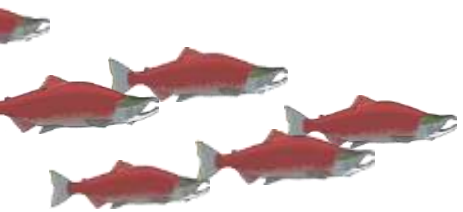
Ruminations on Juvenile Fish Passage Performance Evaluations of the Floating Juvenile Bypass System, Baker River Hydroelectric Project

PUGET SOUND ENERGY

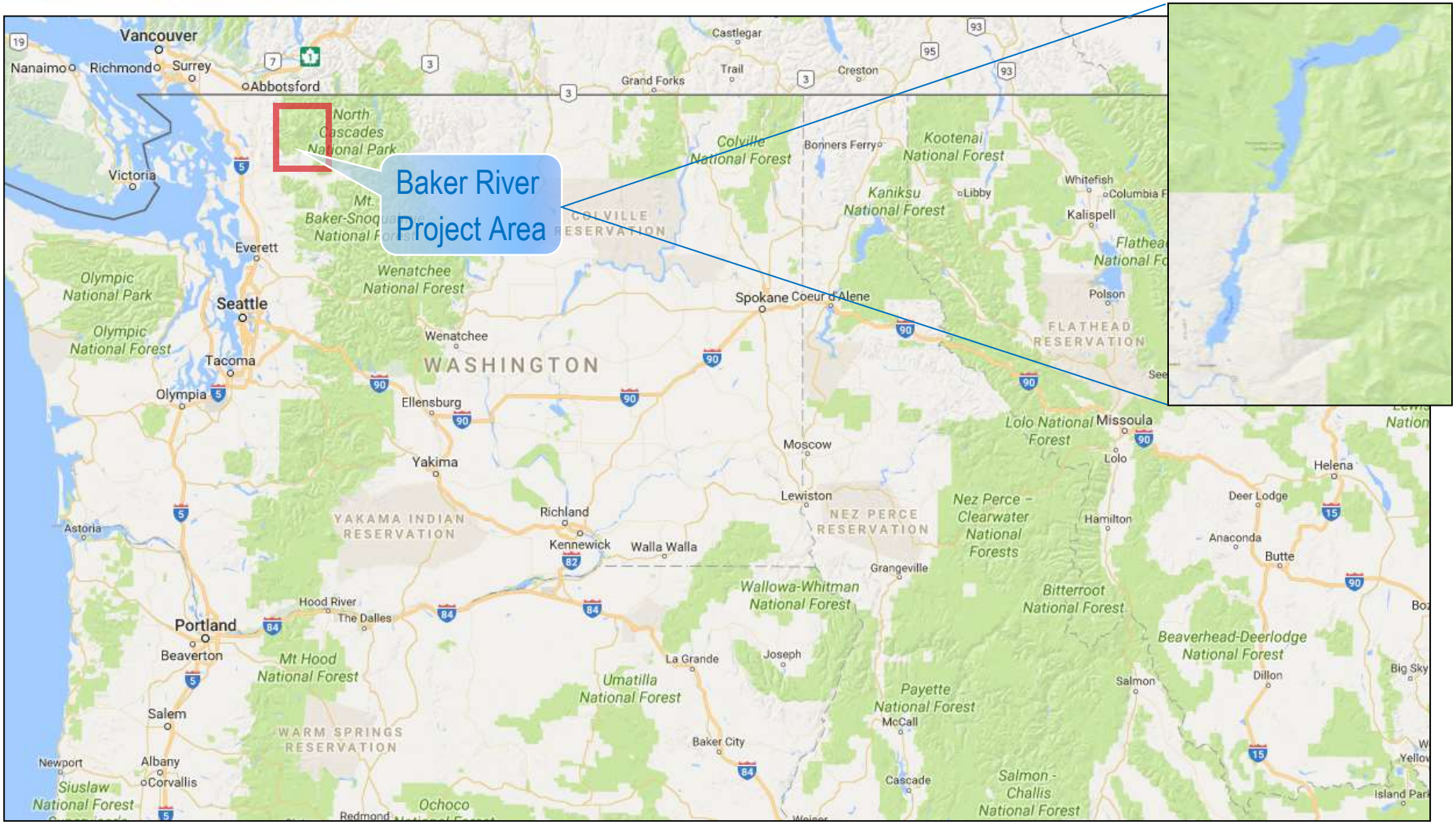


Nick Verretto, Fisheries, Puget Sound Energy

April 9, 2019

American Fisheries Society
WASHINGTON - BRITISH COLUMBIA CHAPTER

Baker River, FERC No. 2150

