Monitoring Aquatic Organism Passage Structures

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Emplementation
Construction
DODGE
Stability Analysis

Monitoring Is Imperative for Detecting and Understanding Failures AND Successes

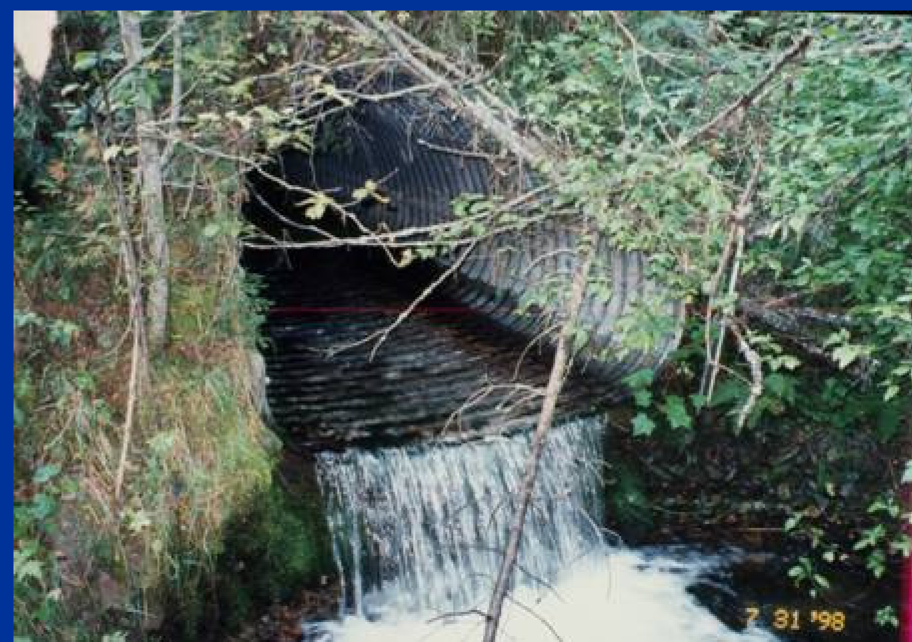
Failures Are Pay-dirt for Learning!


