

FERC Fish Passage Workshop, Alden Research Lab, Nov. 13, 2003

# Defining Fish Passage- Expectations for Facility and Organizational Performance

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## Outline



- A. Random Thoughts about Fish & Fish Passage
- B. What Should We Expect From a Fish Passage Facility?
- C. What Should We Expect From an Effectiveness Study?
- D. What Should We Expect From the Project Cooperators?



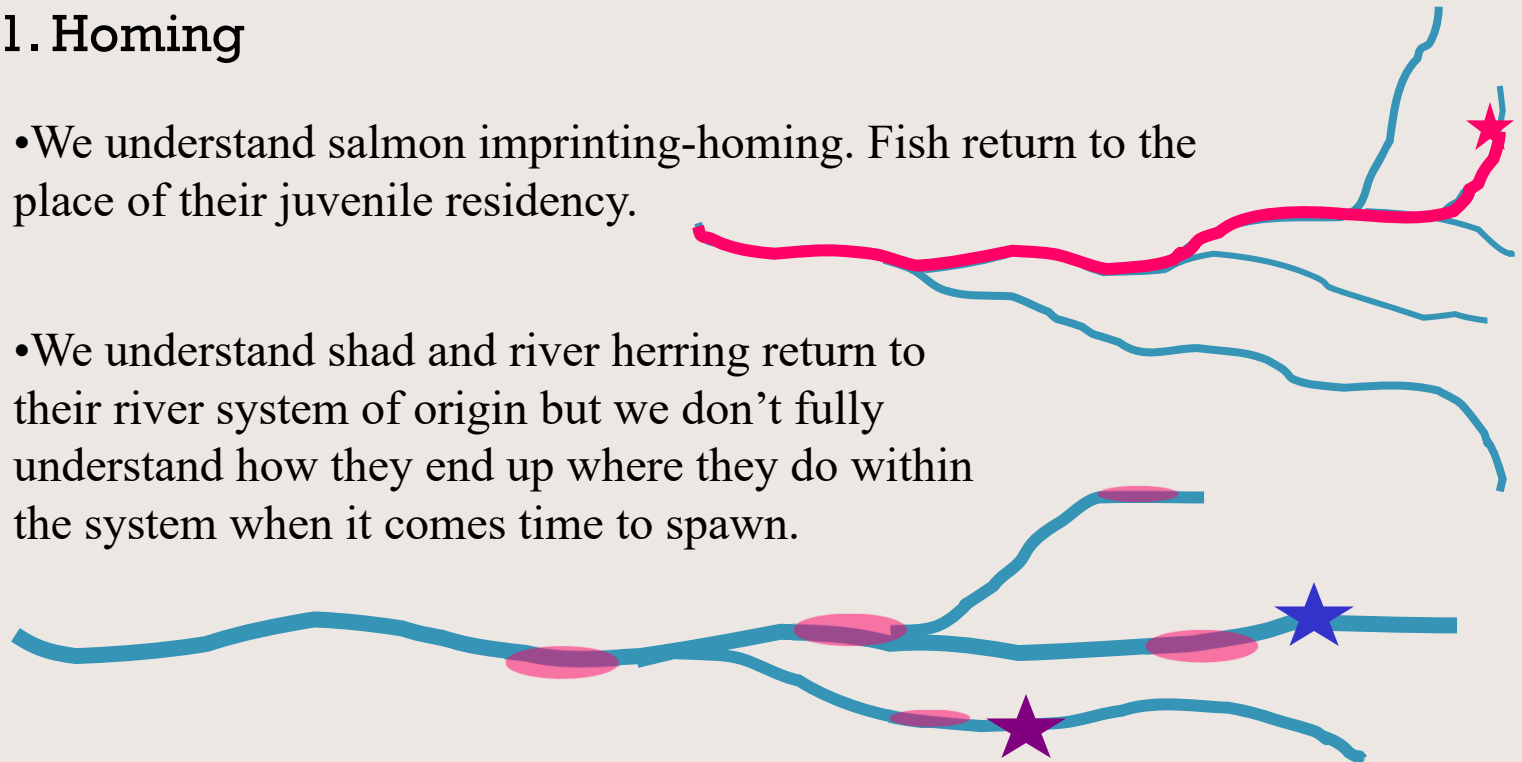
## A. Random Thoughts About Fish and Fish Passage

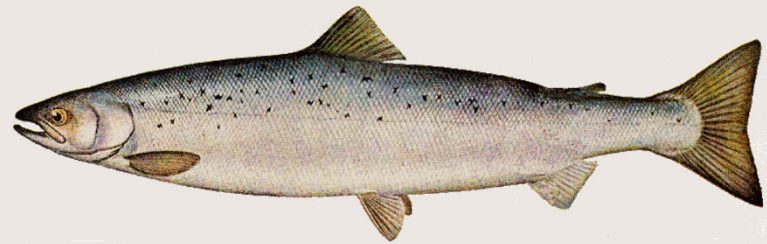
### 1. Homing

- We understand salmon imprinting-homing. Fish return to the place of their juvenile residency.