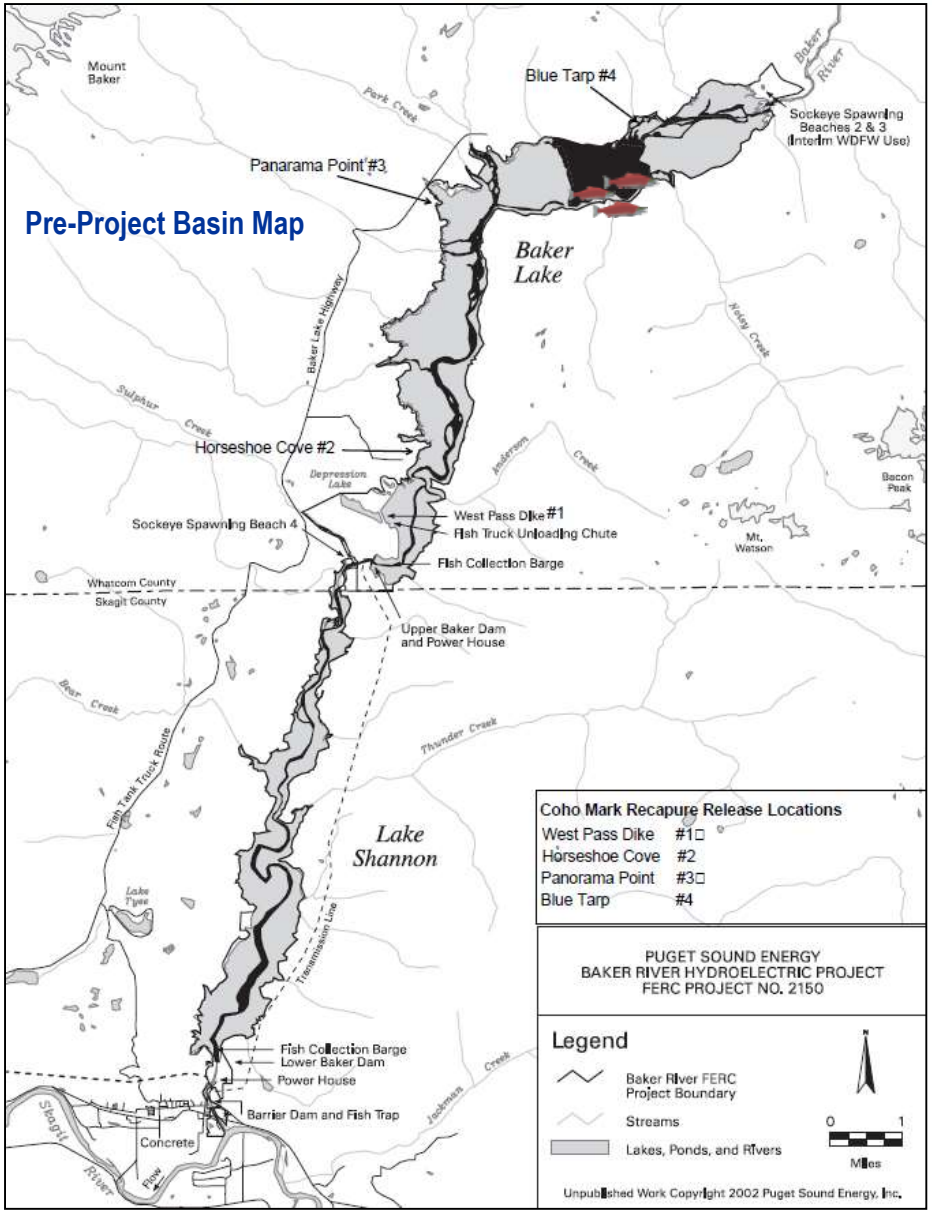


Location – Northwest Washington

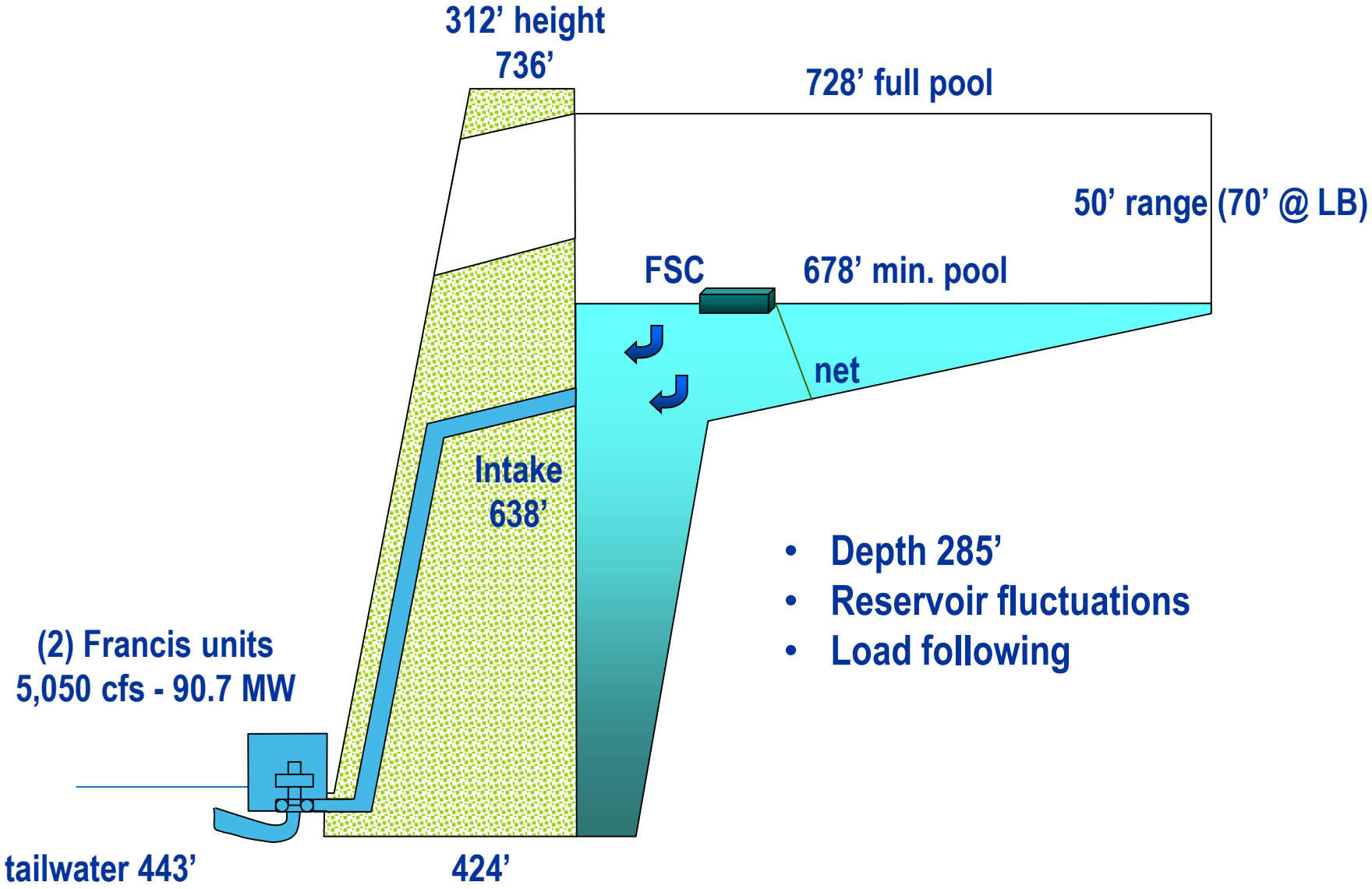
Project Description

PUGET SOUND ENERGY

Pre-Project Basin Map



Upper Baker Dam



- Depth 285’
- Reservoir fluctuations
- Load following

Original Fish Passage

Upstream Passage

- Picket weir & trap
- Short ladder & tramway
- Upstream trap

Downstream Passage

- Entrainment
- Ski-jump spillway
- “Gulpers”

