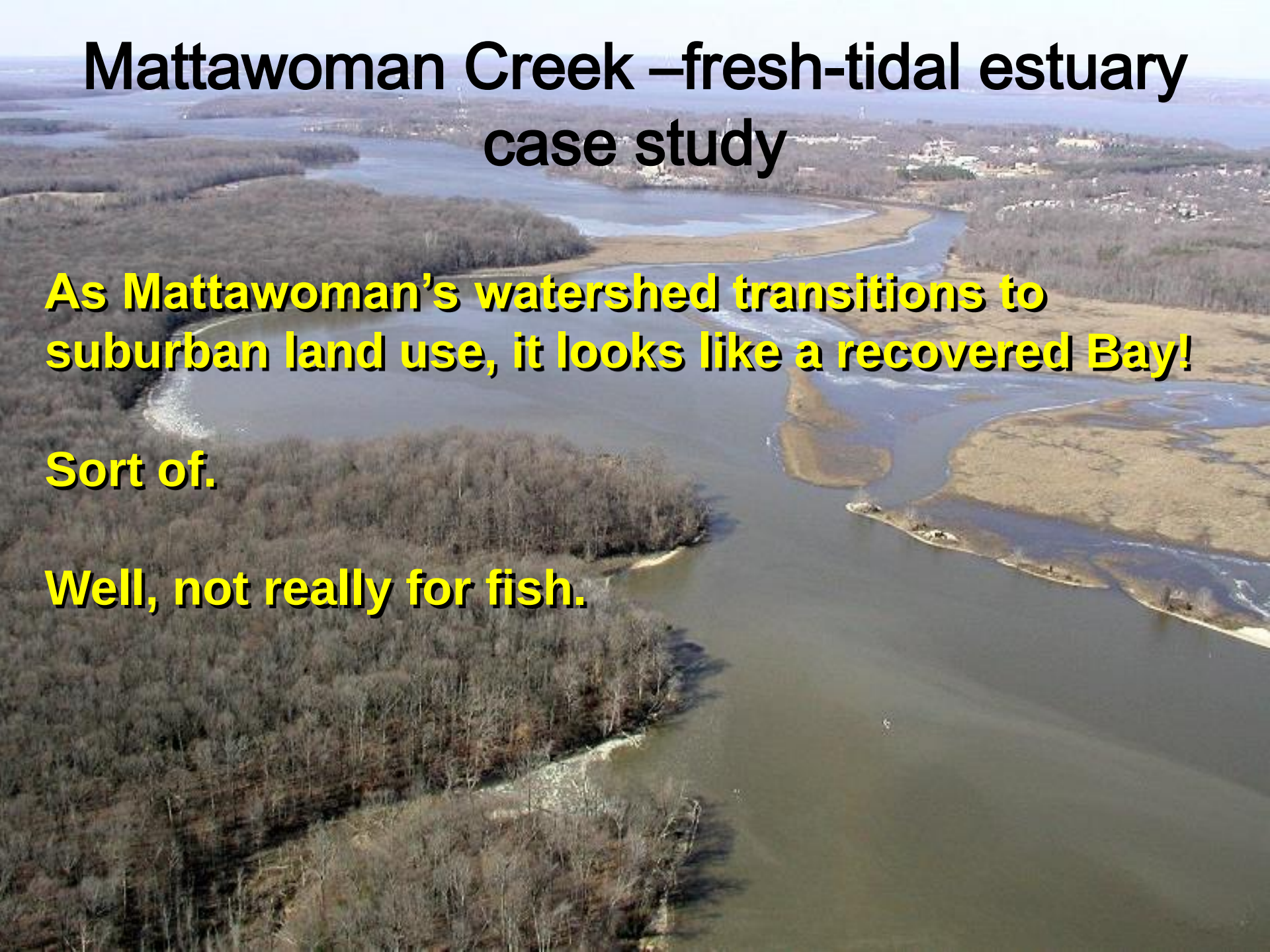
Mean summer bottom DO and percent impervious, by salinity classification (ppt), during 2003-2011.



Bottom habitat occupation by iconic species in brackish tributaries decreases with development, reflecting DO trend



