Development, Stressors, Habitat, and Fish Community Changes in Mattawoman Creek

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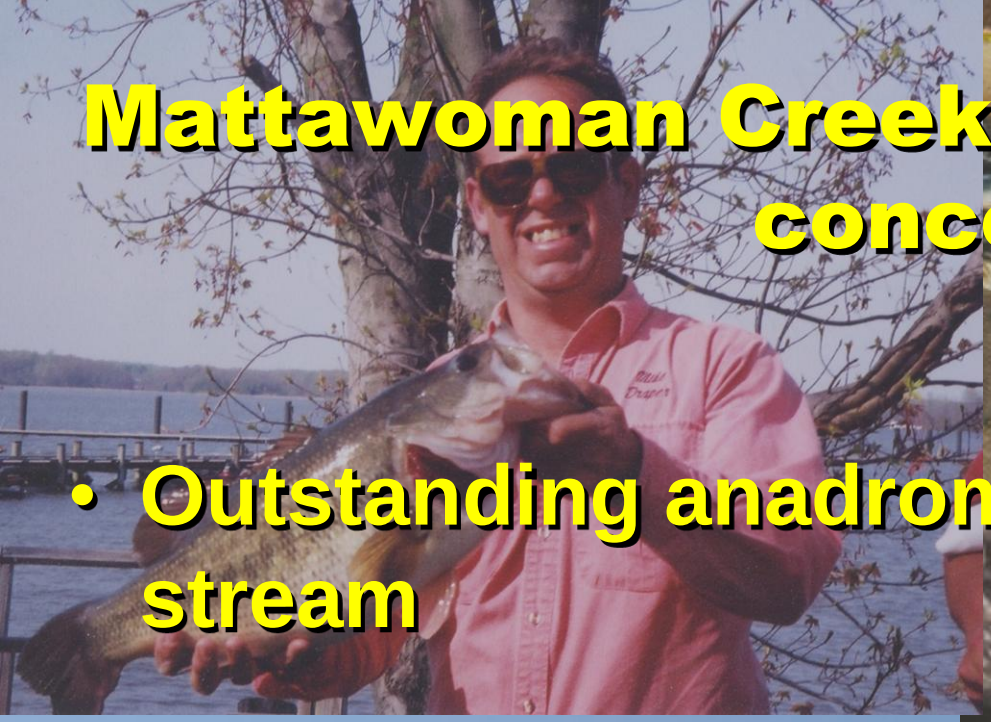
Fisheries Service
MD DNR
With lots of assistance from
Tidewater Ecosystem Assessment (TEA)

Mattawoman Creek: Fisheries Service concerns



- Outstanding anadromous fish spawning stream

- Diverse & abundant tidal fish community
- World-class tidal largemouth bass fishery

"Bad things" associated with increased development impact fish habitat

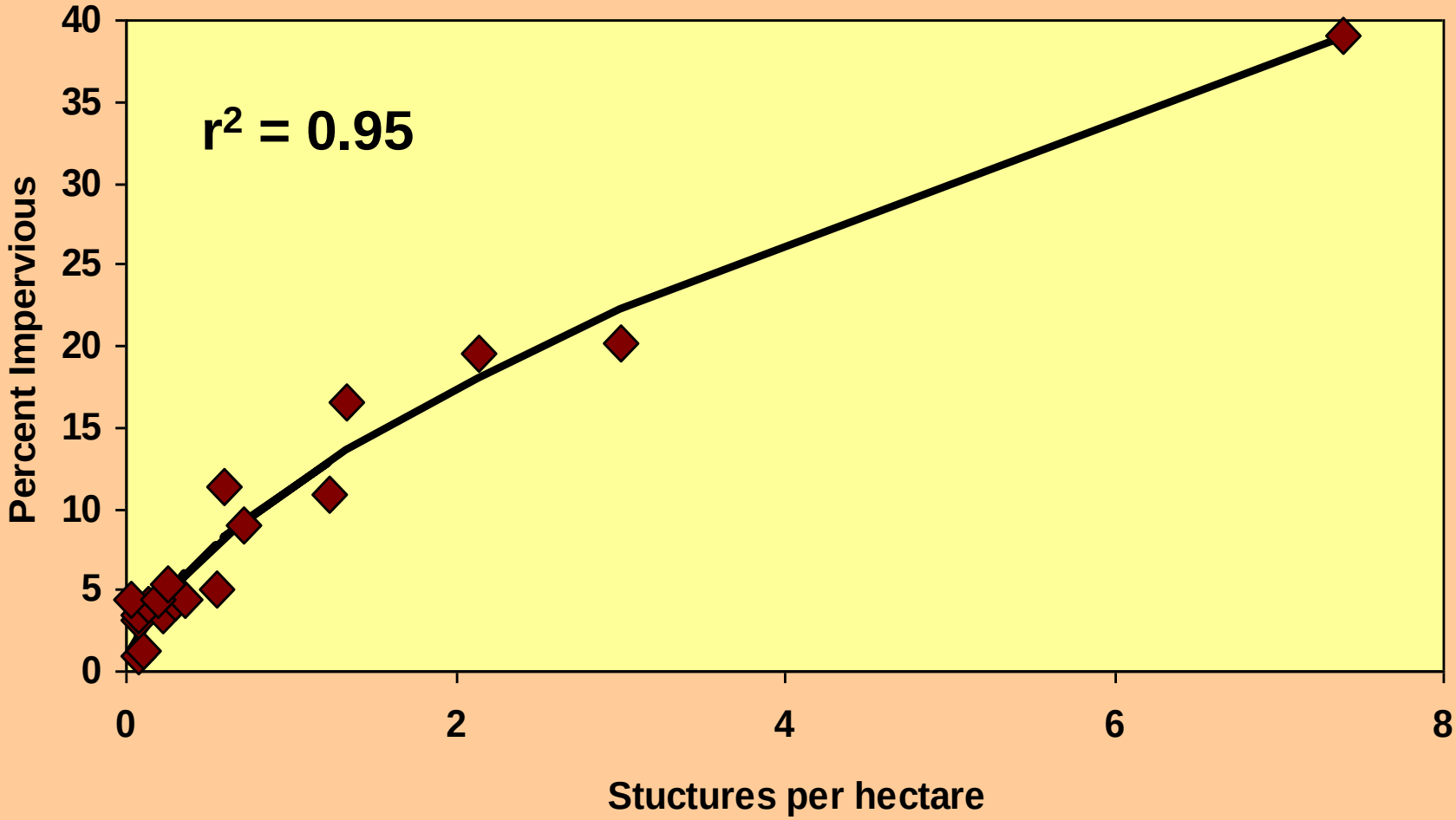
- Increased nutrients and decreased dissolved oxygen
- Increased contaminants
- Increased sedimentation
- Disrupted flow regimes
- Increased water temperature

Impervious surface indicates intensity of development

- Impervious surface = pavement, roof tops & compacted soil
- Rural = 5% impervious surface or less
- Suburbs = 10% impervious surface or more
- Towson U. estimates made in 1999-2000

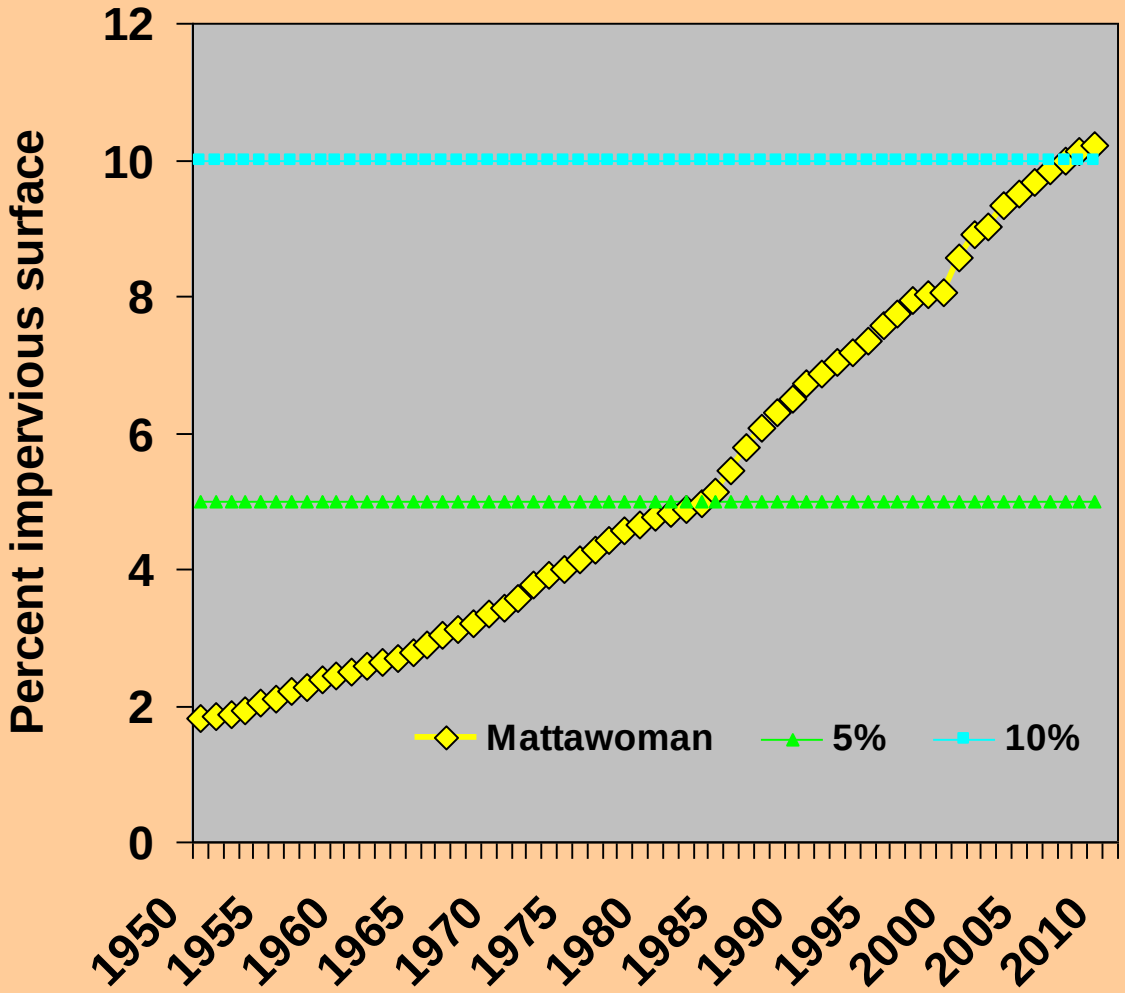
Structures per hectare in watershed from Md tax maps are related to impervious surface estimates (year = 2000). Generate % impervious history, 1950-present.