Original Downstream

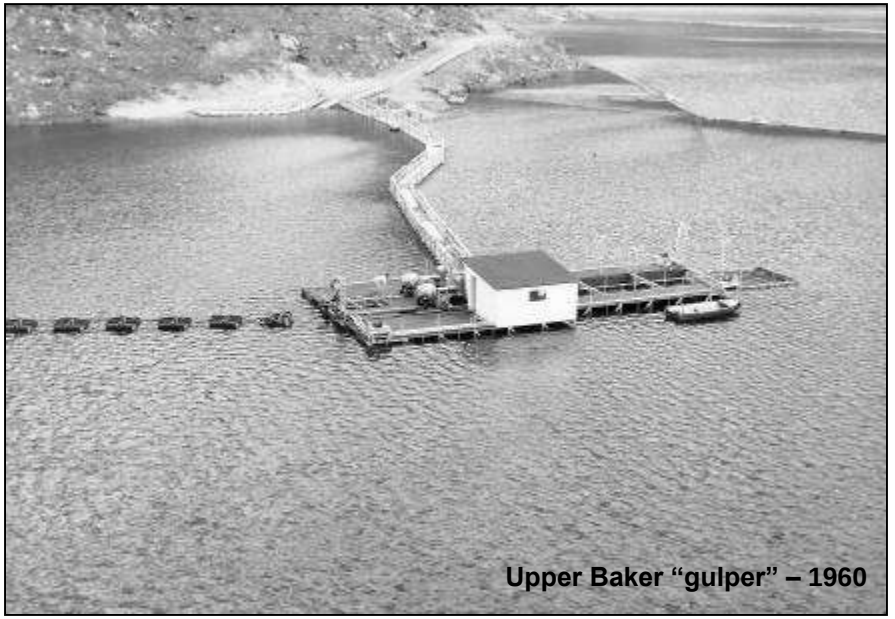
LB “gulper” installed 1958

- Tested two years
- 90-cfs flow
- 36’ x 68’
- Bypass pipeline to tailrace


Lower Baker “gulper” – 1958

UB “gulper” installed 1960

- 165-cfs flow
- Bypass pipeline to tailrace
- *1961 Performance Evaluation = 5-139% recapture?*


Upper Baker “gulper” – 1960

New Downstream Passage

UB FSC 2008

- 60’ x 130’
- 500-1,000 cfs (6x gulper)
- NTS & lead net
- Six-acre guide net


Upper Baker FSC – 2008

LB FSC 2013

- Hydraulic “improvements”
- 500-1,000 cfs (11x gulper)
- Eight–acre guide net
- Pier & boat access/transport


Lower Baker FSC – 2013

Performance Criteria

Description	Standard
Collection *(C)*	95%
Survival (within the facilities) *(S)*	98%
Reservoir passage *(R)*	80%
Efficiency (overall survival) *(CxSxR)*	75%

- Install dates: UB – 2008, LB – 2013
- Evaluate 500 cfs & 1,000 cfs flow
- Expand to 1,000 cfs screens if FSC fails to meet performance criteria

Implications

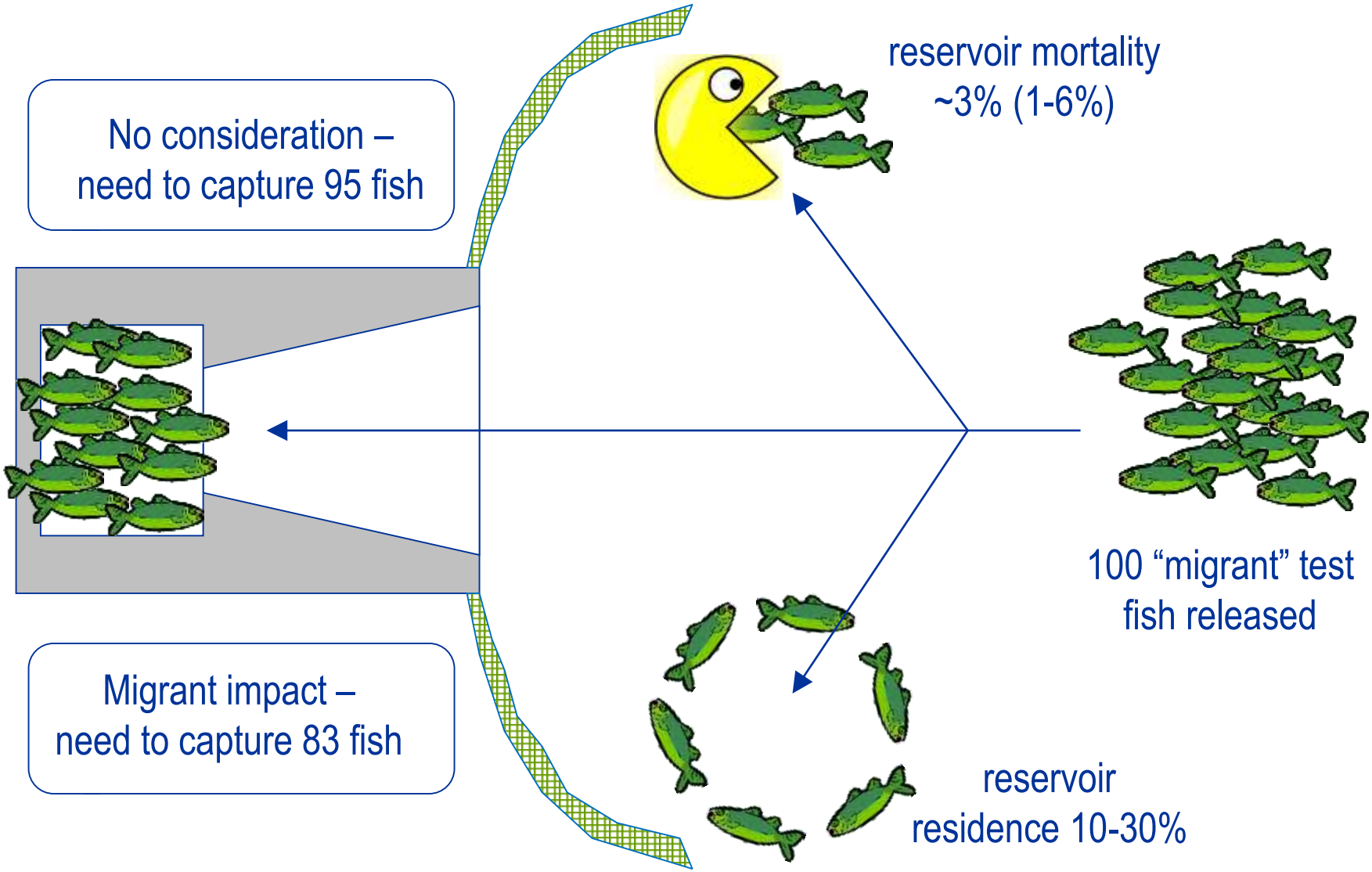
Implications of Missed Targets

- Less than 70% = discuss
- Difference of 15-20% in flow study = construct phase II

