

Two factors that deserve more attention if we are to be successful in anadromous fish restoration programs

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UMass

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Consider...

- ✓ *If established program goals are always met - the goals are incorrect.*
- ✓ *If established program goals are never met - the goals are incorrect.*

Susquehanna Basin Goals

“By 2025, produce self-sustaining annual populations of 2 million American shad ... and provide 500,000 angling days annually...for these species.”

(Hendricks and St. Pierre 2002)

Susquehanna Program Components

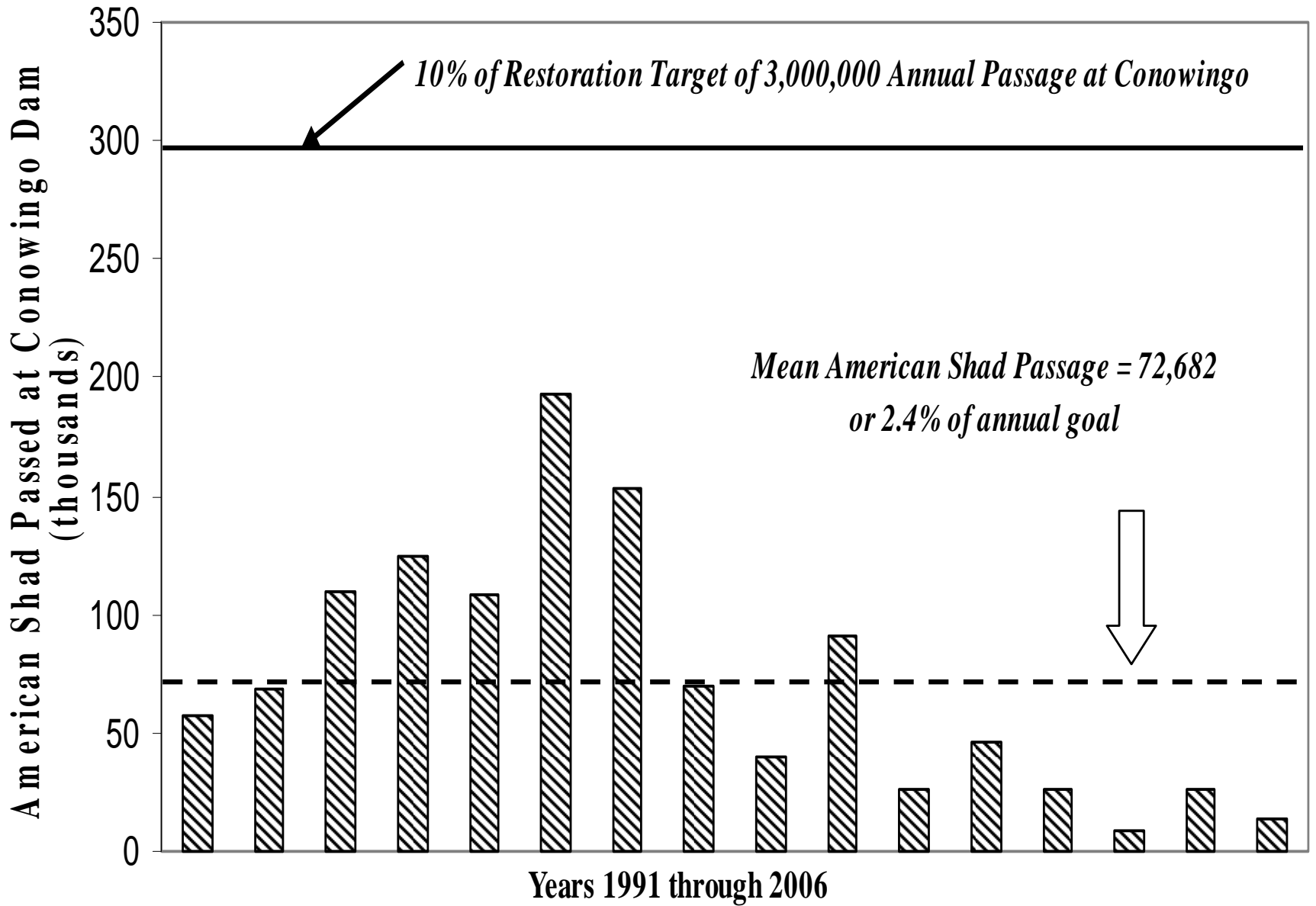
- Upstream passage at all 4 lower river dams
- Hatchery contribution of ~10M fry/year since 1984
- Out of basin transfers of adults and eggs earlier in program
- Moratorium on all fishing in MD beginning 1980
- Significant research program since early 1980's