- We understand shad and river herring return to their river system of origin but we don't fully understand how they end up where they do within the system when it comes time to spawn.

- Salmon and shad captured and released at one dam often are recaptured at a different part of the system. To date, we don't know which is the 'mistake', if either.





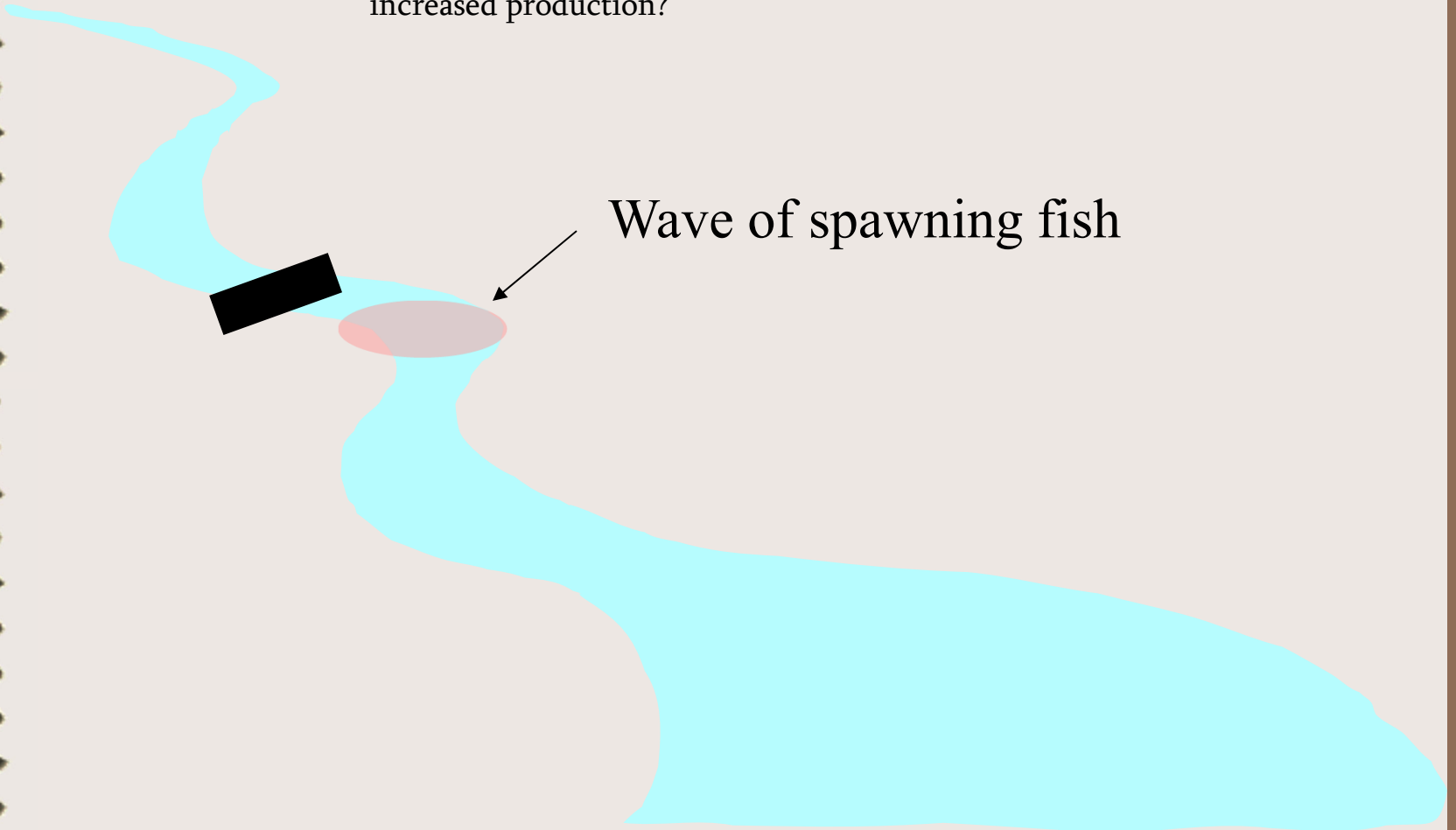
## 1. Homing (cont.)