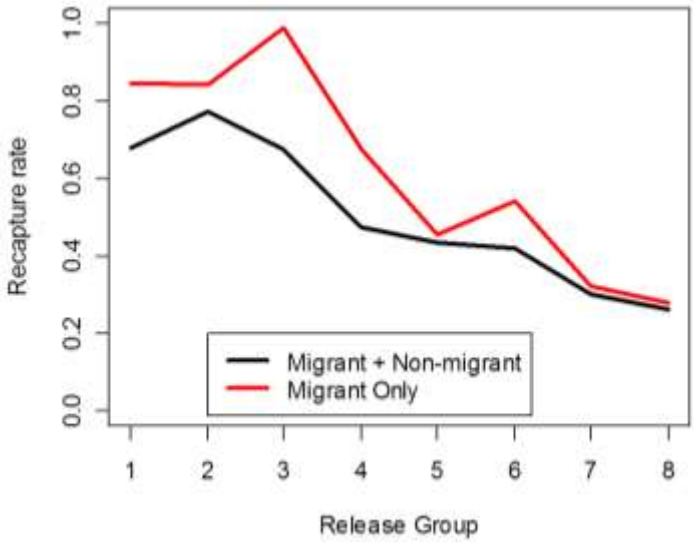
Percent Recovery	
Year 1	70%
Year 2	77%
Year 3	83%
Year 4	88%
Year 5	92%
Year 6	95%

… spent two years developing methodology & establishing baseline.

Non-Migrant Effect

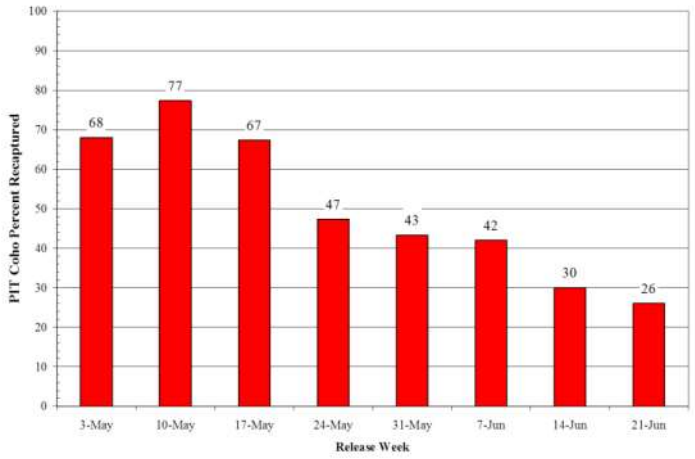


Non-Migrant Effect



Gill Na^+/K^+-ATPase Analysis

- Individuals' peak migration readiness is brief.
- % migrants varies over time.
- LTE 90% were migrants (98% CI).
- Since tightened to 4% non-migrants.