Structures = MD Dept of Planning data. Watershed-specific estimates by Marek Topolski, Fisheries Service

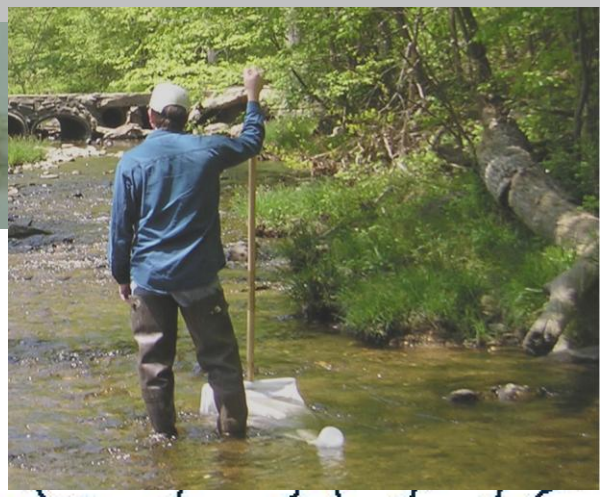


Percent impervious surface and benchmarks

MD Dept of Planning data. Watershed estimates by Marek Topolski, Fisheries Service

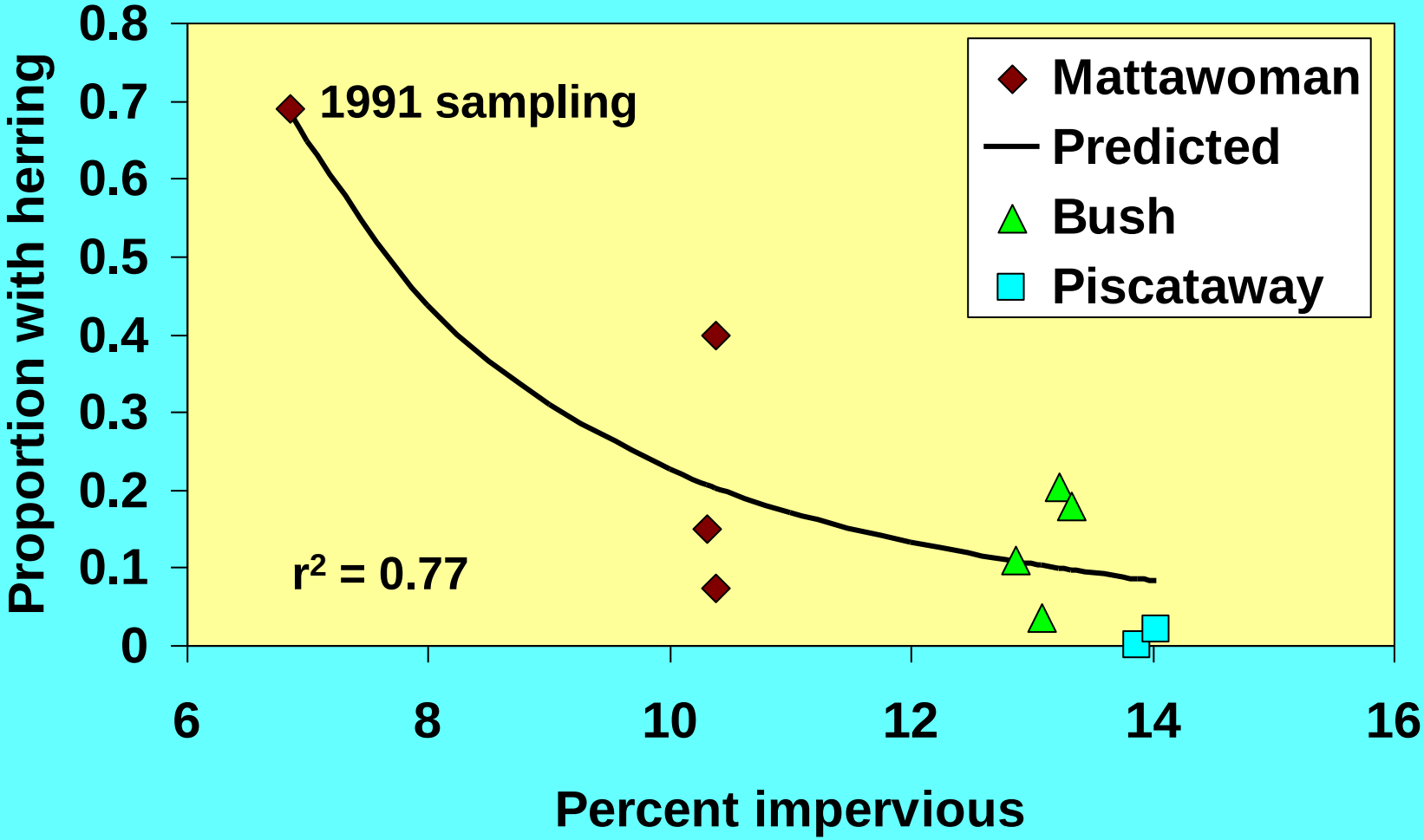


Mattawoman's stream is spawning habitat for anadromous fish

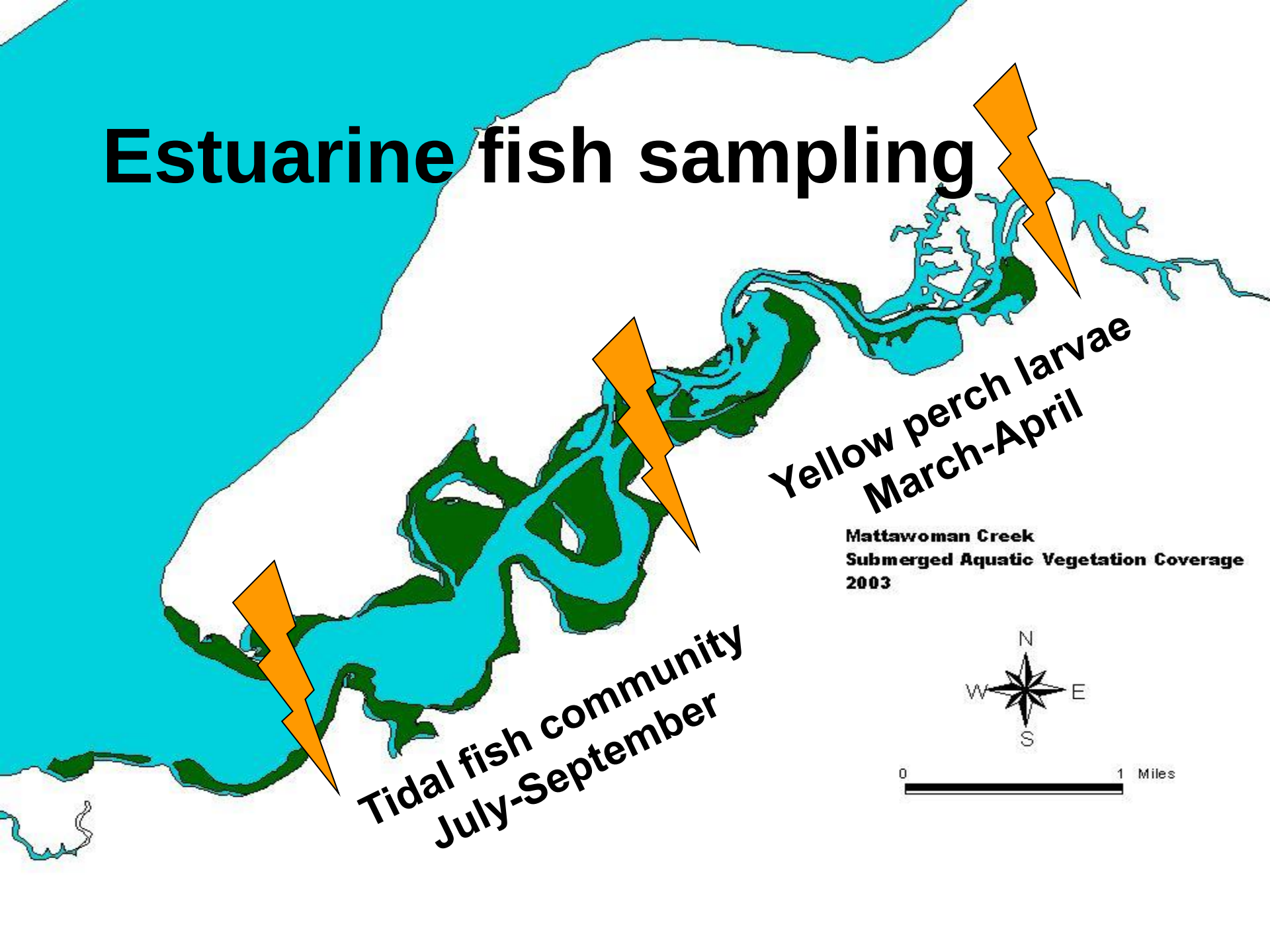