Susquehanna Basin Limiting Factors

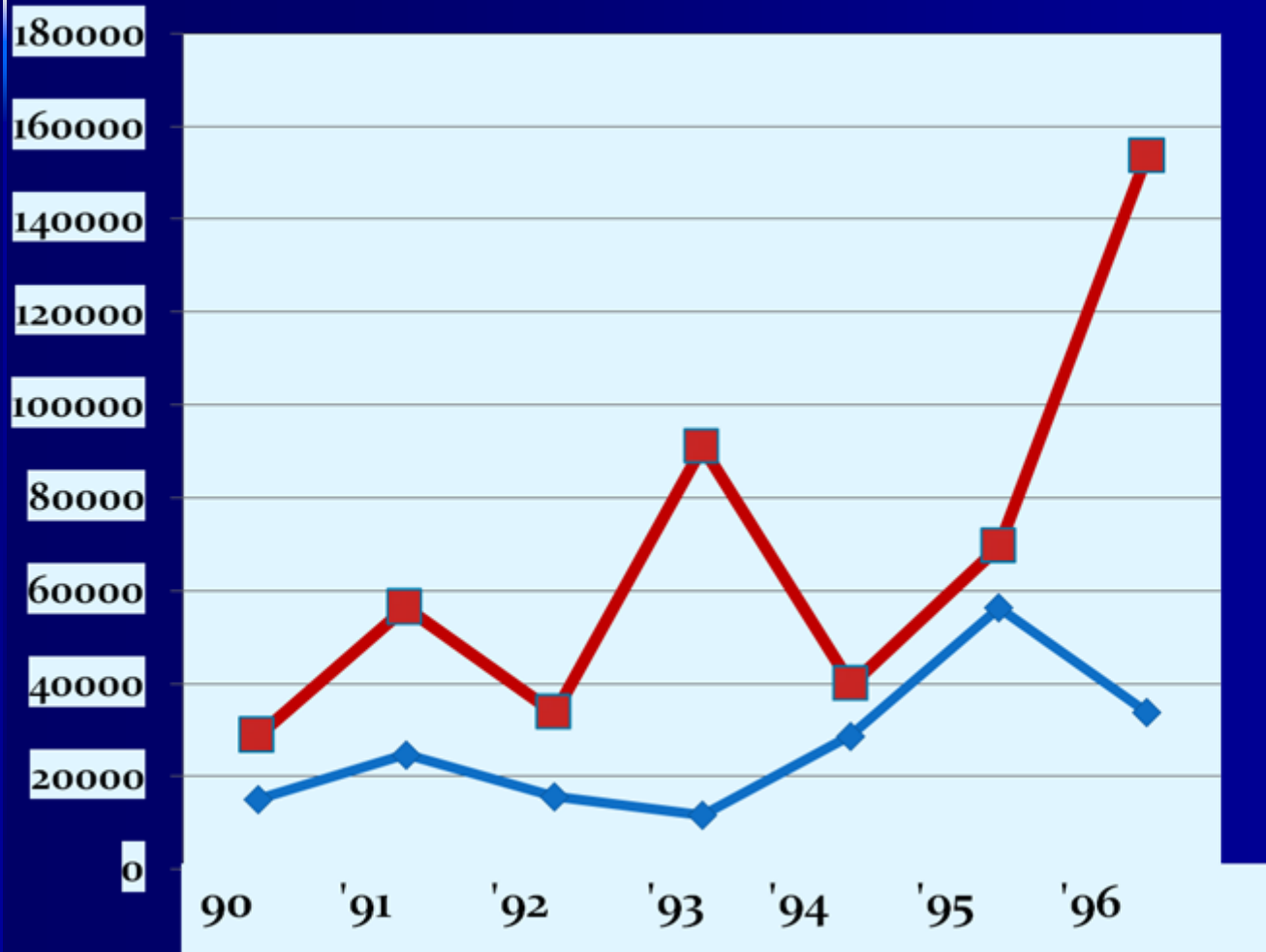
- No measurable spawning habitat between the 4 dams
- Bottleneck(s) in upstream passage (population at risk of crashing due to installation of 4 fishways)
- Run is not self-sustaining, may never be