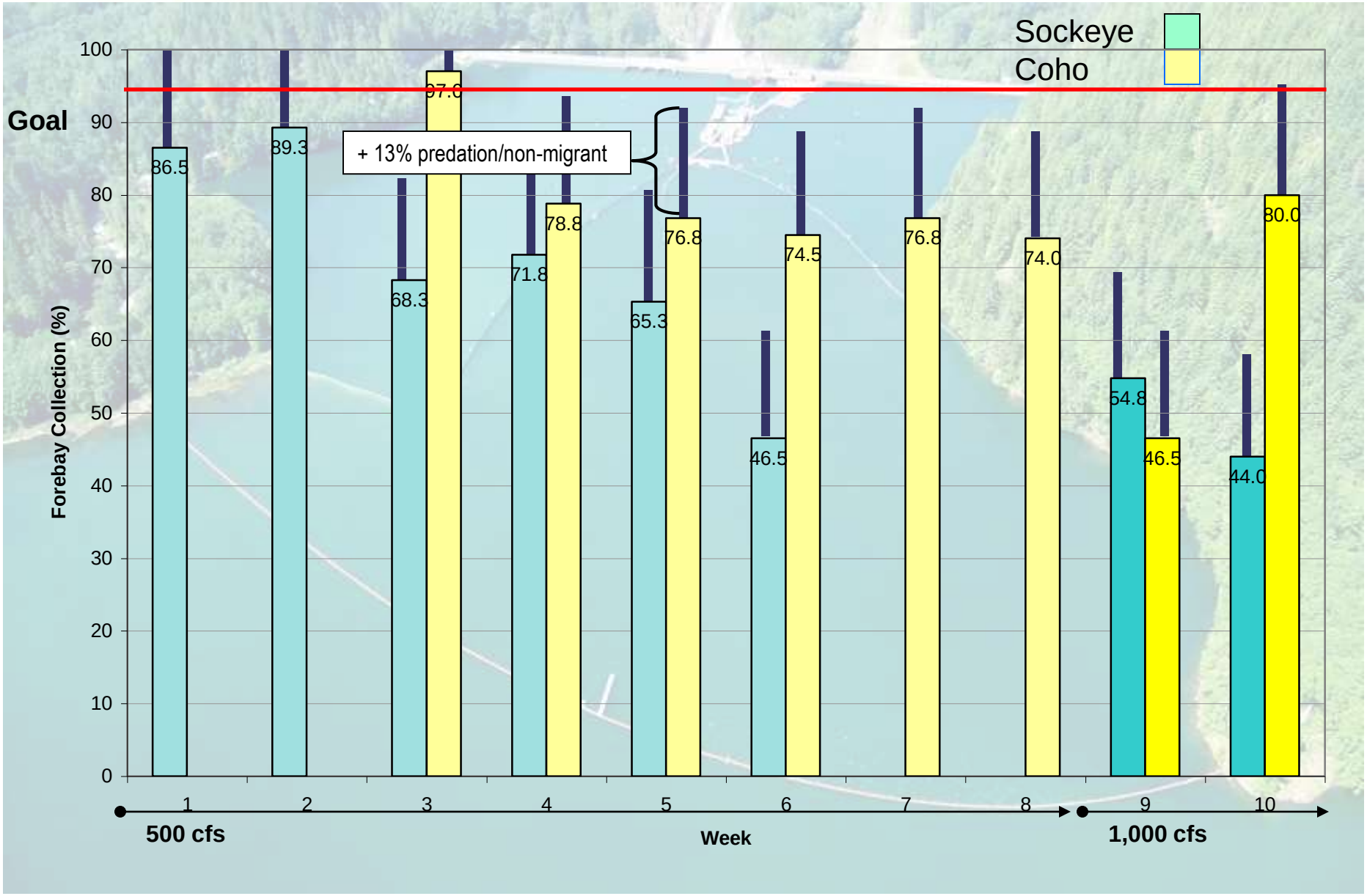


Evaluation

Objectives

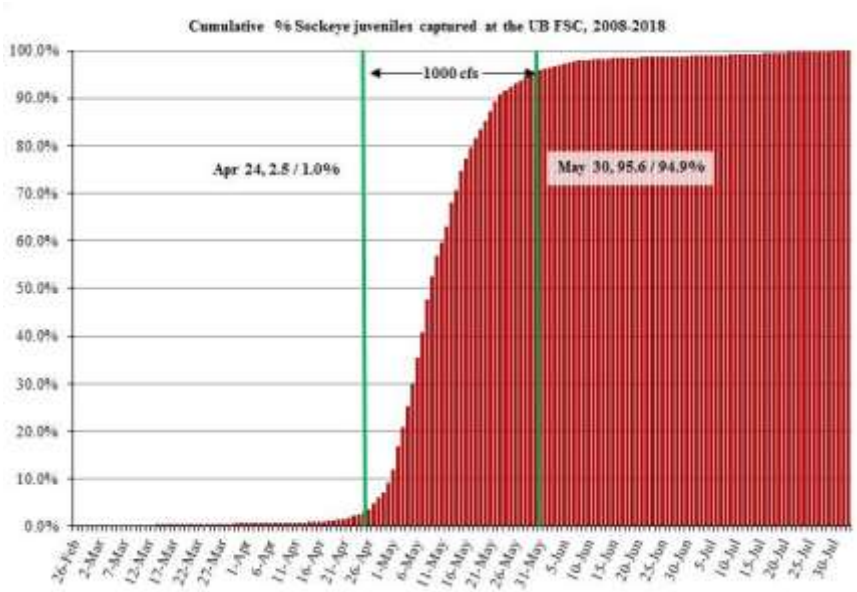
1) Recapture rates (collection) for Sockeye & Coho at 500 cfs inflow.
2) Survival (smolts & fry) through collection, holding, and transport facilities.
3) Limited tests of FSC collection performance at 1,000 cfs inflow.
4) Entrance channel rejection using acoustic telemetry.
5) Predation impact on performance of the FSC.
6) Test sub-sampling strategies throughout migration period.

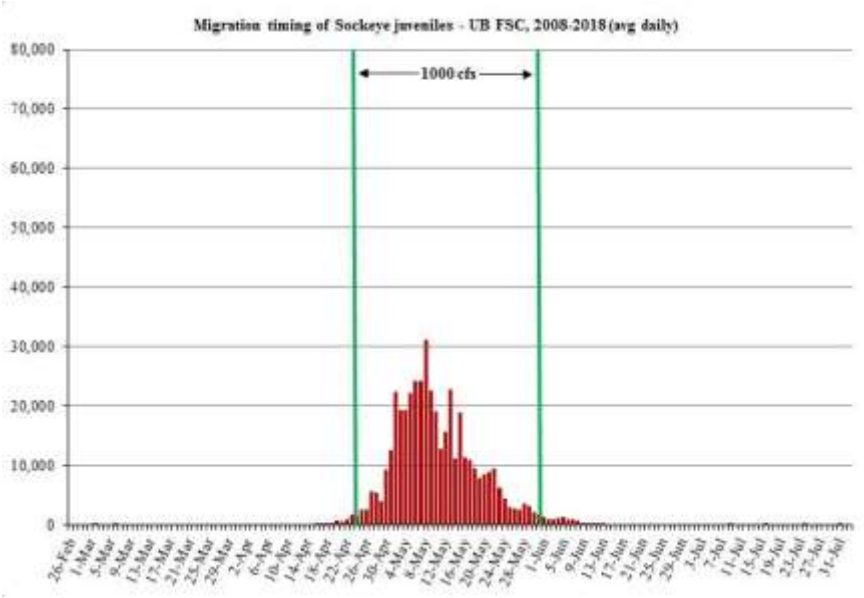
2008 Performance Results

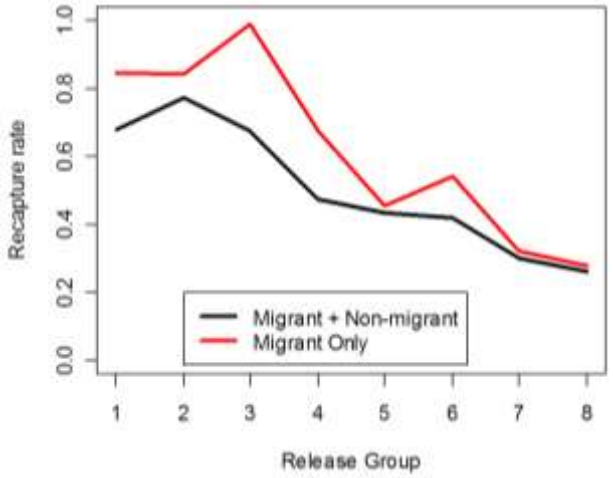


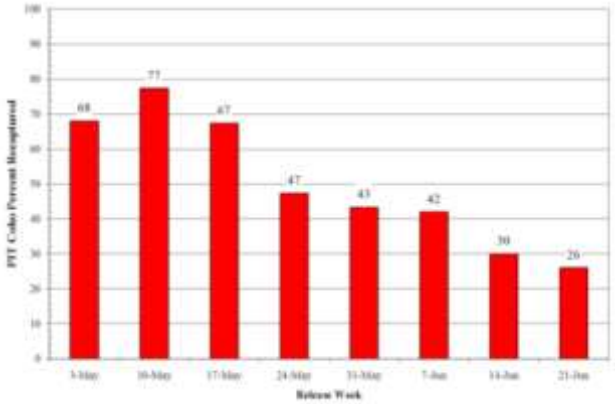
Migration Timing, Response

… impacts on performance by study methods & release timing is unavoidable.