Steady State

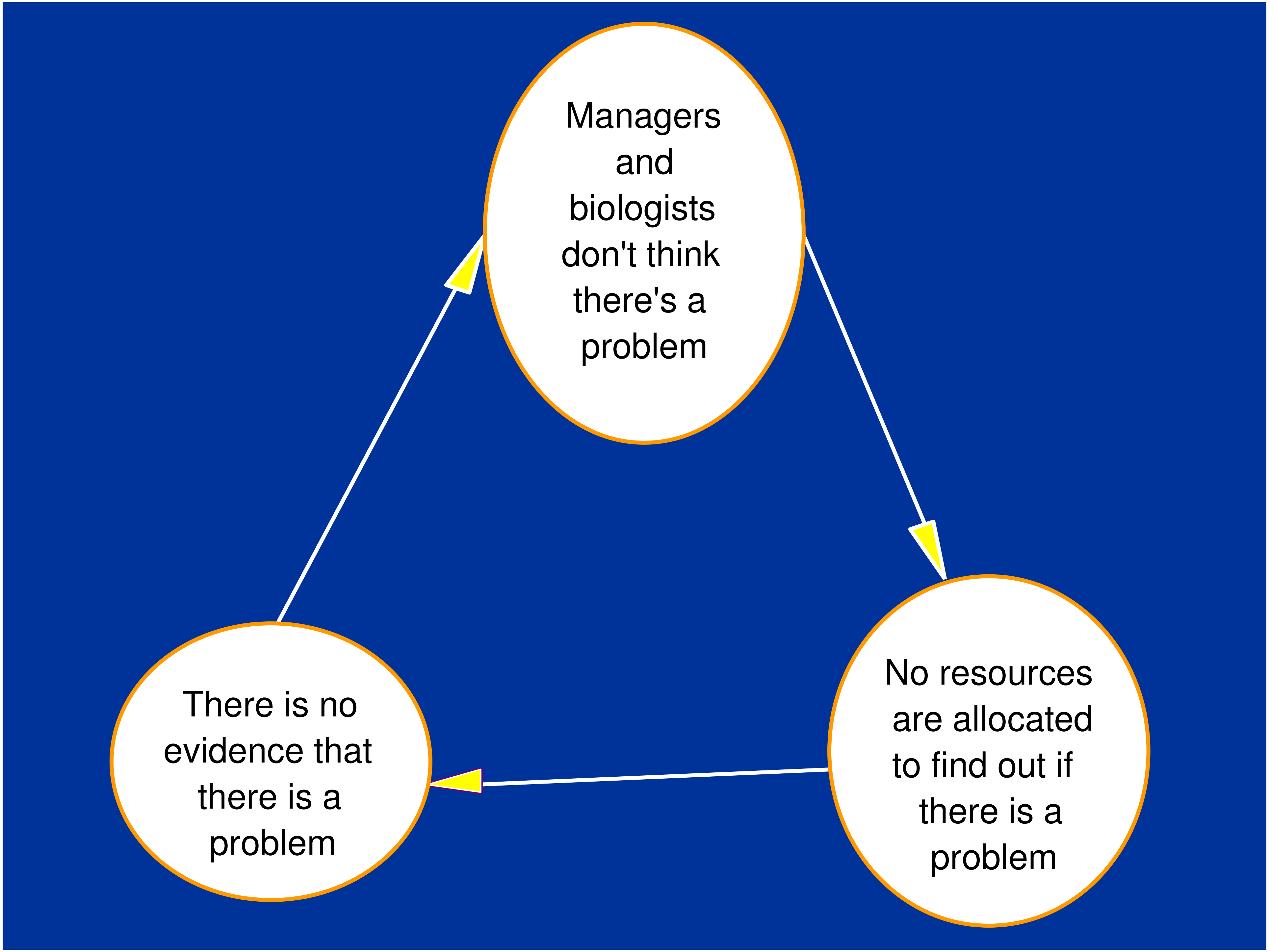
Streams Change

Upstream,
Downstream,
Adjacent Streams

1979



1998


Managers and biologists don't think there's a problem
No resources are allocated to find out if there is a problem
There is no evidence that there is a problem

Historical Convention

Experiments Without Monitoring ☹

- Do project and on to the next thing…Assuming it works.
- Try something innovative, (wait for stream to fill an empty pipe) simply assume it worked, or declare it a success.
- Lingering uncertainties, Perpetuated ignorance.
- S M O O (Same Mistakes, Over and Over).

Developing a Monitoring Plan

- Frame practical, researchable questions.
  - Set up a few pipes for intensive, detailed monitoring.
  - After construction, low water, 1 year, floods, periodically
- Focus on design and process questions, drill in on questions.
  - Set a simple, do-able protocol for all treated crossings. Repeat.
  - Plan for flood monitoring, jump on it!

Monitoring plans vary in intensity, breadth & time, and are designed to answer one or more important questions:

- Implementation – Did we build what we designed?
  - Was the design changed in any way? Why?
- Effectiveness – Does it work?
  - Has the new stream profile remained stable or or achieved suitable equilibrium through time, floods, droughts?
- Validation – Were our assumptions correct?
  - Has the barrier to all aquatic organisms been removed?

How To Performance Monitor Aquatic Organism Passage Structures

Define performance expectations (objectives):

- Does the structure provide passage for
  - all aquatic organisms? THE BIG QUESTION
  - wood & sediment?
  - Water?

- Is the structure stable
- Is the stream channel and structure in continuity
  - (No uncontrolled scour, head cut, bank erosion or other "fault" conditions)
- Throughout the project life?

Monitor against these.

