Trinity River Restoration Program
2013 Science Symposium

TRRP's Scientific Advisory Board Review of Phase 1

Review process, findings, and recommendations

Presented by Mike Merigliano, U of Montana & Science Advisory Board to the Trinity Management Council & the Trinity River Adaptive Management Group, August 27, 2013

Team

Science Advisory Board:

- John Buffington, geomorphology
- Chris Jordan, fisheries
- Mike Merigliano, riparian ecology and wildlife
- Jim Peterson, fisheries
- Clair Stalnaker, fisheries

Support Contractors:

- John Ferguson & David Glaser, Anchor-QEA
- Sebastian Araya, Tom Lisle & Jay Stallman, Stillwater Sciences
- Tracy Hillman, BioAnalysts
- Rich Hinrichsen, Hinrichsen Environmental Services

Please keep this in mind:

- An incredible amount of work has been accomplished by the TRRP and all its associated partnerships
  - ROD / EIS – provides a framework for tackling a very large physical / biological management issue
  - Habitat manipulation – a decade of intensive, extensive, expensive, innovative habitat rehabilitation work
  - Monitoring data collection – a decade (or more in some cases) of intensive, extensive, expensive environmental monitoring

Review’s Purpose

From the TRRP’s Guidance document:

Conduct an independent scientific review and assessment of the initial phase of implementation activities in reference to TRRP’s foundational documents

Evaluate the channel rehabilitation projects and gravel augmentation program implemented from 2005 through 2010

Develop a review document to serve as a foundation and direction for the second phase of implementation.

Trinity River Restoration Program Strategy

From the Flow Evaluation report (1999):

Recommended a restoration strategy for the Trinity River that integrates restoration of riverine processes with the instream flow-dependent needs of salmonids.

This strategy is intended to rehabilitate the river ecosystem to improve and maintain the fish and wildlife resources of the Trinity River through managed flows combined with mechanical rehabilitation and coarse sediment augmentation projects.

The Phase 1 Review focused on this aspect of the strategy:

“. . . .managed flows combined with mechanical rehabilitation and coarse sediment augmentation projects”.

Because of this combination, we must look beyond the projects themselves

ROD Components

Variable flow regime

Physical channel rehabilitation

Sediment management

Focus

Watershed restoration

Infrastructure improvements

Adaptive Environmental Assessment and Management Program

The SAB's Approach

We used four scales:

Design element (e.g., side channel, lowered flood plain, etc.)

Site (a rehabilitation project, such as Sawmill Gulch)

Reach (a stretch of river having similar characteristics)

System (the river and bottomland from Lewiston to N. Fork)

Sources of Information

1) Reports provided by the TRRP

Hydrology

Geomorphology, including sediment loads

Fish populations, habitat use, habitat area

Riparian vegetation

Rehabilitation sites (designs, as-built, objectives when available)

Data related to the above

Sources of Information, continued

2) Basic Data

Aerial photography (20 different years, 1944 through 2011)

Maps (bank lines, bathymetry)

Channel cross-sections

Hydraulic model

Essentially, the TRRP opened up their books for us.

Primary Parts of the Review

Channel Rehabilitation Projects

Geomorphic and flow context followed by a review of each Phase 1 project

Spatio-temporal analyses

Relating many system-wide and project level aspects to each other to understand biological trends and river behavior.

GRTS Analysis

Trends in habitat and redds based on TRRP sampling

High-level indicators

Synopsis of TTRP monitoring of 11 performance measures (e.g., fish populations, water flows, temperature, escapement

Primary Parts of the Review, continued -

Riparian Vegetation Dynamics

Erosion and deposition of channel margins and vegetation transitions

Decision Support System

A guide to making management decisions using an integrated suite of empirical and simulation models

Data-frame development and meta-data

Summary of findings and Recommendations

Some Highlights of the Results. . . .

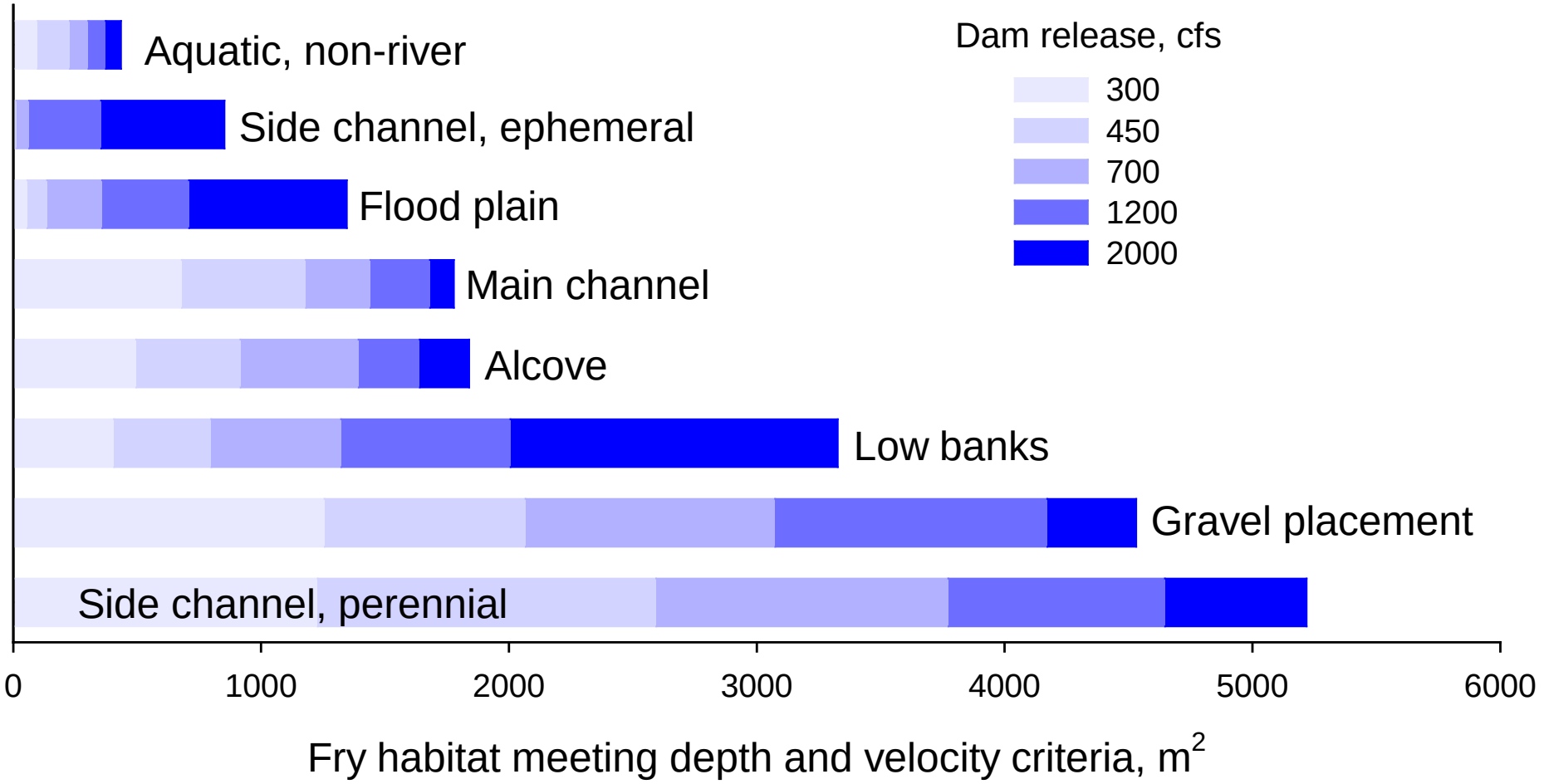
Fish Habitat at Design Elements

How much fish habitat was created at the various types of channel design elements such as side channels, gravel placement, etc?

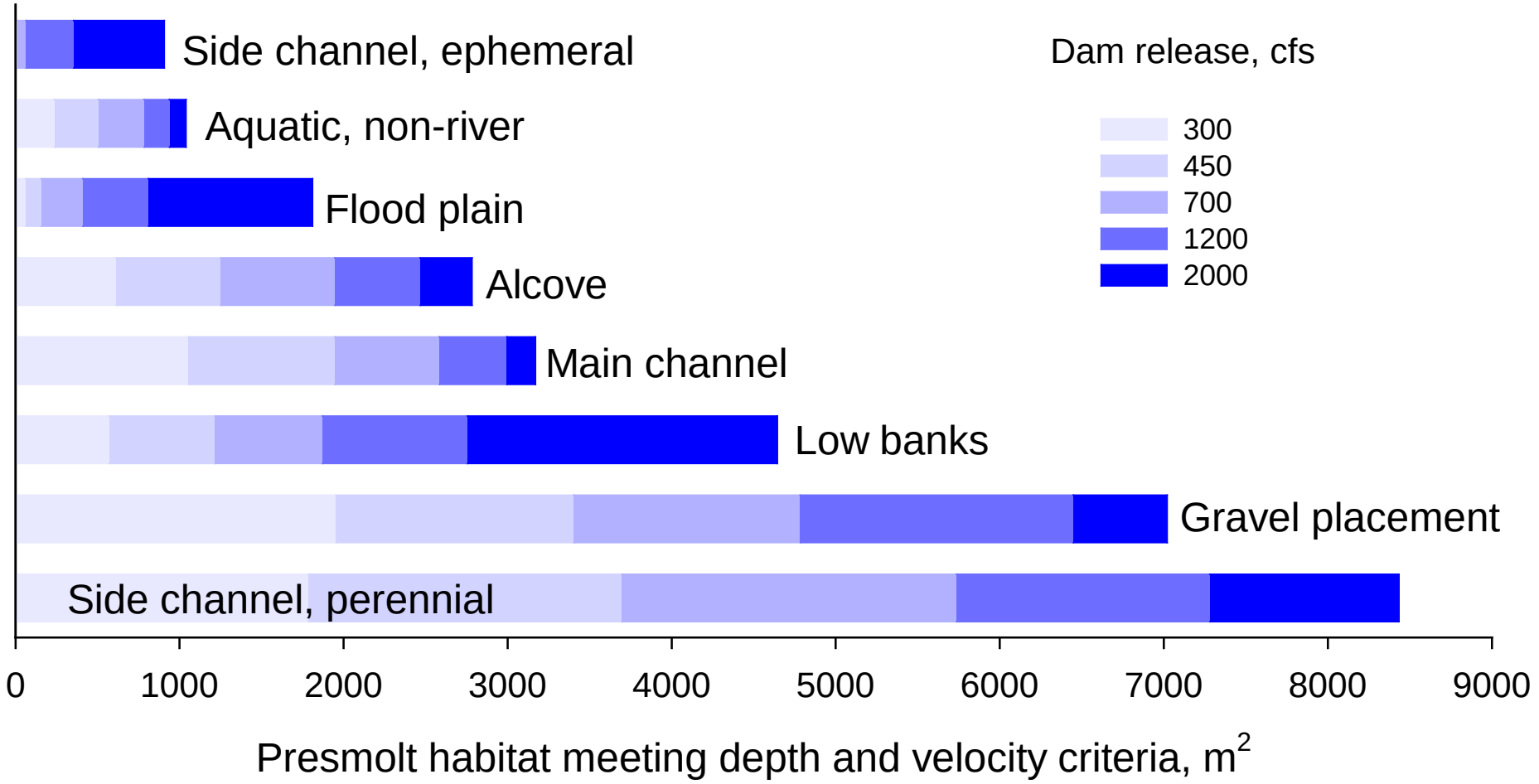
Post-construction habitat was measured at a range of flows at the following projects:

Cableway gravel augmentation
Cableway
Lowden Ranch
Dark Gulch
Reading Creek
Hocker Flat

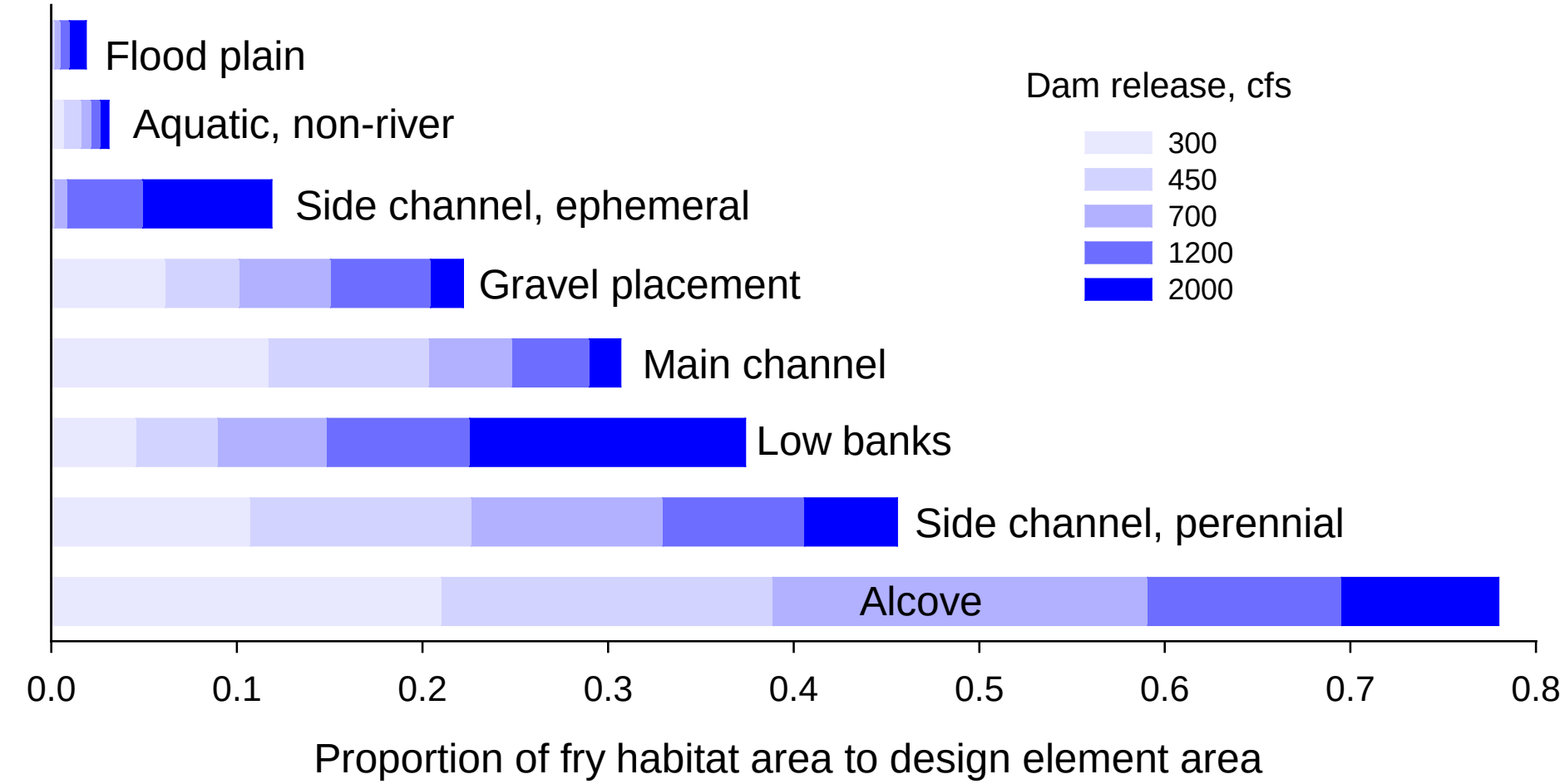
Habitat Created at Channel Construction Sites ~ Fry



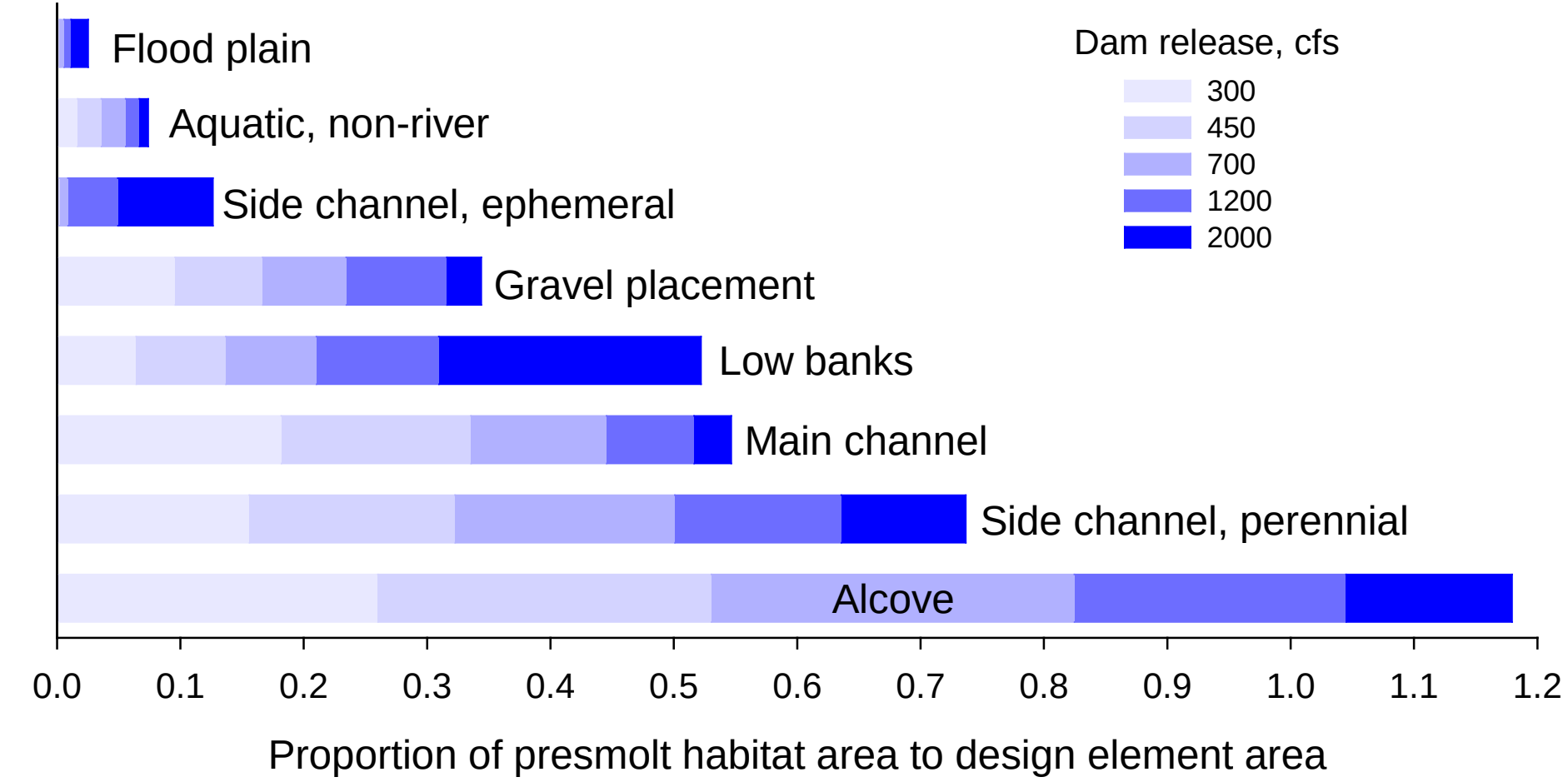
Habitat Created at Channel Construction Sites ~ Presmolts