- It seems likely that variations in weather, flows, hydroelectric operational regimes, etc. could influence the movement of returning adult fish in a river system.
- There has been considerable debate concerning the role of previous imprinting upon the motivation and expectation that fish (esp. clupeids) will ascend a fishway to reach upstream habitat from which they did not origin.
- There is too much data showing instances of 'naïve' fish ascending a new fishway to accept the idea that fish won't spawn in a river reach from which it did not originate.
- More research into the nuances of clupeid homing and habitat instream migration is needed, but do not use lack of upstream trucking as an excuse to tolerate poor fishway performance.

## 2. How do we know when habitat is full? (cont.)

- If additional habitat is made accessible, do we know that it will result in increased production?

Wave of spawning fish



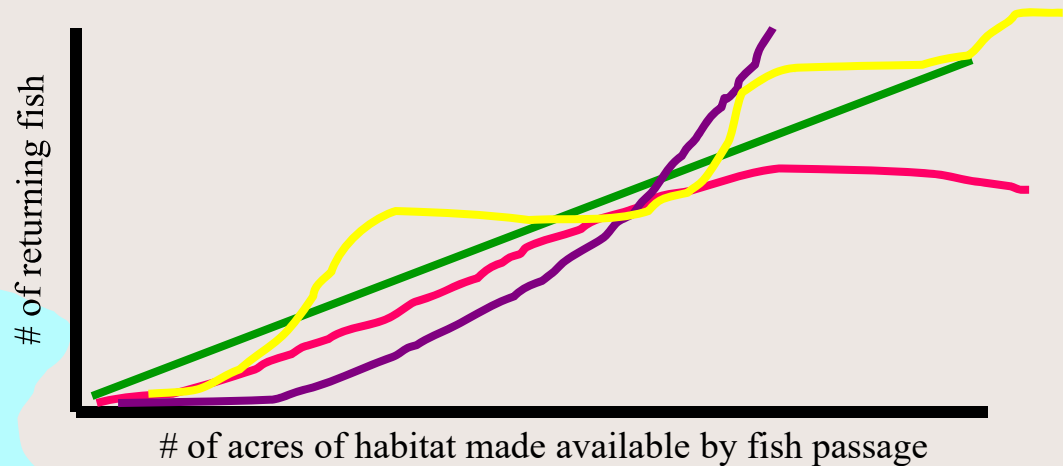
## 2. How do we know when habitat is full?

- If additional habitat is made accessible, do we know that it will result in increased production?
- Will a portion of the population colonize the new habitat?
- Or will the entire population colonize the new habitat, abandoning the previously occupied habitat? If the latter, is there a net gain?

• Some evidence from larger rivers that focus of the spawning run may just be re-located once a fishway is completed. But it may not have to be that way– the response could vary with time and design.

## 2. How do we know when habitat is full? (cont.)

- Plenty of evidence that net increase in production will occur as more habitat is opened, but the relationship is unclear.



## Random Thoughts (cont.)



3. Don't confuse the effectiveness of a fishway with the pace of a restoration program.
4. Acceptable fishway passage percentages (of assumed total populations) may vary between projects. 40% passage efficiency at the first dam at tidewater is likely to be unacceptable whereas 40% passage at the fifth dam 300 km from the sea could be acceptable. Critical factors in determining acceptable passage percentages include: available suitable habitat, available metabolic energy on the part of the spawners, and variability of motivation on the part of spawners (e.g. lower habitat that has a high density of spawners may motivate some spawners to seek out additional habitat that is lightly seeded).
5. Notwithstanding point 4, designing for less than maximum passage, assuming a lesser need, is very dangerous because some of this critical information may be unknowable (at least at this time).



