

Presented at

# Great Rivers Reference Condition Workshop

January 10-11, Cincinnati, OH

Sponsored by

The U.S. Environmental Protection Agency and The Council of State Governments



**EMAP**  
Great River Ecosystems



U.S. EPA Office of Research and Development

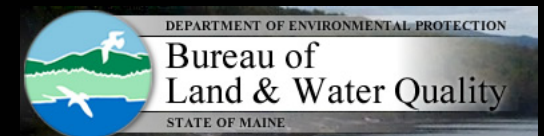
Environmental Monitoring and Assessment Program

# Potential Uncertainties in Great River Biocriteria:

## An example from the rehabilitation of the Kennebec River (Maine)



Andrew F. Casper , James H. Thorp, Susan P. Davies and David L. Courtemanch.



## **Workshop Goals:**

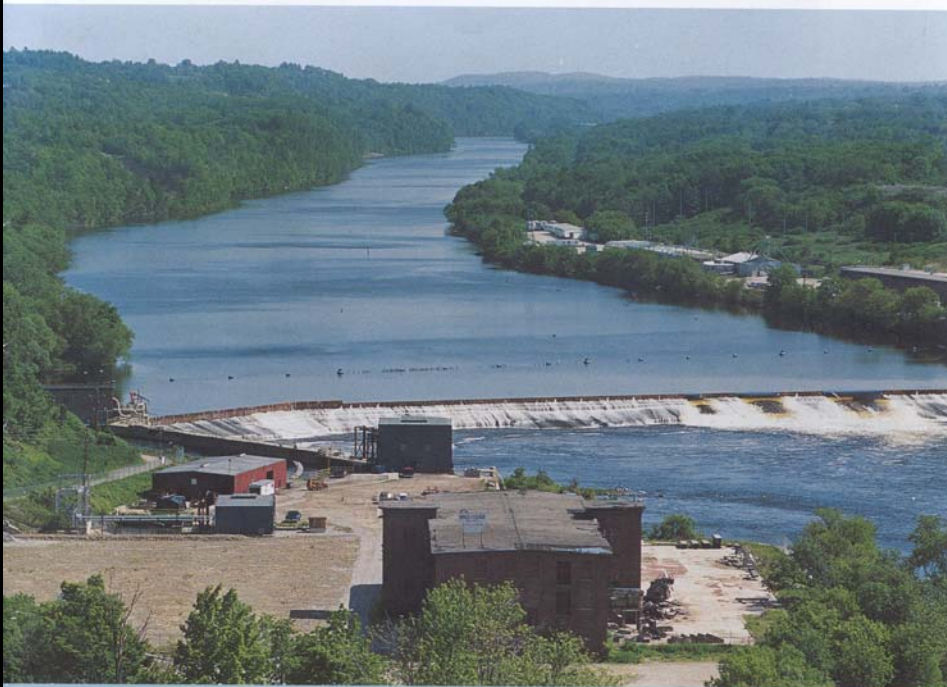
- developing reference biocriteria
- defining reference conditions / sites

## **Goals for this Presentation:**

- Do not focus on impairments alone  
(e.g. rehabilitation)
- Assessment / Management are situation specific (i.e. they influences choice of reference site/conditions as well as biocriteria)



## A River Reborn



Benefits for People and  
Wildlife of the Kennebec River  
Following the Removal  
of Edwards Dam

THE KENNEBEC COALITION



1 Backhoe scoops out gravel packed behind the dam

gravel gone, the water flows

ENVIRONMENT

## A River Runs Through It

75,000 dams were built. Now a few are coming down.

salmon migrating to sea. As a result, the Federal Energy Regulatory Commission (FERC) is refusing to relicense dams where the environmental costs outweigh the value of the hydropower, or demanding that a dam be retrofitted with fish ladders. That's often so expensive that the owner opts to

## Dam being destroyed as a preservation act

By Glenn Adams  
ASSOCIATED PRESS

AUGUSTA, Maine—As church bells pealed Thursday, a torrent of water was unleashed through a manmade

Gov. Angus King started the process by ringing a bell. More bells ringing from a church signaled a big backhoe to rip into a temporary dam.