Volunteers redid 1971 anadromous fish stream survey in 2008-2010 to explore development's effect.

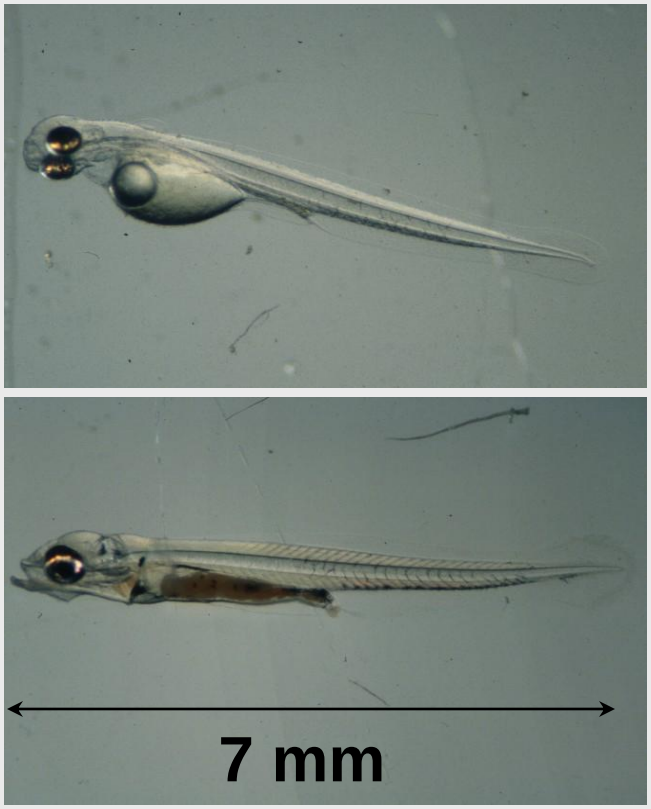
Proportion of stream samples with herring eggs or larvae versus impervious surface (2005-2010 & 1991)



Estuarine fish sampling



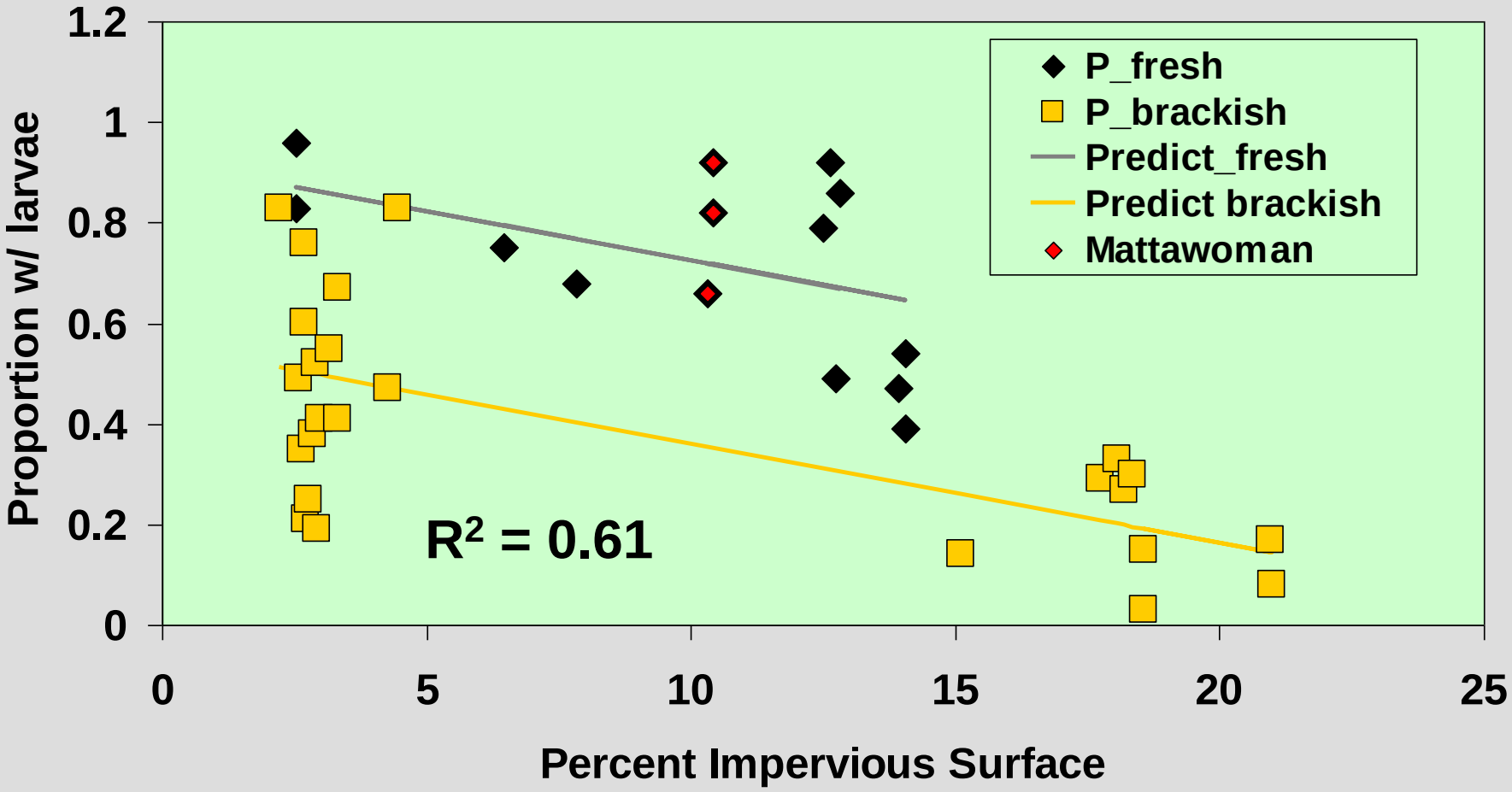
Estuarine yellow perch larvae were sampled with plankton nets towed from boats



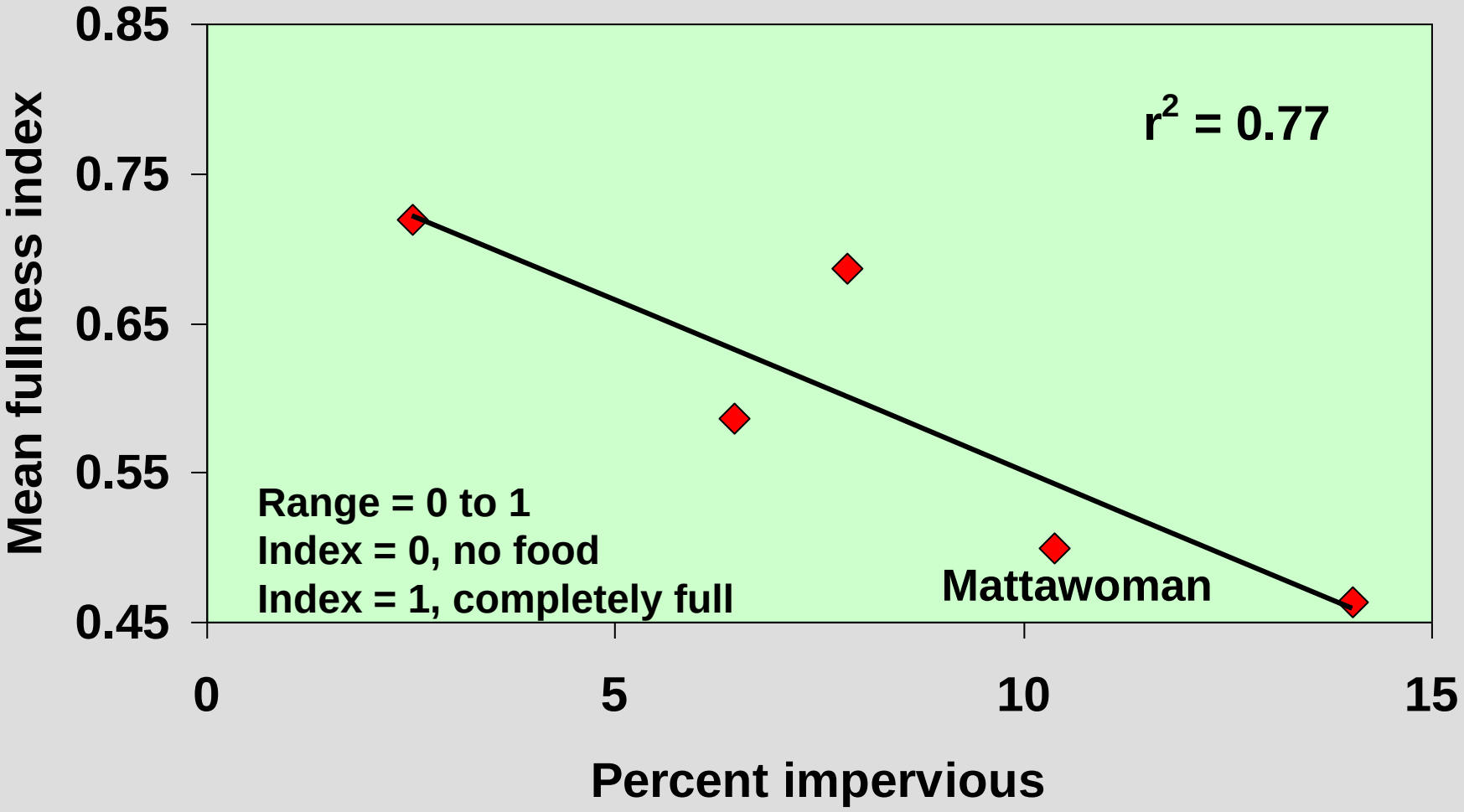
2010 – Start looking at feeding success; important to survival