Mattawoman Creek –fresh-tidal estuary case study

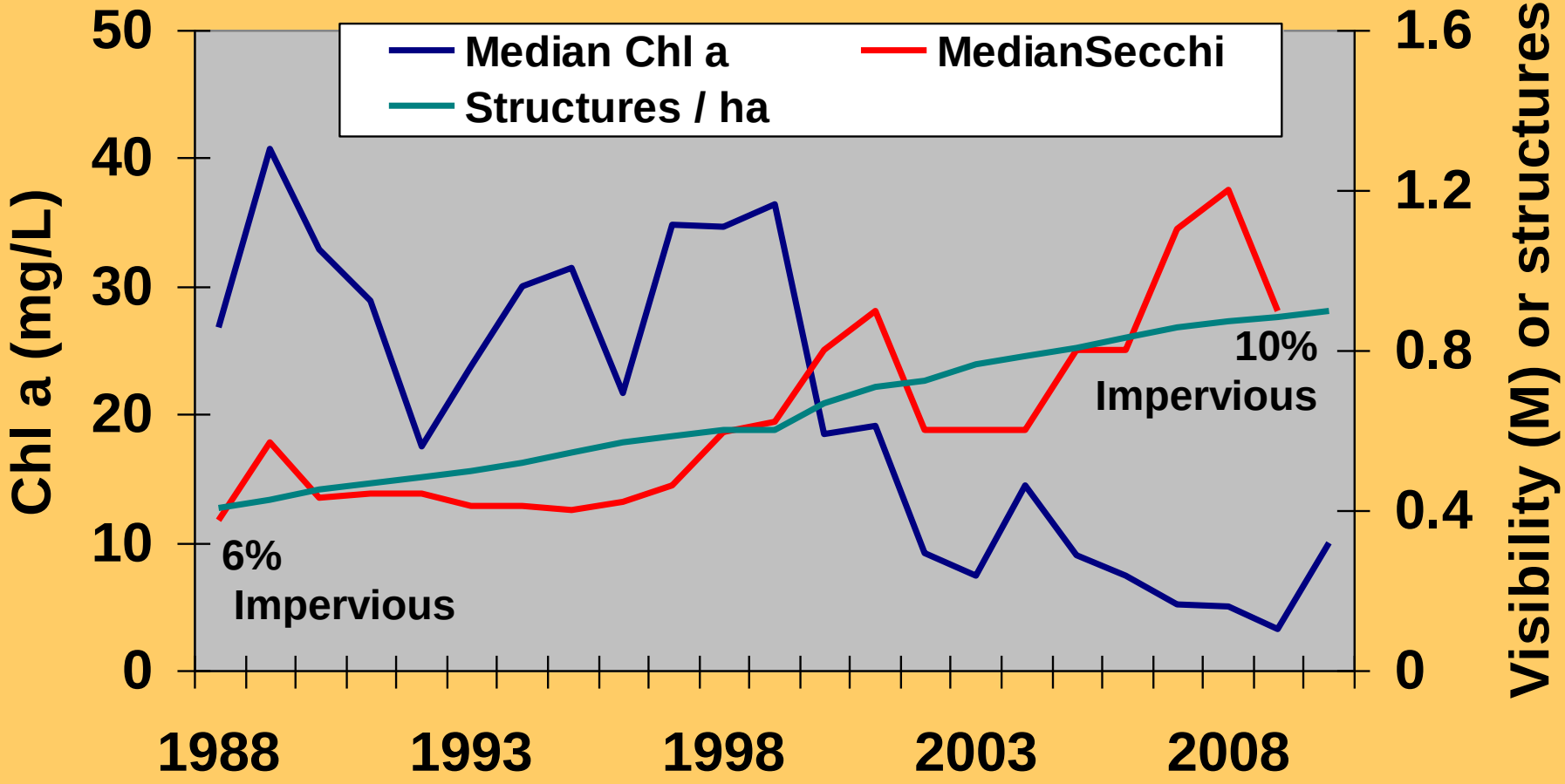


As Mattawoman's watershed transitions to suburban land use, it looks like a recovered Bay!

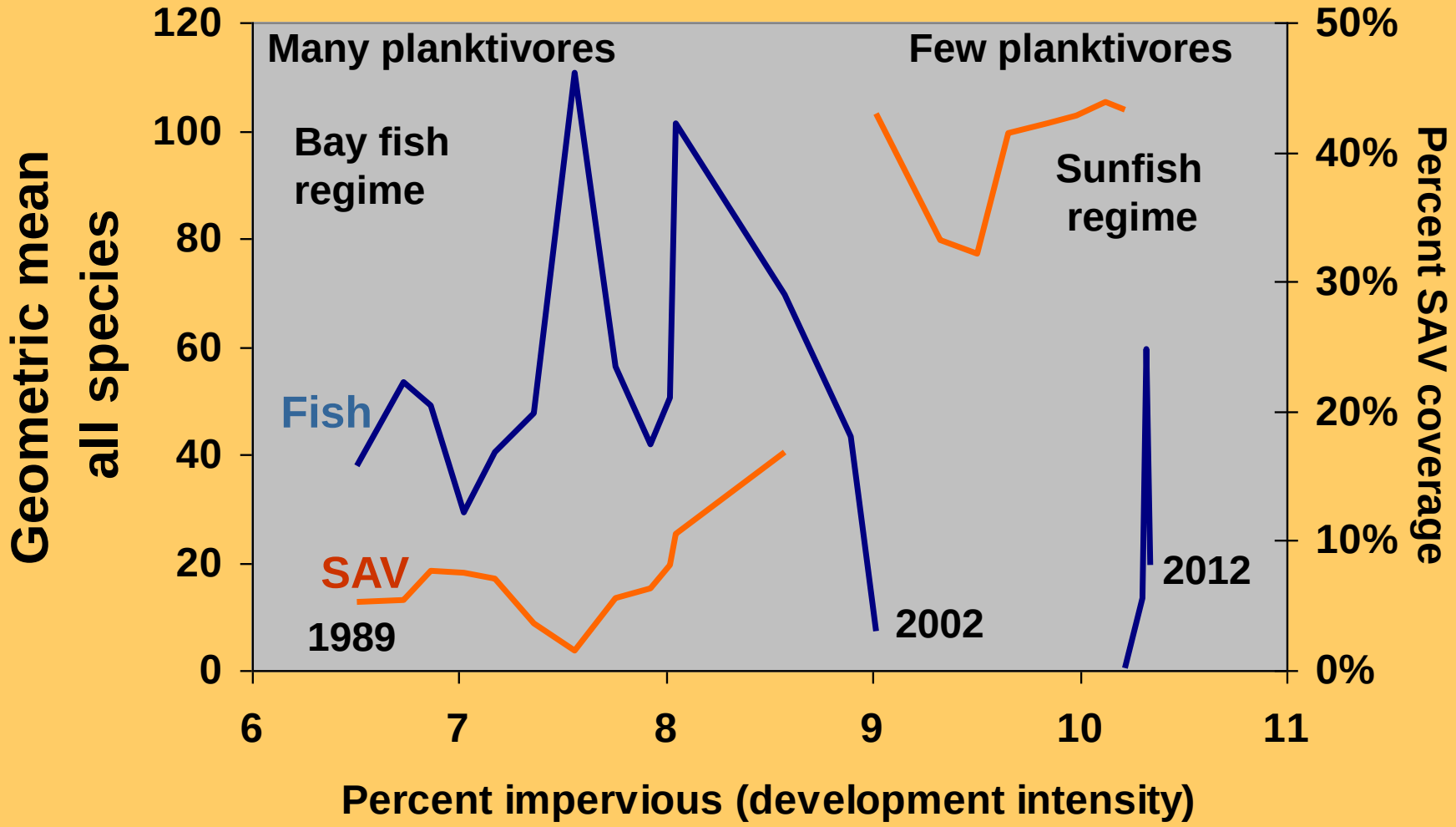
Sort of.