THE NEW YORK TIMES NATION

## National News Briefs

### Dam Removal Project Is Successful in Maine

AUGUSTA, Me., Nov. 6 (AP) — To the delight of conservation groups and fishermen, Atlantic salmon have returned to the waters above the site of a 162-year-old dam that was torn down last month to allow fish to swim upstream.

Striped bass have come back, too, in such numbers that fly fishermen are having a field day on the

upper Kennebec River. The striped bass have been feeding on another species that swims upstream from the sea, alewives.

The removal of the 24-foot-high Edwards Dam has completed the rebirth of what was historically such a rich fishery that early settlers grew weary of eating fish.

The dam was built in 1837 to supply power to mills that rose along the river's banks. It was about 40 miles upstream from the Atlantic and

stretched 917 feet across the Kennebec, blocking salmon, shad, herring and other fish from reaching their spawning grounds upstream.

In 1997, the Federal Energy Regulatory Commission decided the dam should be torn down for the good of the environment. It became the first hydroelectric dam in the country ordered removed by the federal government against its owners' wishes.

### Fearing His Father Dead, Boy Shoots Himself

YUCATAN, Minn., Nov. 6 (AP) — A teenager who mistakenly thought he had killed his father in a hunting

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## **Local Resource Management Situation:**

Hydropower usefulness declines

Maintenance/Safety expense rises

+ Sport-fishing/boating/tourism rising

## **Expectations from [Edwards] Dam Removal:**

Increased biodiversity & productivity

## ***Does dam removal work ?***

***Conditional Yes,***

**[based on benthic biomonitoring in smaller rivers]**

- Upstream Migration—Connectivity of fish improves**
- Downstream near-term sedimentation increases**