Susquehanna River Annual Passage Targets

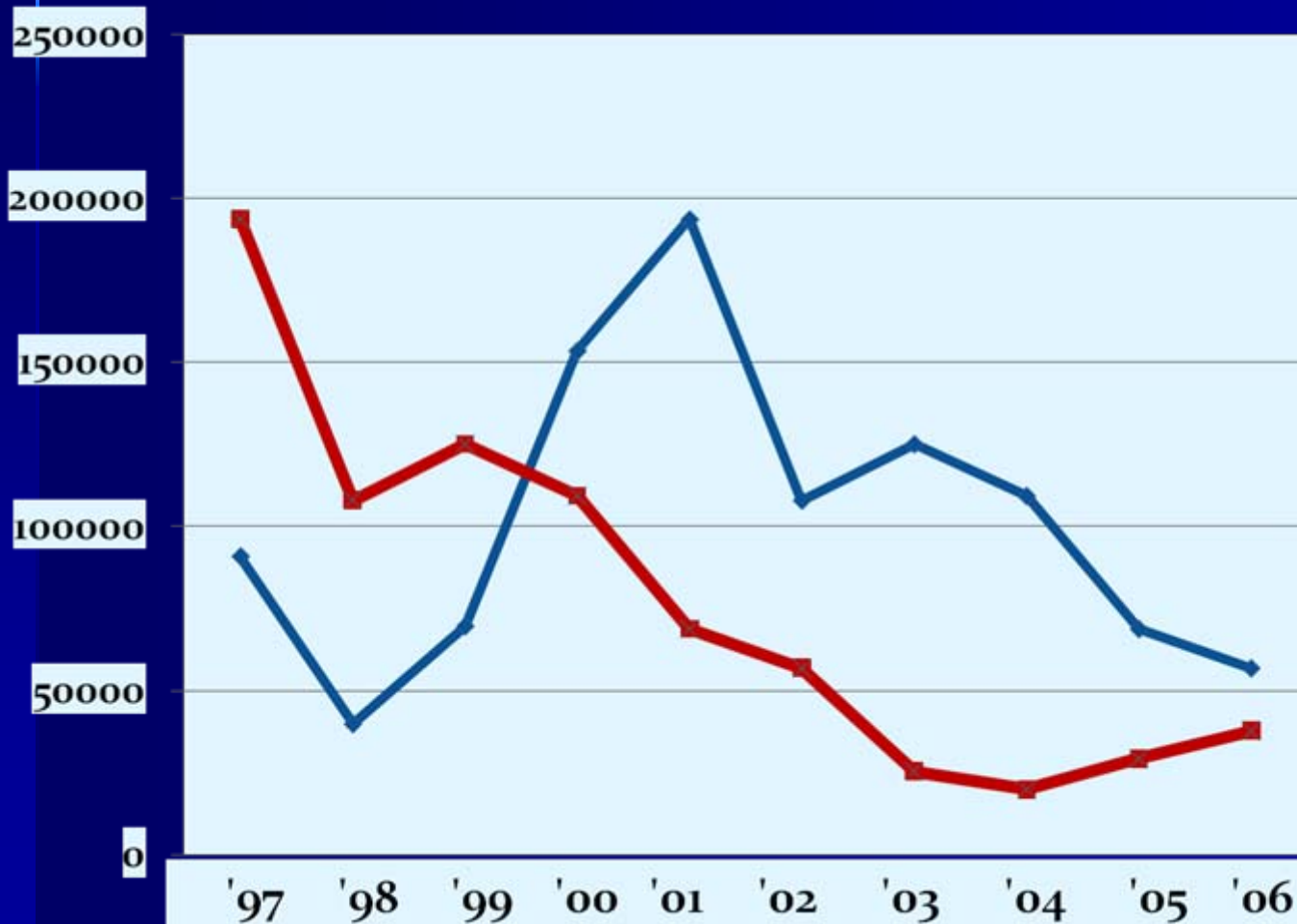
Project	Annual Target	Best to Date
Conowingo	3,000,000	193,574
Holtwood		109,976
Safe Harbor		89,816
York Haven	2,000,000	16,200