Well, not really for fish.

Mattawoman Creek median summer Chlorophyll a, summer Secchi depth (visibility), and development trends

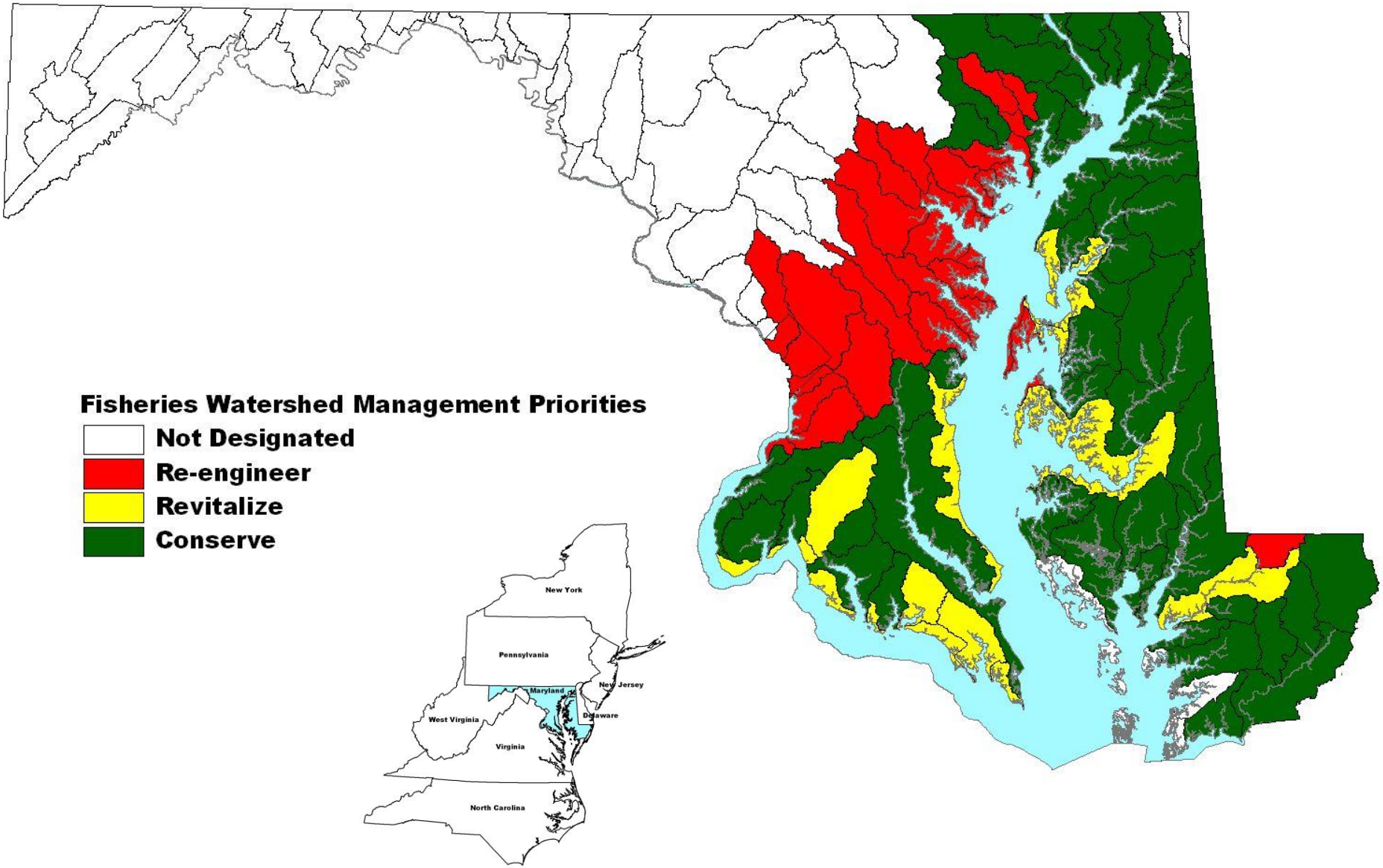


SAV expands. Fish abundance in summer trawl samples (bottom channel) undergoes trophic / regime shift in species.