Proportion of tows with yellow perch larvae declines with development in tidal-fresh and brackish subestuaries

(fresh and brackish as categories in regression)



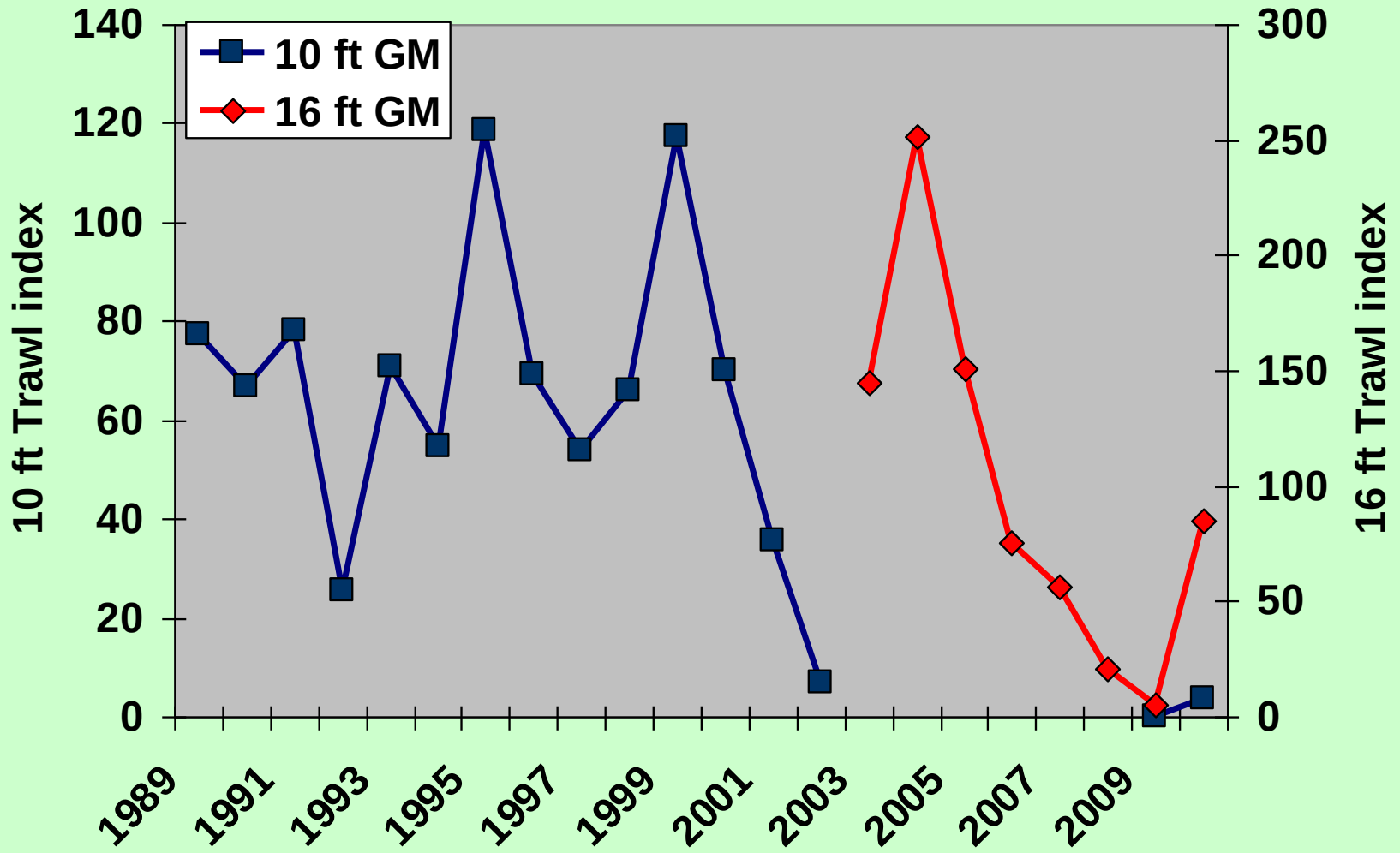
Early larvae feeding success on zooplankton in 2010 was negatively related to development in 5 subestuaries



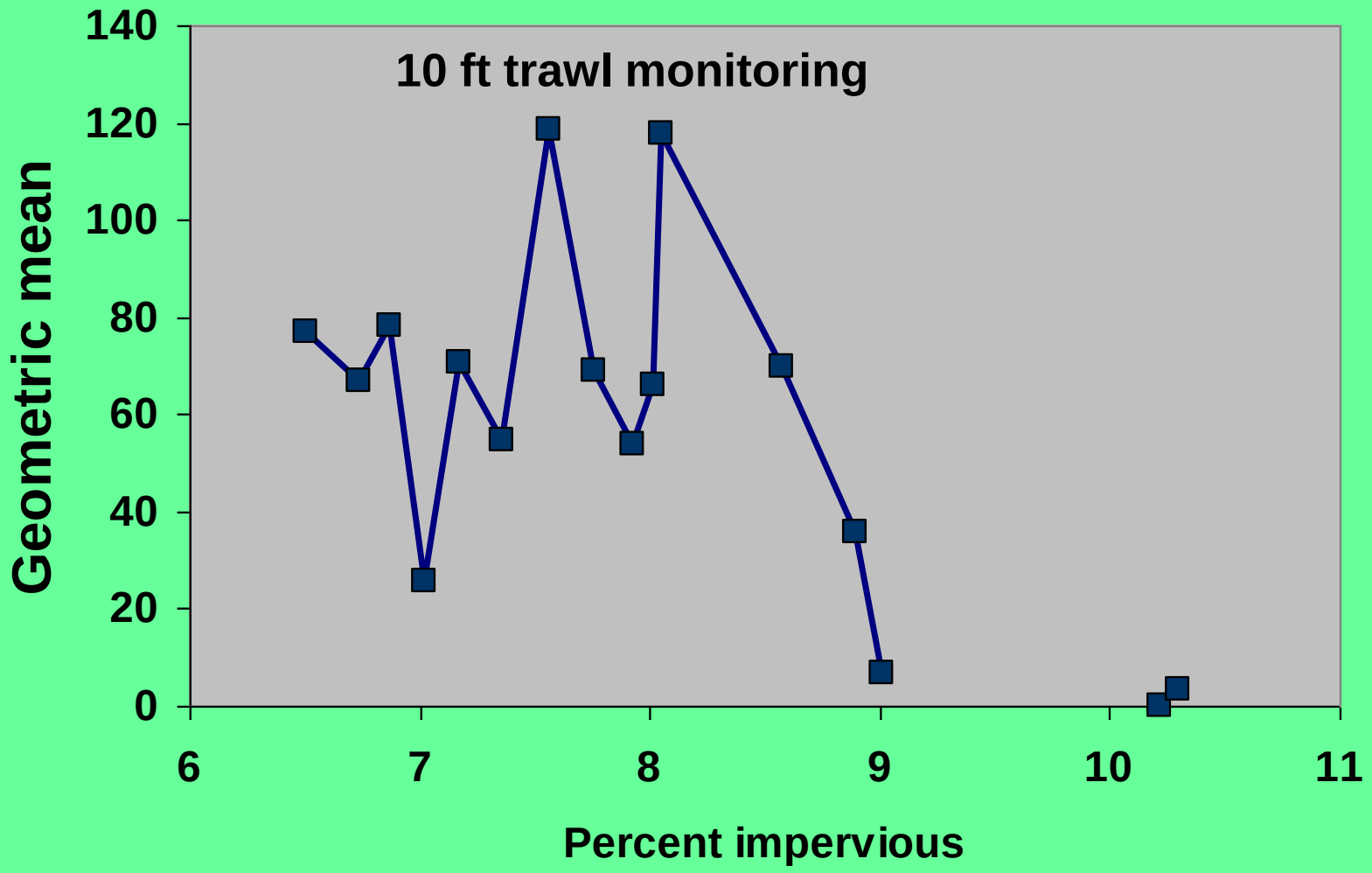
Summer habitat and fish community sampling

Mattawoman Creek : relative abundance of all fish species in summer trawl sampling.