## B. What Should We Expect From a Fish Passage Facility?

Since we can never be certain just how many fish need/want to go upstream, the simple answer is to let all fish that want to go upstream go:

*“A fish passage project should allow full volitional upstream and downstream passage of all fish phases of all species in the river, to the extent they passed prior to the construction of the dam, as well as comparable passage of introduced species that are prime management targets.”*



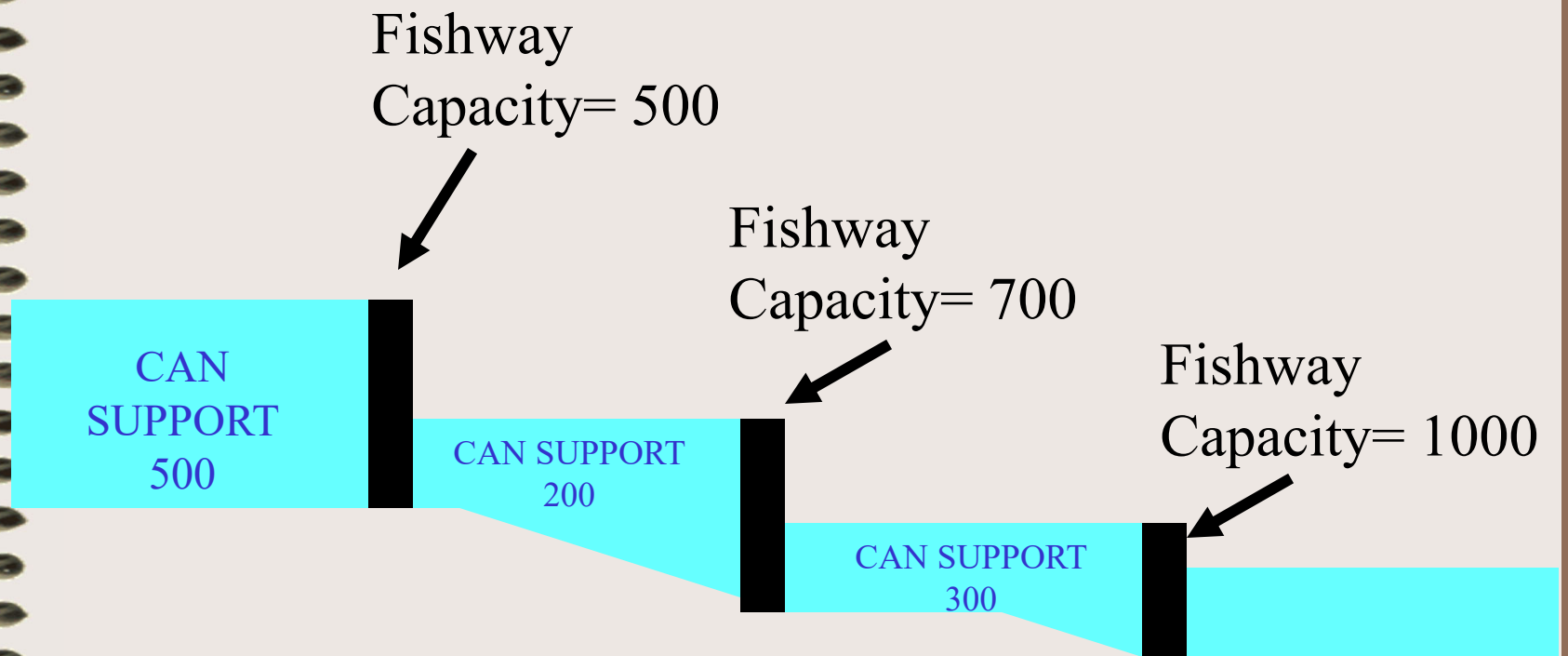
## B. What should we expect from a Fish Passage Facility? (cont.)

A more practical goal for fishways is needed:

*“A successful fishway complex should allow safe passage of all critical life phases of all targeted species so that for upstream passage, enough spawners are able to pass through during a species-specific timeframe and reproduce to fully seed all upstream habitat, and for downstream passage, all (or an acceptable percentage of the total) downstream migrants that are likely to be produced from full upstream production are able to pass the dam in manner that allows them to reach downstream or marine habitat within a species-specific timeframe.”*