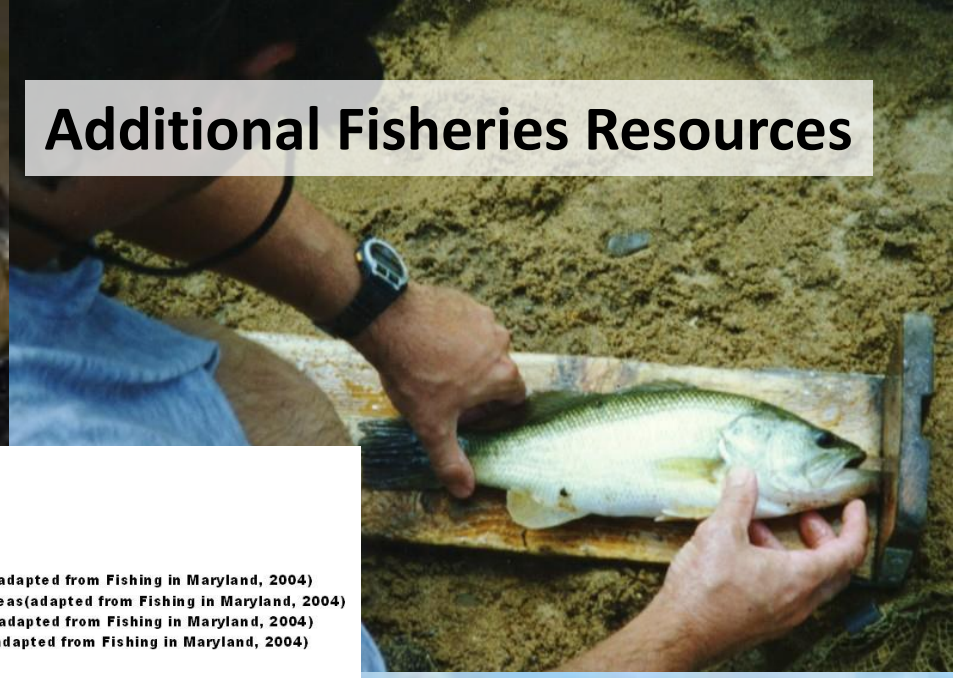


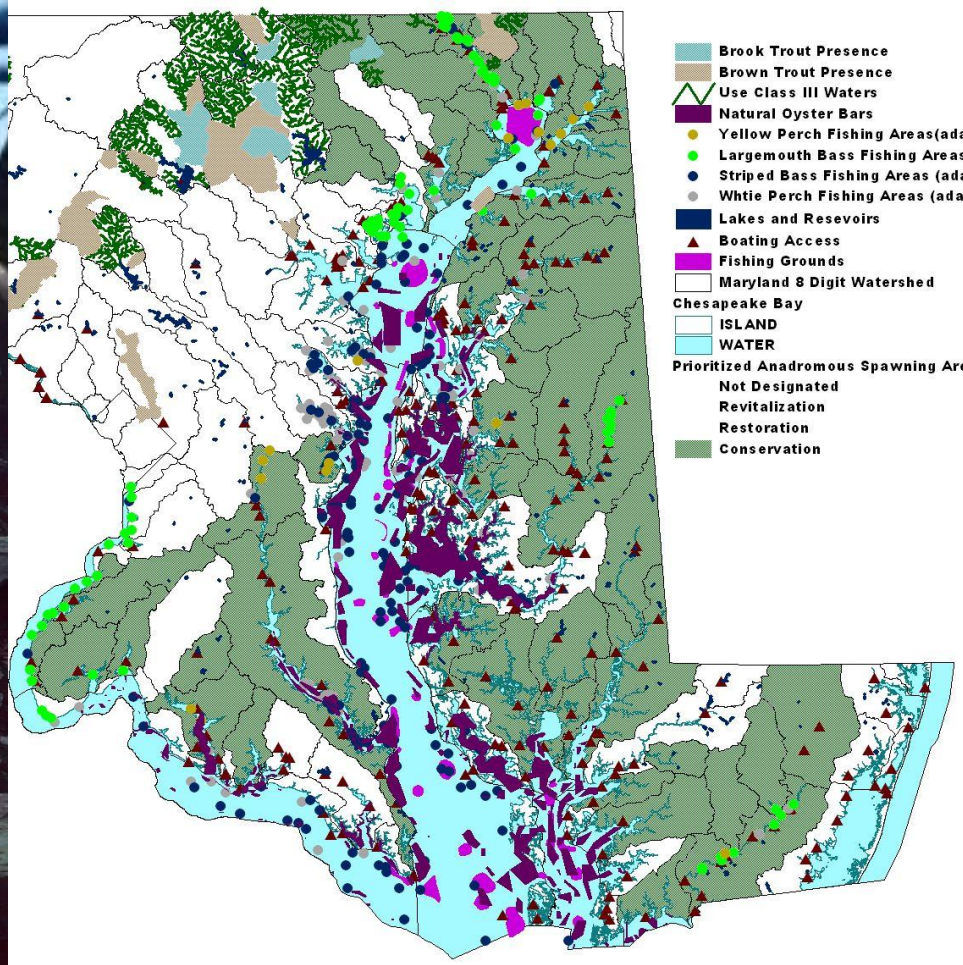
Impervious surface reference points: fisheries on resident species

- **< 5% impervious - harvest restrictions & stocking; conserve watershed**
- **5-10% - option to decrease harvest & stocking to compensate. Conserve & revitalize watershed**
- **10-15% - Conserve & reconstruct degraded watershed**
- **>15% - options limited and localized**