Other Elements To Consider Monitoring

- Project Development and Implementation
  - Objectives, Investigation, design, contract, inspection
  - Was it sufficient to predict, describe, assure success?
- Structural conditions –
  - Provided by bridge inspection program - inadequate as is…
  - Durability, maintenance frequency, corrosion & abrasion rate, structure settlement, deformation, piping of fill, embankment erosion threat?
- Stream simulation channel complexity

What You Get

- Validation of assumptions
- Patterns of failure
  - Essential for adapting and improving project development skills, minimizing failures
- Insights into development & construction problems and design solutions.
  - Everyone becomes wiser
- Research setup for additional work - *Biological*

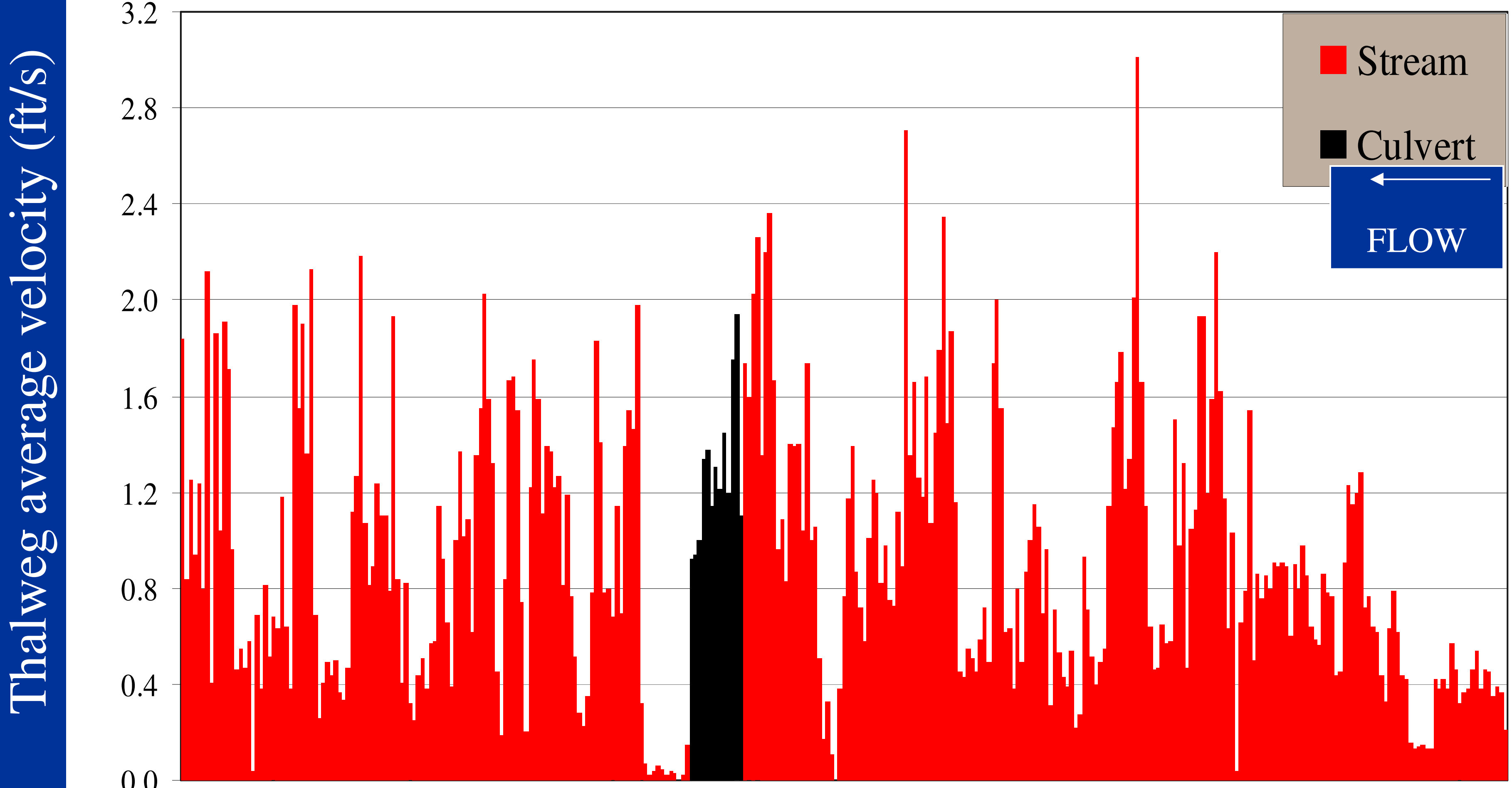
Performance Monitoring of Simulated Stream Bed for Geomorphic Continuity

