

FISHPass User Guide

For <http://fishpass.psmfc.org/>

Table of Contents

Table of Contents	1
Introduction	3
Browser recommendations	3
Navigating the Site	3
Account administration	5
Landing page	5
Creating a user account	6
Help and Information	10
Optimization Process	11
Beginning the optimization process	11
Step 1: Setting the geography and barrier treatment options	13
Selecting a Spatial Focus	13
Downstream Treatment	15
Step 2: Filter by ownership	16
Step 3: Budget considerations	17
Use Estimated Costs	18
Budget Type	19
Pop-Ups and Modals:	20
Set Pre-Mitigation Passability	20
Set Barrier Mitigation Cost	22
Editing Individual Barriers	23
Step 4: Naming and Describing a run	25
Map functionality and data	26
Optimization map	27
Results map	30
Layers	30
Results	31
Report components	33
The report map	36

Exporting and Printing the report	38
Sharing the report	39
Troubleshooting	39
More information	41
Bibliography	41
Map layer bibliography	41

Introduction

FISHPass is a free, online, open-source decision support tool developed by the [California Fish Passage Forum](#) designed to help users identify fish passage barriers for remediation.

FISHPass uses barrier information from the [California Passage Assessment Database](#) (PAD), and performs customized optimization analyses for targeting the removal, repair, or mitigation of diadromous fish passage barriers in California. It is based on and built using OptiPass™, a Microsoft Windows®-based program developed by Jesse O'Hanley of Ecotelligence in 2015. For more information on how the optimization functions, see [OptiPass: The Migratory Fish Passage Optimization Tool, Version 1.1 User Manual](#) (O'Hanley 2015). The web interface for this version of FISHPass was developed by Ecotrust.

The optimization used in this tool considers barrier passability (upstream and/or downstream), potential river habitat gain for one or more target species, and optionally mitigation cost to identify passage improvement strategies. Using the state-of-the-art optimization modeling and solution techniques developed in OptiPass, this tool explicitly considers the spatial structure of barriers and the interactive effects of passage improvement on longitudinal connectivity. The tool allows for further functionality tailored to a user's needs, such as performing batch runs across a range of budget values, limiting the geographic scope of the analysis to a selected spatial focus, and forcing specific barriers in or out of the optimal solution. Additionally, this web-based tool provides a simple and dynamic web-mapping interface, and the ability to document, save, edit, and export optimization runs.

Strengths and Limitations of Barrier Removal Optimization Using FISHPass

The purpose of FISHPass is to help users identify potential fish passage barriers for remediation in an objective way based on the number of stream miles that could be restored to anadromous species by removal of a barrier. If costs of remediation and passability scores are known, users can enter these values for consideration in the run. Users can also use barrier removal cost estimates provided by FISHPass in their optimization runs. Barrier removal optimization through tools such as FISHPass can provide resource managers unbiased recommendations to help shape restoration priorities.

Since the default passability scores and remediation costs in FISHPass are estimated values, users are encouraged to enter barrier specific data for more reliable optimization results.

Data regarding barrier status and passability are provided by the PAD. Barriers that have an unknown, or unassessed status in the PAD are not considered for remediation by FISHPass. You can increase the usefulness of FISHPass for all users by providing regular updates to the PAD administrator regarding the status of barriers in your area.

Stream data are currently provided by the NHD medium resolution 1:100,000 layer. Some small streams do not appear on this layer. Barriers on those streams are not considered for potential solutions in FISHPass. Please bear in mind that small streams can be especially important for certain anadromous fish species. We recommend consulting local experts regarding potential benefits of barrier remediation in those streams. When NHD-plus high resolution stream layer is available for California, many of those streams and barriers will be available for consideration in FISHPass.

FISHPass focuses on barriers to anadromy within California and the Klamath Basin. As such, downstream barriers closer to the ocean are likely to be recommended for treatment if downstream barriers are considered in an optimization run. Users should exclude downstream barriers from consideration if their focus is restoration of habitat for non-anadromous species. Be aware that downstream barriers are still likely to be prioritized and recommended for treatment.

If you have questions not answered in this document, please contact info@cafishpassageforum.org.

You can also help make FISHPass more useful and reliable by regularly contacting the [PAD administrator](#) with updates regarding the status of barriers in your area.

Browser recommendations

We recommend using FISHPass on Chrome if available, or Firefox if Chrome is not an option. For the best user experience, Internet Explorer is not recommended. However, if Internet Explorer can't be avoided, it must be version 11 or later.

Navigating the Site

There are four main sections of the tool: [account administration](#), [help and information](#), [the optimization process](#), and [reporting](#).

There are several ways to access and interact with [account administration](#). From the landing page at <https://fishpass.psmfc.org>, a user may sign up, log-in, or reset a forgotten password using pop-up windows. Once logged in, a user may edit their profile and change their password from the upper left menu.

[Help](#) can be found in the upper-right drop-down menu, and contains contact information, the user guide, and frequently asked questions.

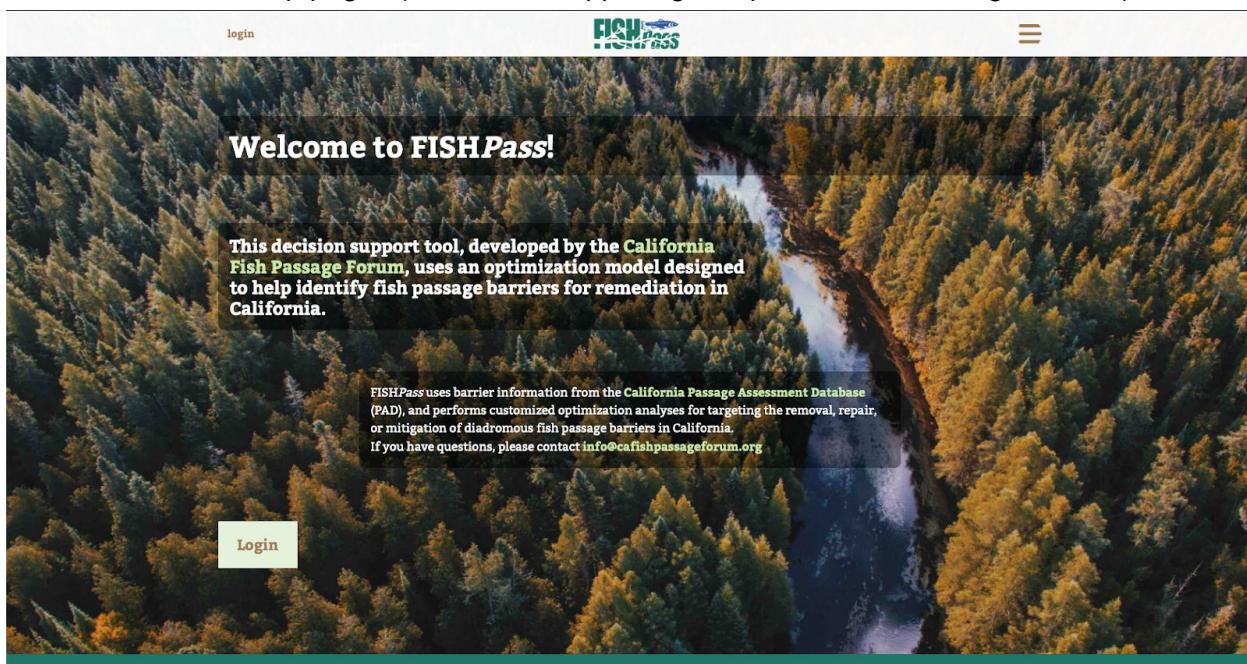
The [optimization process](#) is comprised of four main steps and additional functionality via a map and pop-up menus. The optimization is reached by clicking on any “Launch App” link (on the

landing page or from the upper-right drop-down menu) when logged in, and then beginning a new optimization or editing a previously saved optimization. A user must be logged in to access the optimization or reporting functionalities. Completing an optimization process will generate results that can be viewed on the [results](#) page. Users can reload, view, and rerun previously run optimization results from the Create new/Load saved pop-up menu reached when launching the tool.

Account administration

Landing page

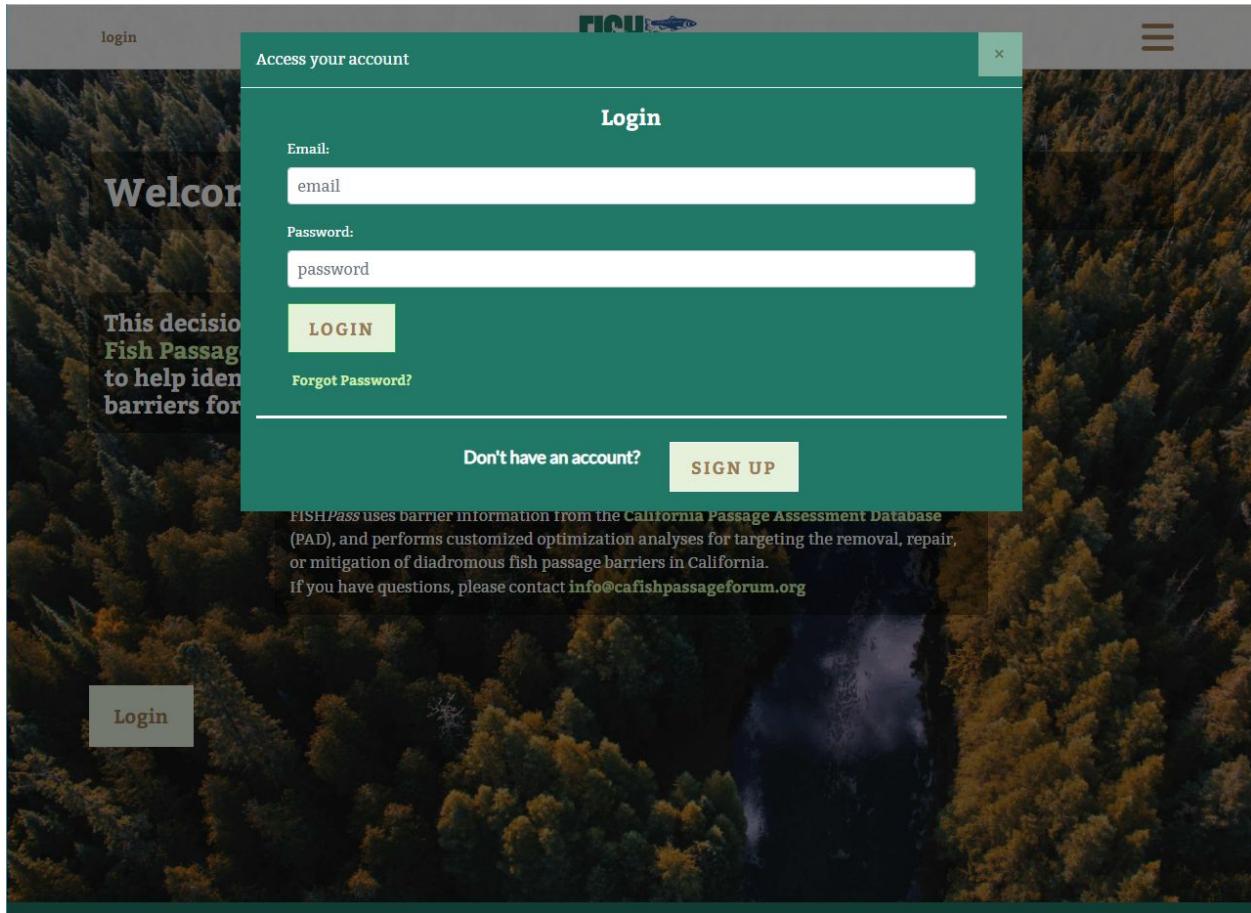
FISHPass can be found at <https://fishpass.psmfc.org/> where unregistered users may log in or visit the contact or help pages (found in the upper-right expandable “hamburger” menu).



The FISHPass landing page, before a user logs in.

Creating a user account and retrieving passwords

Clicking on any “login” button will bring up a login screen with a “Sign Up” button at the bottom for new users.