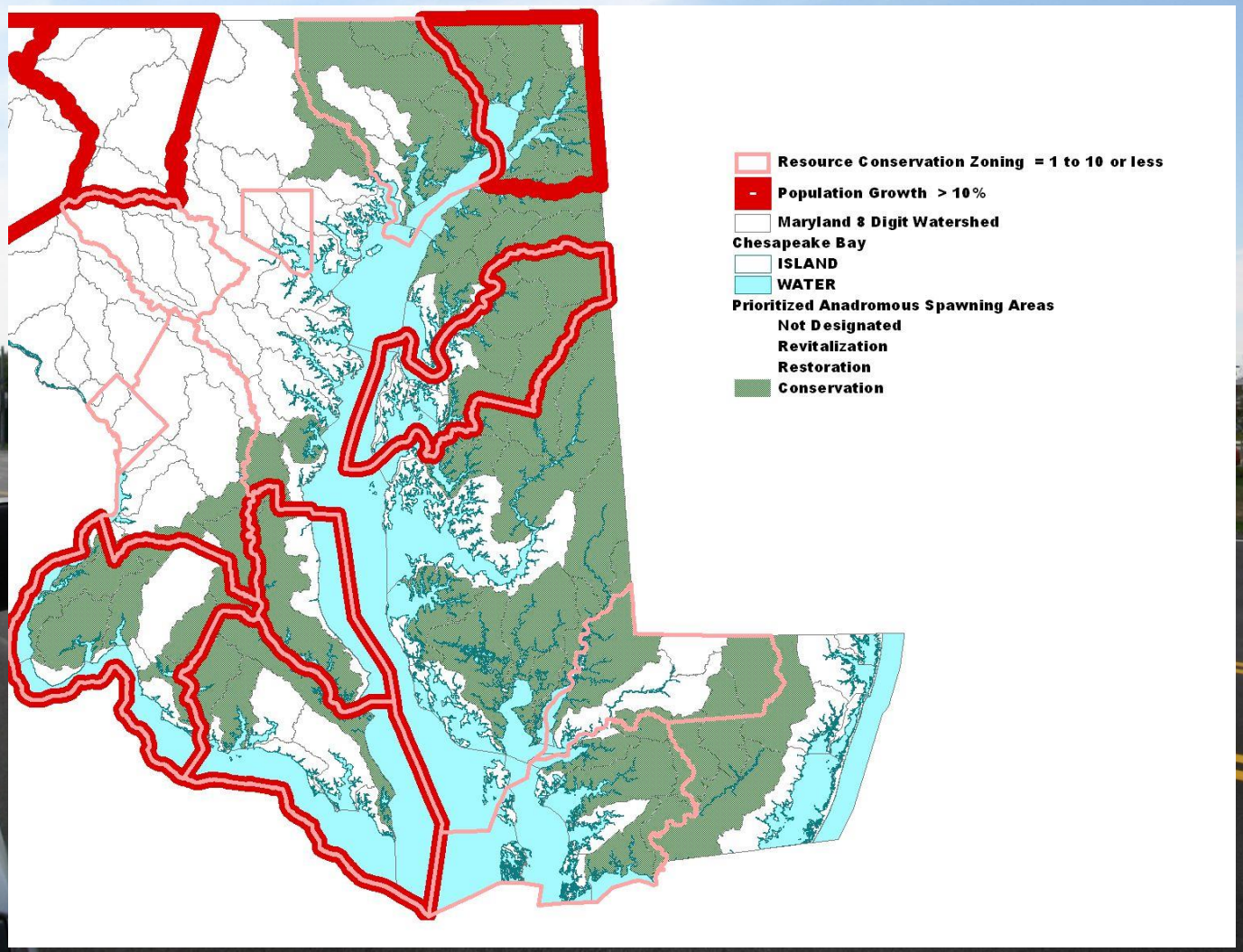

Fisheries Watershed Management Priorities
Not Designated
Re-engineer
Revitalize
Conserve
New York
Pennsylvania
Maryland
New Jersey
Delaware
West Virginia
Virginia
North Carolina