- Michelle Riba, Hydrologist Freemont NF – Compared three-dimension velocity measurements of simulated bed and adjacent stream channels.

- Bob Barnard, Washington Dept. Fish & Wildlife – Compared simulated stream bed physical characteristics to an adjacent stream channel reference reach.

- Interfluve, Cenderelli, Weinhold - Additional stream simulation channel complexity comparison of reference reach and stream sim bed.

Thalweg Average Velocity



Michelle Riba Thesis

West Fork Silver Creek

Example - Stream Simulation Monitoring to Determine If the Simulated Bed Falls Within Range of Variability of the Stream Reach

Compare:

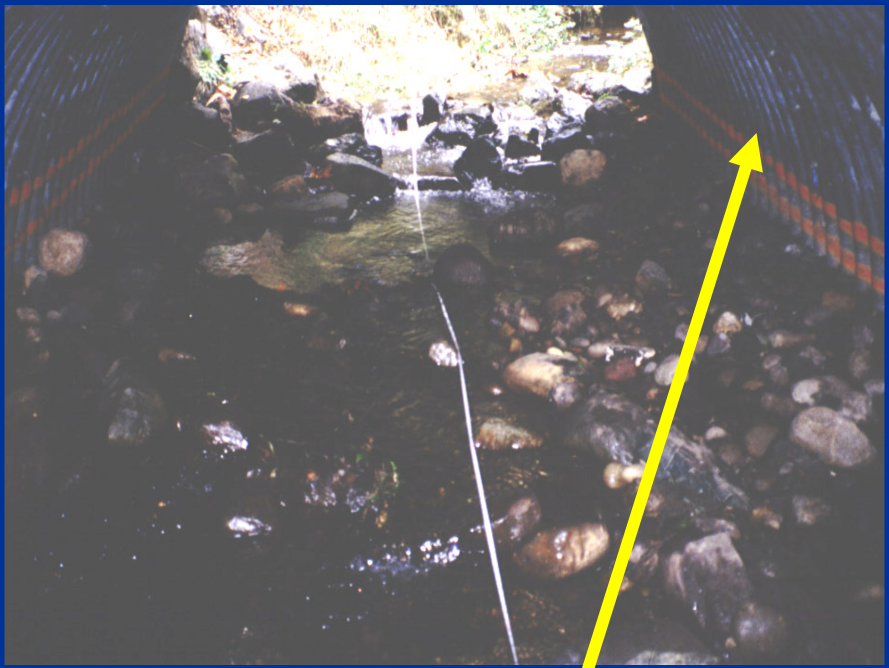
The simulated stream channel VS stream channel

- Bed form frequency & physical characteristics
- Pebble count based gradations of bed & stream beds
- Structure width & stream width parameters
- Structure bed slope & long profile slope, ~ 20*BFW
- Channel x-section shapes& elevations inside structure (2-4), upstream (1-3) and downstream (1-3)
- Are banks present and similar?