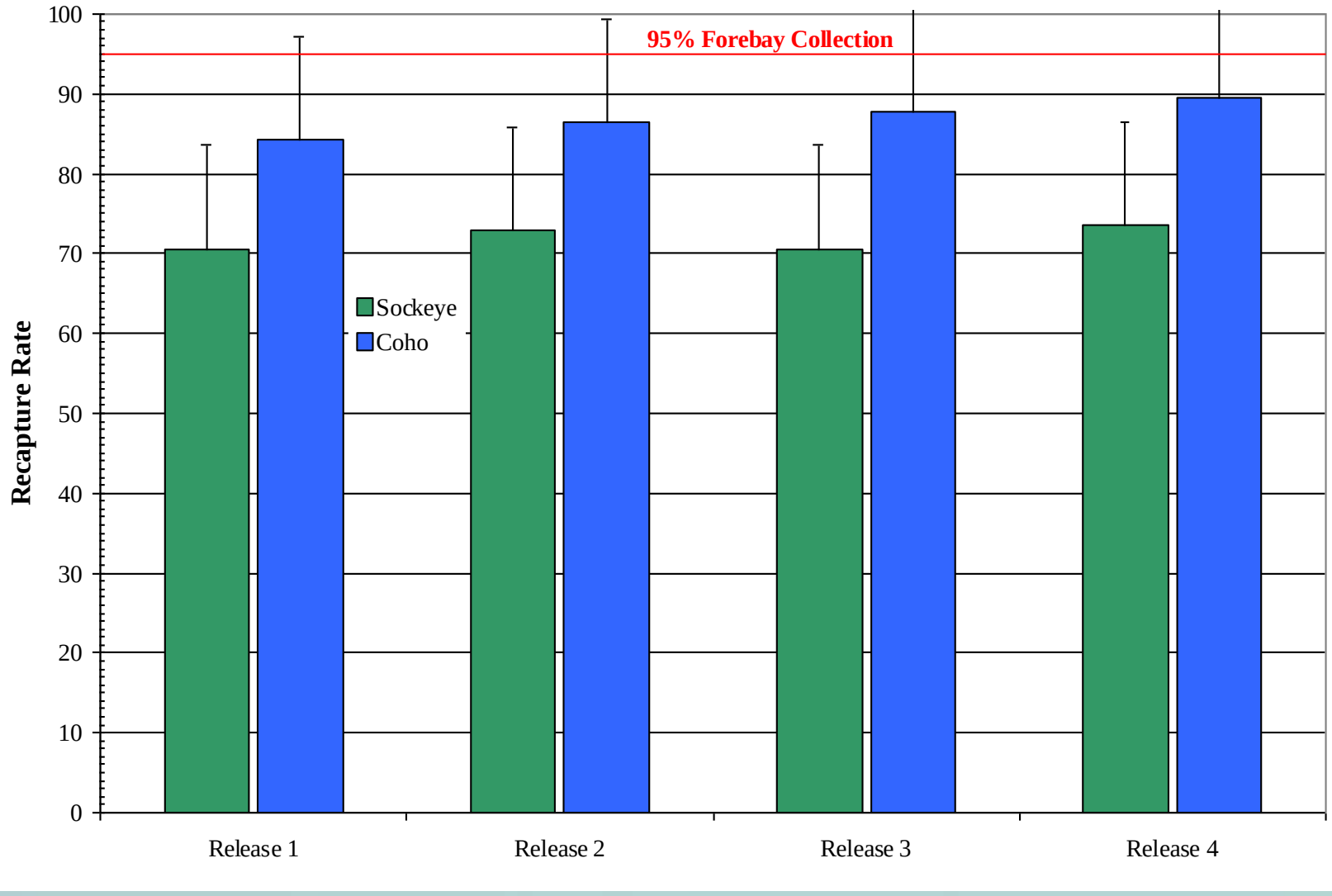




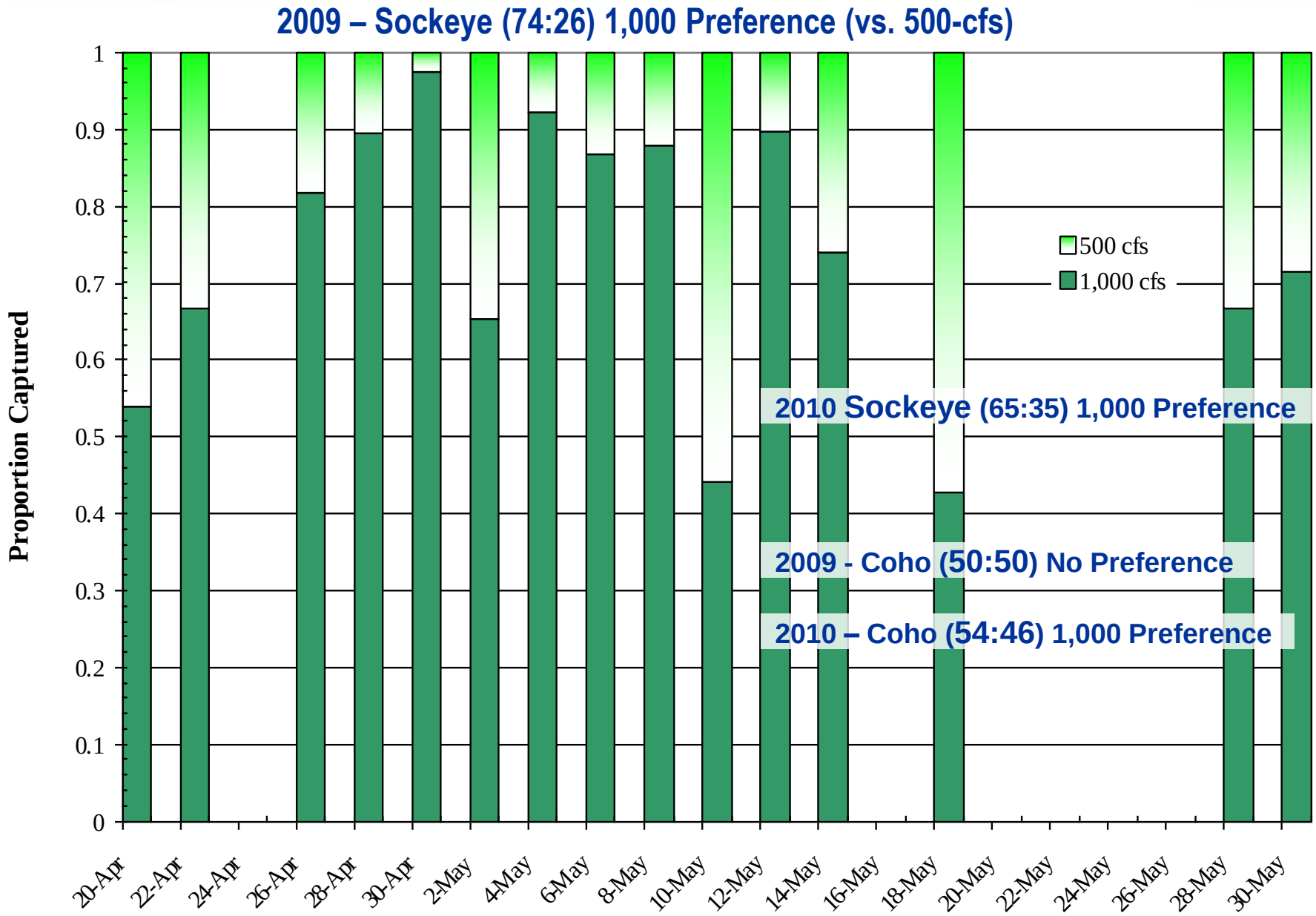




2009 Performance Results



Flow Preference Results



Evaluation Results

	% recovery UB	% recovery LB
Sockeye mean	83.7	81.2
Sockeye range	79.0-96.8	82.7.0-98.8
Coho mean	90.7	92.1
Coho range	82.6-99.0	87.5-96.1

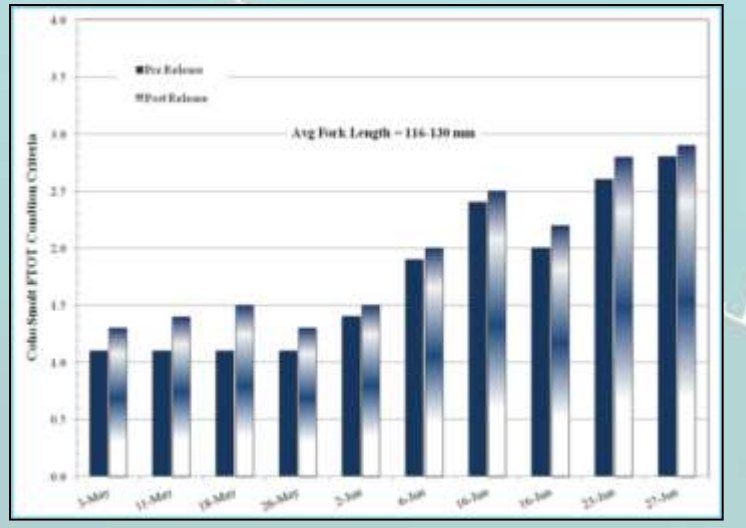
FTOT diagnostics scoring:

1 = no damage

2 = partially descaled one side

3 = partially descaled two sides

4 = descaled, body or head wounds



PUGET SOUND ENERGY

"Evaluation" Defined?

- Identify long-term goals & parameters to meet them.
  1. Achieve conservation & management targets.
     - Recovery, stabilization, sustainability, enhancement, harvest
     - Behavior, facility, operations, environmental influences