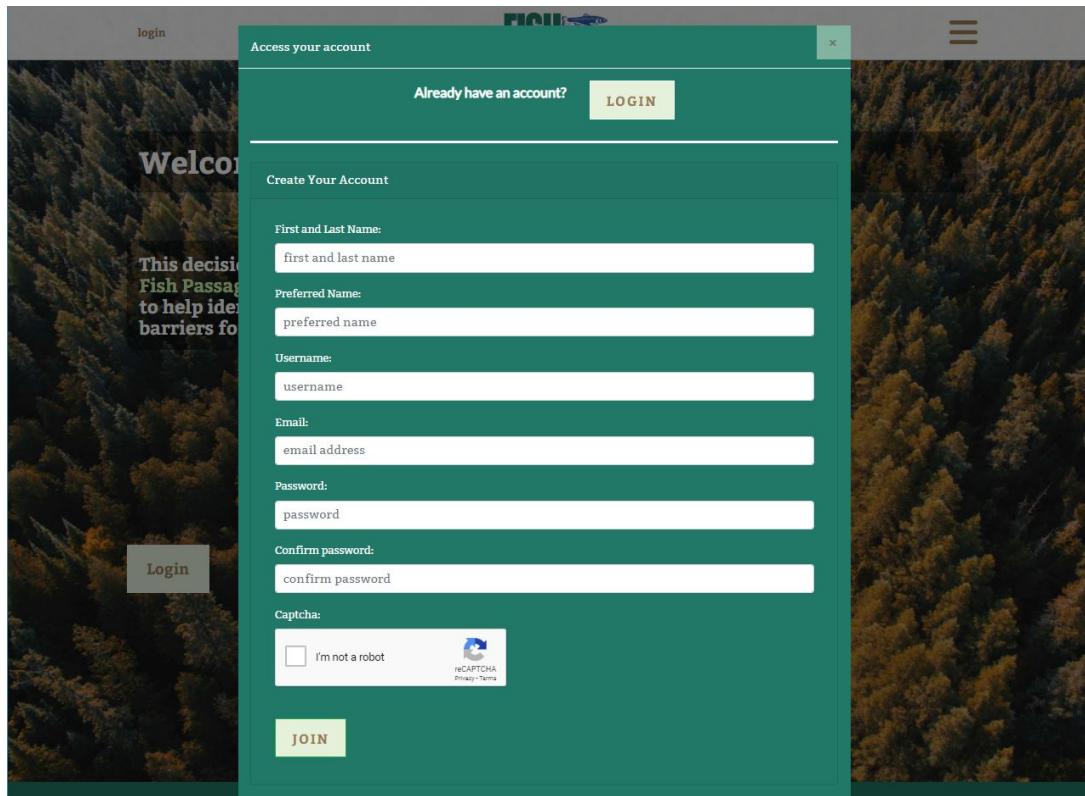


The Login pop-up.

Passwords may be retrieved by clicking on the “Forgot Password?” link on the Login pop-up, above.

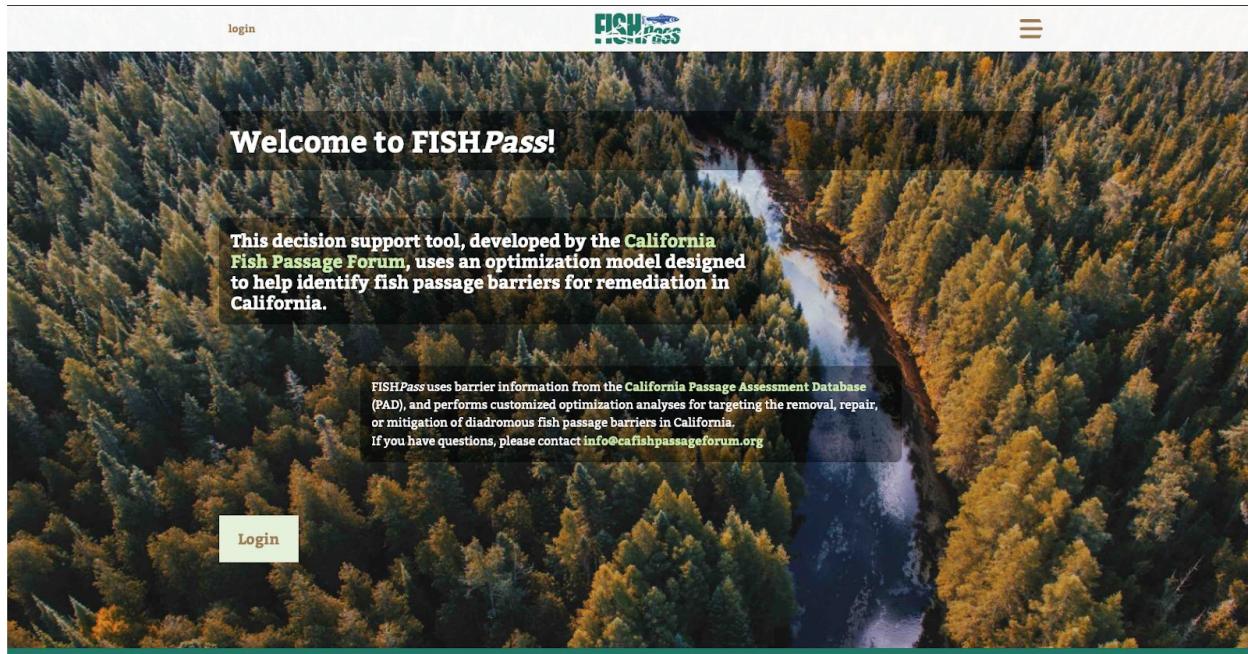
To create a new user account, fill out the “Create Your Account” form.

- “Preferred name” is the name by which a user prefers to be addressed.
- “Username” is used to signal which user is logged in to the tool. It is visible in the upper left of the tool when a user is logged in.
- “Email” addresses are used to log into the tool.
- “Password” must be at least 6 characters long.



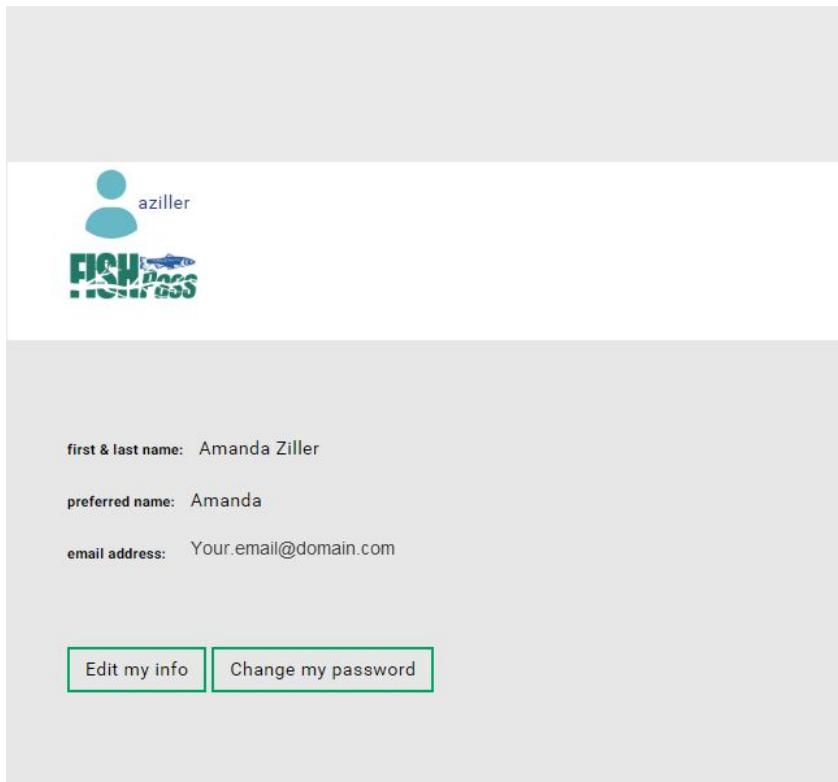
The Create Account pop-up.

When logged in, the username appears in the upper left of the page, and a “Launch App” button appears at the bottom.



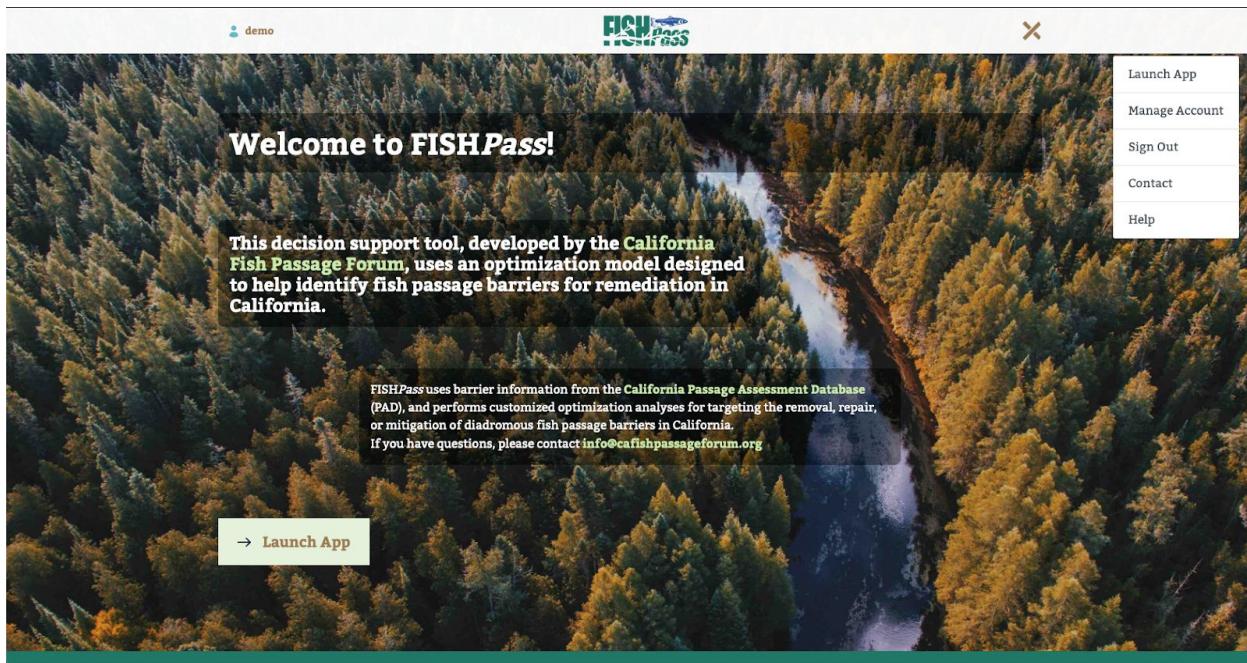
The FISHPass landing page, after a user logs in. The username is in the upper left, and there is a “Launch App” button in the lower left.

To update user info, including name and password, a user can click on the username in the upper left, or “Manage Account” in the upper right drop down menu. Click “Edit my info” button to update an email address, real name, or preferred name. Click “Change my password” to update login credentials.



Detail from the FISHPass account page.

Once logged in, the upper-right drop-down menu reveals additional links: “Launch App,” “Manage Account,” “Sign Out”, “Contact,” and “Help.”



The upper-right drop-down menu, when open.

Click “Launch App” to begin using the optimization tool. You may do this from the button in the lower left, or from the upper-right drop-down menu.

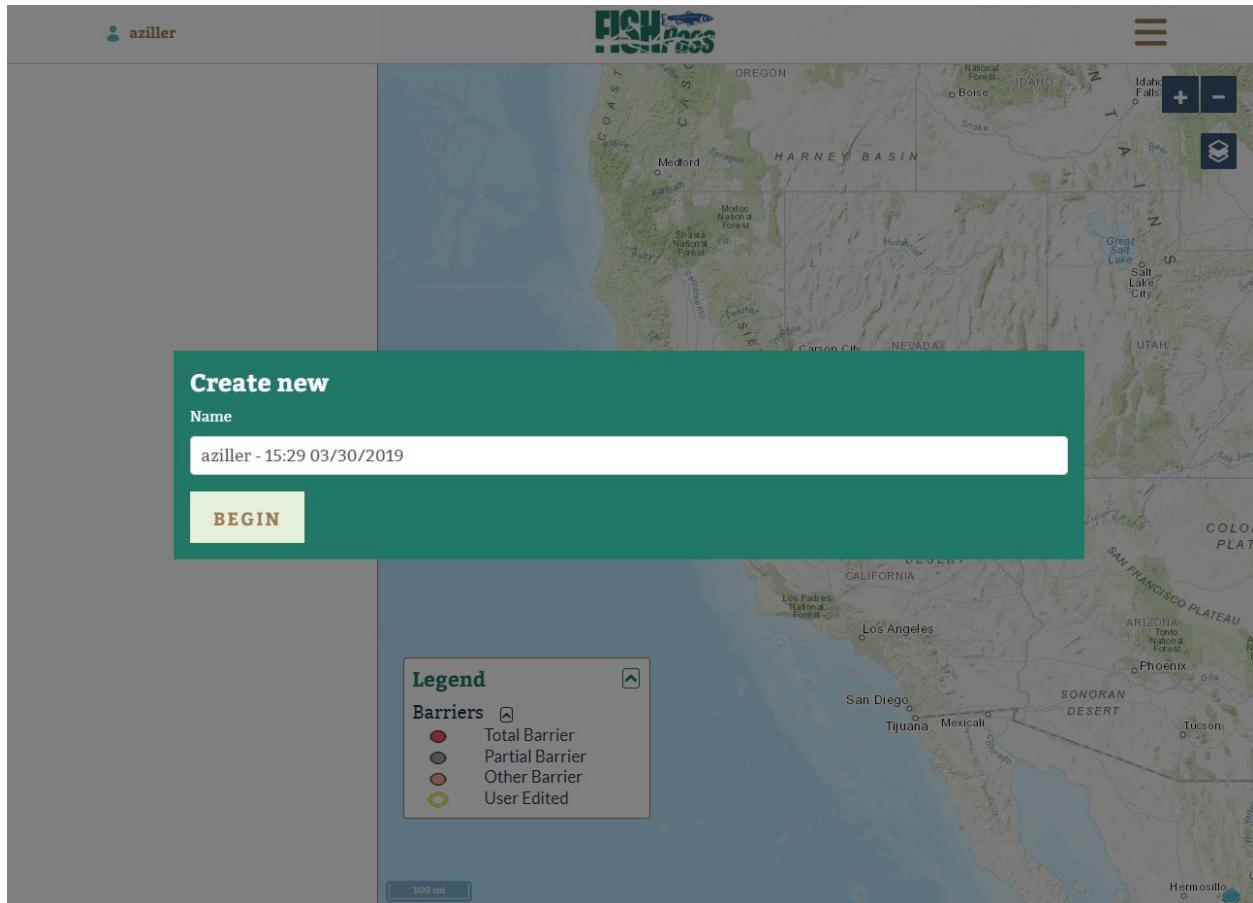
Help and Contact Information

Help and additional information can also be found in the upper-right drop-down menu. The "[Help](#)" page contains links to this document, and further questions can be directed using information found on the "[Contact](#)" page.