Additional Fisheries Resources

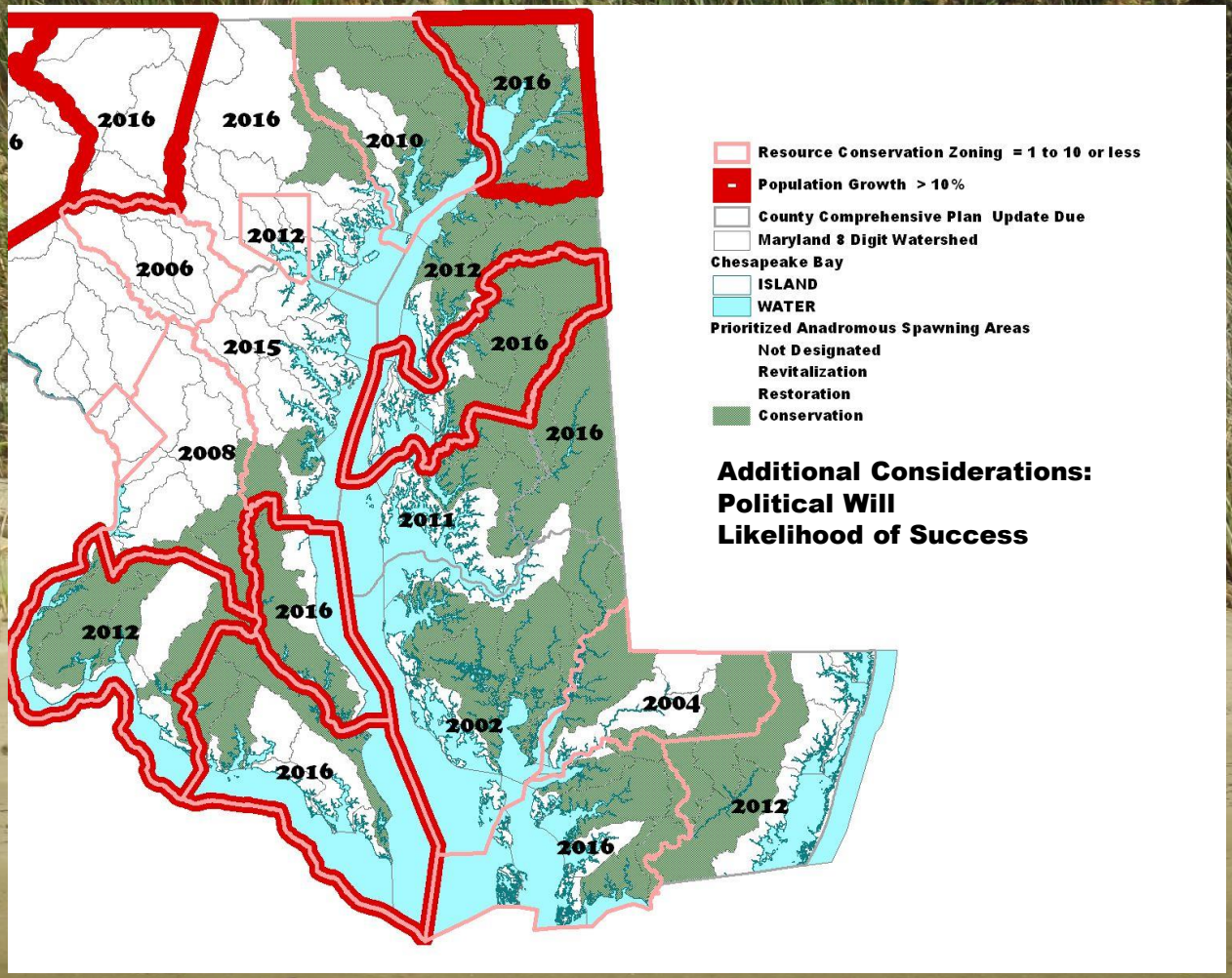




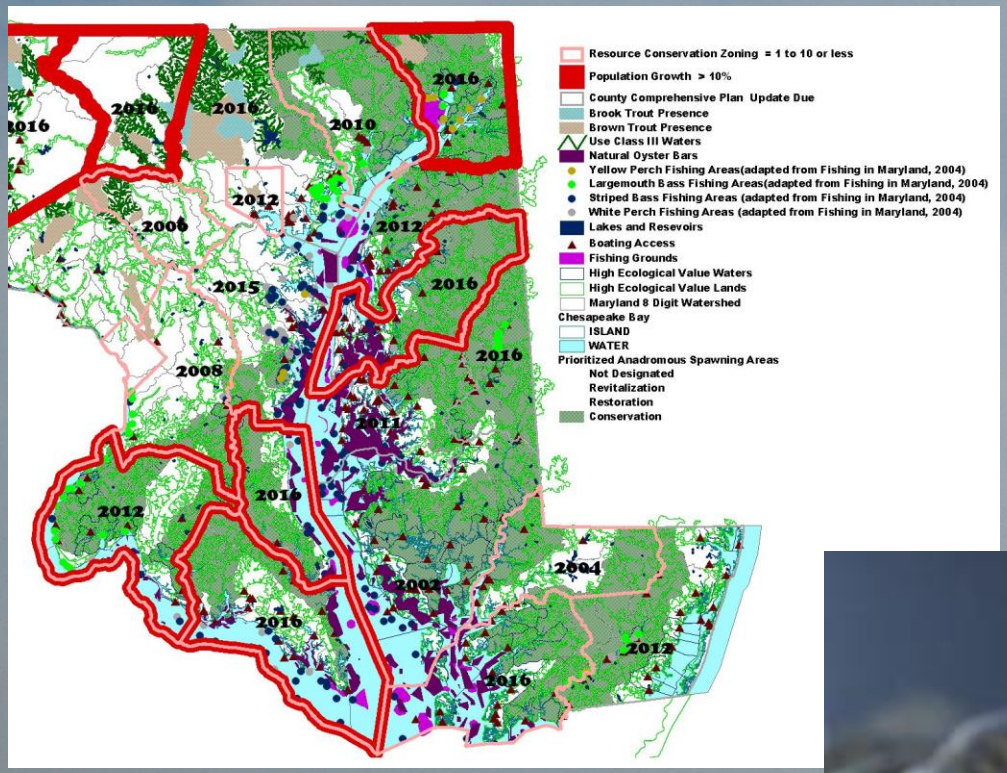
Vulnerability



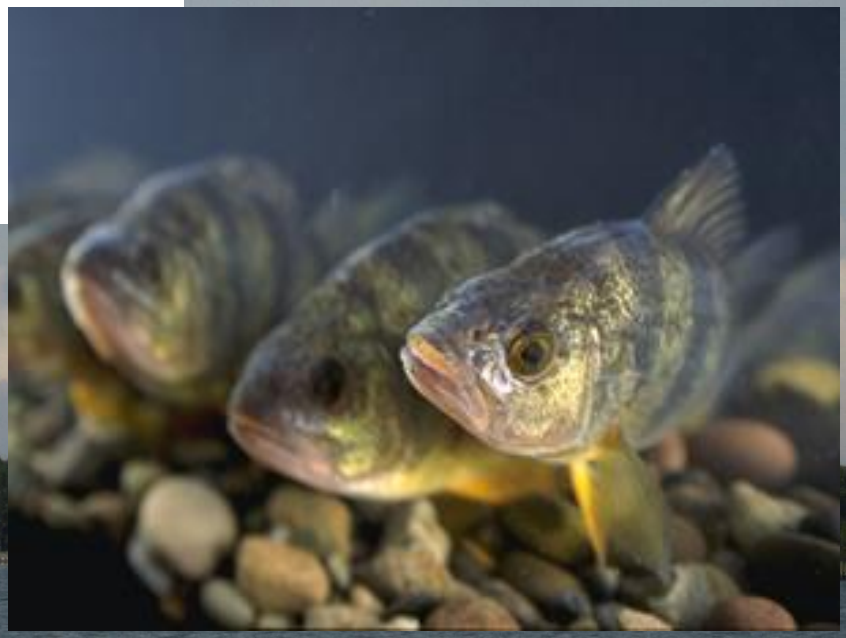
Opportunity



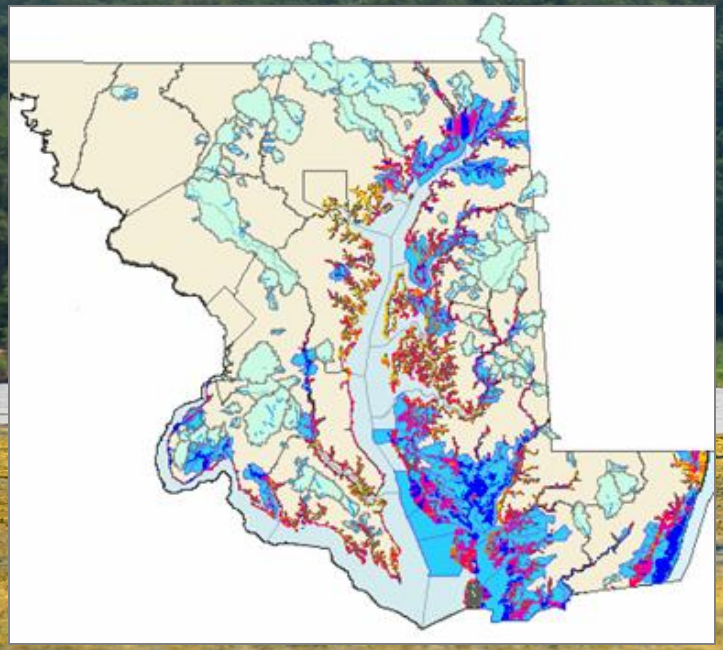
Data Guides Priorities



Target Vulnerable Watersheds for Conservation and Restoration