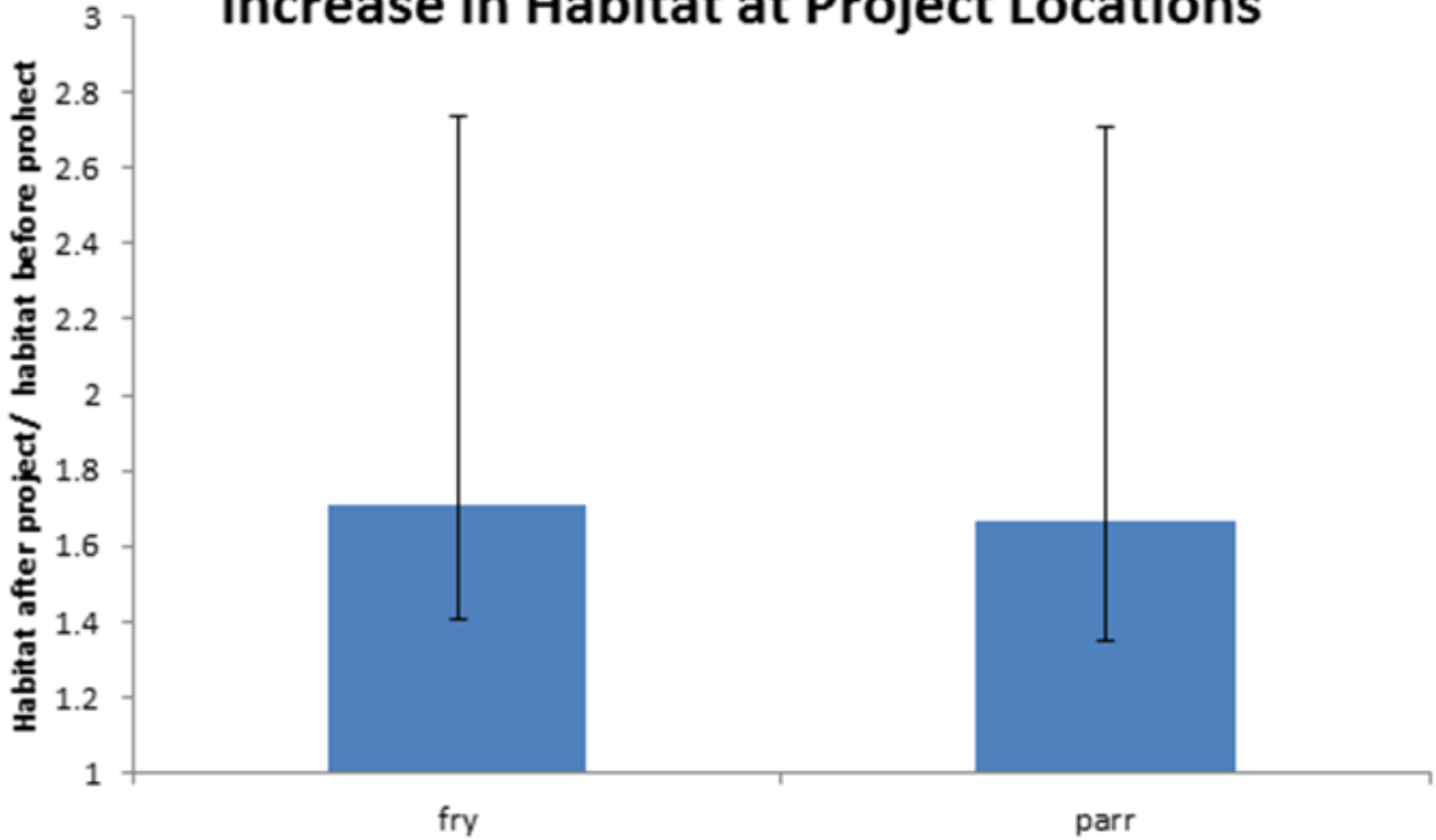


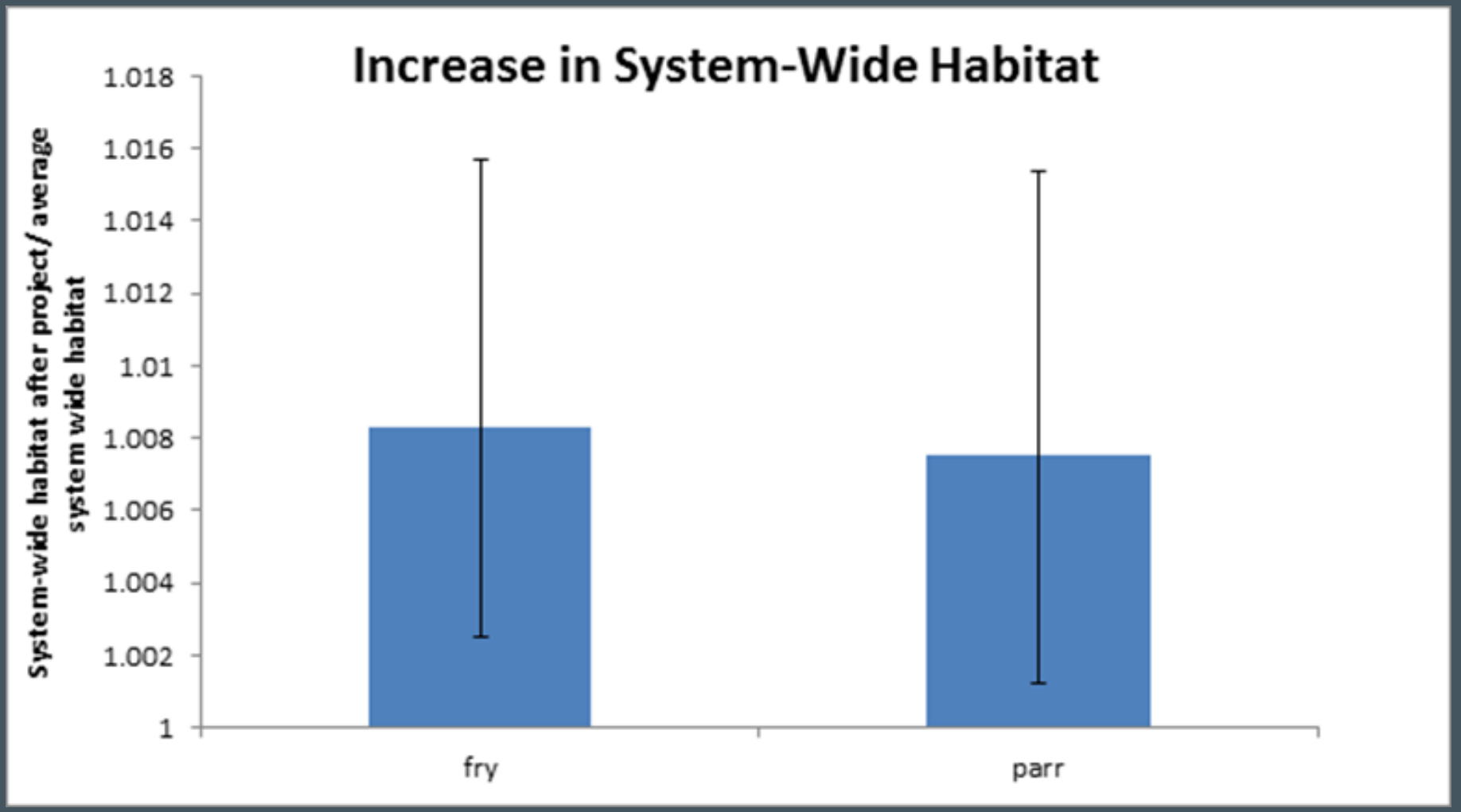
Efficiency of Design Elements for Creating Habitat ~ Fry



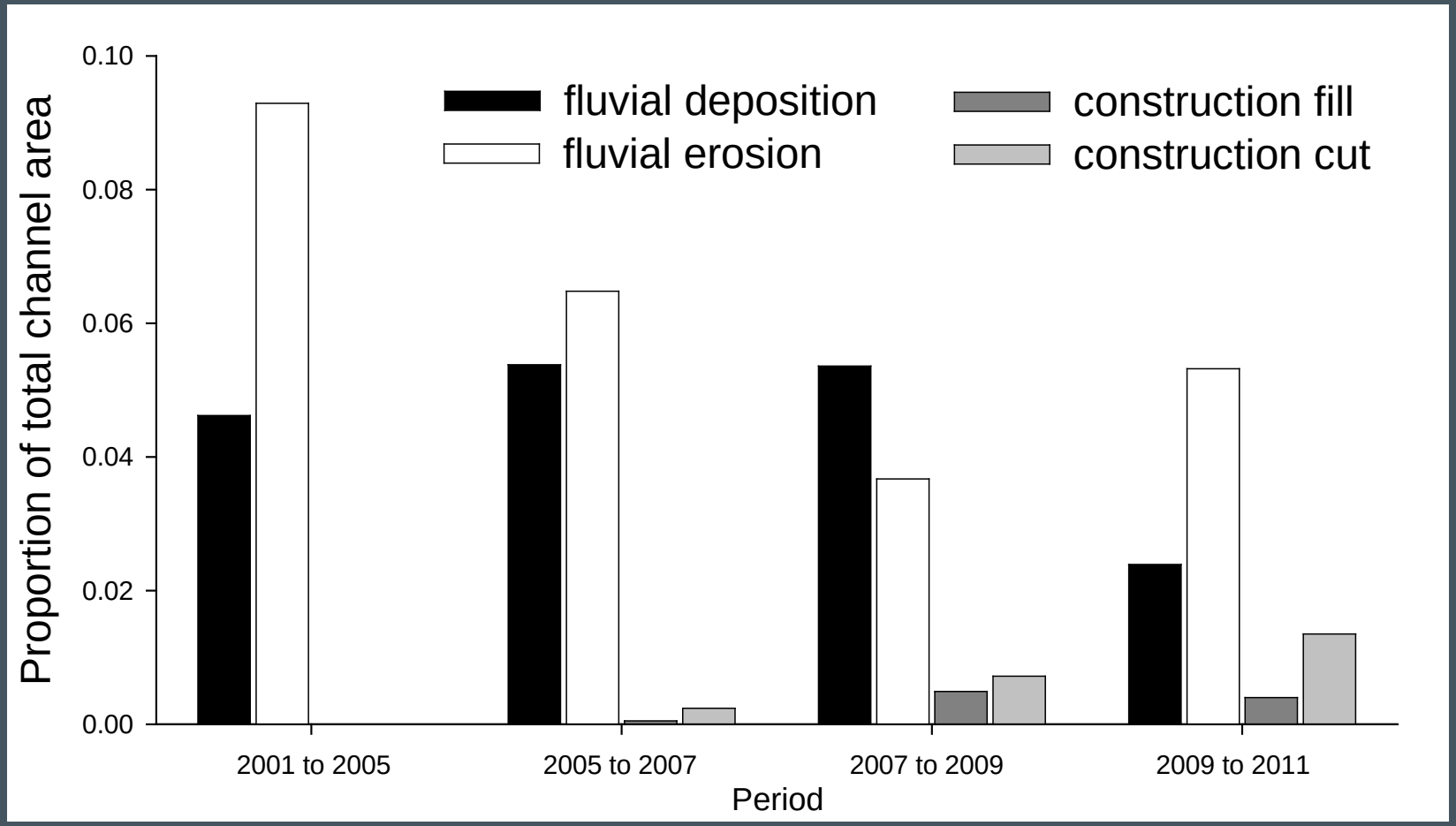
Efficiency of Design Elements for Creating Habitat ~ Presmolts