Physical Monitoring - Reference Points

In the channel & structure: x-sections, longitudinal profiles, pebble count locations, elevation references

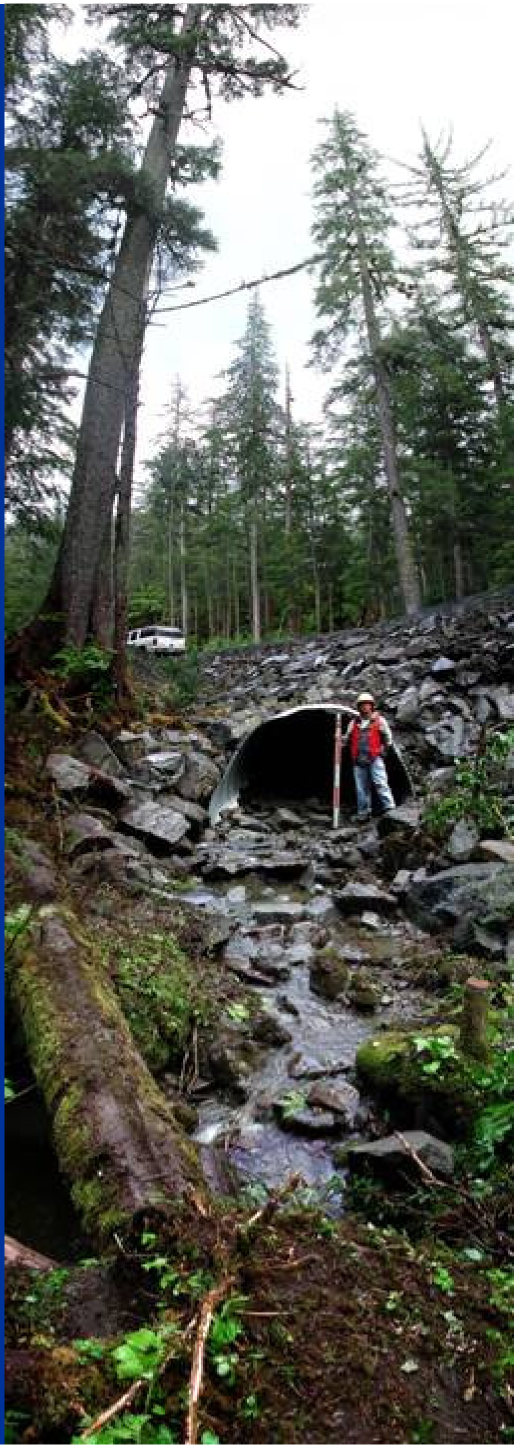
Step-pool structure painted on wall



Original fill line

Before and After shots from <u>permanent reference points</u>

Future shots



Skinner Creek Temporary Retrofit

Before

After One Year

Example - Labor Estimate

(for Stream Simulation Monitoring Example)

- Inventory Assessment monitoring 2 people, 3-4/day
- Project Assessment monitoring 1-2 people plus surveyor, 1-2 projects a day.
  - Survey long profile and X-sections, high accuracy and tied to permanent bench marks
  - Biologist - habitat, engineer - structure, and fluvial geomorphologist - continuity, geomorphic features for best observations
- Note taking, recorder, photographer, pebble counts

Biological Monitoring

– Visual observations

– Rapid bio assessments (RBA)

