Jun 20th, 3:15 PM - 3:30 PM

Landscape Approaches: FISHPass: A Decision Support Tool for Optimizing Barrier Mitigation

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A Decision Support Tool for Optimizing Barrier Mitigation

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Fish Passage 2016, 20 June 2016

The FISHPASS Team

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- Lisa DeBruyckere – California Fish Passage Forum

Outline

- Fish migration issues and species impacts in California

- Why optimization?

- FISHPass
  - Current functionality
  - Data format

- Where are we now and future direction

Fish Migration Barriers in California

- More than 16,000 potential barriers contained in the California Passage Assessment Database (PAD)

- At least 1,500 man-made barriers are considered severe or impassable

- 10 of 14 salmon and steelhead ESUs/DPSs in CA are federally listed

Total Barrier
Partial Barrier
Extent of the Forum/California's Anadromy
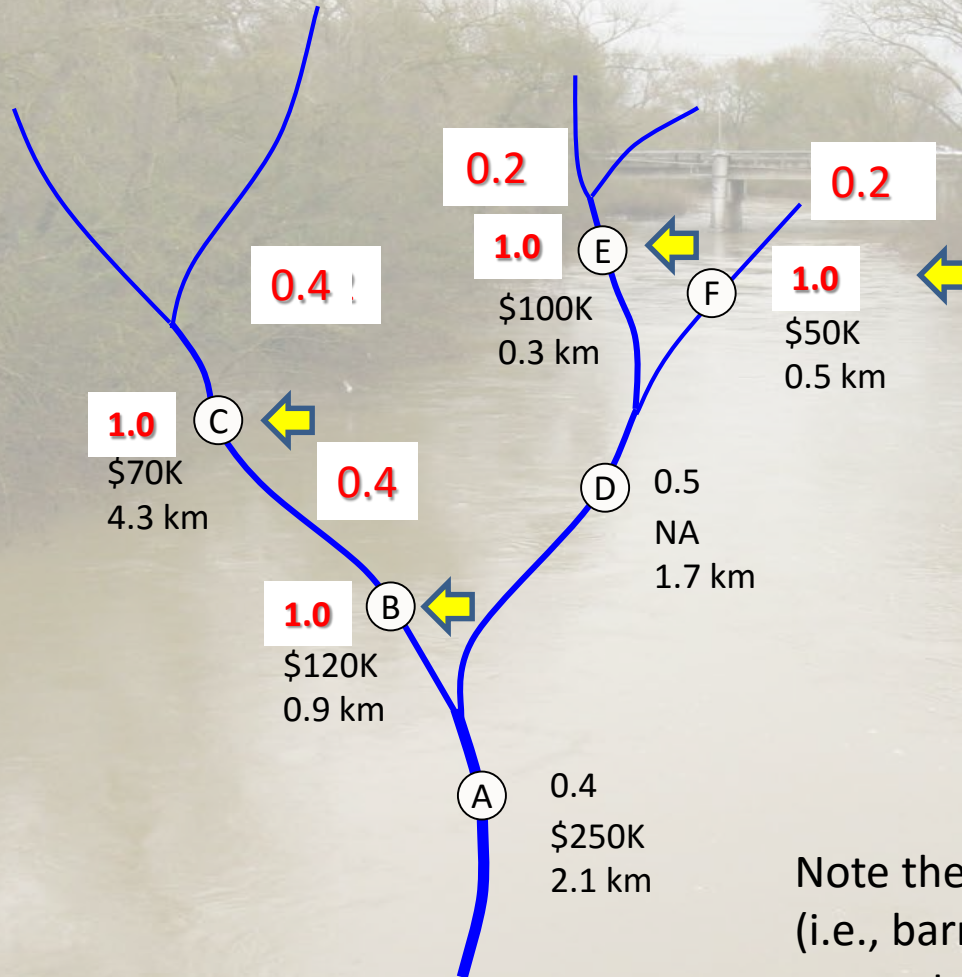
0   37.5   75   150 Miles
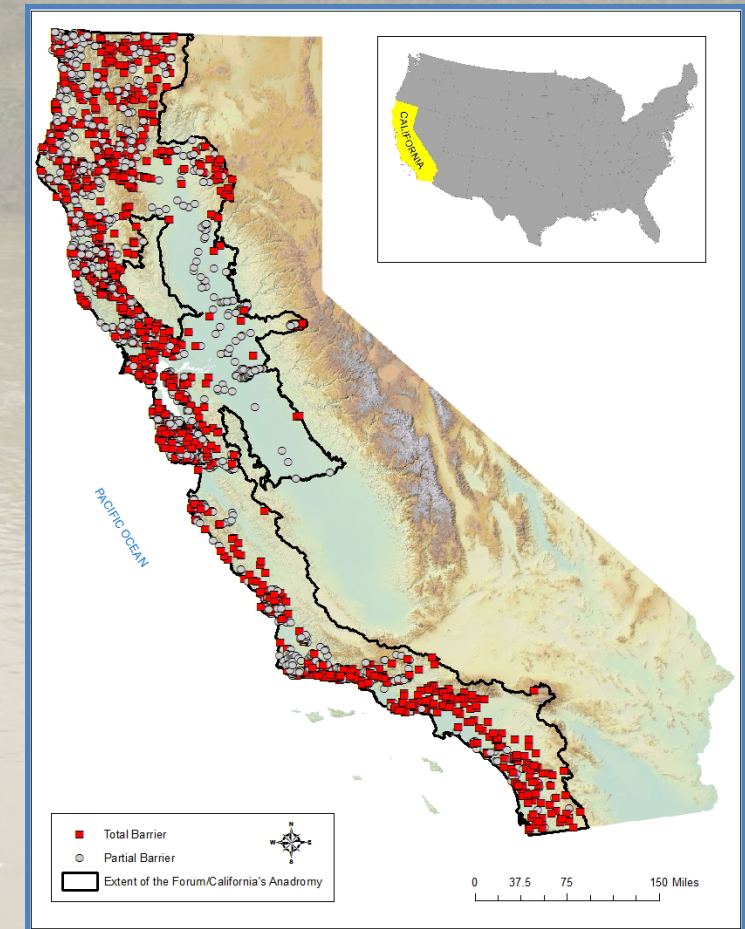
Why Optimization?