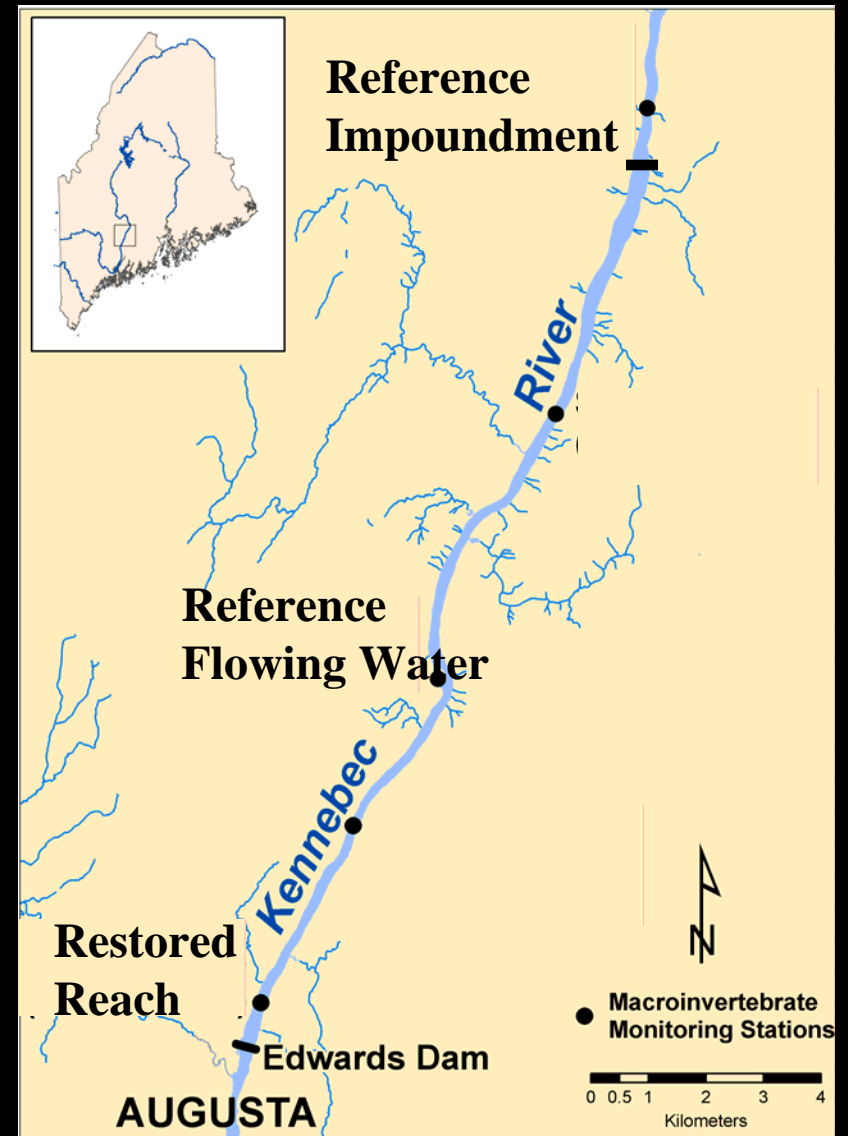


*Photos USFWS & Stanley & Doyle*

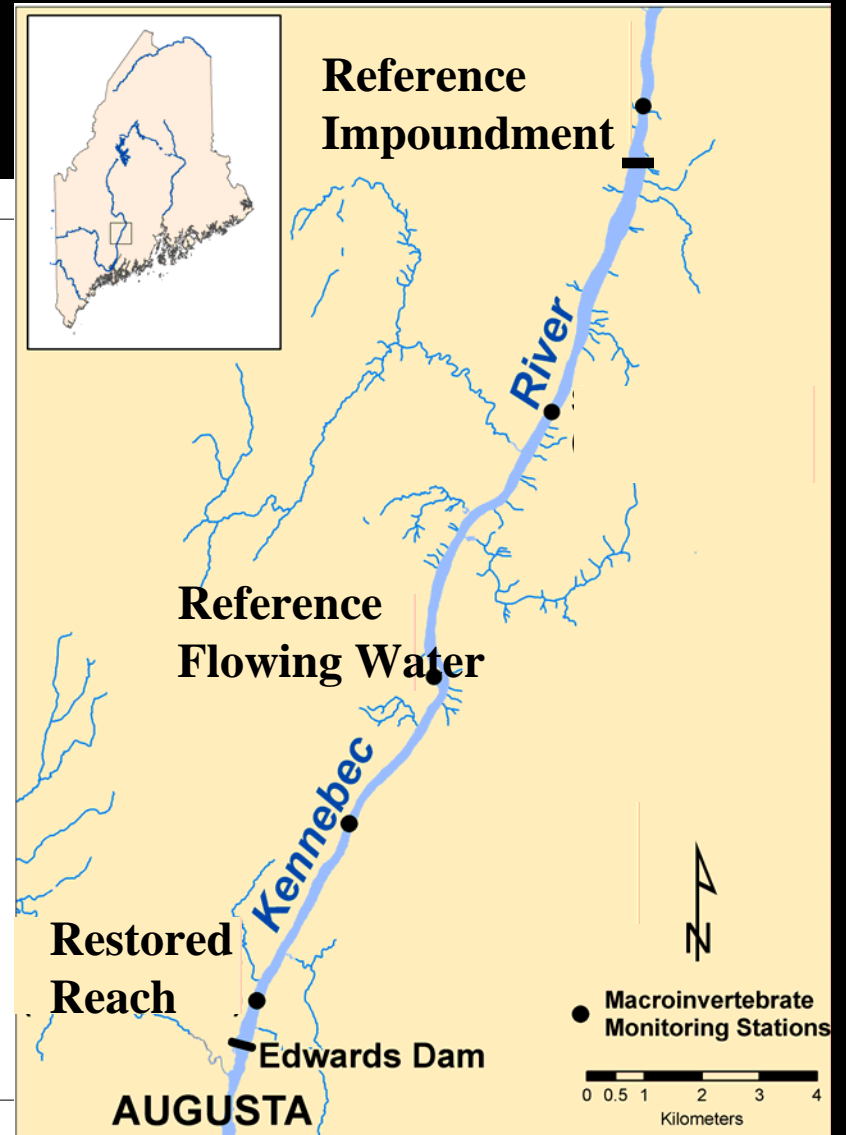