Optimization Process

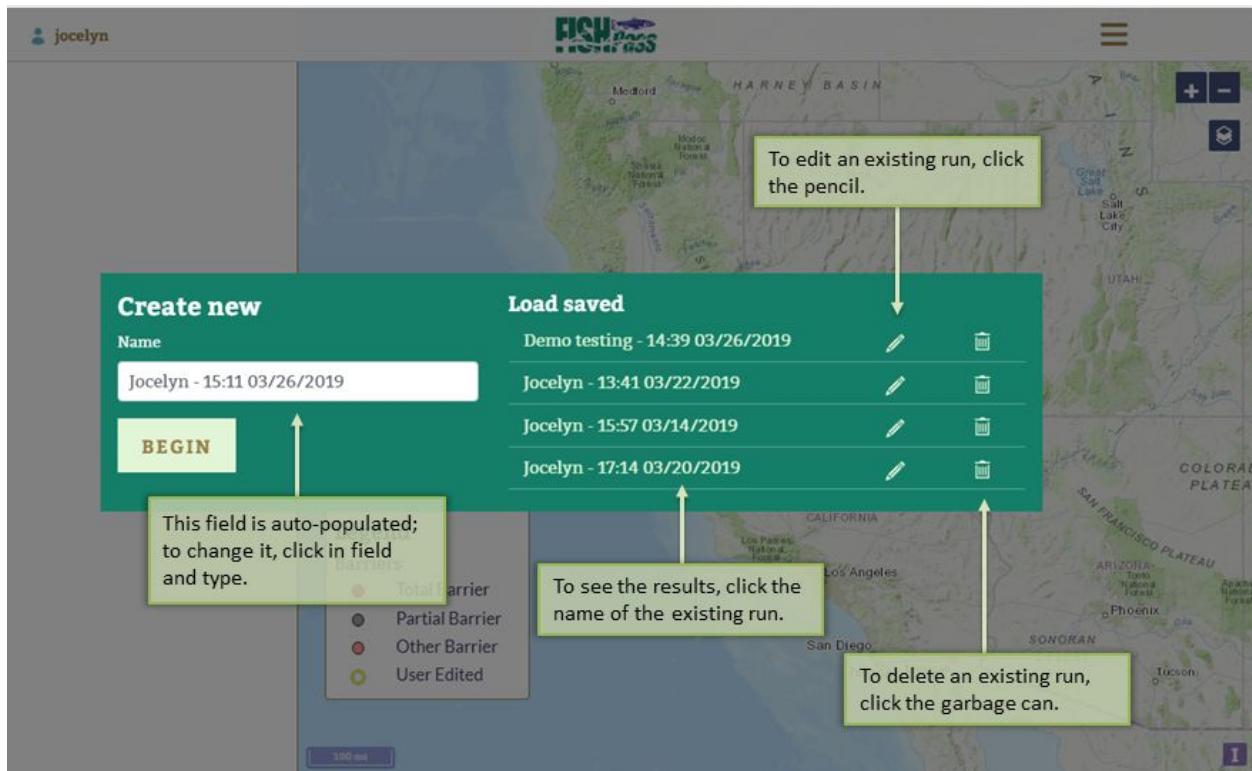
Beginning the optimization process

After launching the app and entering the tool, all users see a green pop-up menu. For first-time users, the menu will appear as below, showing only the ability to create a new run. Each run name is automatically populated with the user's name and a time and date stamp. This name can be edited by the user by typing in the white text bar.



The Create New/Load Saved pop-up as it appears to first-time users.

Users that have previously created optimization runs will see a similarly-styled pop-up with more options:



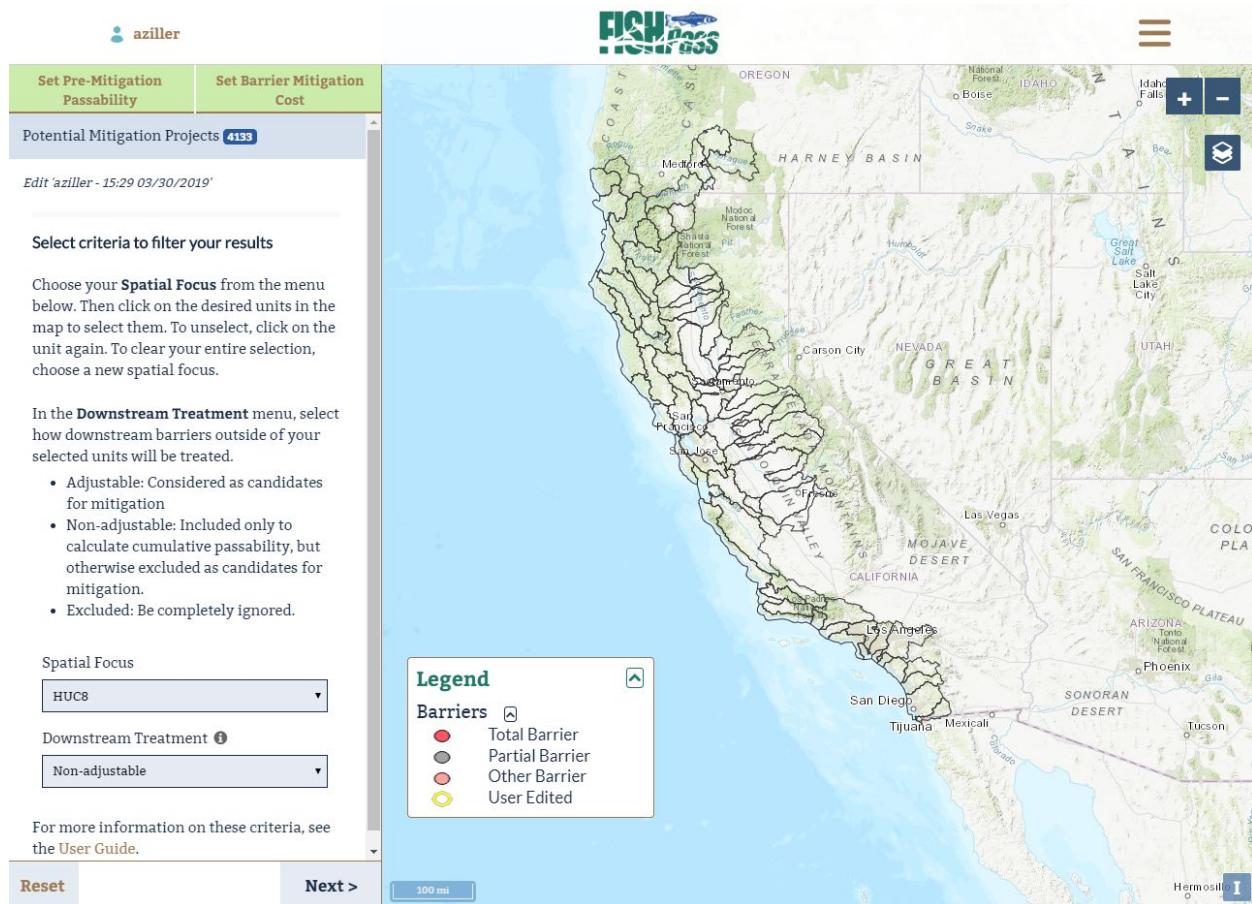
The Create New/Load Saved pop-up.

Under “Load Saved,” click on a run name to see the results. To edit a run, click on the pencil icon next to its name. To delete a run, click the garbage can icon. This request must be confirmed with a second click before deletion occurs.

Optimization runs are automatically and continuously saved, and will be available under “Load Saved” in the future if an optimization run is completed by clicking “Save” in [step 4](#). (This action generates the optimization results.) If a run was not completed by clicking “Save,” the optimization run will retain all inputs, but the name will not be clickable in the “Load Saved” list, as no results were generated.

Step 1: Setting the geography and barrier treatment options

In step one, users first encounter the map that is present throughout the entire optimization parameter-setting process. (To learn more about this map, go to [The Map](#) section of this document.) Users choose a “Spatial Focus,” or geographic area of interest for their optimization run, and set a “Downstream Treatment” option.



Step 1: selecting spatial focus units and setting downstream treatment options.

Selecting a Spatial Focus

Users choose a Spatial Focus from the drop-down menu in the left-hand panel. Spatial Focus is the geographic unit that users will select from to determine their area of interest. Spatial Focus options are: hydrologic units (HUC2 - HUC12), Counties, the entire FISHPass boundary, FISHPass regions, and Coho, Chinook, and Steelhead ESUs/DPSs. Click on the “Spatial Focus” drop-down menu to see and select an option. Hover over a spatial focus layer in the map to see a pop-up displaying identifying information for each unit.

aziller

Set Pre-Mitigation Passability **Set Barrier Mitigation Cost**

Potential Mitigation Projects **4133**

Edit 'aziller - 15:29 03/30/2019'

Select criteria to filter your results

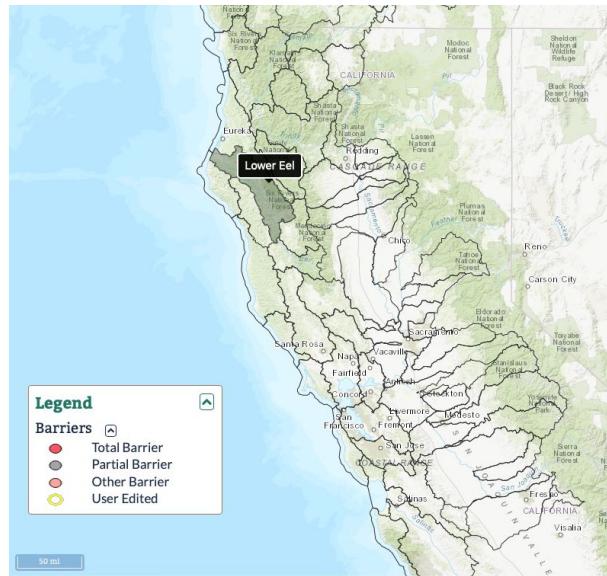
- HUC2
- HUC4
- HUC6
- HUC8**
- HUC10
- HUC12
- FISHPass boundary
- Counties
- FISHPass Regions
- Coho ESU
- Chinook ESUs: all other ESUs
- Chinook ESUs: Central Valley Spring run
- Chinook ESUs: Central Valley Fall run
- Steelhead DPS
- HUC8

Downstream Treatment i

Non-adjustable

For more information on these criteria, see the [User Guide](#).

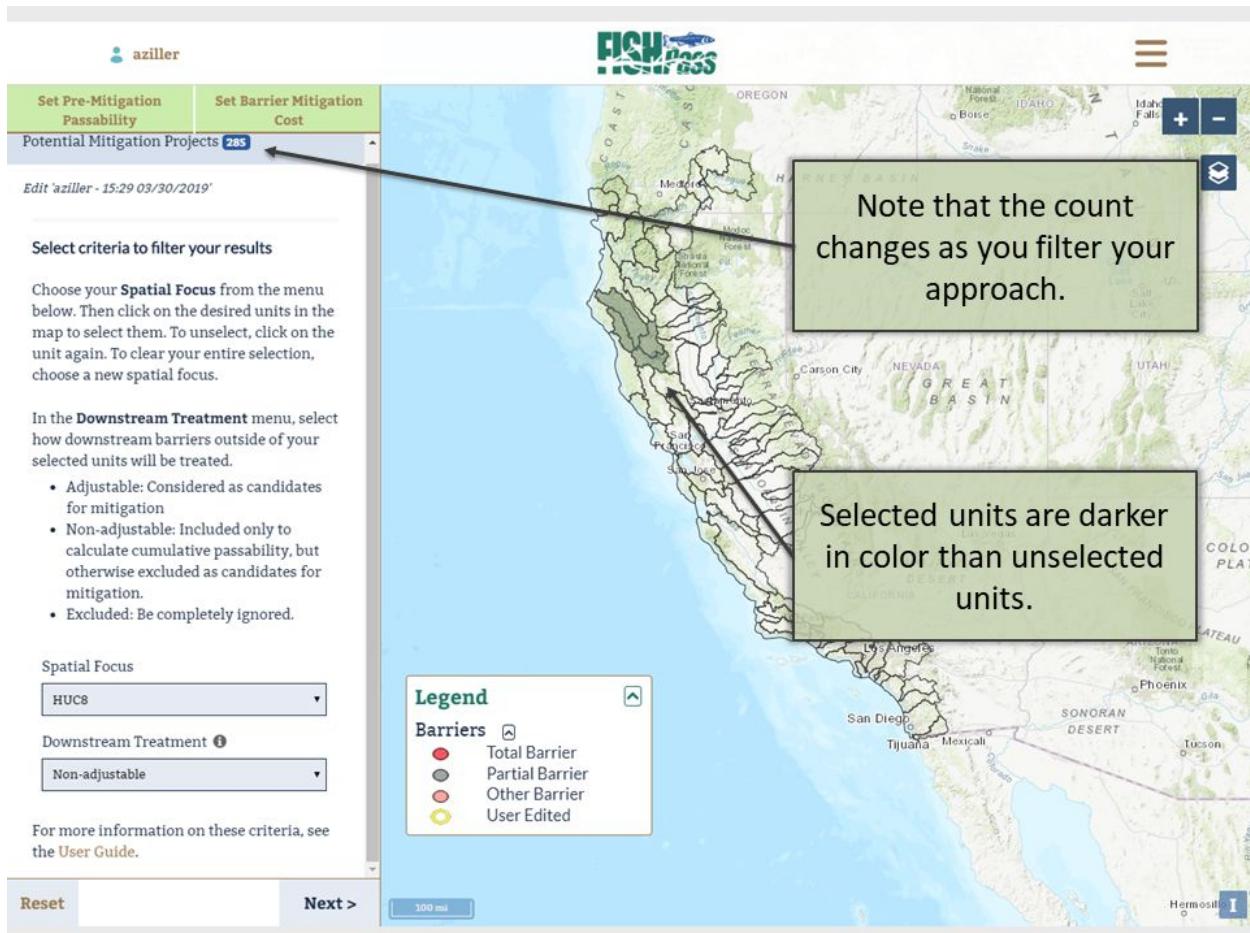
Reset **Next >**



Detail: Hovering over a layer selected in Spatial Focus will show a pop-up identifying the unit.