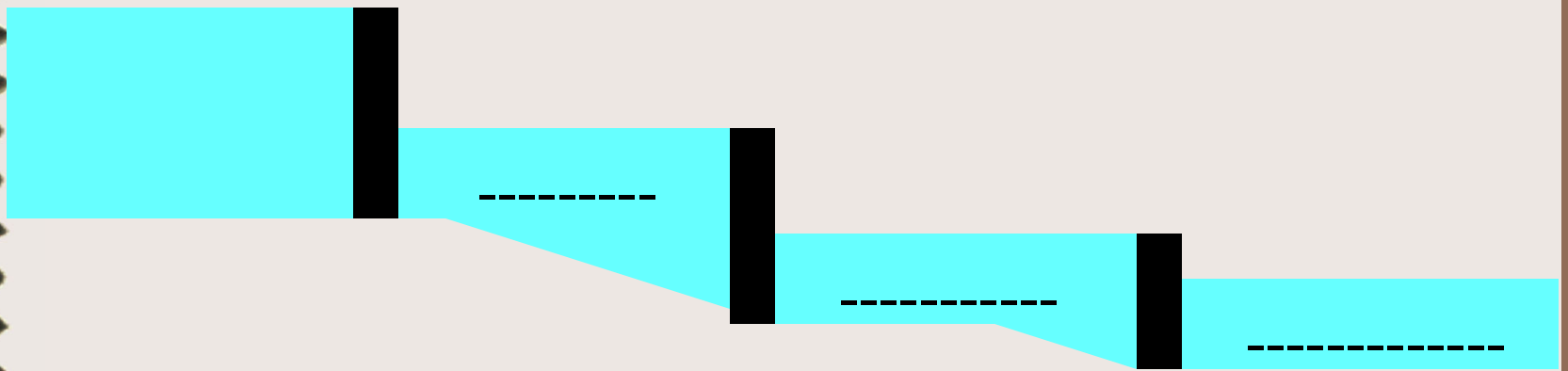
**It must be recognized that this is a goal for design and that actual fish utilization patterns may not adhere to these expectations.**

## Fishways are designed this way...



...but evaluated this way.

What percentage of fish that arrived below the dam passed above the dam?



## Traditional Expectations?

### UPSTREAM PASSAGE

**Sturgeon** and other listed species: >90%\*

**Salmon, trout, sea lamprey** and other strong migrants: 90%

**Clupeids:** 60%

**Stripers, white perch** and non-spawners: NA

**Eels:** Impossible to quantify most population below dams; lacking data on rates of natural mortality and silver eel production per unit of habitat to allow us to calculate how many elvers are needed to fully seed upstream habitat. Need to consult with experts to obtain reasonable estimates for these rates to develop a restoration model for rivers.



### DOWNSTREAM PASSAGE

**Sturgeon** and other listed species: >90%\*

**Salmon, trout, clupeids:** 90%

**Eels :** >90%. Eels stocks are declining and high level of protection is needed but we don't know enough about passage conditions preferences to expect to achieve such high rates at this time.

**Sea lamprey:** Stocks seem to be stable but we lack any data on marine return rates to set passage guidelines and we don't know enough about passage condition preferences to expect compliance of any guidelines.

## C. What Should We Expect From an Effectiveness Study?

1. Effectiveness studies are more than monitoring and passage numbers but numbers are needed. Viewing or video windows are necessary and should not be avoided as unnecessary frills.



2. If a percentage of the tailwater population is a fish passage objective (particularly at tidewater), then an accurate population estimate below the dam is needed.

## C. What Should We Expect From an Effectiveness Study? (cont.)

3. Radiotagging is preferable to visual tags because visuals only provide data on successes and give no information on failures or provide data to estimate dropbacks.



4. Studies should focus on targeted species but not fail to assess impact of other species, which are often not given much consideration in the planning and design of fishways. Consider both ecological and mechanical impact of species such as suckers, gizzard shad, carp, perch, etc.