Increase in Habitat at Project Locations
Habitat after project/ habitat before prohect
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
fry
parr


Increase in System-Wide Habitat
System-wide habitat after project/ average system wide habitat
1.018
1.016
1.014
1.012
1.01
1.008
1.006
1.004
1.002
1
fry
parr

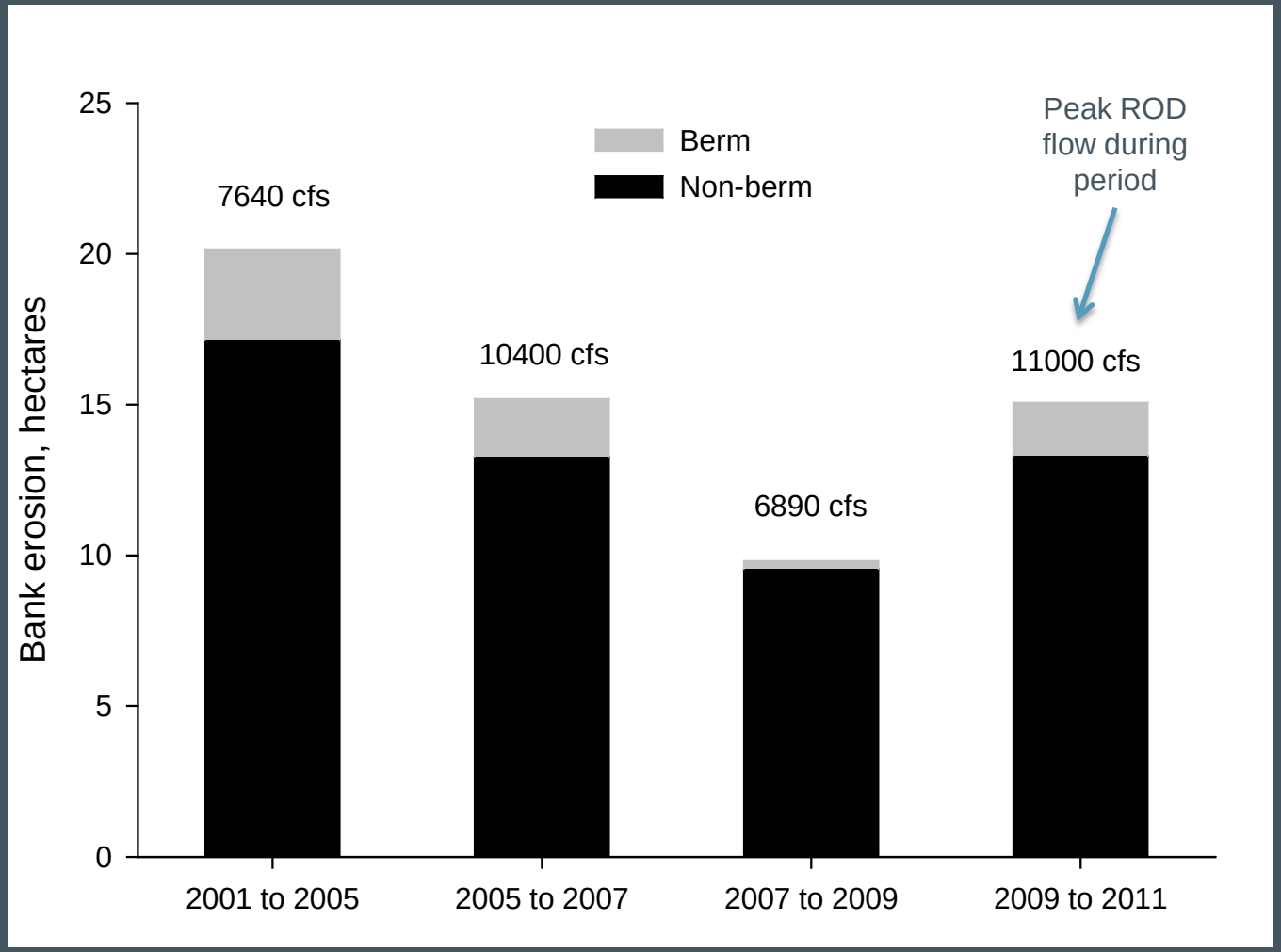
Channel dynamics



The channel is widening, generally, over time

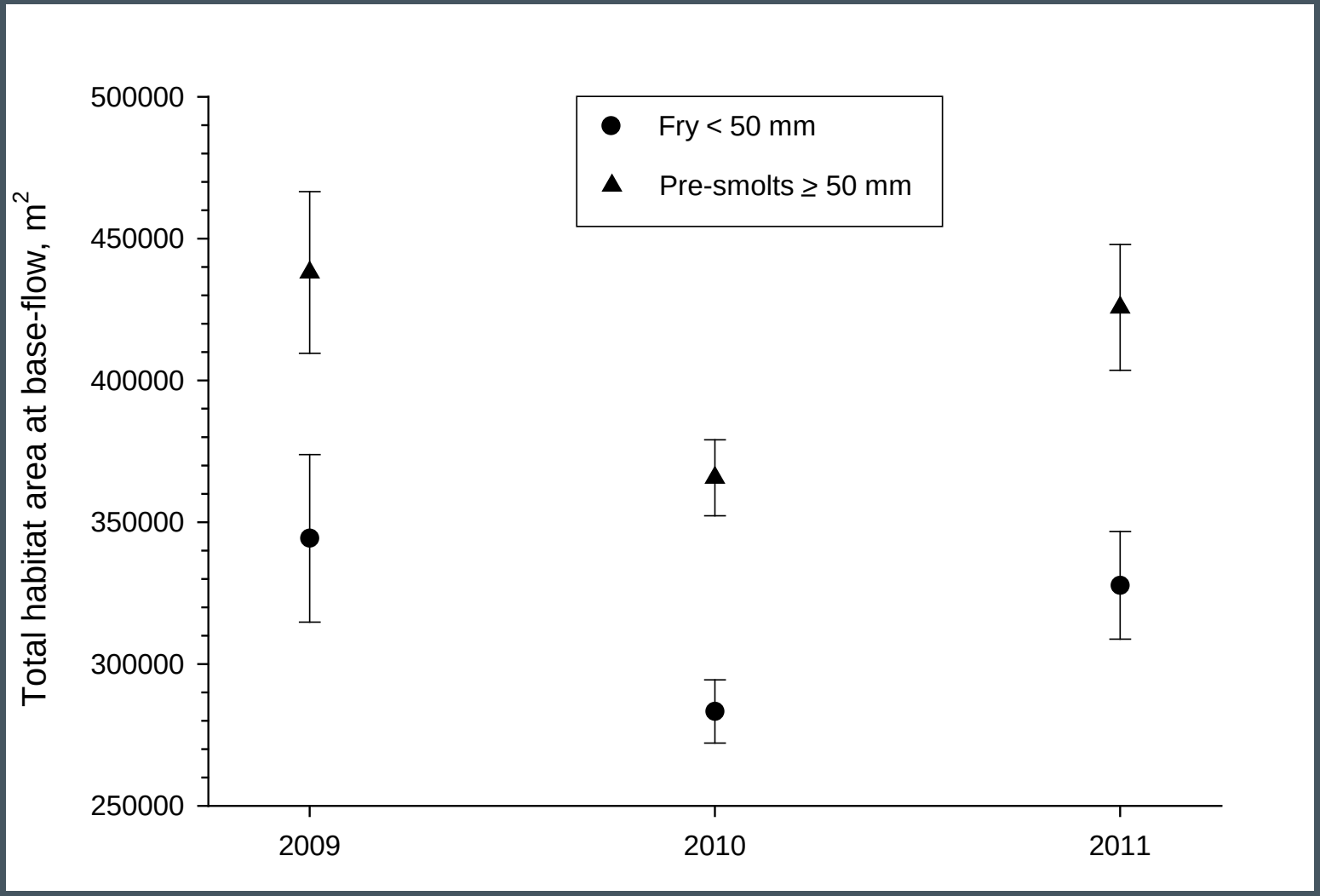
The length of non-constructed channel is twice that of constructed channel