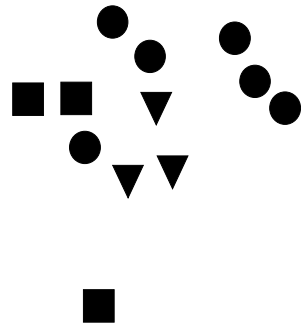
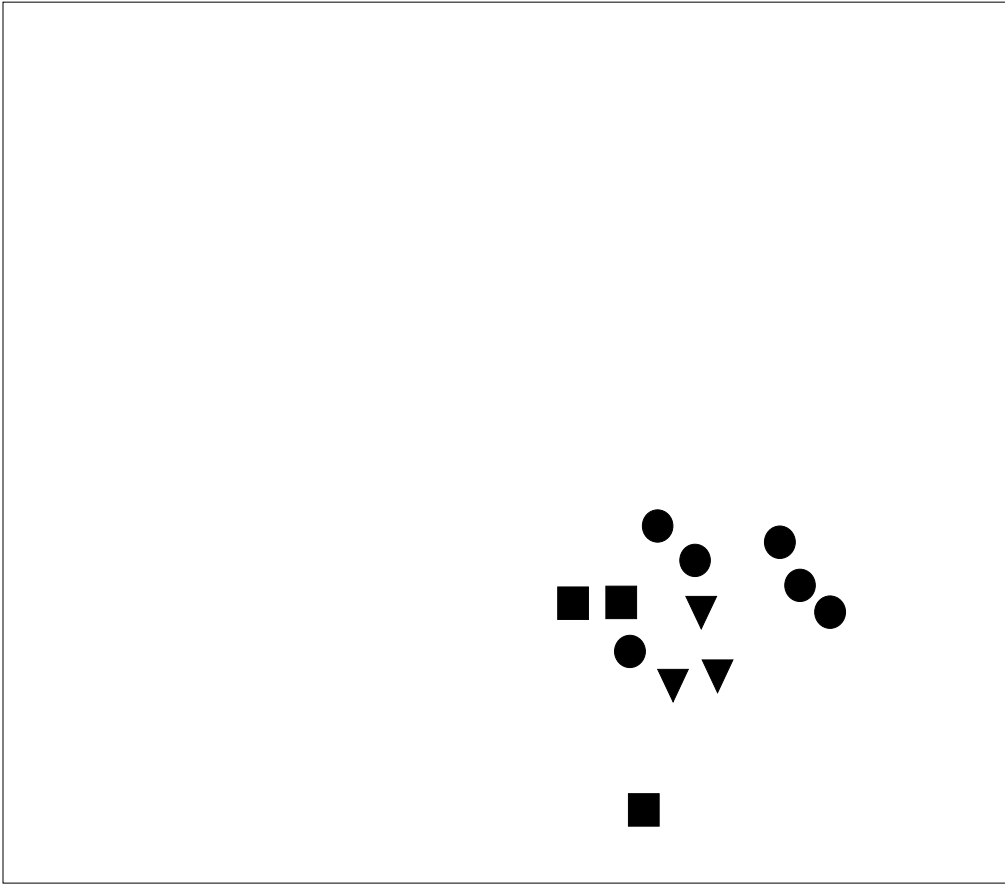
# Edwards Dam / Kennebec River Assessment:

Three levels of resolution:

- Community similarity
- Dominant taxa
- “Most responsive” taxa

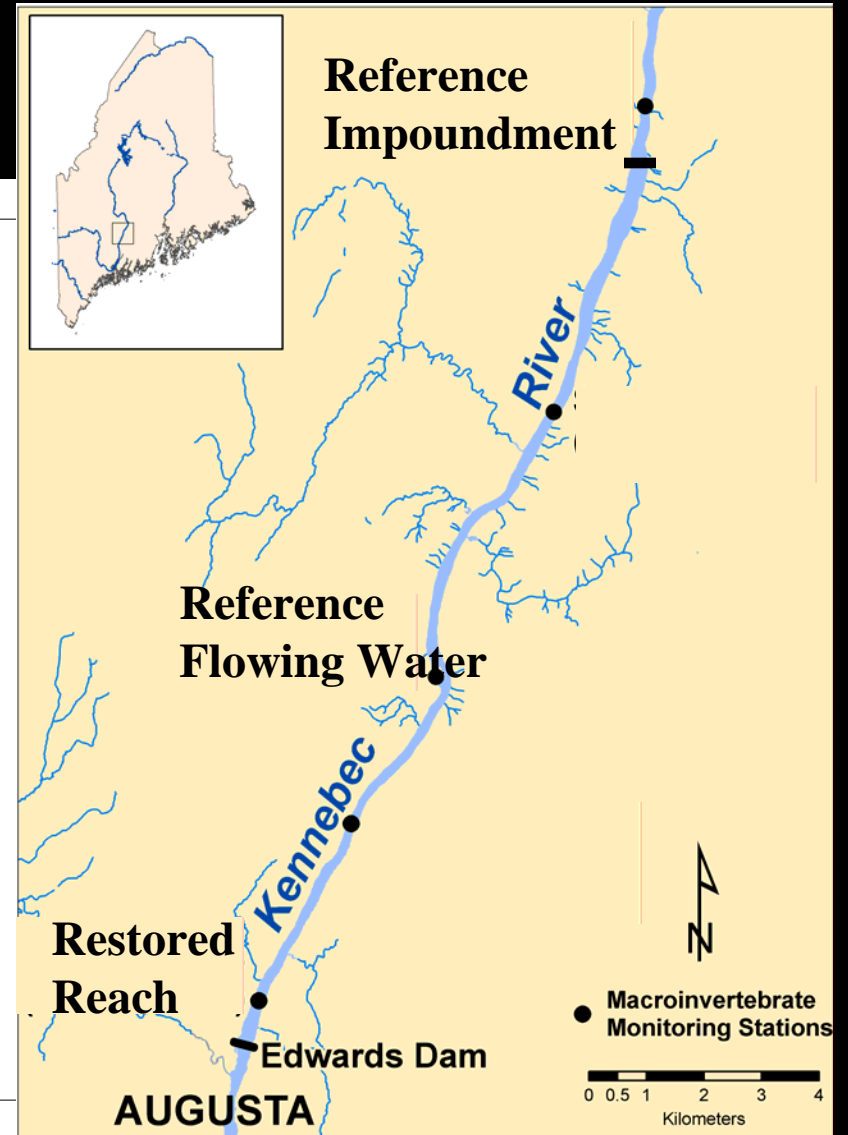
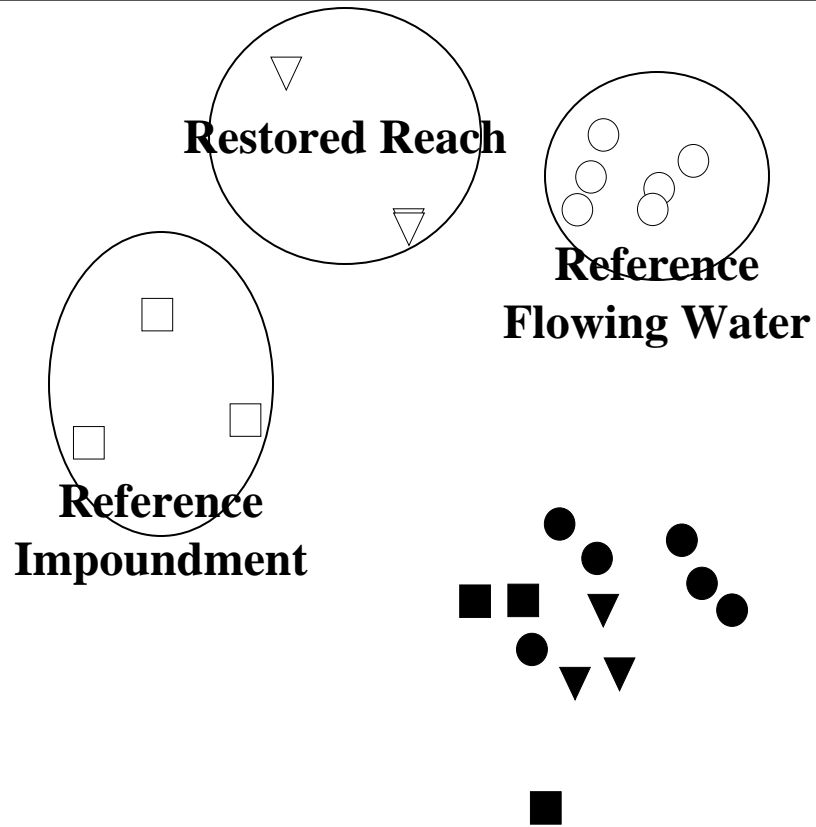