Passage at Conowingo '90-'96 (blue) and Again 4 Yrs Later '93-'00 (red)



Passage at Conowingo '97-'06 (blue) and Again 4 Yrs Later '00-'10 (red)

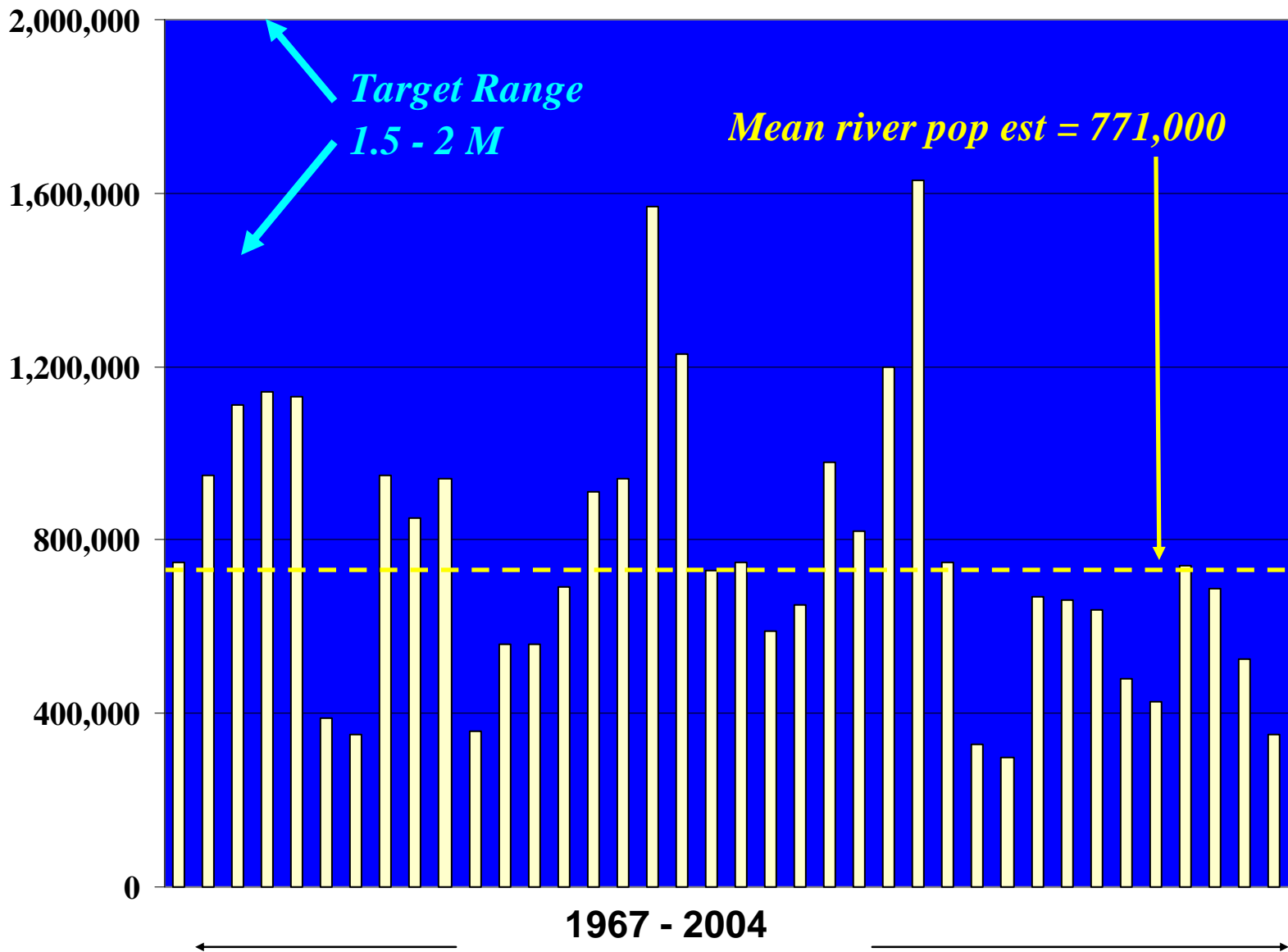


Connecticut River Goals (CRASC 1992)