Riparian Berm Erosion



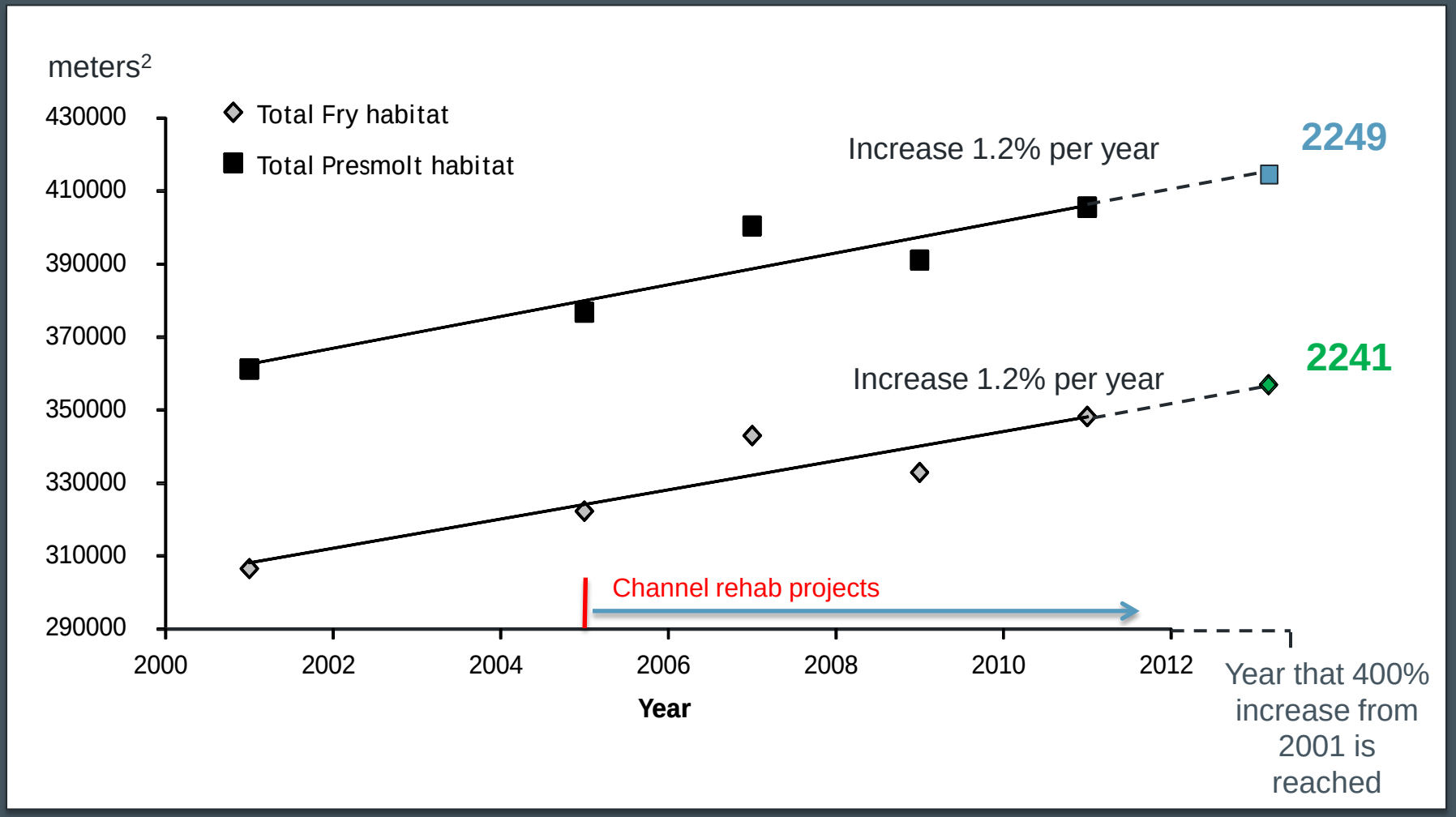
Percent of total berm eroded since mapped in 2003 = 18%

Habitat Trend - monitored



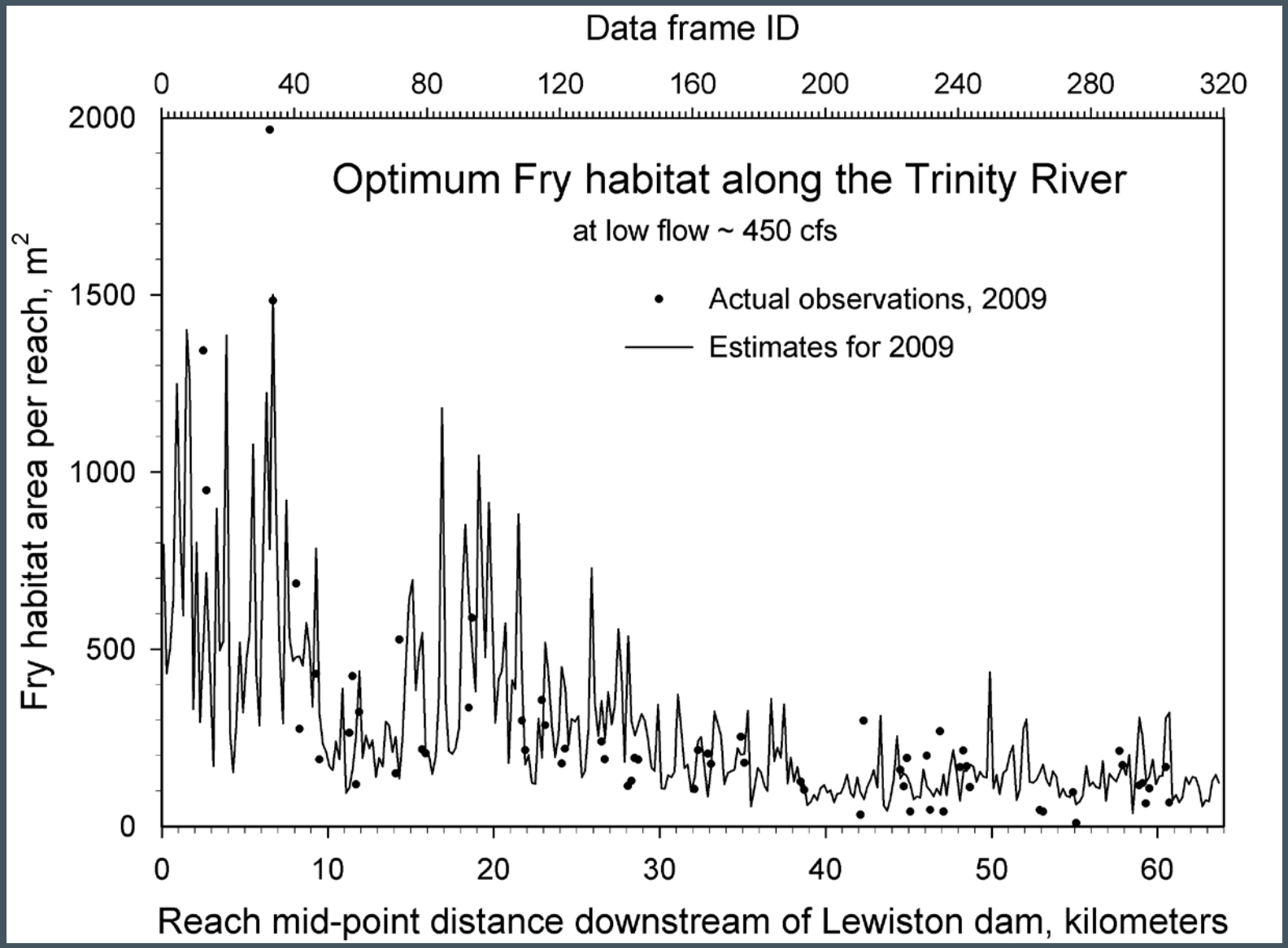
Based on sample estimates; error bars are 1 standard error of the mean