Detail: Spatial Focus drop-down menu.

Once the appropriate focus is selected in the drop-down menu, click on the desired unit/s in the map to select them. Selected units will appear gray on the map (see below). To unselect, click on the unit again. To clear your entire selection, choose a new spatial focus from the drop-down menu. As units are selected the number of "Potential Mitigation Projects," at the top of the left-hand pane, updates to indicate the number of barriers in the selected units.



Step 1: additional functionality.

Downstream Treatment

“Downstream Treatment” allows a user to determine how downstream barriers outside the selected focus region(s) will be treated in the optimization analysis. There are three options in the drop-down menu:

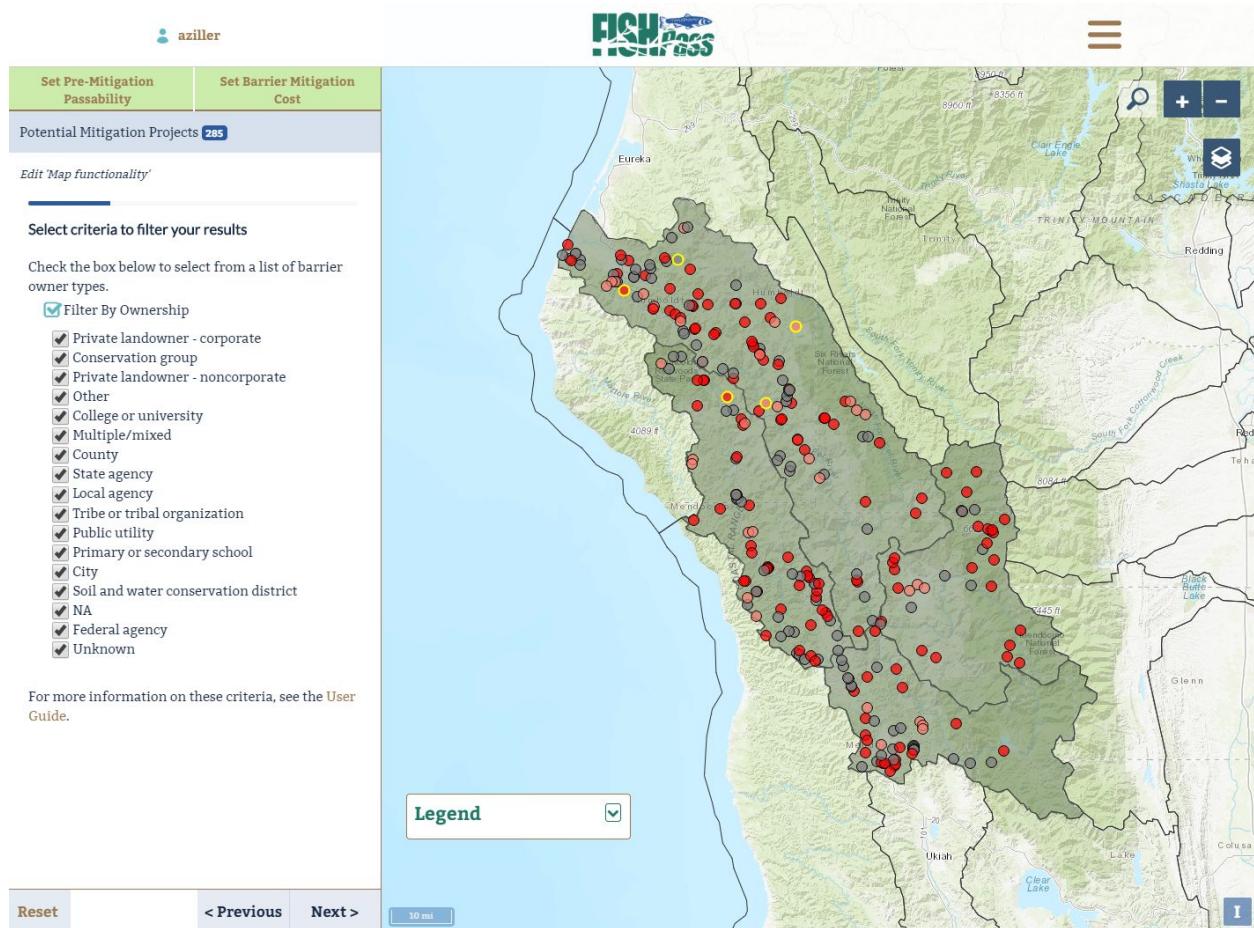
- Adjustable: downstream barriers will be considered as candidates for mitigation (i.e., for potential repair or removal).
- Non-adjustable: downstream barriers will be included for the purposes of calculating cumulative passability but otherwise excluded as candidates for mitigation.
- Excluded: downstream barriers will be ignored entirely (i.e., the focus region(s) will be treated in isolation). Useful for inland species, not recommended when analyzing barriers to anadromy.

When the desired Spatial Focus units and Downstream Treatment are selected, click “Next” to advance to Step 2.

Step 2: Filter by ownership

In Step 2, users may further filter potential mitigation projects by ownership. To do this, click on the “Filter By Ownership” box. This will expand a list of ownership types from which to select. By default, all ownership types are selected. These ownership types are pulled from the Passage Assessment Database (PAD). Using this filter will restrict the selected barriers to those owned by the agency or category selected.

In this step, fish passage barriers become visible on the map. Also, the progress bar, a blue line in the upper left of the left-hand panel, above “Select criteria to filter your results” is visible.



Step 2: Filter by ownership.

Filter By Ownership

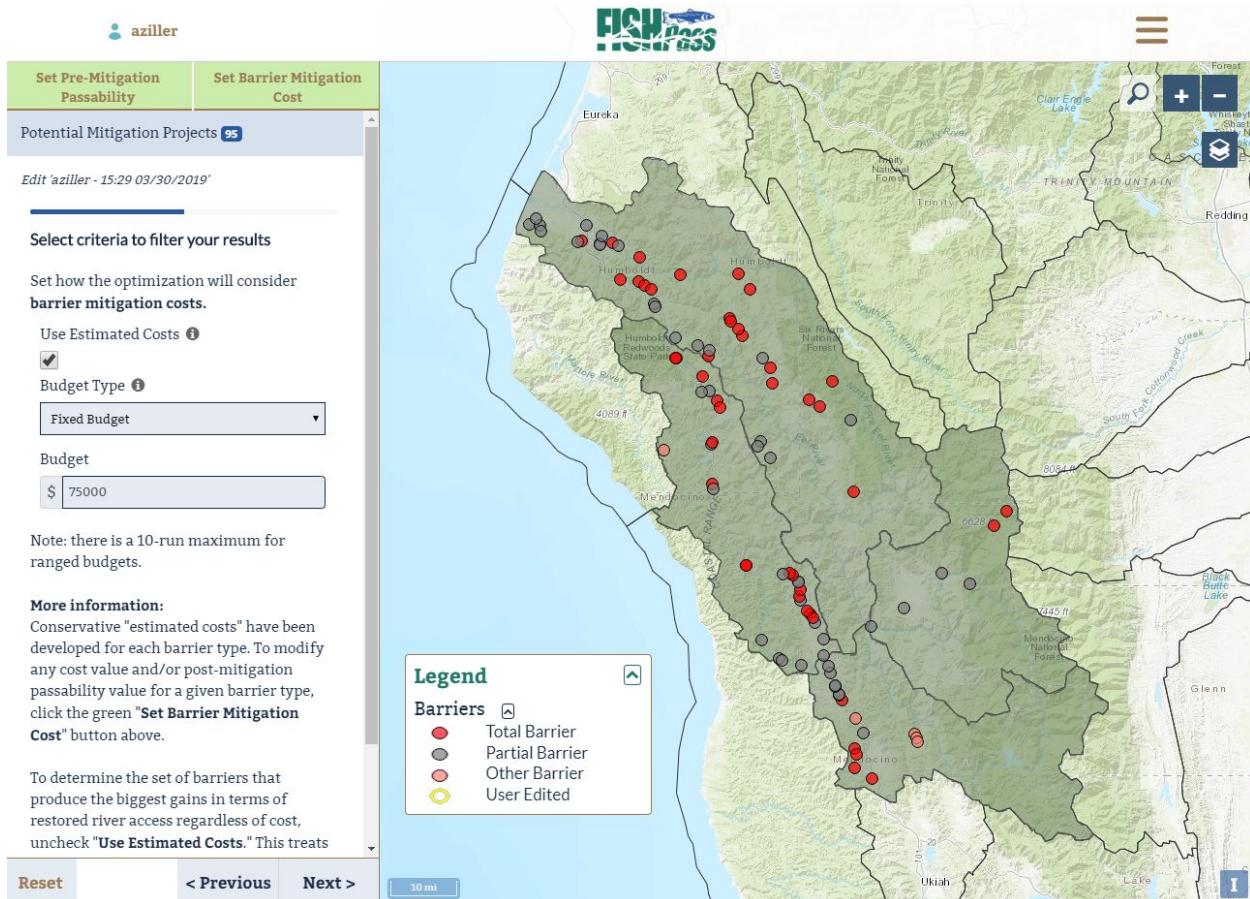
- Private landowner - corporate
- Conservation group
- Private landowner - noncorporate
- Other
- College or university
- Multiple/mixed
- County
- State agency
- Local agency
- Tribe or tribal organization
- Public utility
- Primary or secondary school
- City
- Soil and water conservation district
- NA
- Federal agency
- Unknown

Detail: Step 2: View of the ownership selection options.

Step 3: Budget considerations

In Step 3 users have the ability to customize how the optimization run will consider barrier mitigation cost. Over the years, the California Fish Passage Forum has made great efforts to collect and analyze as much fish passage barrier cost data as possible to make this data input as robust as possible. While the Forum was successful in collecting cost data from many partner organizations and other sources, this exercise demonstrated how variable, and often limited, this information is. Through a robust analysis, the Forum has created “estimated costs” for each barrier in FISHPass organized by site type (as determined in the PAD).

Recognizing that cost data is highly variable, the default setting in FISHPass does **not** include cost data in an optimization run unless a user elects to do so by checking the “Use Estimated Costs” box. If the “Use Estimated Costs” box is checked as seen in the image below, FISHPass’ default setting is the cost to repair or remove a barrier in order to restore it to full passability (if users would like to set passability to less than full, they have the ability to make that change). This is explained further in the [Set Barrier Mitigation Cost](#) section further down in this document). There are three main ways for the user to do this: using or not using estimated costs; setting a fixed or ranged budget, and specifying the budget themselves.



Step 3: Budget considerations.

Use Estimated Costs

If "Use Estimated Costs" is checked, the optimization will consider the cost of mitigating barriers. By default, the optimization will use predetermined cost estimates, although a user may influence these in several ways (see [Set Barrier Mitigation Cost](#) and [Editing Individual Barriers](#) sections, below). When this box is checked, a user enters a dollar figure in the Budget box.

If "Use Estimated Costs" is unchecked, barriers are treated equally in terms of repair/removal cost. This can be used to determine the set of barriers that produce the biggest gains in terms of restored river access regardless of cost. When this box is unchecked, users enter the number of barriers to consider for the optimization result in the Budget box (e.g., the number of barriers the user wants to remediate).

These "Estimated costs," or predetermined-cost estimates, have been derived for each of the different barrier structure types based on an analysis of actual project costs in California. These values represent "conservative" estimates of potential mitigation costs for such barriers, and may be reviewed by clicking on the green "Set Barrier Mitigation Cost" button at the top of the

left pane. The resulting pop-up window also allows a user to modify any cost value and/or post-mitigation passability value for a given barrier type (see [Set Barrier Mitigation Cost](#), below).