## C. What Should We Expect From an Effectiveness Study? (cont.)

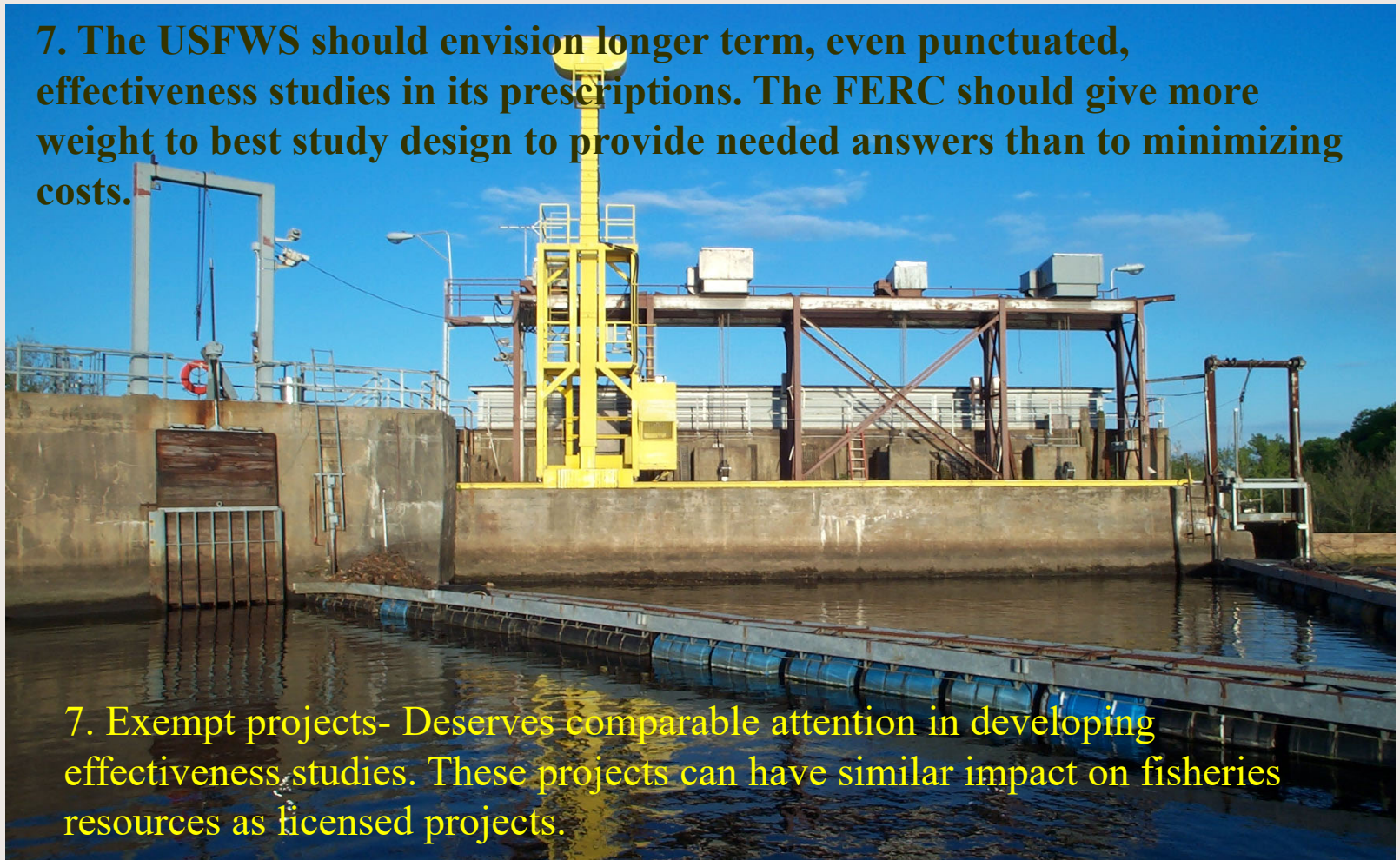
5. Two-phased study plans should be considered. Phase I could be relatively inexpensive and could lead to a consensus that the facility is very effective without the need to collect additional, more expensive data. If Phase I does not succeed at doing so, Phase II would be initiated, using more intense, expensive methods to study the effectiveness.

6. Long term monitoring is important. Long-term averages should factor into effectiveness studies. Passage numbers should be averaged over time and compared to project objectives. For licenses that are 25 years or longer, an initial three-year study should be followed by a ten year data review to see if the first ten years lived up the expectations of the three-year effectiveness study. If not, there should be provisions in the license for cooperators to work together to find solutions to problems.



C. What Should We Expect From an Effectiveness Study? (cont.)

**7. The USFWS should envision longer term, even punctuated, effectiveness studies in its prescriptions. The FERC should give more weight to best study design to provide needed answers than to minimizing costs.**



**7. Exempt projects- Deserves comparable attention in developing effectiveness studies. These projects can have similar impact on fisheries resources as licensed projects.**

## D. What Should We Expect From the Project Cooperators?

1. Cooperation between licensee and agencies- common goals.

2. Professionalism, congeniality, and good communications should be the norm.



3. While the fieldwork is the responsibility of the licensee, the agencies should cooperate/participate when appropriate.

4. Settlement agreements between licensees and agencies should be encouraged– and not overruled by FERC staff or commissioners.

## D. What Should We Expect From the Project Cooperators? (cont.)

5. For larger projects, Study Advisory Committees should be considered: licensee, State, USFWS, NOAA, academics, consultant, FERC staff. If a fish passage project and/or its effectiveness study is highly contentious, a committee should be formed.

6. While fairness is always important, decisions should not be made out of a sense of simple compromise or even-handedness. Effectiveness studies are about protecting natural resources. Once the decision to build a fishway has been made, then a commitment to an accurate and conclusive study is needed.

