

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

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

Donnie Ratcliff
U.S. Fish and Wildlife Service

Jesse R. O'Hanley
University of Kent

Lisa DeBruyckere
California Fish Passage Forum

Follow this and additional works at: https://scholarworks.umass.edu/fishpassage_conference

Ratcliff, Donnie; O'Hanley, Jesse R.; and DeBruyckere, Lisa, "Landscape Approaches: FISHPass: A Decision Support Tool for Optimizing Barrier Mitigation" (2016). *International Conference on Engineering and Ecohydrology for Fish Passage*. 13.
https://scholarworks.umass.edu/fishpassage_conference/2016/June20/13

This Event is brought to you for free and open access by the Fish Passage Community at UMass Amherst at ScholarWorks@UMass Amherst. It has been accepted for inclusion in International Conference on Engineering and Ecohydrology for Fish Passage by an authorized administrator of ScholarWorks@UMass Amherst. For more information, please contact scholarworks@library.umass.edu.



*A Decision Support Tool for Optimizing
Barrier Mitigation*

Donnie Ratcliff, US Fish and Wildlife Service
Jesse R. O'Hanley, Kent Business School, University of Kent
Lisa DeBruyckere, California Fish Passage Forum
Fish Passage 2016, 20 June 2016



The FISHPASS Team

- Dr. Jesse O'Hanley – Kent Business School, Ecotelligence LLC
- Dr. Paul S. Kemp – University of Southampton
- California Fish Passage Forum (Forum)
- Donnie Ratcliff – USFWS
- Anne Elston, Brett Holycross, Liam Zarri and Robin Carlson – Pacific States Marine Fisheries Commission
- Lisa DeBruyckere – California Fish Passage Forum