10 ft trawl less efficient than 16 ft.



Suggests fresh-tidal fish community impervious surface threshold.



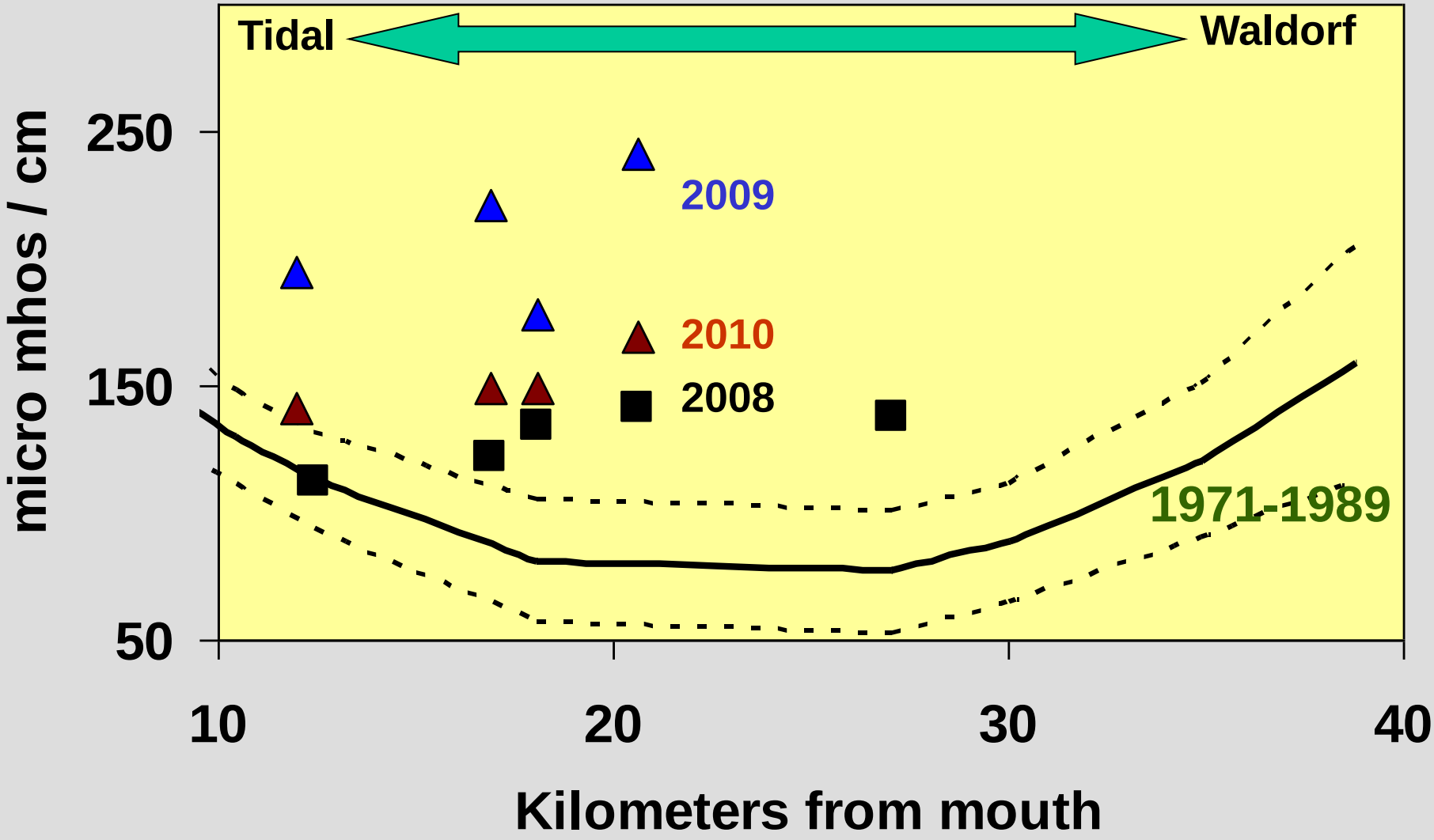
Some fish trends (trawl monitoring)

- Sunfish species & bass more abundant (SAV = structure)
- Spottail shiner abundant
- White and yellow perch still there
- Herring, American shad and gizzard shad, once common, now rare (stream spawners and open water plankton feeders)

Habitat Stressors

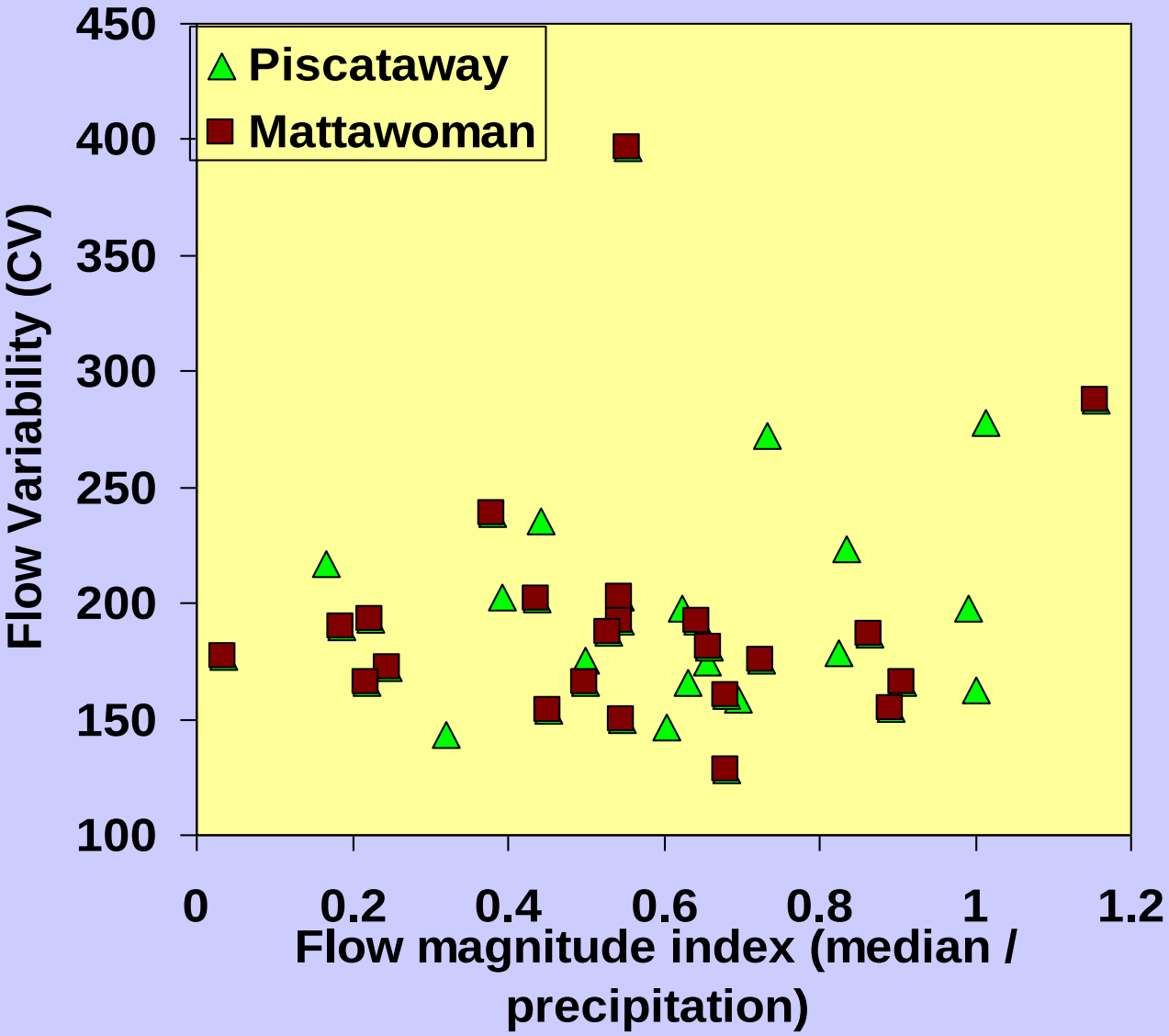
Changing non-tidal stream chemistry: increased conductivity indicates development impact spread downstream.

All season 1971-1989 trend & 95% CI and spring 2008-2010 spawning survey site means (symbols).