Checked:

- considers cost of mitigation
- uses pre-determined cost estimates
- potential to edit
- Enter budget as \$

Unchecked:

- barriers considered to have equal mitigation cost
- Returns biggest gains in restored river access
- Enter budget as barrier count

Step 3: *Estimated costs.*

Budget Type

In the “Budget Type” drop-down menu, users may select from Fixed or Ranged budget options. These budgets will either be in dollars, if the “Use Estimated Costs” box is checked, or in number of barriers, if it is unchecked.

In a fixed budget, a user will enter a single, total budget value in the “Budget” box. In a ranged budget, a user may enter a budget range, from a minimum (“Budget min”) to a maximum (“Budget max”), and then an “Increment” which indicates the budget step size, or amount by which each successive run should be increased. For ranged budgets, there is a 10-run maximum; i.e., dividing the difference between the budget max and budget min by the increment should result in a value of 10 or less.

Budget Type ⓘ

Ranged Budget

Budget min

\$ 5000000

Budget max

\$ 10000000

Increment

\$ 1000000

Detail: When the “Ranged Budget” type is selected, the single “Budget” fields will change to three fields, seen here.

Pop-Ups and Modals

In addition to the steps above, a user may influence the optimization through three additional functions that may be activated at almost any step in the process: 1) Set Pre-Mitigation Passability 2) Set Barrier Mitigation Cost 3) Editing Individual Barriers. All pop-ups are activated by clicking on the appropriate button in the interface or an individual barrier in the map. All may be effectively canceled by clicking either on the “x” in the upper right of the pop-up, or outside of the pop-up.

Set Pre-Mitigation Passability

The “Set Pre-Mitigation Passability” pop-up is reached by the green button at the top of the left pane in all steps of the optimization process.



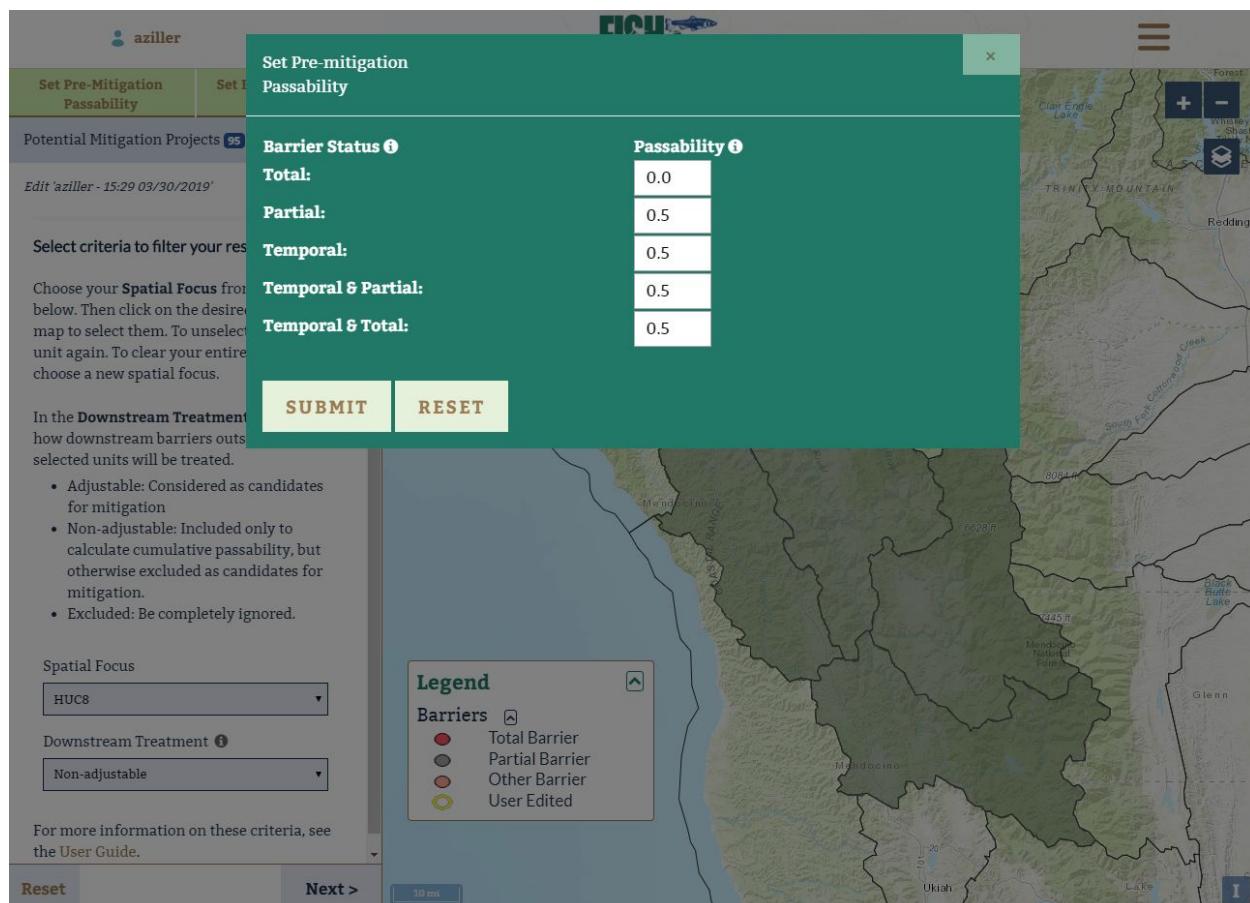
Detail: Set Pre-Mitigation Passability pop-up link.

This pop-up allows a user to set the pre-mitigation, or current, passability (normally upstream) of barriers for all barriers with the same status. The pre-mitigation passability of individual barriers can be edited; see [Editing Individual Barriers](#), below, for more information.

Barrier passability quantifies the degree to which a barrier inhibits the dispersal of fish, and is defined as the fraction of fish which are able to pass through, over or around a barrier while migrating upstream. Barrier passability is assigned values between zero (0) for full barriers (with no passability) and one (1) for full passability. Partial barriers should have values between 0 and 1 (O'Hanley 2014).

Definitions of barrier status used in the tool are as follows:

- **Total:** A complete barrier to fish passage for all anadromous species at all life stages at all range of flows.
- **Partial:** Only a barrier to certain species or life stages.
- **Temporal:** Only a barrier at certain flows.
- **Temporal & Partial:** Only a barrier to certain species or life stages and only at certain flows.



The Set Pre-Mitigation Passability pop-up.

Set Barrier Mitigation Cost

The “Set Barrier Mitigation Cost” pop-up is reached by the green button at the top of the left pane in all steps of the optimization process.



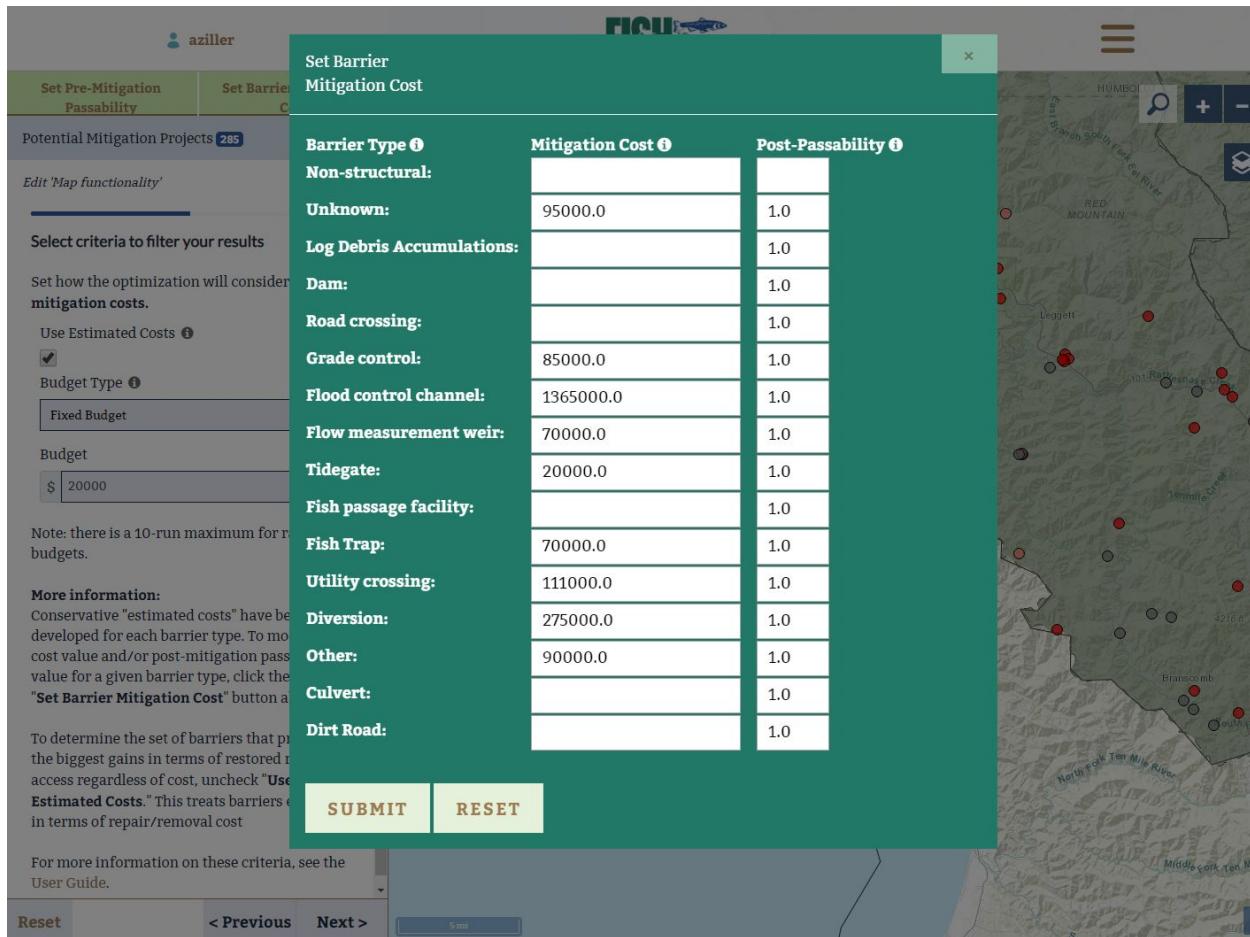
Detail: Set Barrier Mitigation Cost pop-up link.

This pop-up allows a user to bulk modify the mitigation cost and/or post-passability value for all barriers of the same type. These values can be modified for individual barriers; see [Editing Individual Barriers](#), below, for more information.

Users are currently unable to bulk modify mitigation costs for the following barrier types: non-structural, log debris accumulations, dams, road crossings and culverts, and fish passage facilities.

Post-passability is the expected future passability of a barrier following mitigation. This value should be greater than or equal to current or pre-mitigation passability. See above, in the [Set Pre-Mitigation Passability](#) section, for further discussion of passability and pre-mitigation passability, and go to the [Use Estimated Costs](#) section for further information on estimated costs. Mitigation costs are in US Dollars.

As a default, post-passability in FISHPass is set to 1 (full passage). Users can change this value to reflect partial remediations (e.g. retrofits, adding or modifying baffles and fishways).



The Set Barrier Mitigation Cost pop-up.

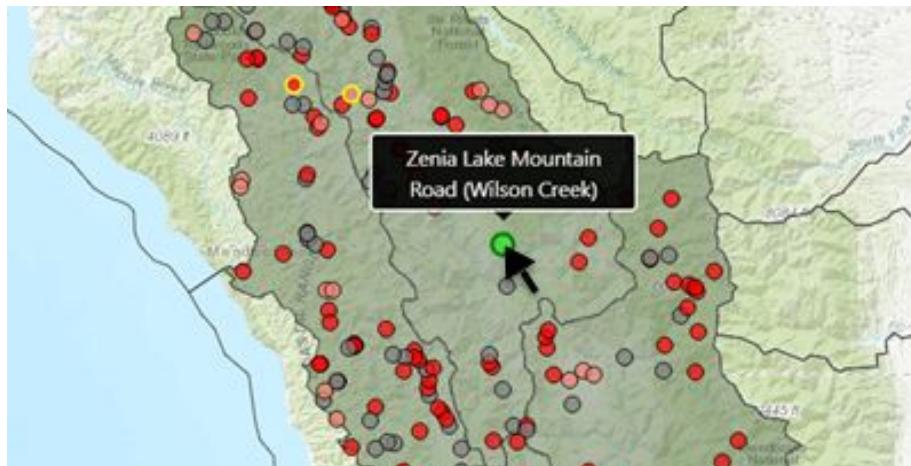
Bulk edit of pre-mitigation passability and mitigation cost

FISHPass also allows for the bulk modification of pre-mitigation passability and mitigation cost for all barriers of the same type (mitigation cost) or status (passability). Bulk editing of these fields can be useful for controlling variables in an optimization run. Users should be cautious when interpreting results since passability and mitigation cost is barrier and site specific.

Editing Individual Barriers

Since each barrier site and remediation project is unique, editing individual barrier cost and (pre and post) passability with known values will improve the results of your optimization run.

This can be done in steps 2 and 3 when the barriers are visible on the map. To edit a barrier, click on it in the map. Hovering over barriers will show a pop-up that includes the barrier name.