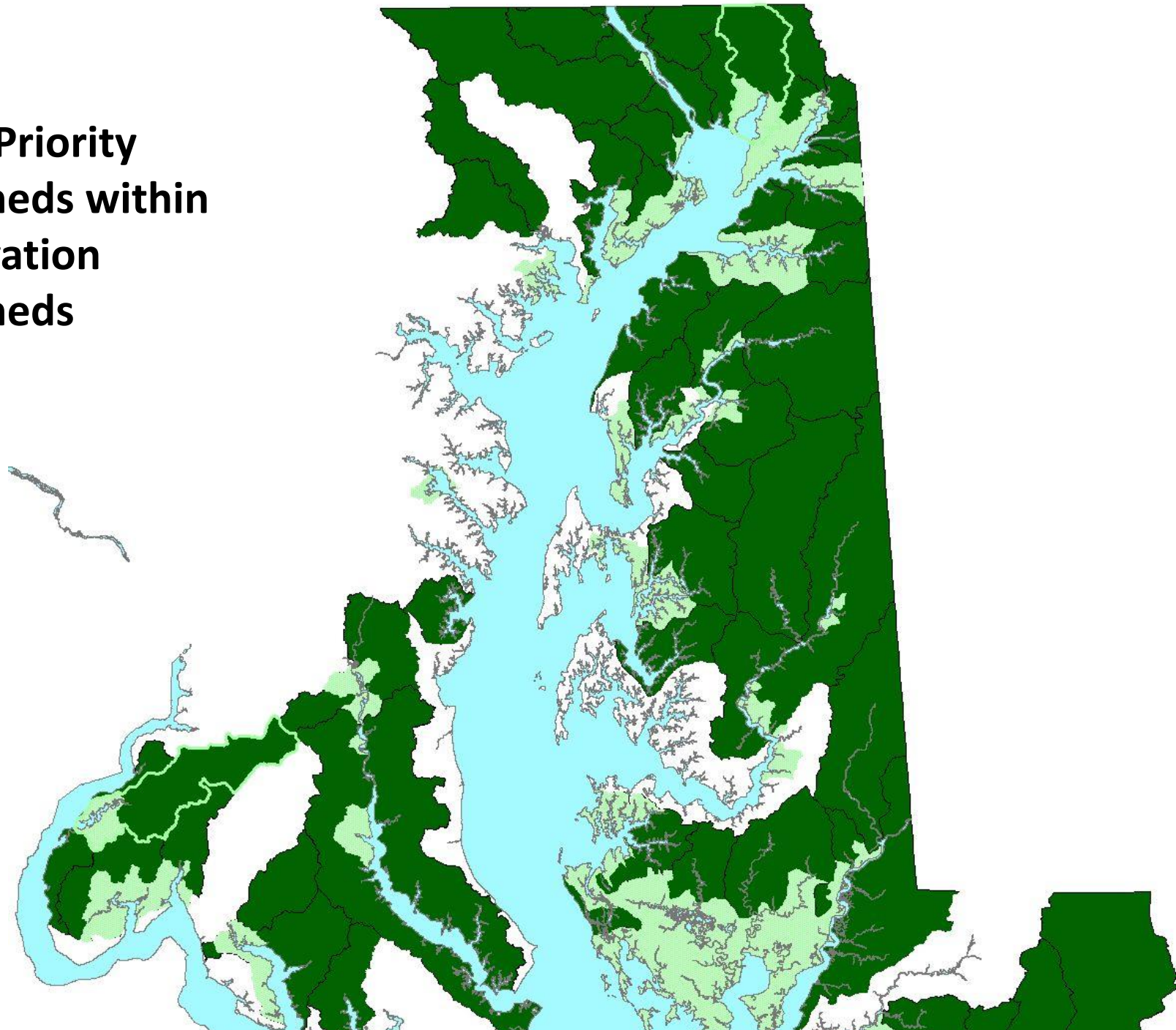


Smaller Scale Restoration Targeting Using the BI Near Shore Assessment

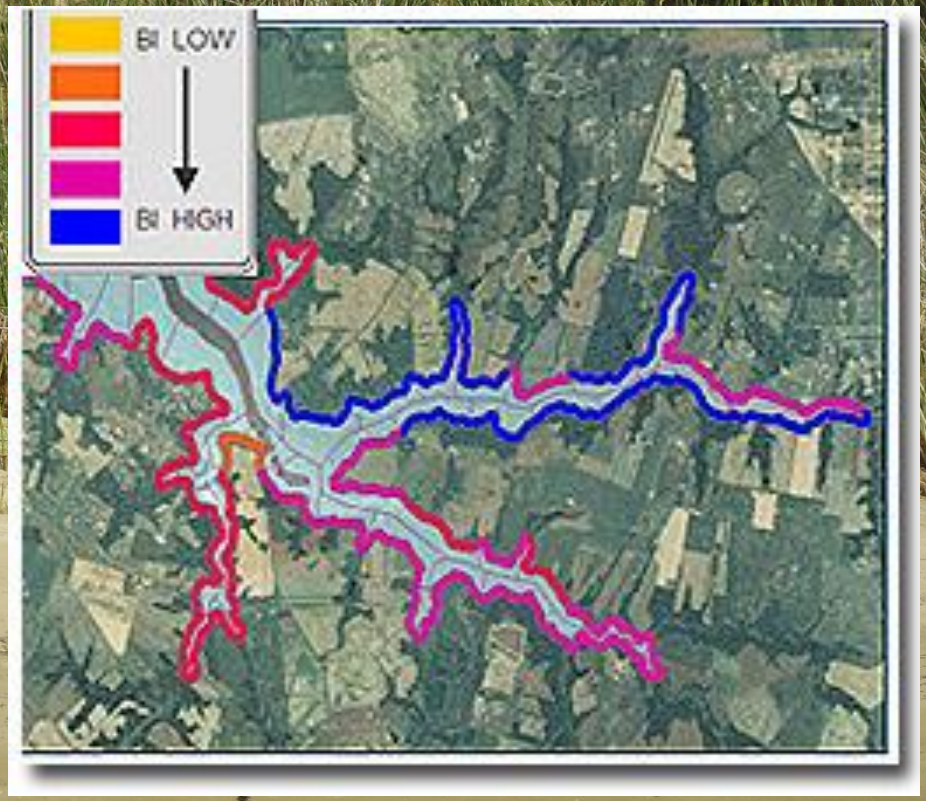


A detailed spatial evaluation of coastal habitat, critical natural resources and associated human uses in the tidal waters and near-shore area of Maryland's coastal zone.