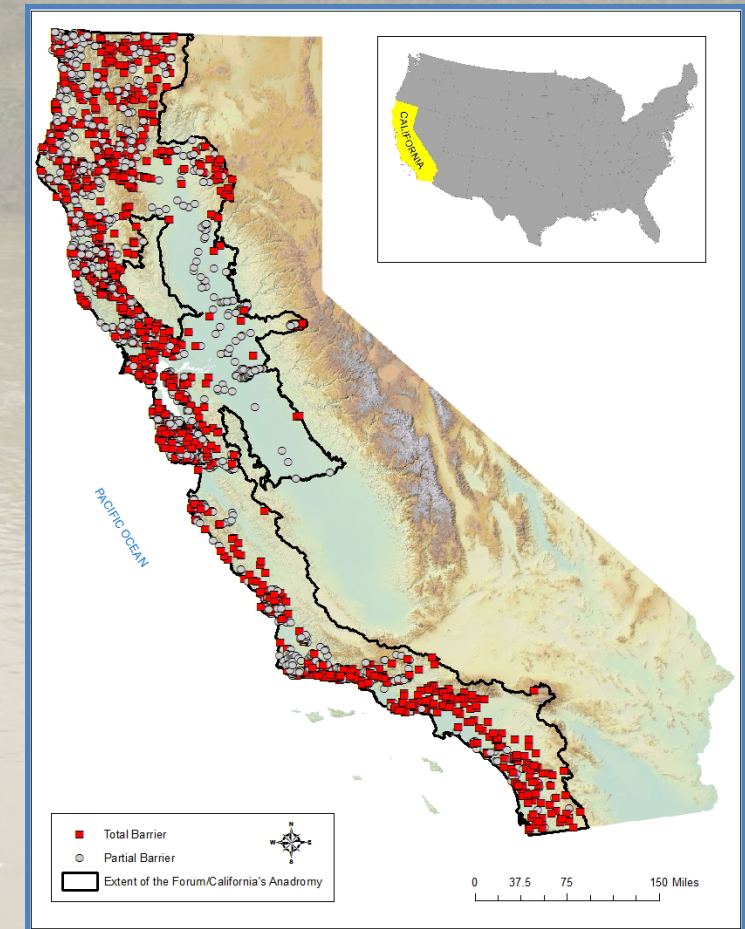
Outline

- 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

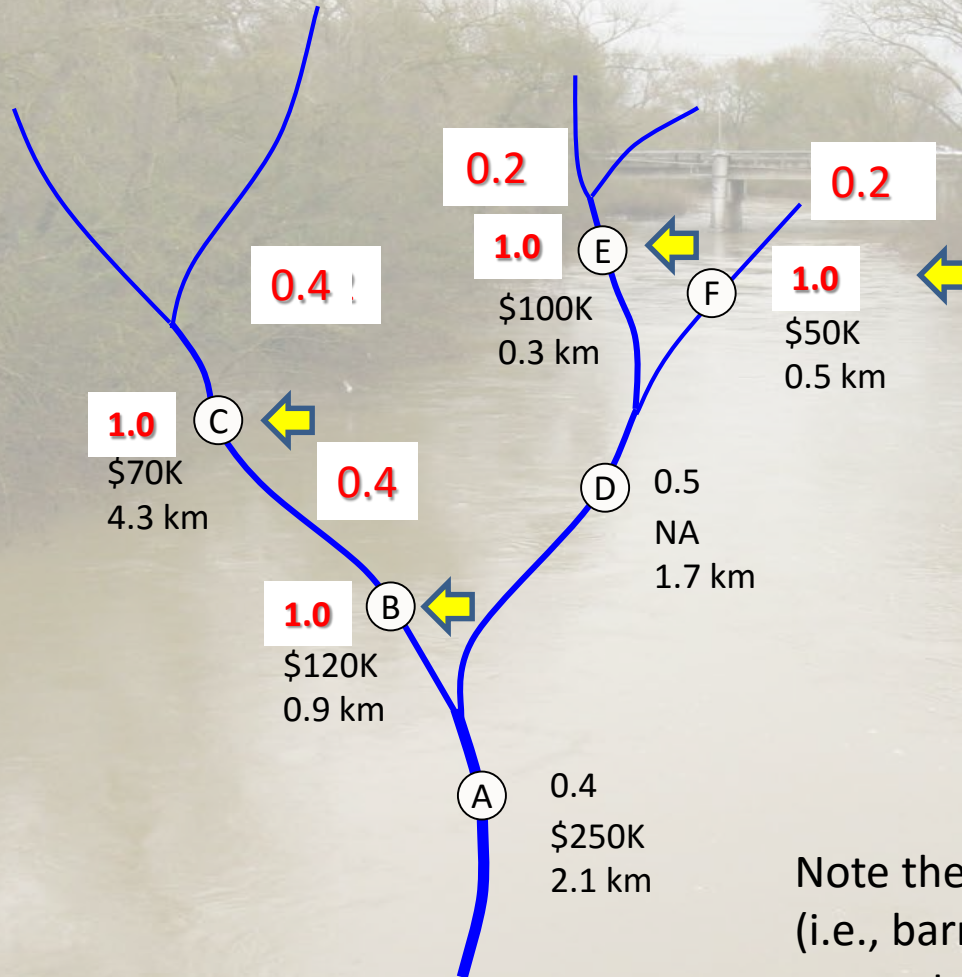


Why Optimization?

- 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 in or forced out 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

PAID	Stream	Agency	Barrier	Type	BarData	Stream	Assess	Water	County	NRID	COL	NEID	Con	X	Point	Y	Miles	Us	Miles	Ln	NEID	On	DS	ID	DS	Mile	DS	Neam
1	100001	San Francisco Bay	San Francisco Bay	Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay	San Francisco Bay



OPTIPASS DATA PORTAL

Home
Next

Barrier Inputs

Restore
Manual Input

Pre-Mitigation Passability

Barrier Status	Passability
Partial	0.50
Total	0.00
Temporal	0.50
Temporal & Partial	0.50
Temporal & Total	0.00

Barrier Ownership

Select All | Unselect All

- City
- College or university
- Conservation group
- County
- Federal agency
- Local agency
- Natural Resource Commission
- Primary or secondary school
- Private landowner - corporate
- Private landowner - non-corporate
- Public utility
- Soil and water conservation district
- Sporting group
- State agency
- Tribe or tribal organization
- Unknown

Barrier Mitigation Costs

Estimated costs Unassigned costs

Cost Est. ?

Regions

North Coast Central Coast ?

Central Valley South Coast

OptiPass: Migratory Fish Passage Optimization Tool

Output log:
 Save to file

Targets:

Budget:

Solve

Batch

Save

Weights

Options

About

Close

FISHPass

Data Portal

Customizing a FISHPass Run?

Barrier Status	Passability	?
Partial	0.50	
Total	0.00	
Temporal	0.50	
Temporal & Partial	0.50	
Temporal & Total	0.00	

OptiPass v1.0

OptiPass: Migratory Fish Passage Optimization Tool

Output log: Save to file

Targets:

Budget:

Buttons: Load Data, Solve, Batch, Save, Weights, Options, About, Close

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

Donnie Ratcliff, donald_ratcliff@fws.gov, 209-334-2968 x409