Detail: Clicking on a barrier in the map will activate the Edit Barrier pop-up.

This pop-up provides significant information and flexibility to the user. The barrier name is listed at the top of the pop-up, as well as a link to the full barrier record in the California Department of Fish and Wildlife's [Biogeographic Information and Observation System](#) (BIOS). Below, a user may edit the barrier's pre-mitigation passability (PrePass), mitigation cost (Cost), post-mitigation passability (PostPass), and any optimization requirements (Action). By default a barrier is "Free," and will be considered for the optimization solution. Alternatively, a barrier may be "forced in" or "forced out" of a solution -- that is, required to be included or excluded from the solution.

The Edit Barrier pop-up window displays the following details:

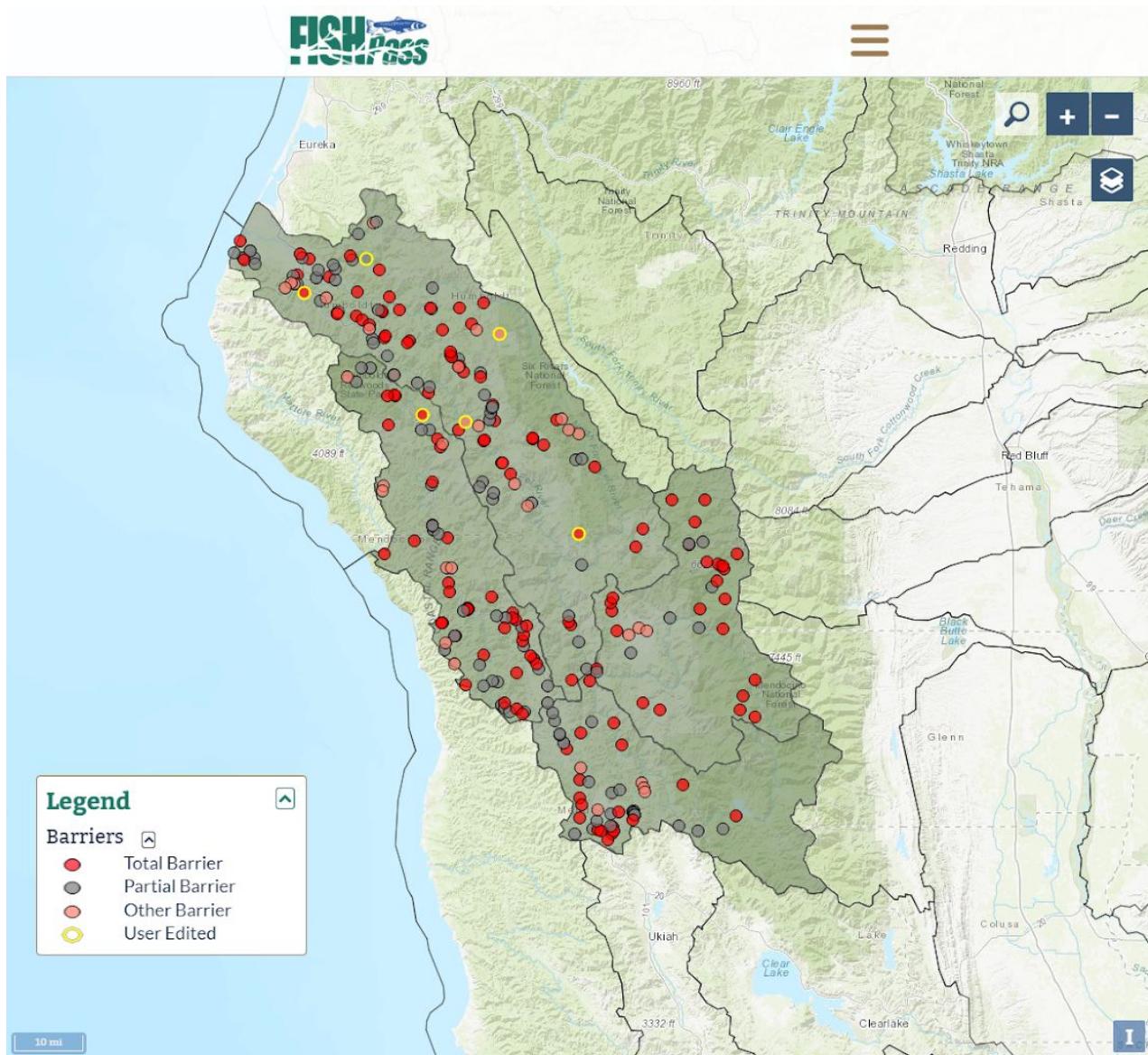
- Barrier Name:** Zenia Lake Mountain Road (Wilson Creek)
- Link to record in California's Biogeographic Information & Observation System (BIOS):** Zenia Lake Mountain Road (Wilson Creek) - View in BIOS
- PrePass:** 0.0, 1.0
- Cost:** 0.0
- PostPass:** 1.0
- Action:** Free, Force-In, Force-Out

Below the pop-up, the main application interface includes:

- Potential Mitigation Projects:** 265
- Edit Map functionality:** Select criteria to filter your results
- Budget Type:** Fixed Budget
- Budget:** \$ 20000
- Note:** there is a 10-run maximum for ranged budgets.
- More information:** Conservative "estimated costs" have been developed for each barrier type. To modify any cost value and/or post-mitigation passability value for a given barrier type, click the green "Set Barrier Mitigation Cost" button above.
- To determine the set of barriers that produce the biggest gains in terms of restored river access regardless of cost, uncheck "Use Estimated Costs."** This treats barriers equally in terms of repair/removal cost.
- For more information on these criteria, see the User Guide.**
- Legend:**
 - Barriers:**
 - Total Barrier (Red circle)
 - Partial Barrier (Grey circle)
 - Other Barrier (Yellow circle)
 - User Edited (Green circle)

The Edit Barrier pop-up.

If an individual barrier is edited, it will appear in the map with a yellow circle around it.



User-edited barriers appear in the map with a yellow circle.

Step 4: Naming and Describing a Run

In Step 4, a user may rename their optimization run, and, if they'd like, add a description. After filling out these fields, click "Save" to save and run the optimization.

aziller

Set Pre-Mitigation Passability | **Set Barrier Mitigation Cost**

Potential Mitigation Projects 285

Edit 'Map functionality'

Provide a Name to identify your optimization

Map functionality

Optionally, you may add a Description

Describing your optimization is recommended.

Legend

Barriers

- Total Barrier
- Partial Barrier
- Other Barrier
- User Edited

Reset < Previous Save 10 mi

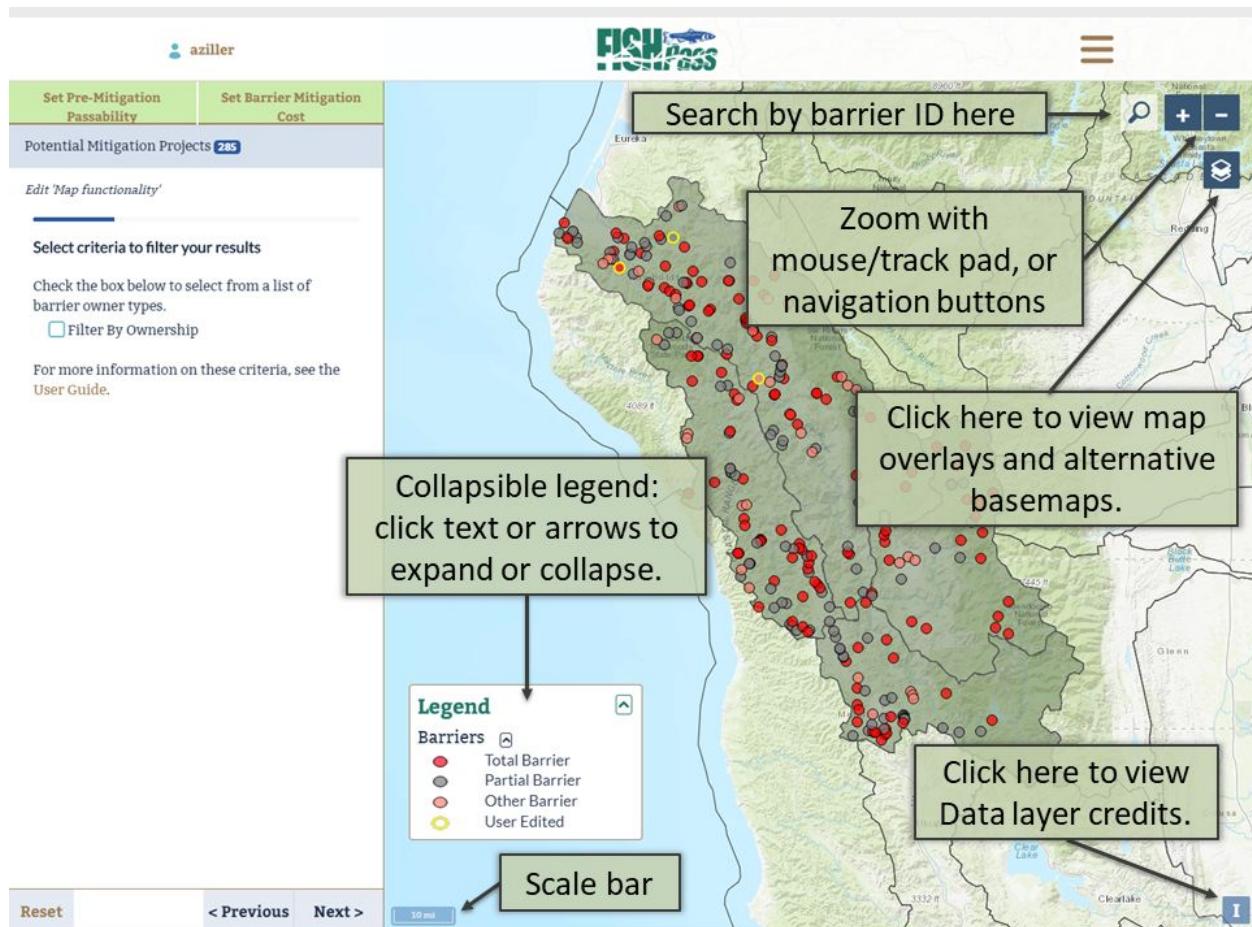
Detail: Step 4: Naming and describing a run.

Map functionality and data

There are two similar but slightly different map features in the tool. Both dynamic, customizable, and multi-functional. The first is present throughout the optimization process, and covers a significant amount of the screen of each step. This map has significant functionality that is described below. The second is a smaller map in the results section. This map has similar, but slightly limited functionality.

Optimization map

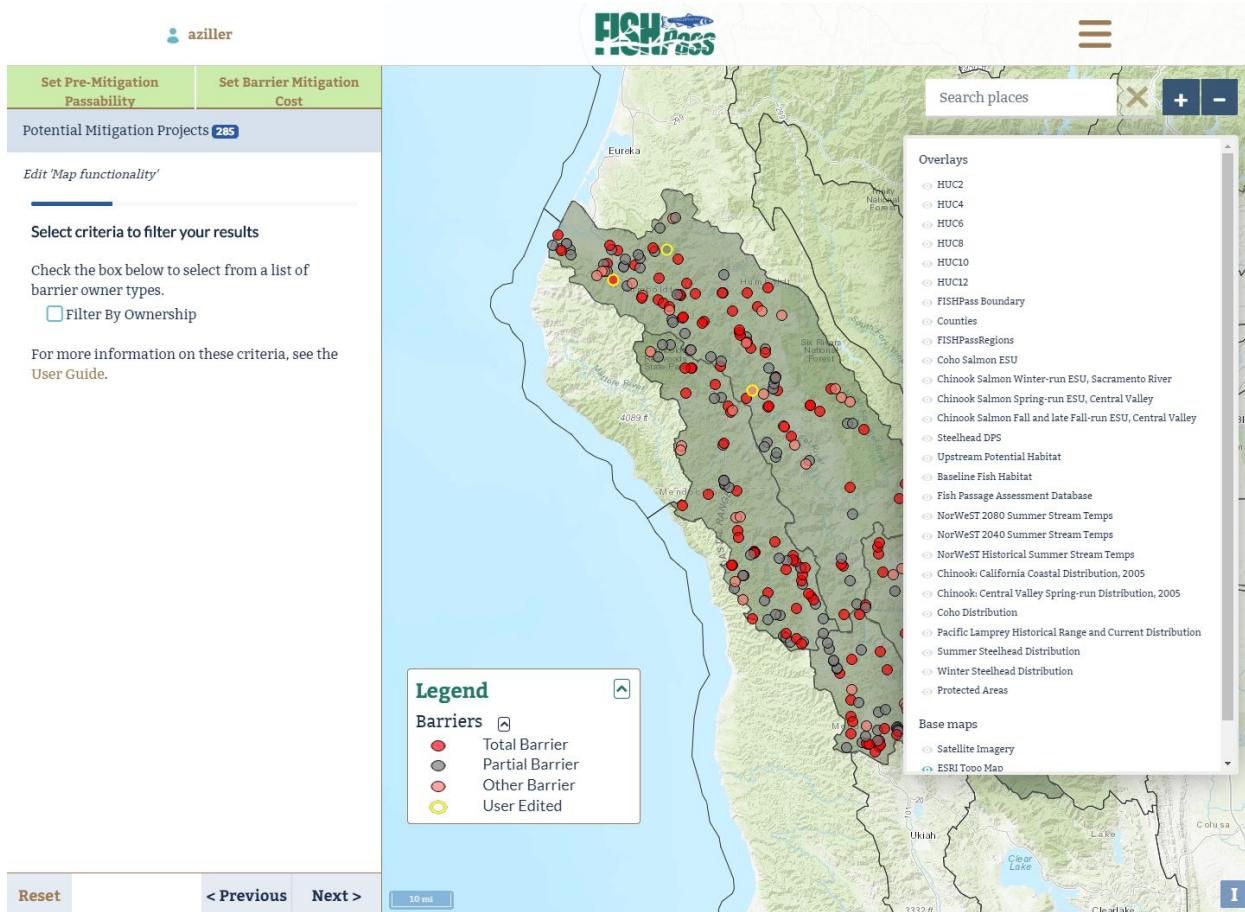
In the optimization map, users may zoom in and out with a mouse or trackpad, as well as the + and - buttons in the upper right corner of the map. Clicking the “I” button in the lower right corner will display credits for the data layers shown in the map. The collapsible legend in the lower left corner automatically updates as a user selects overlays from the data layer menu in the upper right.