– Presence/Absence Surveys

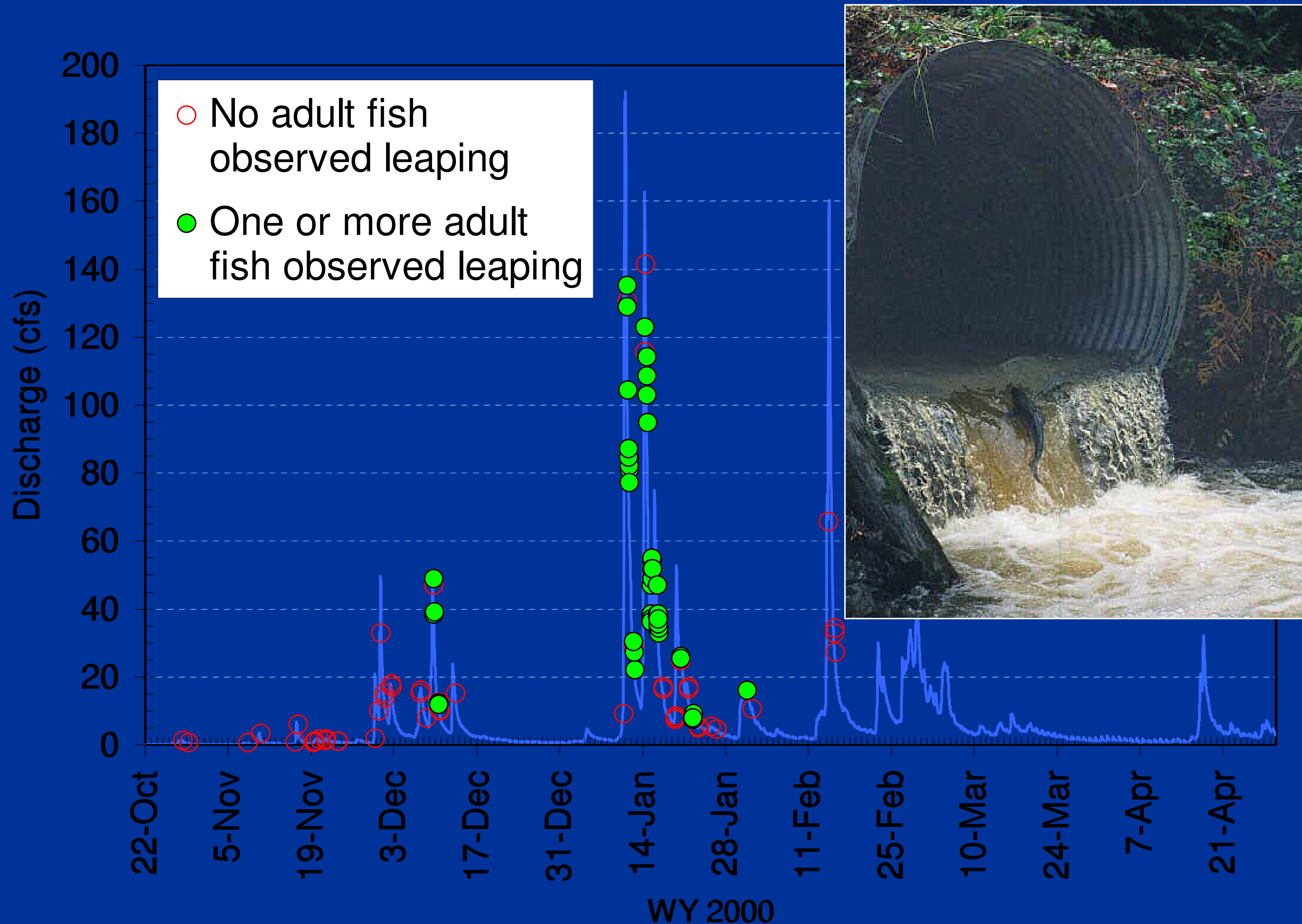
Spawner or redd surveys

– Snorkel or e-fishing

– Mark and recapture; baiting

– Tagging

Observation Monitoring



Biological Monitoring

- Mark Hudy - Sampling assemblages quick, inexpensive, effective
- Takes more time than physical monitoring
- Need to monitor day, night, seasons, flows
- Above and below, before and after construction
- Not all aquatic organisms can be monitored
- Rapid Bio Assessments are efficient
- A good research task

Flood Monitoring

What You Get – Flood Triggered Monitoring

– Opportunistic – only chance to observe and characterize high-flow hydraulics

– Observations of failure mechanisms and consequence

– Insights into processes and rate

– Validation of streamflow, bedload transport, debris assumptions

– Essential for modifying design criteria

Common Monitoring Pitfalls
(From: L. M. Reid)

- Field personnel do not have adequate training to carry it out
- Sampling plan cannot provide the answers sought
- Untimely analysis: problems not discovered until too late
- Insufficient duration
- Insufficient collateral information
- Technology failures
- Inadequate statistical design
- Personnel changes

Worthwhile to Ask and Answer:

- Did we do it?
- Did it work?
- Are the assumptions correct?
- What can we improve before the next project?


Questions?
The End (C) amigo 1996.