# Community Similarity (Pre-Removal)

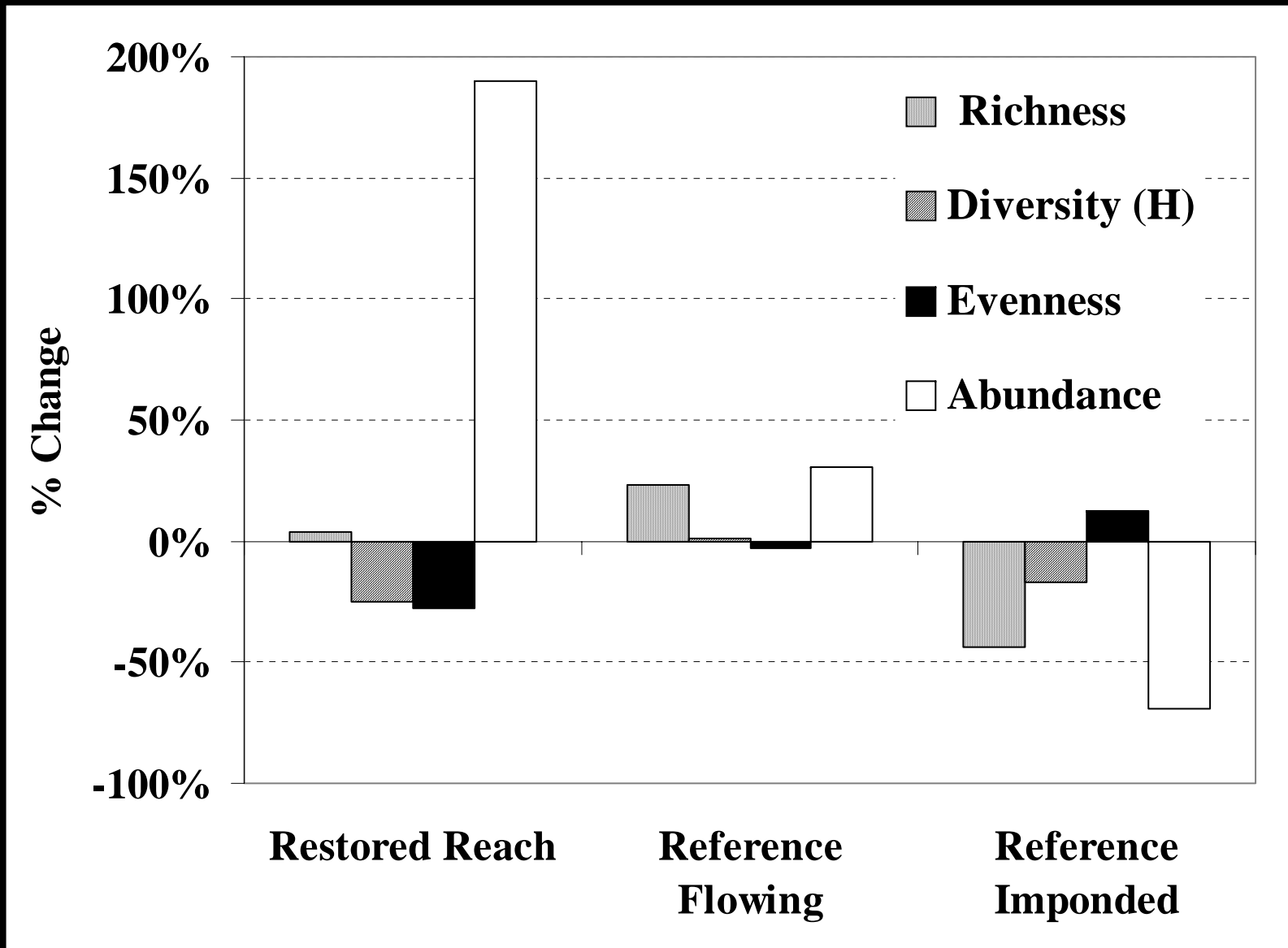




# Community Similarity (Post-Removal)



# Community Similarity (more resolution):



## Dominant Taxa (high relative abundance):

Pre-Removal

Restored  
Reach

Reference  
Flowing

*Hyallela*

*Hyallela*

*Stenonema*

*Helopelopia*

*Chimarra*

*Microtendipes*

*Neureclipsis*

*Tribelos*

*Cheumatopsyche*

*Chimarra*

## Dominant Taxa (high relative abundance):

### Pre-Removal

Restored  
Reach

Reference  
Flowing

*Hyallela*

*Hyallela*

*Stenonema*

*Helopelopia*

*Chimarra*

*Microtendipes*

*Neureclipsis*

*Tribelos*