An overview of map functionality.



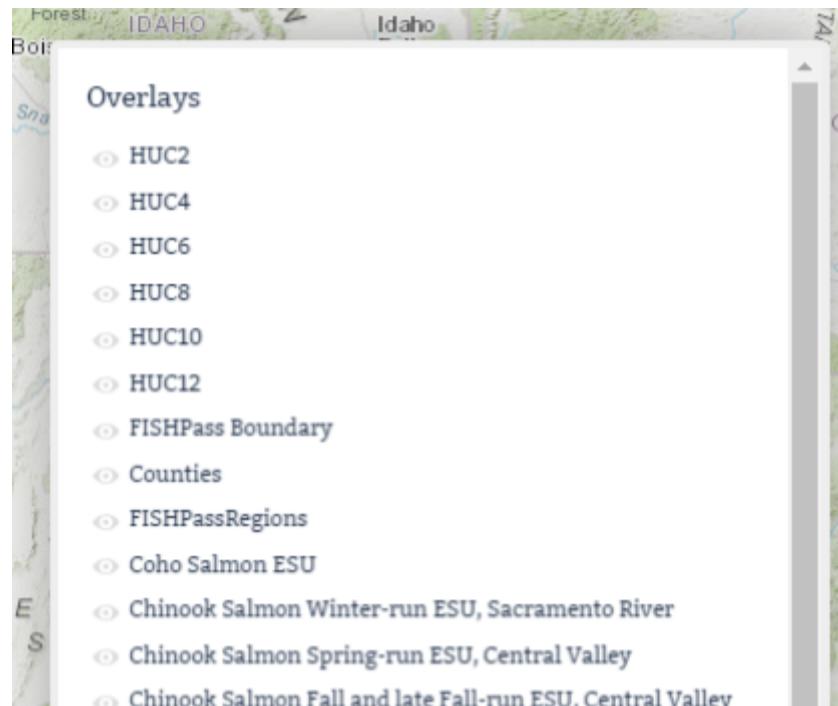
Hovering over the map overlay button in the upper right corner will expand a menu of data layer overlays and alternative basemaps. Some overlays are also spatial foci.



Menu of data-layer overlays.

Clicking a layer in the menu will add it to the map and the collapsible legend in the lower left. The legend and its contents may be expanded or collapsed by clicking on either the title or layer name, or on their corresponding arrows.

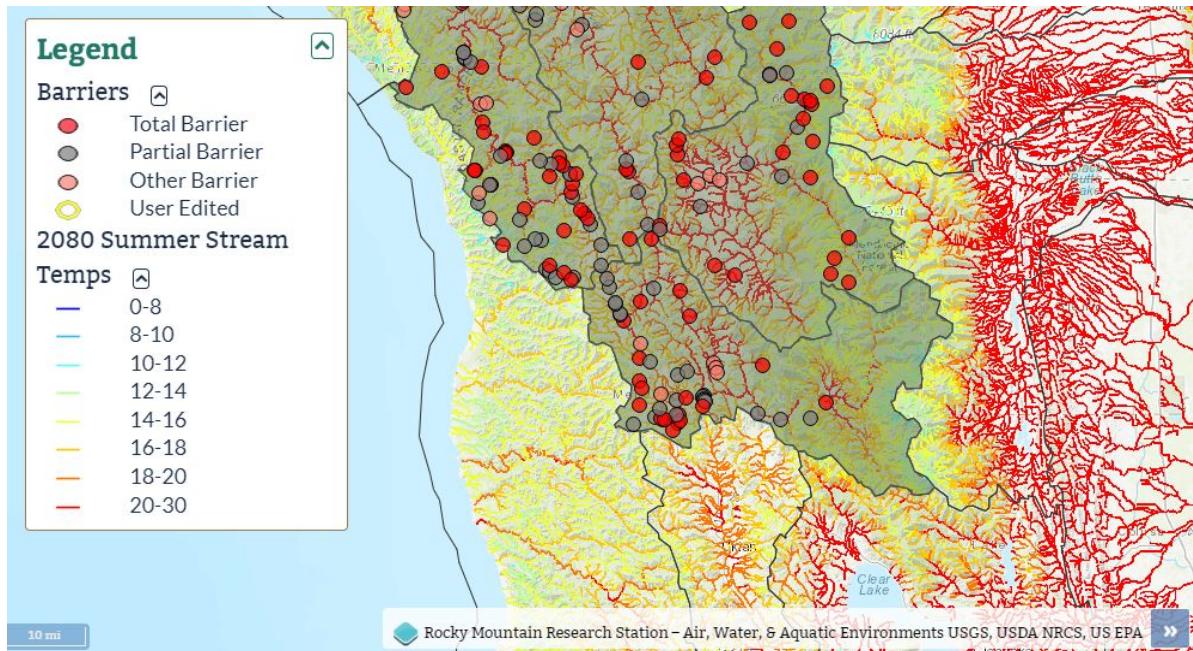
Some layers are pulled from online services, where their symbology (colors and symbols), legends, and zoom levels are predetermined. If a layer does not draw in the map, try zooming in closer in case it is set to draw only at



Detail: Menu of data-layer overlays.

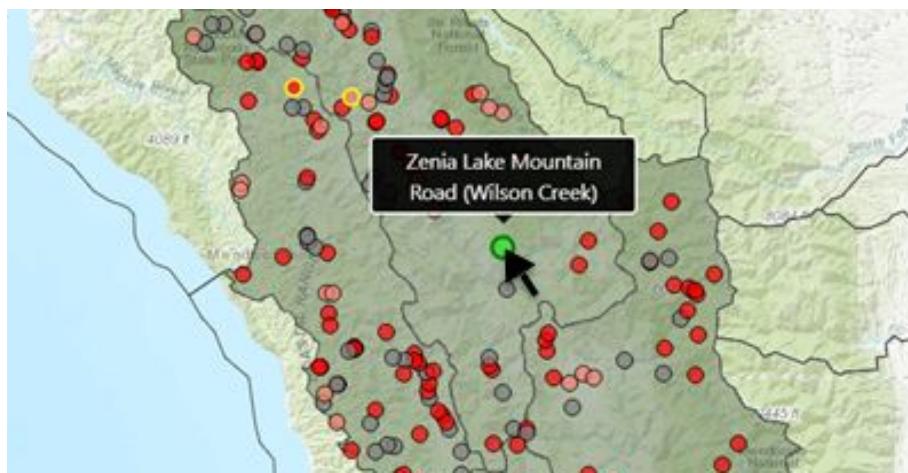
certain zoom levels (as is the case with the NorWeST data, shown below).

Clicking on the “I” icon in the lower right of the map will expand the sources of the visible data layers (Rocky Mountain Research Station in the example below).



Detail: expanded source data information.

When the barriers are visible in the map, in steps 2-4, hovering over them will display a pop-up showing their name. In step 1, hovering over the spatial focus units will identify them by name as well.



Detail: barrier pop-up displayed on hover.

aziller

FISH FISHpass

Set Pre-Mitigation Passability | Set Barrier Mitigation Cost

Potential Mitigation Projects 1233

Edit 'aziller - 15:29 03/30/2019'

Select criteria to filter your results

Choose your **Spatial Focus** from the menu below. Then click on the desired units in the map to select them. To unselect, click on the unit again. To clear your entire selection, choose a new spatial focus.

In the **Downstream Treatment** menu, select how downstream barriers outside of your selected units will be treated.

- Adjustable: Considered as candidates for mitigation
- Non-adjustable: Included only to calculate cumulative passability, but otherwise excluded as candidates for mitigation.
- Excluded: Be completely ignored.

Spatial Focus

Chinook ESUs: all other ESUs

Downstream Treatment

Non-adjustable

For more information on these criteria, see the [User Guide](#).

Legend

Barriers

- Total Barrier
- Partial Barrier
- Other Barrier

Detail: In step 1, hovering over spatial focus units will display identifying information.

Results map

The map in the results has much of the same functionality as the optimization map, with a few key differences. There is no layer legend in the results map, due to limited space. Additionally, the only pop-up shown when hovering describes the barrier indicated -- no additional information is available on the spatial focus units. This map, however, allows the user to interact with the results table, as described in the [the report map](#) section. Tips for managing the layout of the results page and map are discussed later in this section.

Layers

The table below gives a brief overview of the layers used in the map, their function, and source. More detailed information, including links where available, can be found in the [map layer bibliography](#).

Layer or filter name	Function	Source
Aerial imagery	Basemap	Esri
Baseline Fish Habitat	Map layer	PSMFC
Chinook ESUs: all other ESUs	Spatial focus	NOAA Fisheries
Chinook ESUs: Central Valley Fall Runs	Spatial focus	NOAA Fisheries
Chinook ESUs: Central Valley Spring-Run	Spatial focus	NOAA Fisheries
Chinook: California Coastal Distribution, 2005	Map layer	CDFW
Chinook: Central Valley Spring-run Distribution, 2005	Map layer	CDFW
Coho distribution	Map layer	CDFW
Coho ESU	Spatial focus	NOAA Fisheries
Counties	Spatial focus	U.S. Census
Esri Topo Map	Basemap	Esri
Fish Passage Assessment Database	Map layer	CDFW
FISHPass boundary	Spatial focus	PSMFC
FISHPass Regions	Spatial focus	PSMFC
Hydrologic units (HUC2-12)	Spatial focus	USGS, NRCS, EPA
NorWeST 2040 summer stream temps.	Map layer	USDA Forest Service
NorWeST 2080 summer stream temps.	Map layer	USDA Forest Service
NorWeST Historical summer stream temps.	Map layer	USDA Forest Service
Open Street Map	Basemap	OpenStreetMap
Pacific Lamprey Historical Range and Current Distribution	Map layer	CDFW
Protected Areas	Map layer	CAL FIRE
Steelhead DPS	Spatial focus	NOAA Fisheries
Summer Steelhead Distribution	Map layer	CDFW
Upstream potential habitat	Map layer	PSMFC
Winter Steelhead Distribution	Map layer	CDFW

Results

The results of an optimization run are shown on the results page, which includes a map, high-level description of your analysis/run if you provided one, filter parameters, user overrides, a dynamic table of results, and the ability to export the full or filtered results to downloadable .CSV format (which can be opened with Excel). Because of the complexity and breadth of this information, we highly recommend spending time reviewing the layout of the results section and its functionality.



Map functionality

Run on: Apr 24, 2019

Describing your optimization is recommended.

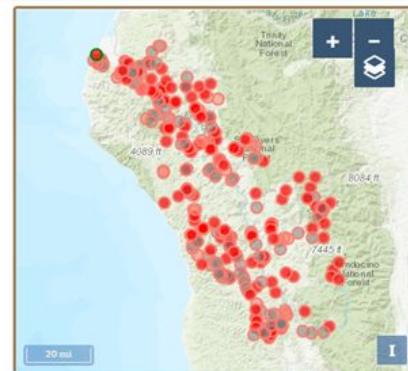
[Download Full Results](#)

[Download Filtered Results](#)

Barriers To Treat	Total Estimated Cost	Potential Habitat
1	\$20,000	407.09 mi
Total Barriers	Budget	Potential Habitat Gain (Weighted)

Filter Parameters:

Spatial Focus: HUC8
Target Areas: 18010103, 18010104, 18010105, 18010106
Downstream Treatment: Non-adjustable
Cost Type: Estimated Mitigation Costs in \$USD



Pre-Passability Overrides:

Barrier Status	Passability
Total	0.0
Partial	0.5
Temporal	0.5
Temporal & Total	0.5
Temporal & Partial	0.5

Default Cost/Postpass Overrides:

Barrier Type	Mitigation Cost	Post-Passability
Non-structural	None	None
Unknown	\$95,000	1.0
Log Debris Accumulations	None	1.0
Dam	None	1.0
Road crossing	None	1.0
Grade control	\$85,000	1.0
Flood control channel	\$1,365,000	1.0
Flow measurement weir	\$70,000	1.0
Tidegate	\$20,000	1.0
Fish passage facility	None	1.0
Fish Trap	\$70,000	1.0
Utility crossing	\$111,000	1.0
Diversion	\$275,000	1.0
Other	\$90,000	1.0
Culvert	None	1.0
Dirt Road	None	1.0

Barrier Overrides:

Barrier	PrePass	Est. Cost	PostPass	Action
705990: Zenia Lake Mountain Road, Wilson Creek	0.0	\$500,000	1.0	Free
711964: Railroad Crossing Culvert (Arch, concrete), Ort Creek	0.0	None	1.0	Free
715429: Culvert with Baffles, Strawberry Creek	0.75	None	1.0	Free
715447: Blue Slide Road Culvert, Slater Creek	0.0	\$50,000	1.0	Free

[Toggle Column Visibility](#)

Search:

PAD ID	Action	Site Name	Estimated Cost	View in BIOS
705092	Do not treat	Falls	NA	link
705093	Do not treat	Falls	NA	link
705095	Do not treat	Falls	NA	link
705101	Do not treat	End of anadromy	NA	link

An example of the results page. Each results page will differ depending on the optimization run that informs it.