Habitat Trend - modeled

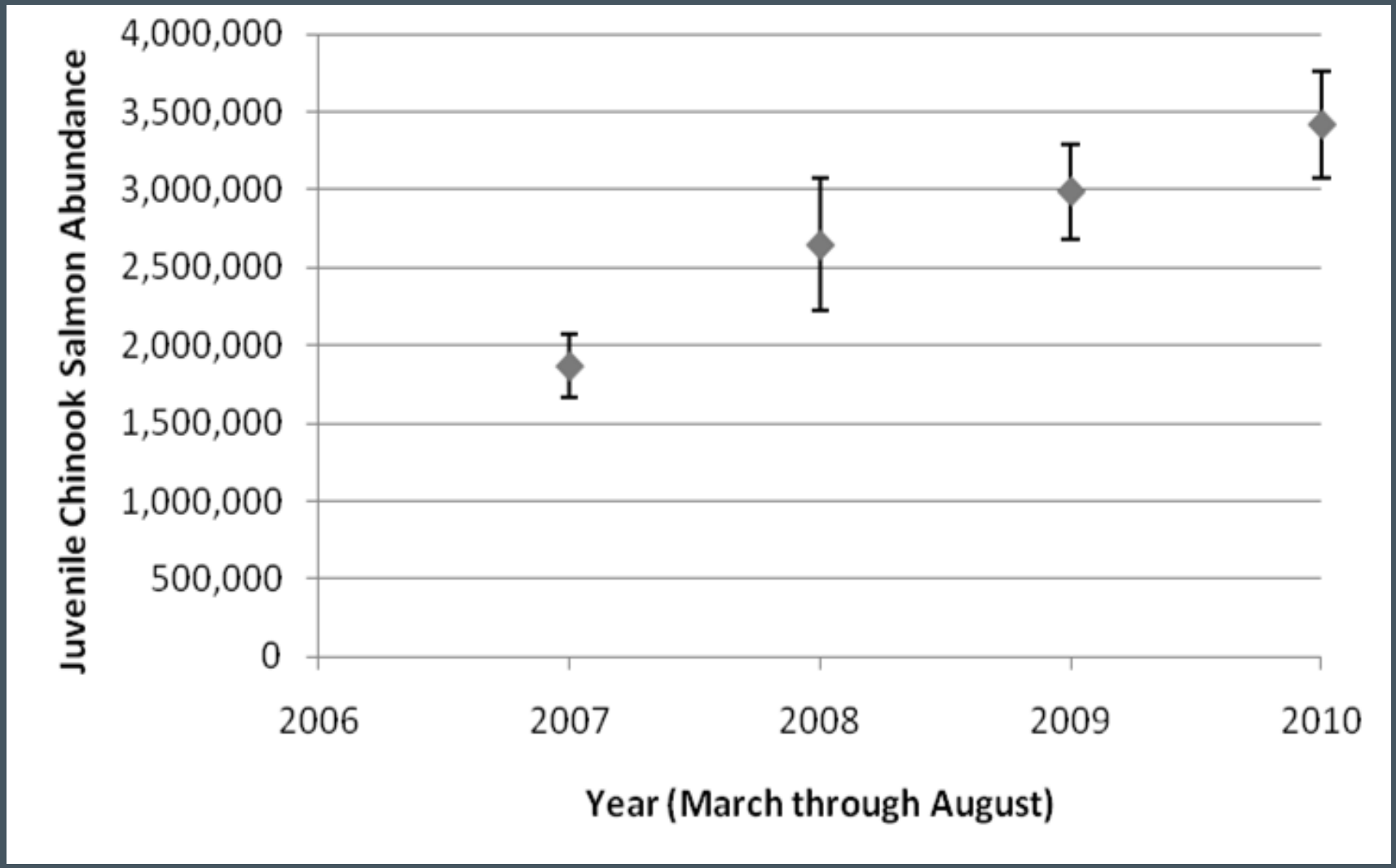


2.5 times the habitat in constructed versus unconstructed reaches

Fish habitat

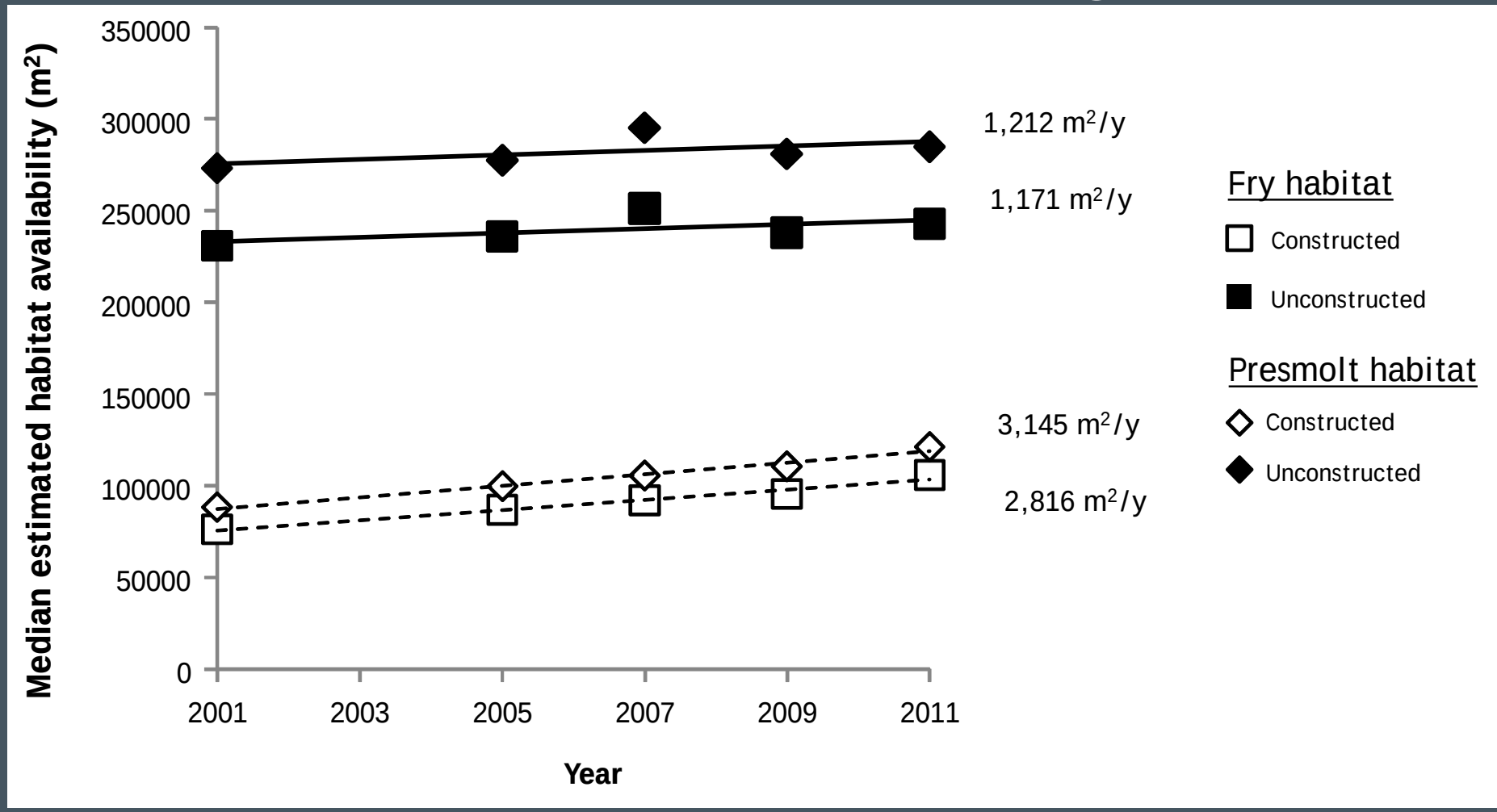


Smolt out-migration Trend at Willow Creek



Note: Data starts in 1989, but different methods confound including them.

Estimated habitat availability at baseflow
constructed vs. unconstructed segments