- Accounts for spatial structure and cumulative passability of barrier networks

- Makes the most efficient use of limited resources

- Can balance multiple, possibly competing, objectives and constraints

- Key uncertainties can be incorporated and assessed in a coherent fashion

Barrier Optimization in Action

Budget	Soln		Gain
$50K	F		0.090
$100K	E	*	0.192
$150K	B	*	0.876
$200K	B, C		2.080
$300K	B, C, E		2.272
$400K	A, B	*	4.047

Note the lack of "nestedness" among solutions (i.e., barriers removed given a certain budget amount may not be removed when the budget is increased)

FISHPass

- FISHPass is a decision support tool for optimizing barrier mitigation

- FISHPass automates the optimization process

- Identifies cost-efficient mitigation actions to maximize the amount of accessible, possibly quality-adjusted, habitat above barriers
  - Uses a mixed integer linear programming (MILP) formulation of the O'Hanley and Tomberlin (2005) model

What Does FISHPass Do?

- Integrates information on
  - Barrier passability
  - Potential habitat
  - Estimated mitigation cost
- Crucially, accounts for:
  - Spatial structure of barrier networks
  - Interactive effects of mitigation decisions on longitudinal connectivity

Current FISHPass Functionalities

- Friendly graphical user interface (GUI)

- Easy upload of barrier datasets

- Performs optimization runs for any desired budget

- Performs batch runs (i.e., run the model across a range of budget values in set increments)

- Can limit analyses to a subset of selected watersheds

Current FISHPass Functionalities – Continued

- Accommodates user-defined solutions in which one or a handful of barriers are forced <u>in</u> or forced <u>out</u> of the final solution

- Handles
  - Multiple species, guilds, etc. (aka restoration targets)
  - Multiple alternative mitigation projects at any given barrier (e.g., fix the barrier a little or fix a lot)

Data Formatting Requirements

 FISHPass requires the following data fields:

- BARID: barrier ID

- REGION: watershed, subwatershed, etc.

- DSID: immediate downstream barrier ID

- USHAB: net upstream habitat

- PREPASS: current barrier passability

- NPROJ: number of mitigation projects that can be carried out
    (normally 0 for natural barriers)

- COST: estimated cost to repair/remove/mitigate a barrier

- POSTPASS: barrier passability following mitigation

How Does FISHPass Work?

Barrier Data

Data Portal

FISHPass

Customizing a FISHPass Run?

Data Portal
- Adjust default passability
- Include species weighting
- Include cost

FISHPass
- Limit spatial focus
- Define can/can't fix specific barriers
- Create 'batched' model run

Where Are We Now?

- FISHPass was used to confirm 2015 and 2016 Forum project selection
- Additional internal testing ongoing and updates expected to be complete by end of 2016
- Forum plans to provide testing opportunities to interested users in California in late 2016
- Additional training, outreach materials and a mapping function are being developed
- Forum is now working to incorporate NorWeST temperature model to represent general habitat quality throughout CA

Questions

cafishpassageforum.org

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