  2. Inform collective actions to improve facility function.
     - Learn, understand, modify (opinions & approach)
  3. Verify adherence to criteria, design.
  4. Evaluate facility against standards (recognize limitations).
  5. Monitoring – identifies issues, guards against complacency.

PUGET SOUND ENERGY

"Evaluation" Defined?

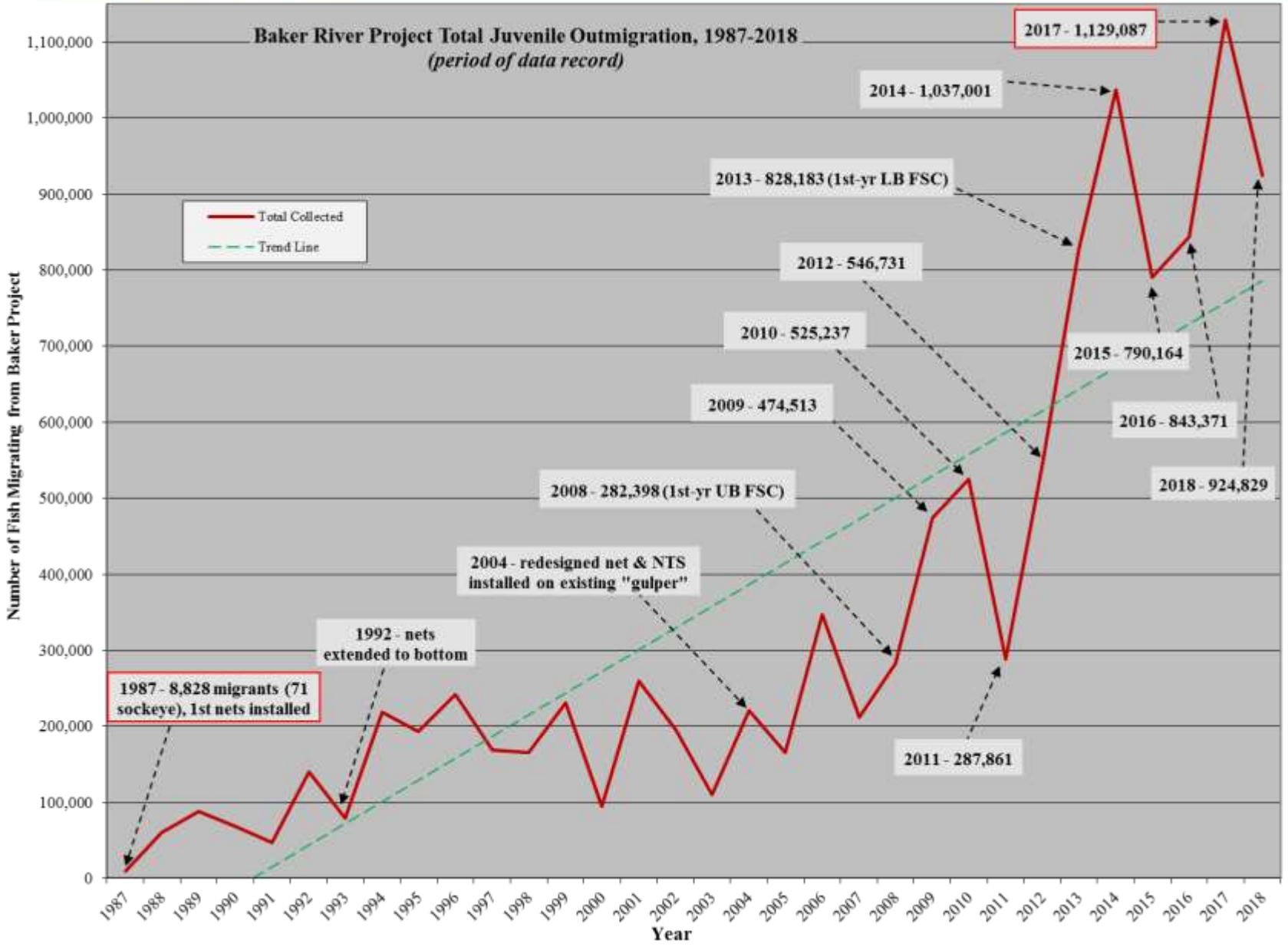
- Evaluating the facility … and your method.
- Methodology (e.g., release timing) impacts performance.
- Know your fish – unpredictable behavior & interannual variability.
- Evaluate numbers in context (unequivocal results are rare).
- High results may be most accurate – they indicate facility capability.
- Your work has just begun – whether standards are met or not.