- 1.5 – 2 million adults entering the river annually
- **Annual passage of 40-60% of spawning run at each dam**
- Maximum exploitation rate of 40% of spawning stock
- **Maximize outmigrant survival**
- Enhance and promote recreational fishing opportunities

Connecticut River Components

- Fish lifts at first dam, ladders at next two (lift may be installed at 2nd dam in future due to poor passage at that project)
- **Run is self-sustaining due to substantial spawning areas below all the dams therefore high passage effectiveness not necessary for self-sustaining run**
- 2nd dam has lowest passage
- **Leggett *et al.* (2004) conclusions support ours with respect to overly optimistic population target**



Connecticut River Annual Passage Targets

Project	Low Target	High Target
Holyoke (Best to Date ~ 500,000)	600,000	1,200,000
Turners Falls (Best to Date ~ 60,000)	240,000	720,000
Vernon (Best to Date ~ 37,000)	96,000	432,000

Santee-Cooper Basin Targets

	Project	Annual Target	Best to Date
	Pinopolis Lock		*
	St. Stephen		~ 600,000
	Total	~ 1,500,000	Could be 1,200,000

Santee Cooper Plan shortcomings

- Target number of 1.5M shad based on the 50 adult shad/acre approach
- **Claims to be modeled after Susquehanna program which is nowhere near the target numbers for that basin**
- Included acreage that was not spawning habitat when the 50/acre x no. acres was used to determine target population (since changed but not in the published plan)
- **No attempt to address other limiting factors such as high female exploitation, non-native fish predation/competition, etc.**
- Does not consider anticipated substantial additional urbanization in basin and the effects that will have on habitat, exploitation, etc.

Santee Cooper System Limiting Factors (that are not addressed)

- Exploitation (12:1 female:male harvest, with exploitation rates at about 40%)
- **Non-native predators – blue catfish, flathead catfish, others**
- High rate of urbanization in basin, particularly lower basin
- **Water quality due to urbanization/industry**

Pee Dee River – NC/SC

- **“Based on available information, the Yadkin-Pee Dee Restoration Plan will adopt a target of 50 [adult] American shad per acre...”**

**USFWS, NMFS, NCWRC, SCDNR
(2006)**

Pee Dee Basin Goals (and our prediction)

- Only the density target of 50 adult American shad per acre provided – no total restoration target or number of acres to be able to calculate the restored population
- **As in other basins, all the limiting factors not considered or addressed – goals likely will not be met in any reasonable time period**

Excerpt from recent DOC final prescriptions letter

“Assuring passage effectiveness is the responsibility of the [FERC] Licensee through use of the best available technology and passage expertise.”

A Key Point

While it may be the licensees' responsibility to provide effective fish passage, defining the fish passage/population targets is totally out of the licensees' hands. These become unending or unsuccessful programs because of insufficient attention to other limiting factors and unrealistic program goals.

Observations

- Redistribution of shad populations over more of a basin, but no sustained population growth
- **After many life cycles, populations are far short of targets**
- Little evidence that targets can be reached

Problems with Past Target Setting

- *Habitat = Fish* is not necessarily valid, yet has been the primary (maybe sole) premise for target setting
- **Little if any actions taken to reverse limiting factors other than fish passage. Focus is on FERC licensees; simplest and least costly steps often ignored or overlooked**
- Few if any use of models to predict and then evaluate actions and performance
- **Narrowly focused, often inflexible policies**
- No validation of previous target setting approaches
- **No accountability, simply reset the clock**

Recommendations

- Critically review agencies' methods/targets and comprehensive plan(s)
- Agencies need to objectively evaluate the '50 adult shad/acre' approach, including adequate field studies of quality and quantity of habitat and fish sampling to validate density (or preferably do away with this density approach)
- River systems differ - use models tailored to the system to predict and then evaluate performance
- Accountability on agencies – include restoration milestones/schedule, 'adaptive management' – what will we do if agencies predictions and assumptions are wrong or overly optimistic?
- Consider risks of passage and redistribution of a target population (as well as non-target populations)
- Minimize the impact of other limiting factors with same zeal as seen in prescribing fishways