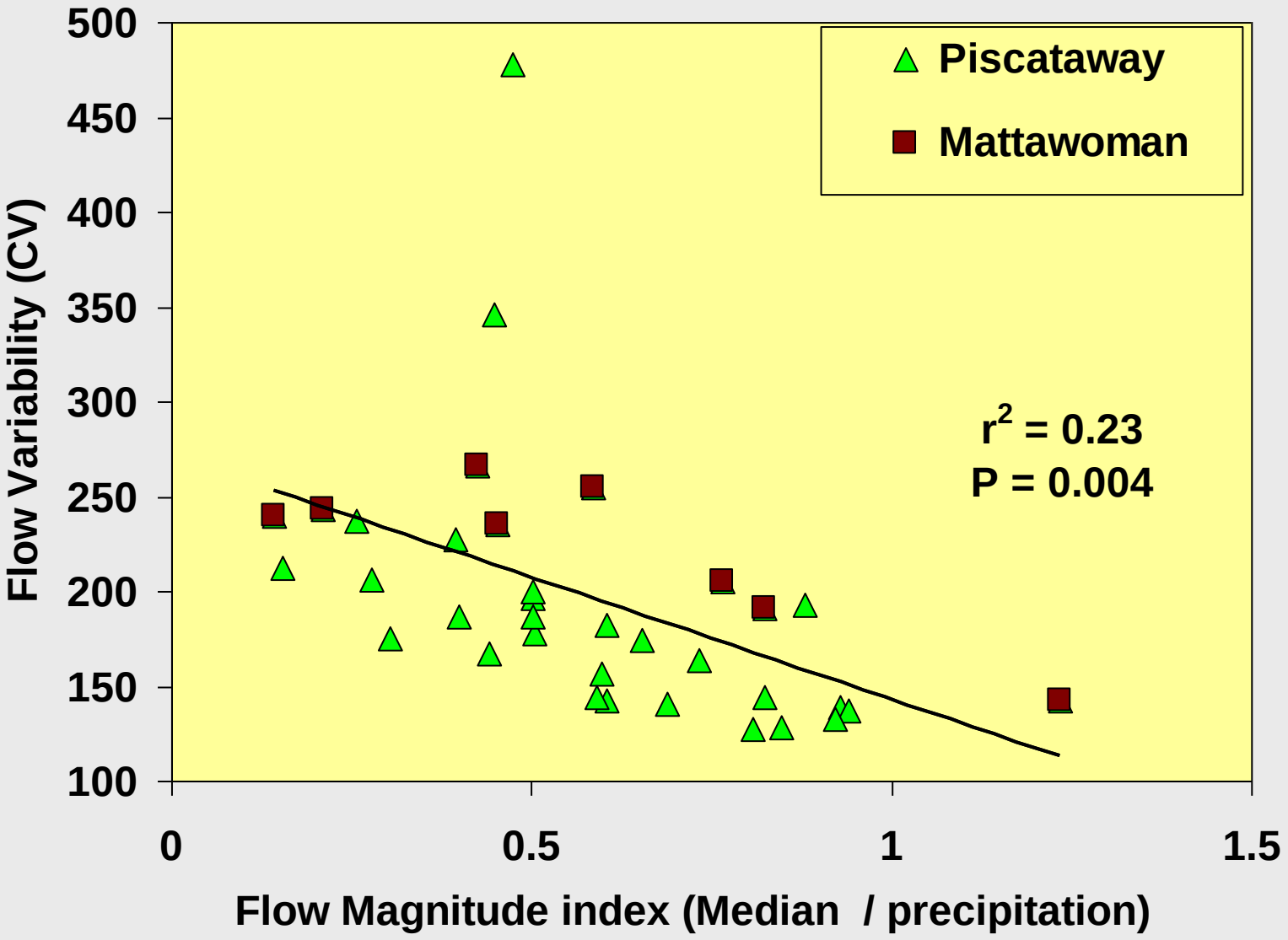
Stream flow and variability - impervious surface less than 9%

Annual median flow (cfs) / precipitation (in) versus variability (CV = coefficient of variation) in Piscataway (1966-1980) and Mattawoman creeks (1950-1972).



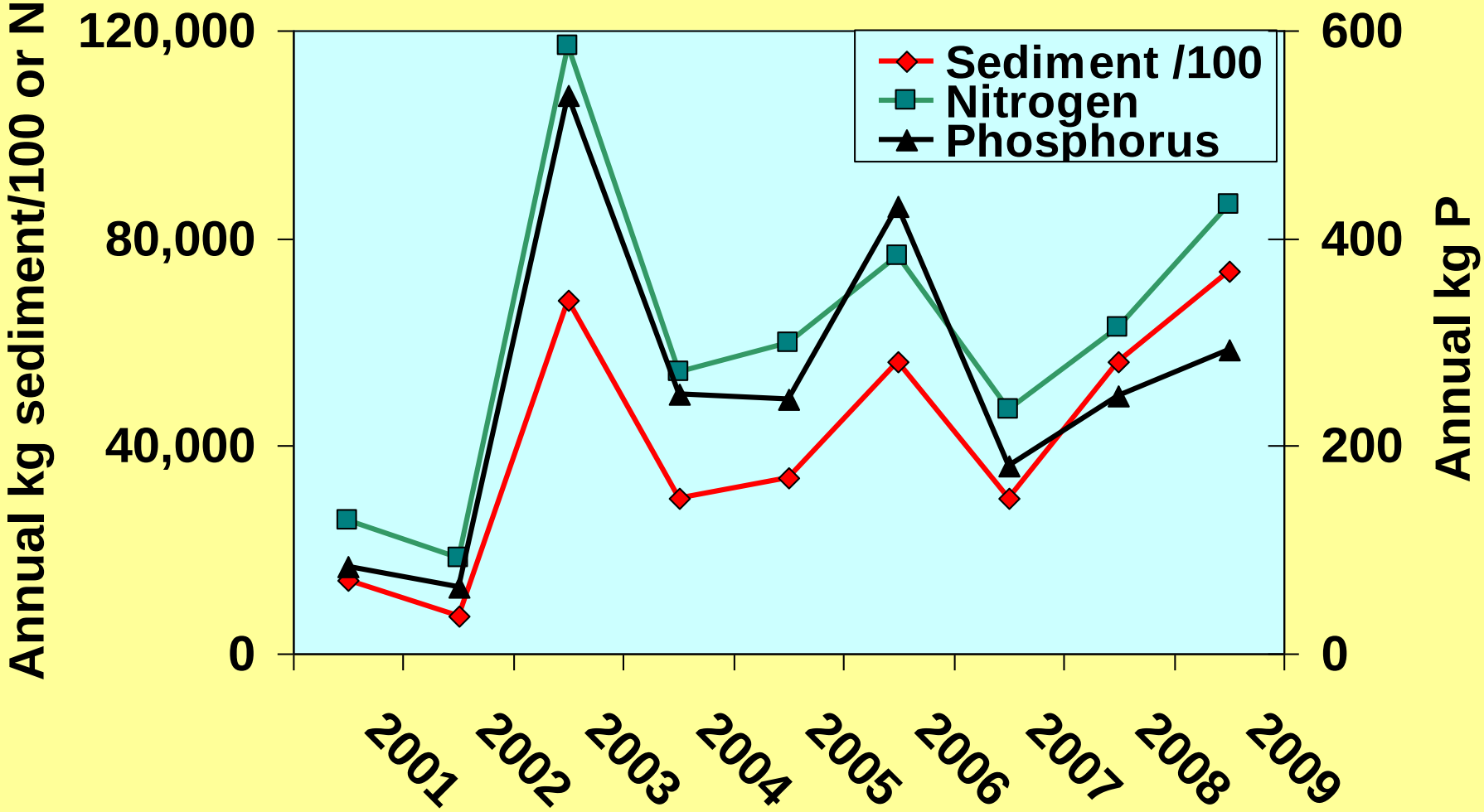
Stream flow and variability - impervious surface 9% or more

Annual median flow / precipitation against CV in Piscataway (1981-2008) and Mattawoman creeks (2001-2008).