PUGET SOUND ENERGY

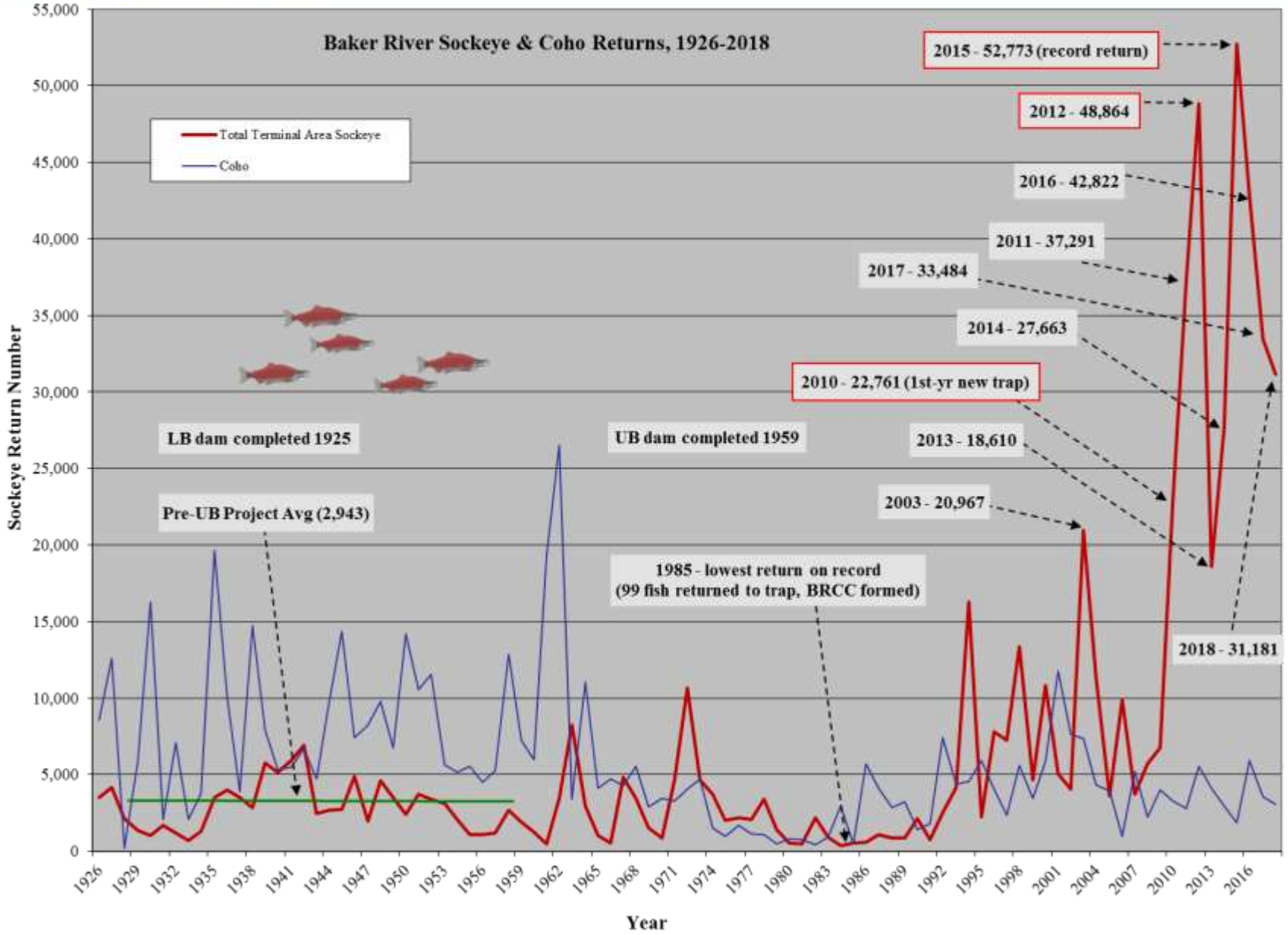
Lessons Learned *(last chance to proselytize)*

- Identify & acquire foundational information up-front.
- Commit to incremental improvements over long-term & adaptively manage (things seldom go as planned).
- Engage deeply, all the time – the job's never done.

Sockeye Trend



Sockeye Recovery



Questions?

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