*Cheumatopsyche*

*Chimarra*

### Post-Removal

Restored  
Reach

Reference  
Flowing

*Chimarra*

*Chimarra*

*Neureclipsis*

*Rheotanytarsus*

*Rheotanytarsus*

*Neureclipsis*

*Microtendipes*

*Hydropysche*

*Stenonema*

*Polypedilum*



## **“Most Responsive” Taxa (low relative abundance):**

Compare Restored Reach...

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**Pre- (1999) versus      Gained 8 unique to restored reach**

**Post-Removal (2000) (6 lotic specialists or facultative), Lost 12**

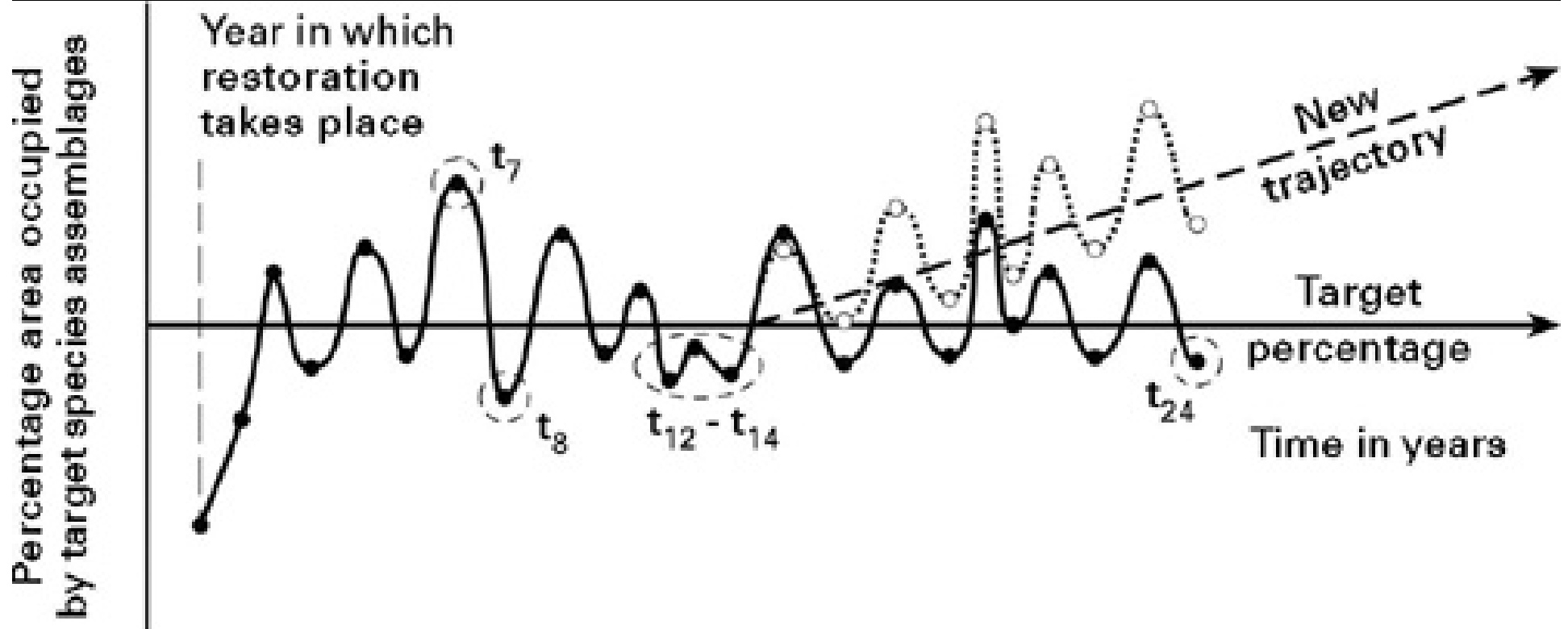
## **Take Home Message for Assessing Dam Removal:**