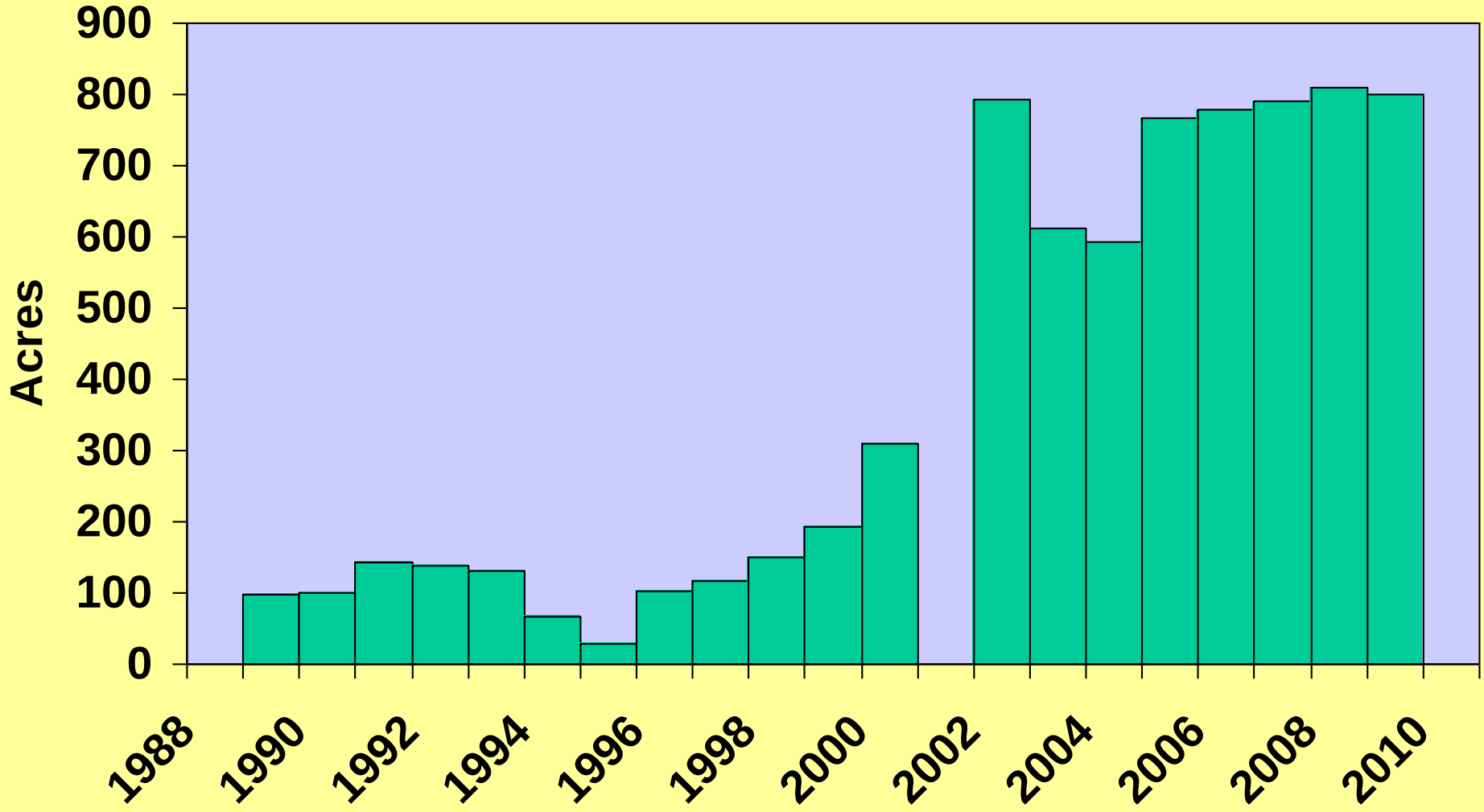
Mattawoman Creek: Annual total suspended sediment, nitrogen and phosphorus at USGS gauge

Sediment delivers nutrients.

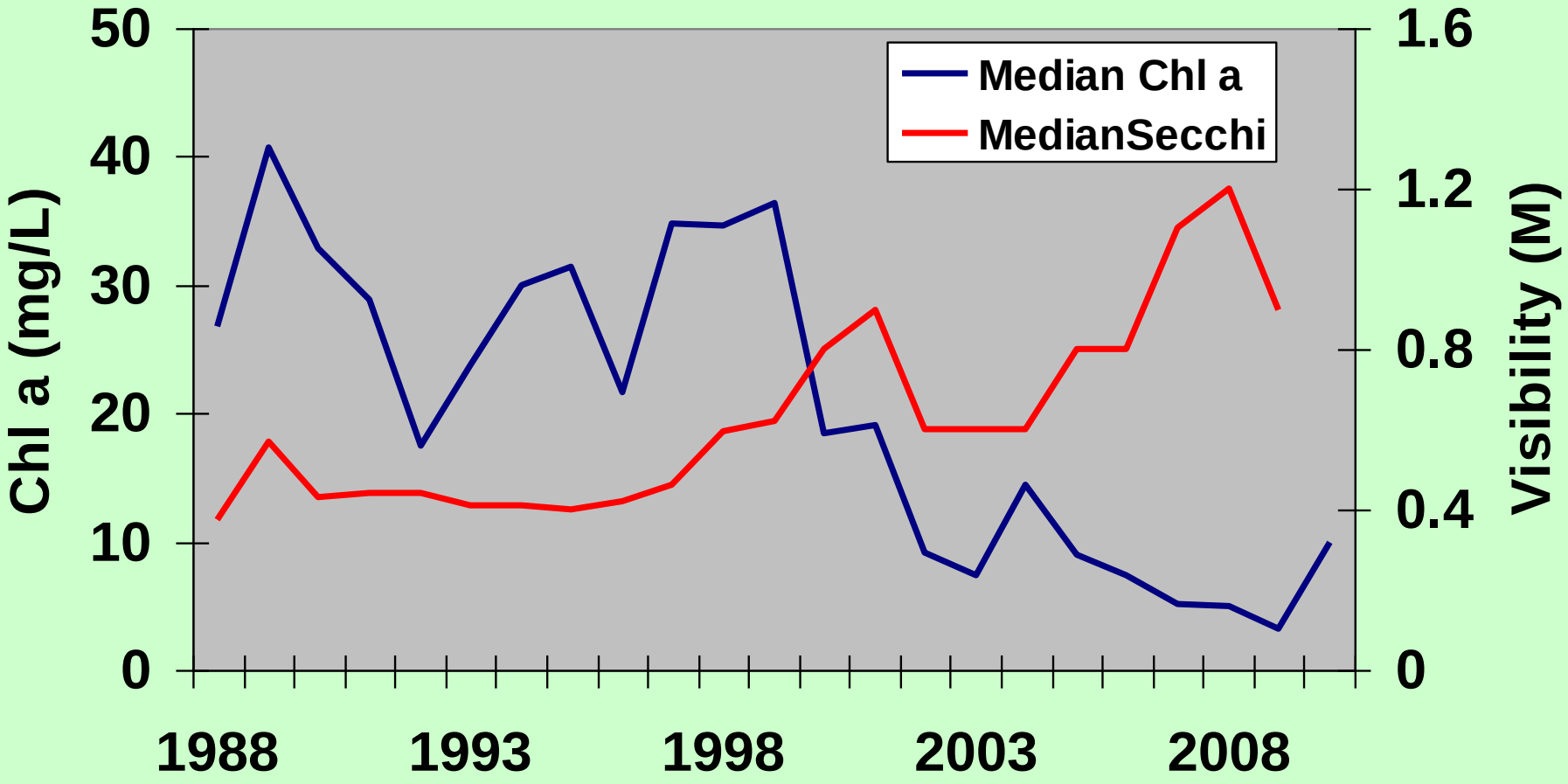


SAV acreage

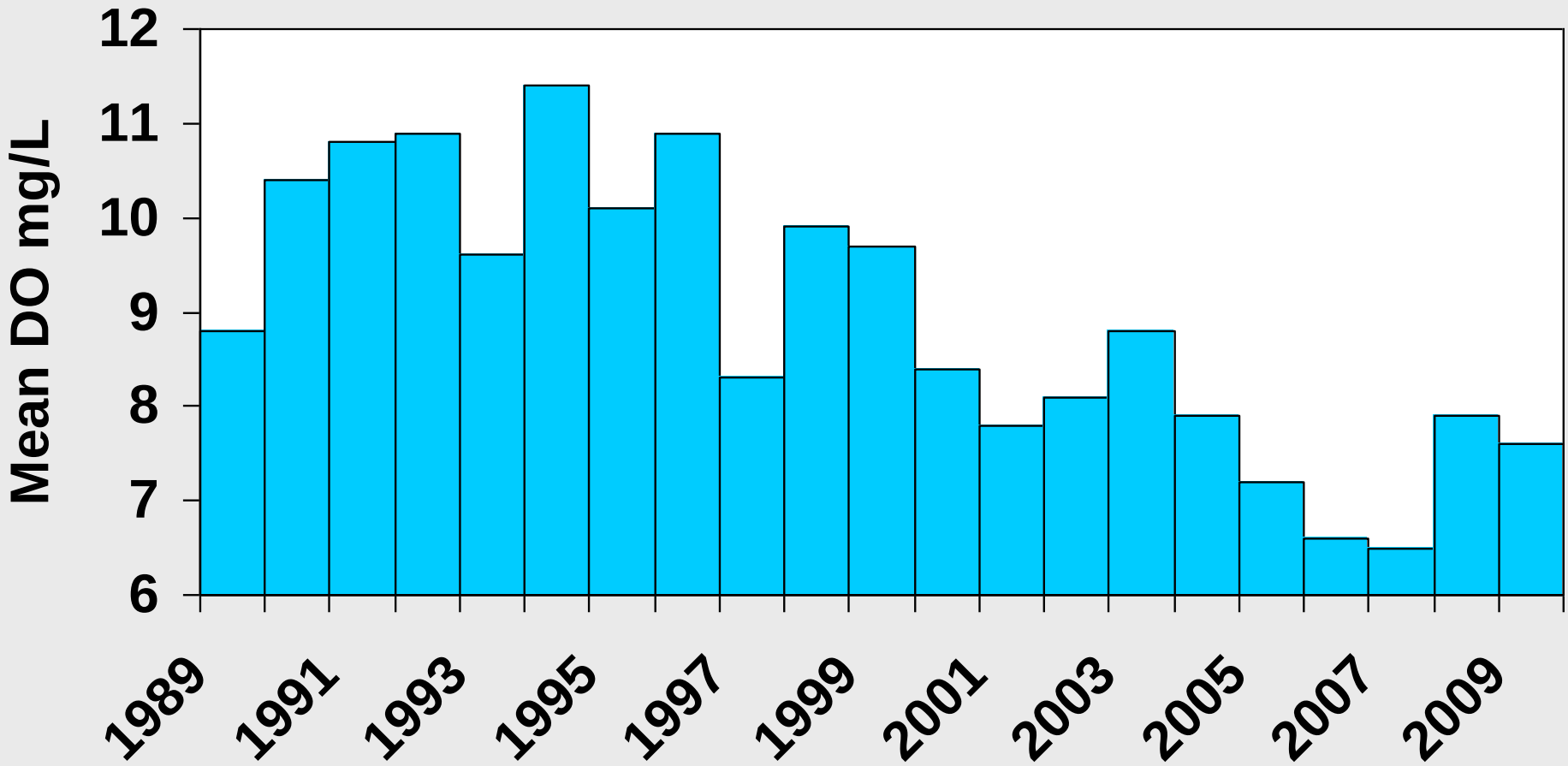
(from TEA)