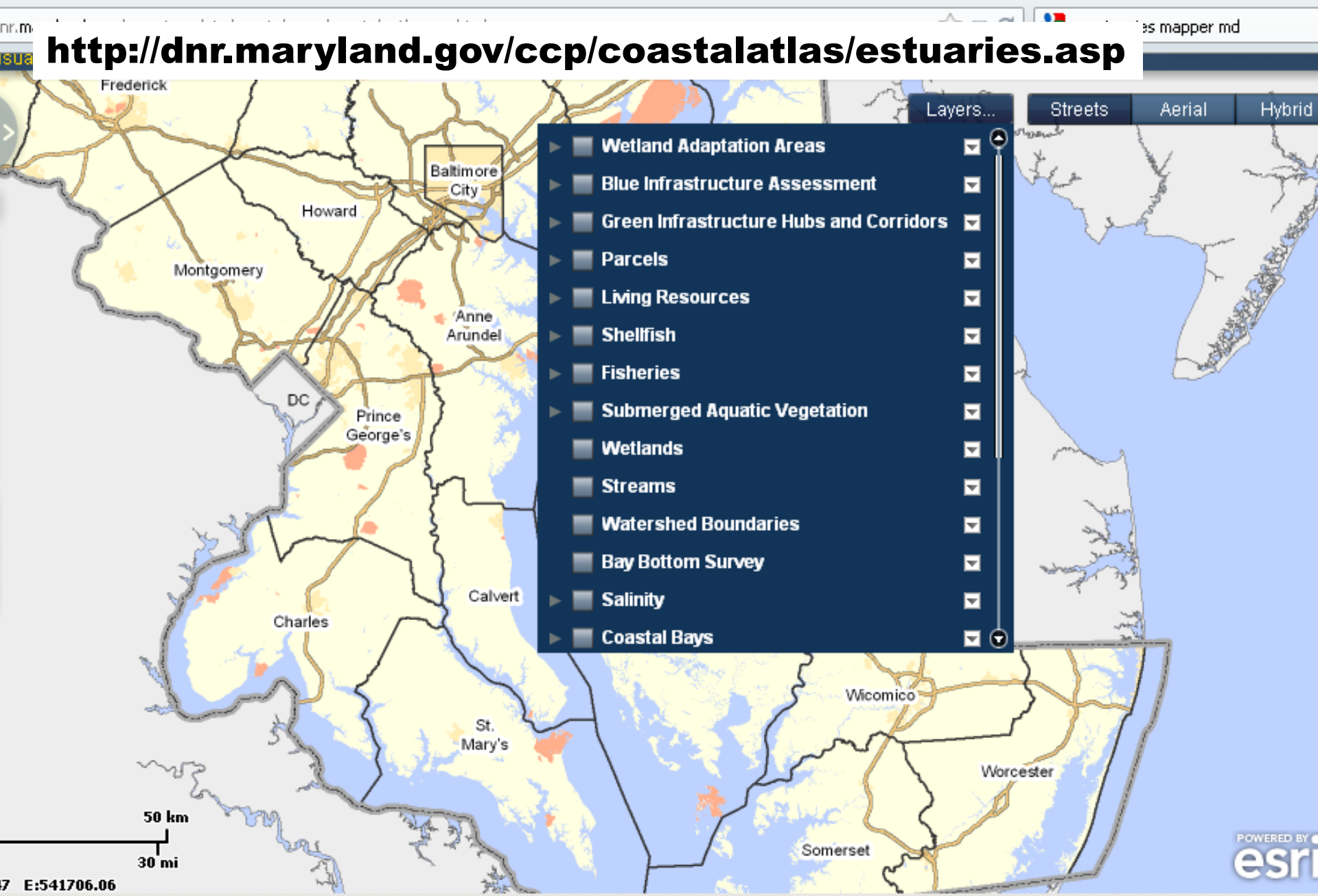
BI High Priority Watersheds within Conservation Watersheds



BI Ranked Segments



http://dnr.maryland.gov/ccp/coastalatlas/estuaries.asp



Recommendations:

Target (biological) restoration in rural watersheds

Develop effective marketing strategies that encourage localities to embrace conservation vision