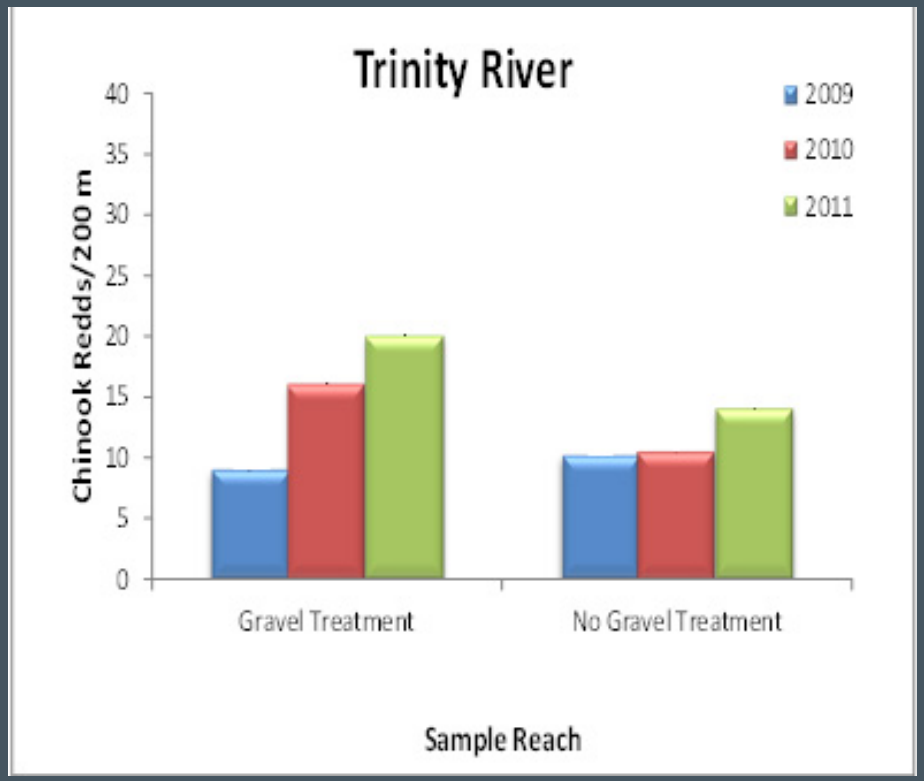
Increase since 2001

Constructed ~3.6% per yr

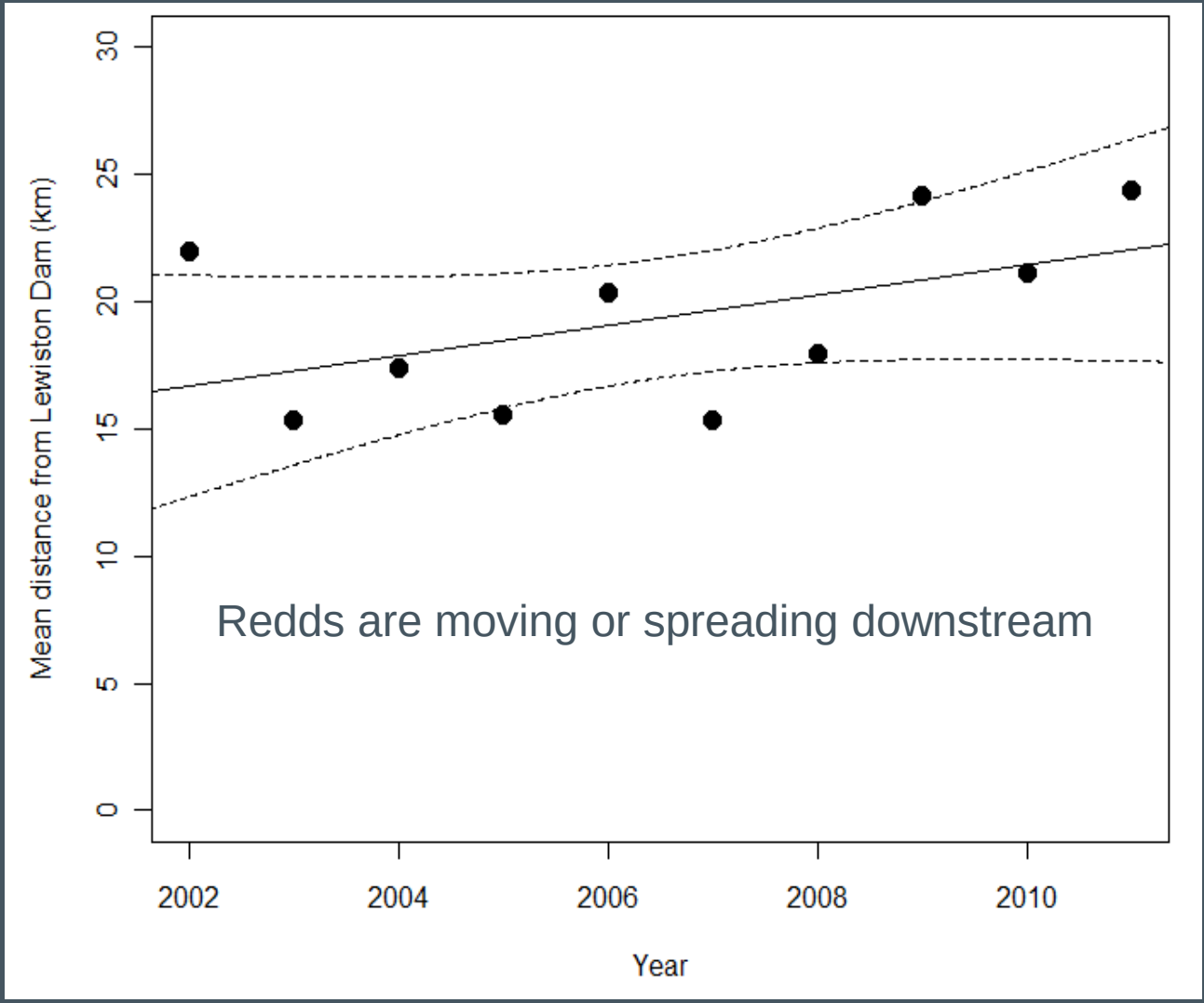
Unconstructed ~0.5% per yr

Results (densities): Change in Chinook redd/carcass distribution at design element scale (gravel augmentation)

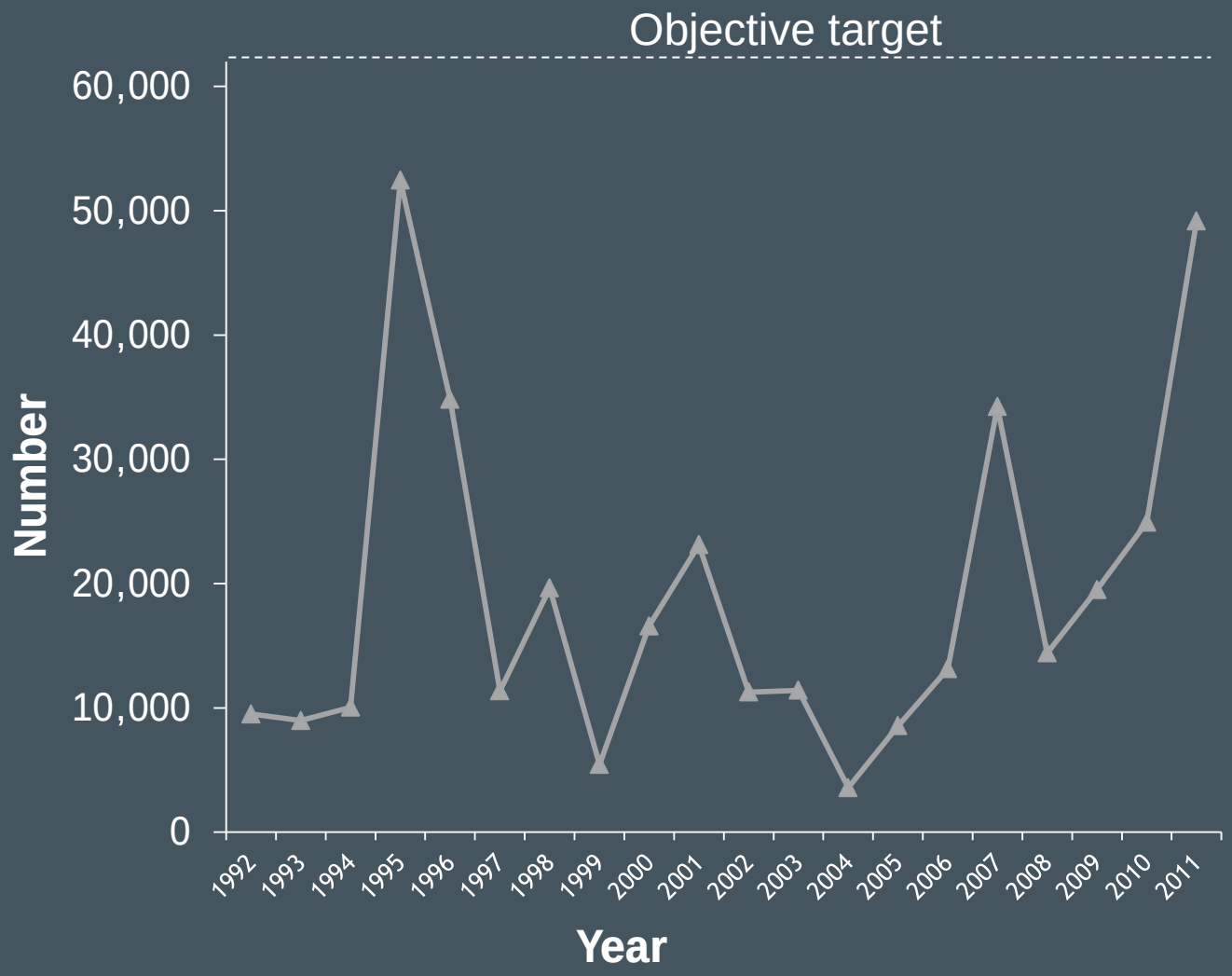
From 2009-2011:
Redds in treatment segments increased 123%, while redds in control segments increased 69%