Median summer water column Chlorophyll a (algae; TEA) and summer Secchi depth (visibility)

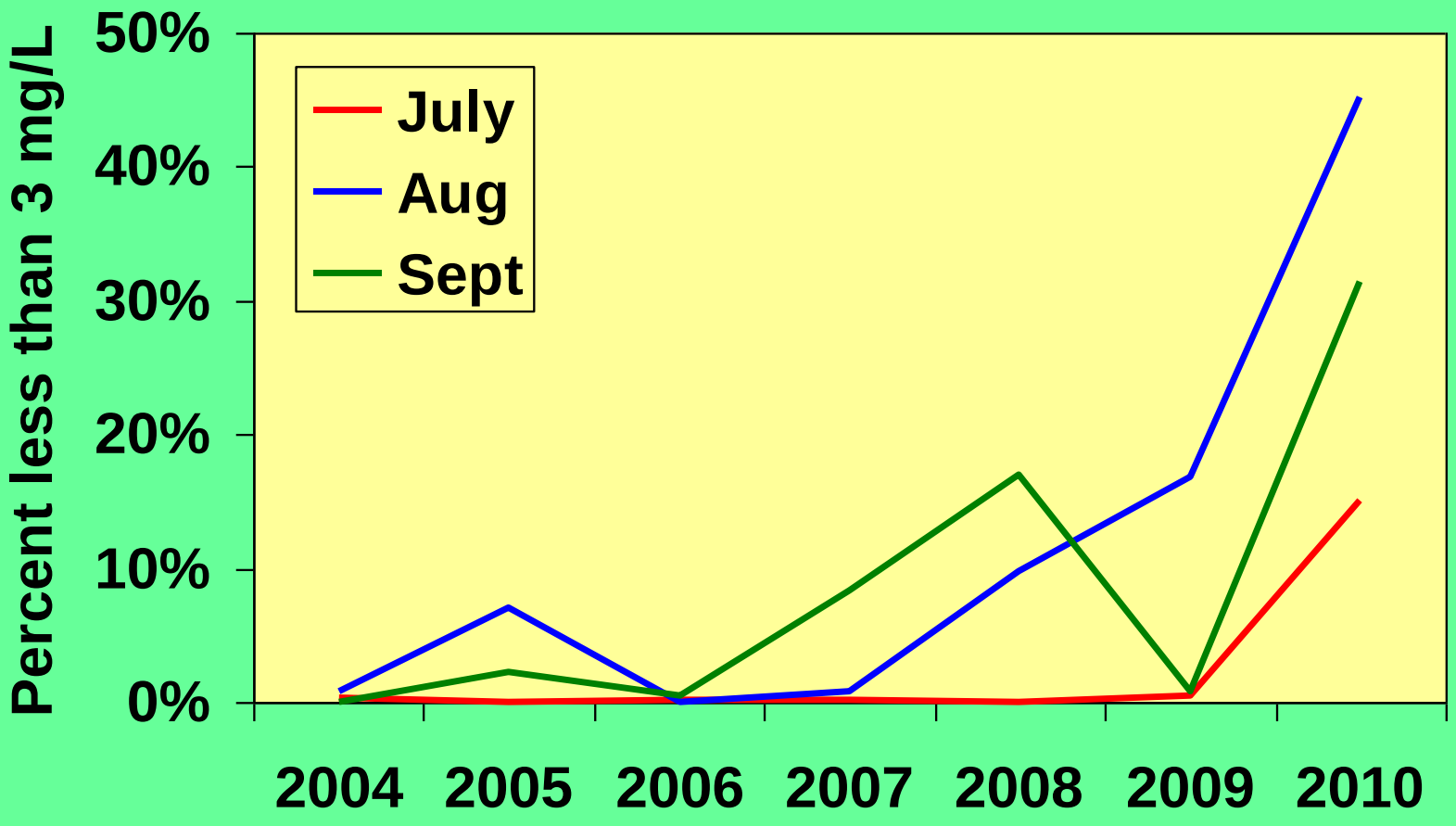


July-September channel mean bottom DO in channel, 1989-2009



Shallow water (potentially SAV-related) DO problem at Smallwood Park Marina. We don't know the extent.

Percent of DO measurements below 3 mg / L threshold at TEA continuous monitor in dense SAV.



Over 7,000 largemouth bass are released each year at Smallwood State Park Marina by tournament anglers

An aerator has been installed in 2011 to prevent death of released fish

A volunteer-based assessment of the extent of low DO in SAV beds started in July, 2011.

Fish encounter multiple development-related stressors

Watershed

Road salt
Sediment
Flow change
Contaminants
Nutrients
Detritus

Streams

Tidal-fresh estuary

Salinity
Zooplankton
Contaminants

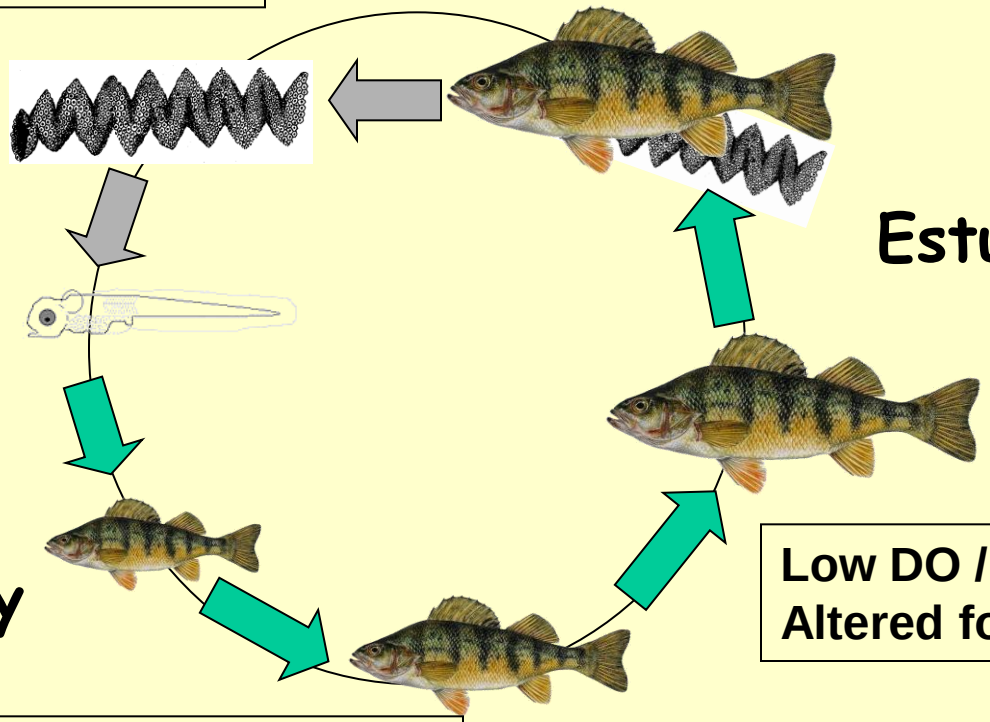
Estuary

Low DO / high nutrients
Altered food web?

Estuary

Low DO / high nutrients
Altered food web?
Endocrine disruptors?
Harvest

Estuary



Impervious surface reference points

- < 5% impervious - harvest restrictions & stocking; preserve watershed
- 5-10% - option to decrease harvest & stocking to compensate. Preserve & fix watershed
- >10% - preserve & fix watershed. Managing harvest & stocking not sustainable strategies.
- >15% - watershed & fishery solutions limited

Planning and zoning is fisheries management!!!

- Development is the source of stressors too extensive for fisheries managers to "go it alone"
- Local development plans are a proactive approach to managing land use and fish habitat
- New DNR effort – state natural resource managers work with local planners to protect fish habitat

Summary

- Altered stream hydrology, increased sediment and nutrients
- SAV, clarity, and channel DO consistent with “recovered Bay”
- Low DO detected in dense SAV, but extent unknown
- Fish community decline isn’t consistent with “recovered Bay” expectation
- Fish community suggests changed trophic regime
- Timing consistent with suburban transition