**“Pollution” sampling frameworks works**

**BUT it would be nice to have better Dam[n] biocriteria  
(i.e. are biocriteria *AND* reference  
impairment/improvement specific?)**

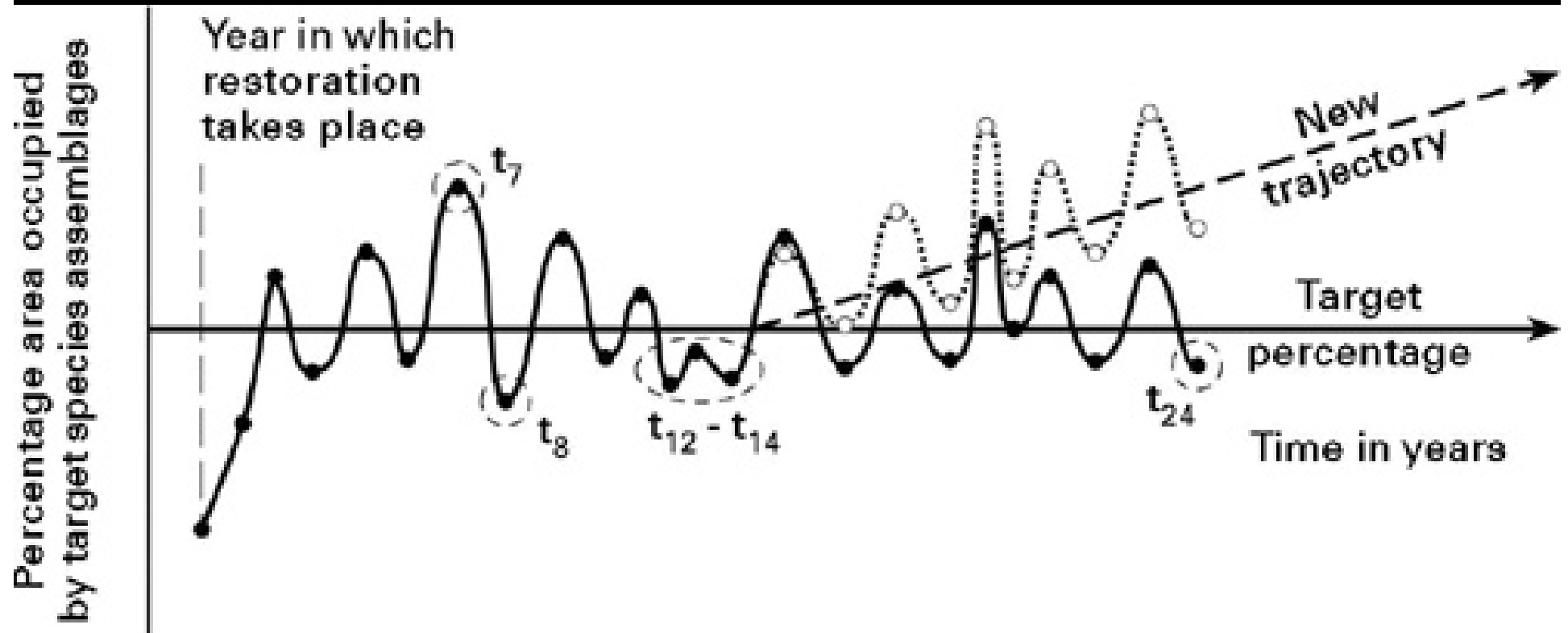
# *Environmental History & biocriteria development?*

-Many catchment parameters have changed since the times of historic reference



## *For Example:*

- there has been considerable climate variability,  
there will be more climate variability
- The presence of alien or non-native species in most river systems has increased over time.







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