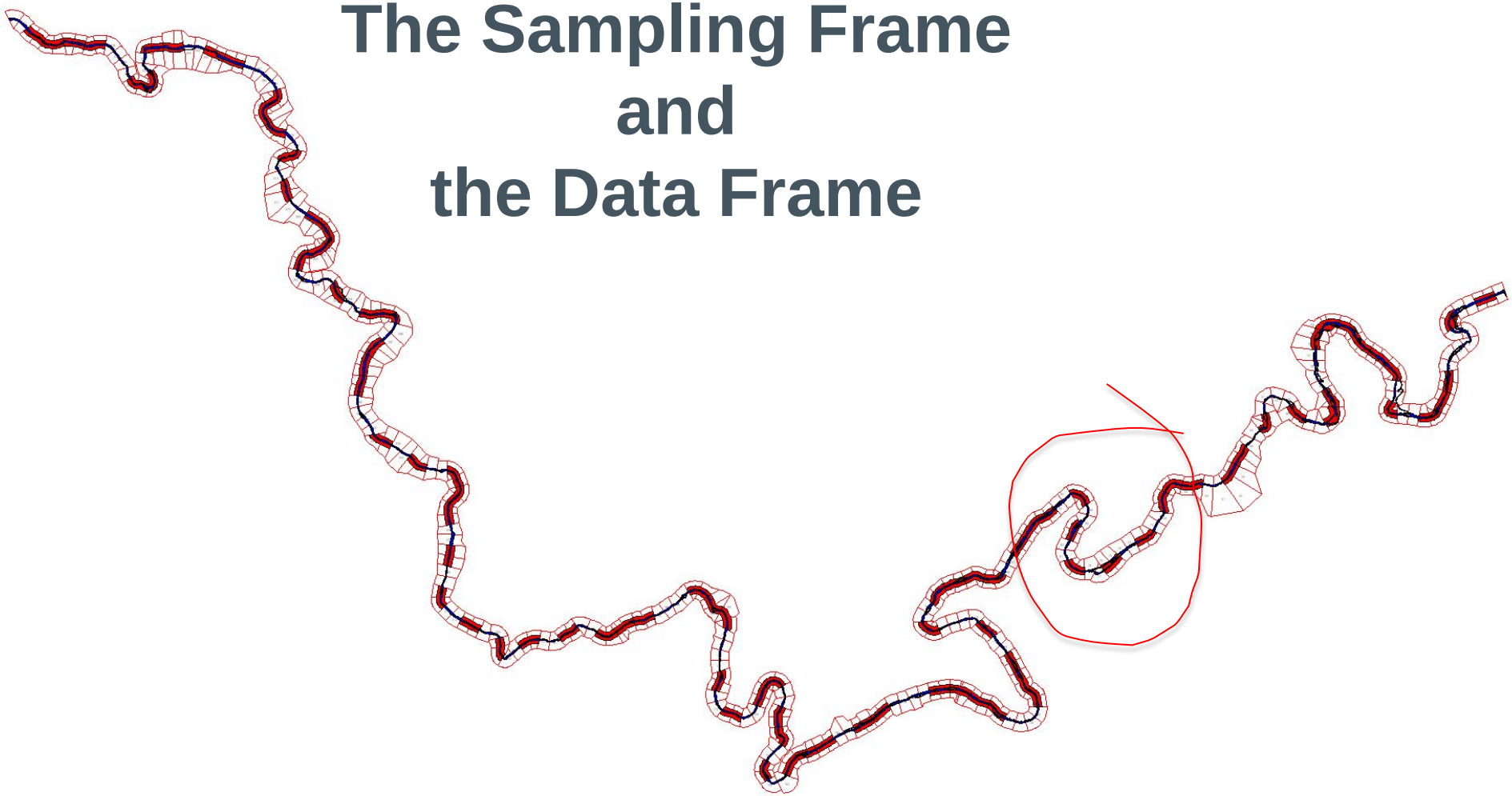
Movement of redd distribution over time

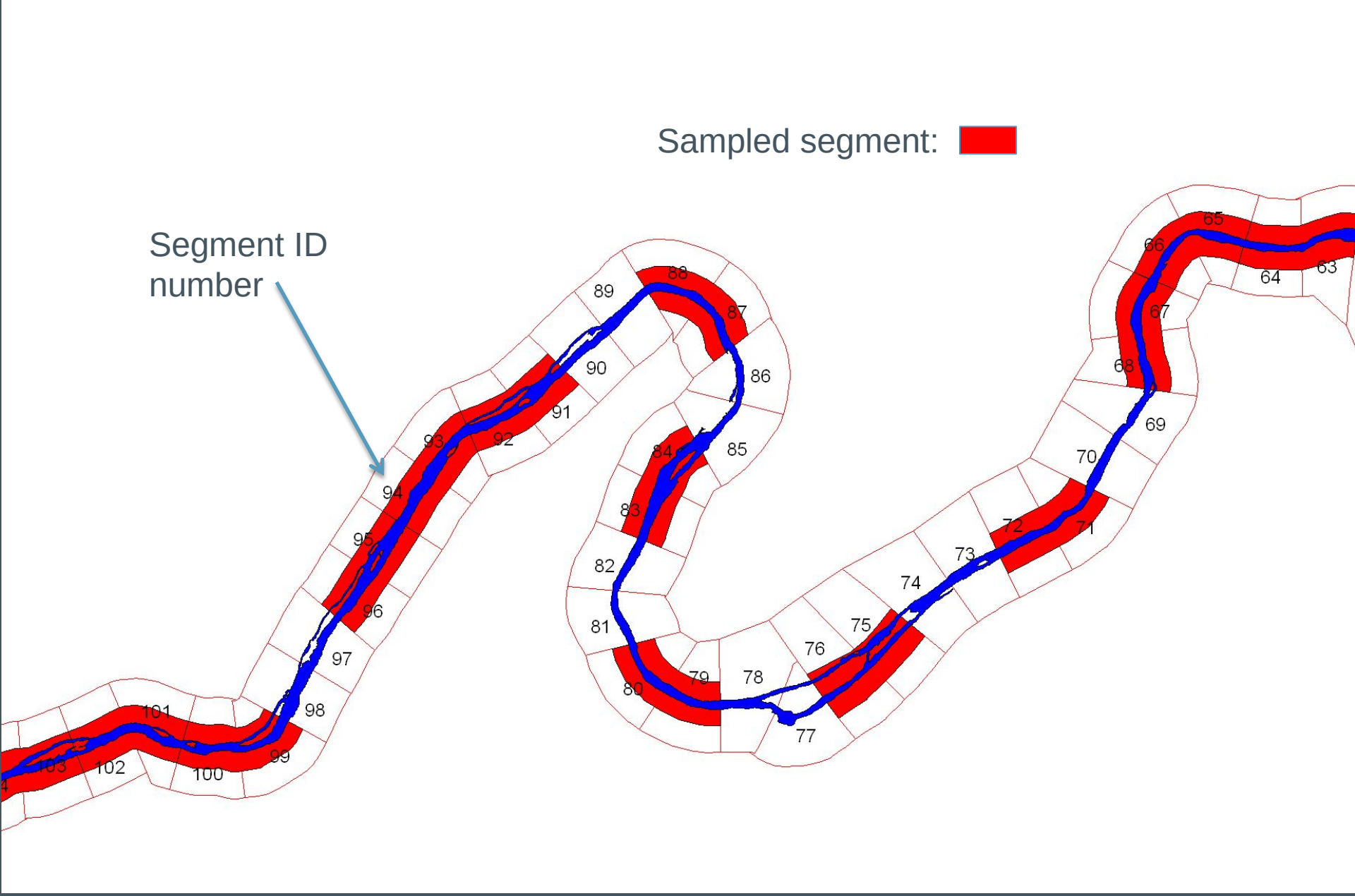


Fall-run Chinook



The Sampling Frame and the Data Frame




Sampled segment:
Segment ID number
88
89
87
90
86
91
92
93
85
84
94
83
95
82
96
81
97
80
79
78
77
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99
100
101
102
103

Questions posed

- Are we on the right track?
  - Yes, but changes are slower than expected and linkage between rehabilitation actions and population response is lacking/uncertain
- Which rehabilitation projects and design elements are successful?
  - Most recent designs have the largest constructed increase in habitat
  - No simple answer
- What should be done for Phase 2?

How are We Learning?

- Can we answer these questions for all TRRP actions (restoration, monitoring and analysis):
  - How did this action move the TRRP forward towards its objectives?
  - How is the TRRP better off given the implementation of this action?
  - Why this action rather than X, Y or Z?

How do we make *informed decisions faster*?

Recommendations

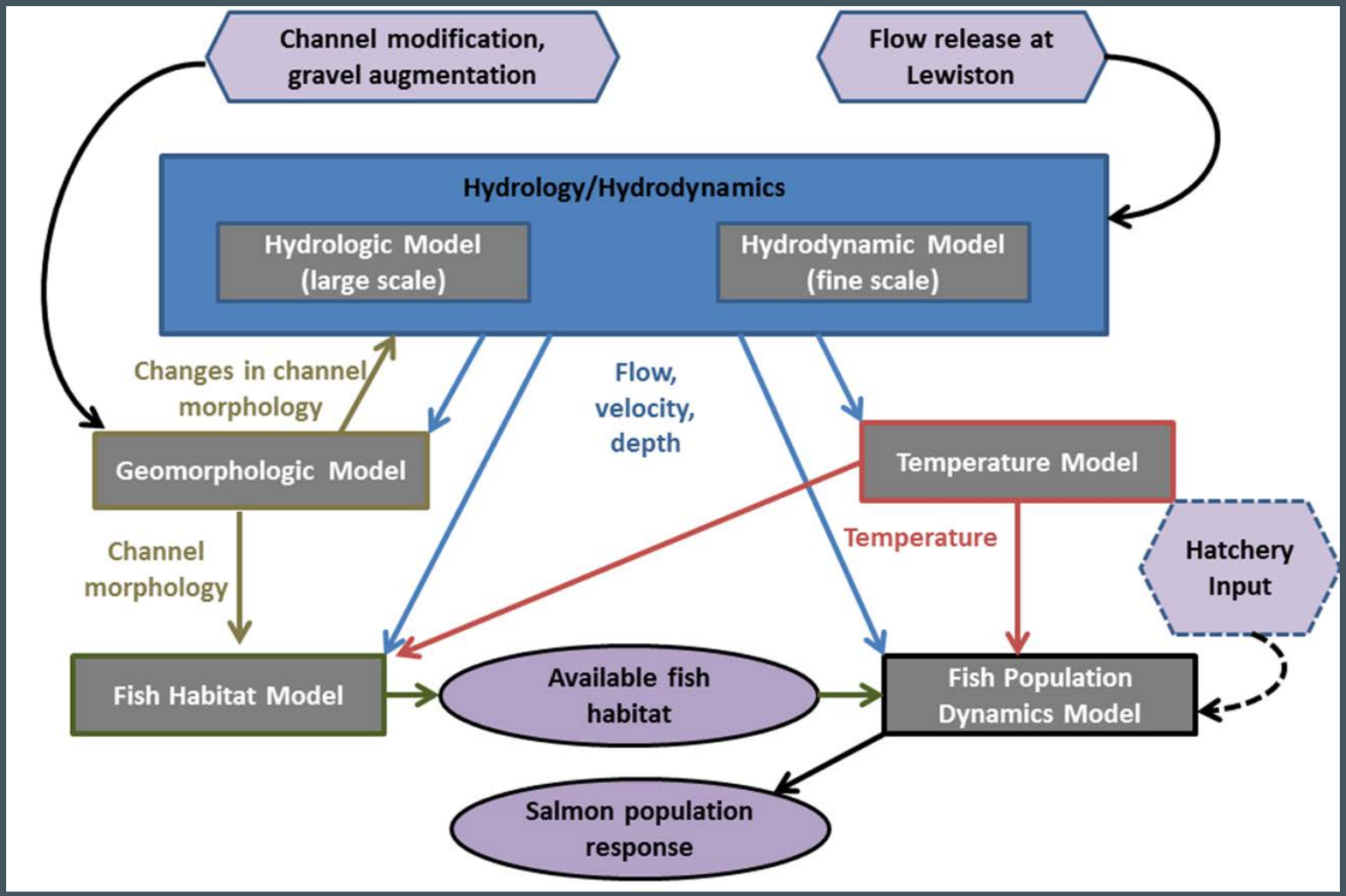
- Develop and implement a decision support system (DSS)
  - Series of linked physical and biological models that allow the Program to:
  - 1) predict site and system response to alternative management actions in relation to ROD and stakeholder objectives
  - 2) focus monitoring efforts; and 3) provide a tool for adaptive management.
  -
  - DSS will help to better structure and integrate Program activities, and increase the defensibility of management actions.

Recommendations

- Quantify program and stakeholder objectives and show how they are related.

- Scientific disagreement should be incorporated into the process using alternative models that represent the alternative scientific hypothesis about system dynamics.

Decision Support System



Recommendations, continued

- Integrate workgroup activities to better achieve specific Programmatic objectives.

- Streamline the internal review process of Program reports to disseminate findings more rapidly to increase the publication rate in peer-review journals.

- Generalize approaches and results to make them applicable to other systems (move beyond the case study of the Trinity)

Physical changes & biological responses

- *Recommendations:*
  - Use DSS to:
    - Re-evaluate potential limiting factors (juvenile habitat) and interim goals (e.g., 400% increase in habitat availability)
    - Formally evaluate the current design philosophy—Are large channel rehabilitation projects more effective at meeting Program goals than small ones, and which goals are best met by each approach?

So what?

- Can we answer these questions for the TRRP as a whole:
  - What do we know now that we didn't in 2001?
  - What lessons from designing, implementing, monitoring, evaluating have been learned?
  - What are we doing differently today because of what we did yesterday?
  - What are you doing differently today because of what another TRRP partner did yesterday?