Report components

Each report includes the user-defined name and description of the run, as well as an auto-generated date. Below this information are two buttons for downloading results, either in full or filtered to include only those barriers selected for treatment. There is also a high-level summary of the results, including:

- The number of barriers identified for treatment
- Total estimated cost, in US dollars
- Potential Habitat (upstream miles multiplied by the passability of the barrier)
- Total barriers considered (this information having been visible to the user during the optimization process)
- The budget (set by the user in the optimization process)
- Potential habitat gain (weighted). This is the sum of the estimated habitat upstream of each barrier suggested for treatment that have been “weighted/changed” using cumulative passability.

Next is a section titled “Filter Parameters” that captures the options selected by the user during the optimization process, including the [spatial focus](#), the spatial focus units selected (“Target Areas”), the [downstream treatment](#) selected (adjustable, non-adjustable, or excluded), and the cost type (Estimated Mitigation Costs in \$USD, or Number of Mitigation Actions, depending on whether [Estimated Costs](#) were selected). This section is collapsible by clicking on the green text of the title.

If a user opens any of three override pop-ups, then those tables will be viewable in the results. Similar to the Filter Parameters section, these are collapsible and expandable by a single click. “Pre-Passability Overrides” reproduces the [Set Pre-Mitigation Passability](#) table as set by the user, “Default Cost/Postpass Overrides” shows the [Set Barrier Mitigation Cost](#) table, and “Barrier Overrides” shows a table of the individual barriers and their parameters that were [edited](#) by the user.

Below the override section is the results table. This table is dynamic, responsive, and contains a wealth of information. At the top of the table is a button labeled “Toggle Column Visibility.” Clicking this button will show all columns available for viewing in the table. Clicking a column header button will add or remove that column from the table. Every field in the table may be sorted by clicking on the column header. Columns may be reordered by clicking and dragging on the column header.

[Toggle Column Visibility](#)

PAD ID	Action	Site Name	Coordinates	Site Type	Barrier Status	Stream Name	Tributary To	Watershed Name
Watershed Level	County	Chinook Salmon ESU	Coho Salmon ESU	Steelhead Salmon ESU	Est. Upstream Habitat			
# Of Downstream Barriers	Downstream Barrier ID	Avg Upstream Reach Slope (%)	Avg Upstream Aug Streamflow					
Avg Upstream Annual Streamflow	Upstream Mean Aug Stream Temp	Upstream Mean Wkly Max Aug Stream Temp		Estimated Cost	Road			
Post Mile	Owner	Image	View In BIOS	BFH	NotSnappedReason	Trace_Status	WebLegend	

Detail: Toggle Column visibility report column options.

If a user runs an optimization with a [ranged budget](#), there will be additional green buttons below the name, date, and description section. Each button corresponds to a separate results page summarizing the results for that level of the indicated ranged budget. In the example below, the budget settings shown lead to a results page as pictured immediately below them.

Edit 'aziller - 12:11 04/26/2019'

Select criteria to filter your results

Set how the optimization will consider **barrier mitigation costs**.

Use Estimated Costs [i](#)



Budget Type [i](#)

Ranged Budget

Budget min

\$ 1000000

Budget max

\$ 10000000

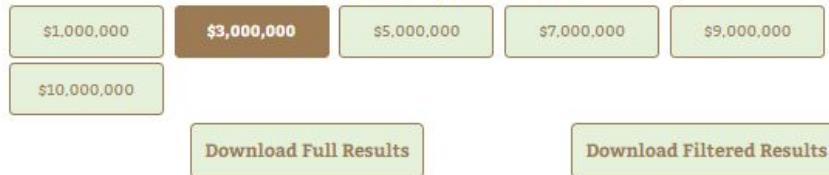
Increment

\$ 2000000

Detail: Example ranged budget settings in step 3 of the optimization.

aziller - 12:11 04/26/2019

Run on: Apr 26, 2019



[Download Full Results](#)

[Download Filtered Results](#)

Barriers To Treat	Total Estimated Cost	Potential Habitat
26	\$2,991,000	488.98 mi

Total Barriers	Budget	Potential Habitat Gain (Weighted)
285	\$3,000,000	87.8 mi

Detail: The results of setting a ranged budget.

Name, date, and description of run

Map functionality

Run on: Apr 24, 2019
Describing your optimization is recommended.

Two download options

High-level results summary

User-set optimization parameters

Results map. The map and legend will remain visible when scrolling through the results page.

If overrides were viewed or selected during the optimization process, they will be included in collapsible tables in the results, here.

Pre-Passability Overrides:

Barrier Status	Passability
Total	0.0
Partial	0.5
Temporal	0.5
Temporal & Total	0.5
Temporal & Partial	0.5

Default Cost/Postpass Overrides:

Barrier Type	Mitigation Cost	Post-Passability
Non-structural	None	None
Unknown	\$95,000	1.0
Log Debris Accumulations	None	1.0
Dam	None	1.0
Road crossing	None	1.0
Grade control	\$85,000	1.0
Flood control channel	\$1,365,000	1.0
Flow measurement weir	\$70,000	1.0
Tidegate	\$20,000	1.0
Fish passage facility	None	1.0
Fish Trap	\$70,000	1.0
Utility crossing	\$111,000	1.0
Diversions	\$275,000	1.0
Other	\$90,000	1.0
Culvert	None	1.0
Dirt Road	None	1.0

Barrier Overrides:

Barrier	PrePass	Est. Cost	PostPass	Action
705990: Zenia Lake	0.0	\$500,000	1.0	Free
Mountain Road, Wilson Creek	0.0	None	1.0	Free
711964: Railroad Crossing Culvert (Arch, concrete), Ort Creek	0.0	None	1.0	Free
715429: Culvert with Baffles, Strawberry Creek	0.75	None	1.0	Free
715447: Blue Slide Road Culvert, Slater Creek	0.0	\$50,000	1.0	Free

Set which PAD columns and attributes are visible with this button.

Search barriers box

Click on a heading to sort table fields. Click and drag to reorder fields.

PAD ID	Action	Site Name	Estimated Cost	View in BIOS
705092	Do not treat	Falls	NA	link
705093	Do not treat	Falls	NA	link

Annotated results page.

The report map

The report map is located by default in the upper right of the browser window, and will remain static and “float” over the page contents as a user scrolls through the page. When the browser window is narrowed, the map changes position, remains static, and is “docked” below the filter parameters and overrides sections of the report page.

As described above, the report map retains most of the functionality of the full-sized map viewable during the optimization setting process. There is no legend because of limited space, and the only information available while hovering are barrier names. However, the map and table results are interactive.

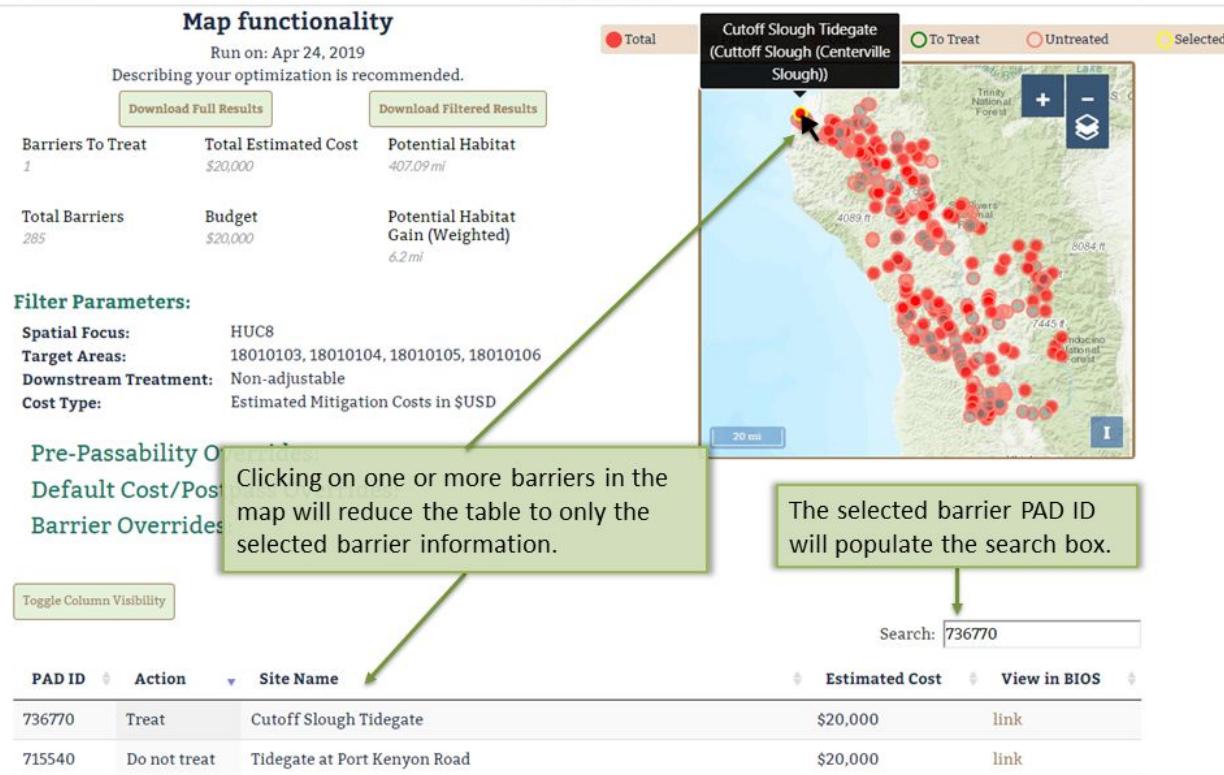
Hovering over a row in the table will highlight the barrier on the map in green.

The screenshot shows the FishPass report interface. At the top, there are tabs for 'Fish Pass Optimizability Overrides' and 'Cost/Postpass Overrides'. The main area has a header 'Barrier Overrides:' and a 'FISH PASS' logo. Below this is a table with columns: PAD ID, Action, and Site Name. A tooltip 'Hovering over a row will highlight it on the map.' points to the 'Do not treat' entry for PAD ID 705990. To the right is a map of a river system with numerous red dots representing barriers. One barrier, corresponding to the highlighted row in the table, is highlighted in green. A tooltip 'The map will stay in place as you scroll down the page.' points to the map area. The map includes a legend at the top with categories: Total (red), Partial (grey), Other (orange), To Treat (green), Untreated (yellow), and Selected (yellow). The map also shows elevation labels (4089 ft, 8084 ft, 7445 ft) and forest names (Trinity National Forest, Redwood National Forest). A zoom control (+/-) is in the top right corner of the map frame.

PAD ID	Action	Site Name
736770	Treat	Cutoff Slough Tidegate
705990	Do not treat	Zenia Lake Mountain Road
758022	Do not treat	Yellowjacket Creek Waterfall
764902	Do not treat	Willits Waste Water Treatment Concrete Weir
713230	Do not treat	Whitlow Road
722821	Do not treat	Waterfall 112313
722813	Do not treat	Waterfall 112305
722588	Do not treat	Waterfall 112077
722288	Do not treat	Waterfall 111777
722285	Do not treat	Waterfall 111774
722282	Do not treat	Waterfall 111771
715165	Do not treat	Waterfall
758027	Do not treat	Waterfall

The map and the results table interact with each other.

Clicking on a barrier in the map will reduce the table to only the selected barrier's information. If more than one barrier is shown in the table, more than one barrier may have been selected in the map. Try zooming in to see if there are multiple barriers in the area of interest. To unselect the barrier and return the table to the full barrier list, click elsewhere on the map or delete the PAD ID number from the search box.



The map and the results table interact with each other.

If the map covers the table in a way that inhibits the table functionality, resize the browser window to make it narrower, until the the map is no longer in the upper right of the page. The map and legend will then be displayed below the filter parameters and overrides, and will not float on top of the table.

Map functionality

Run on: Apr 24, 2019

Describing your optimization is recommended.

[Download Full Results](#)

[Download Filtered Results](#)

Barriers To Treat
1

Total Estimated Cost
\$20,000

Potential Habitat
407.09 mi²

Total Barriers
285

Budget
\$20,000

Potential Habitat Gain
(Weighted)
6.2 mi²

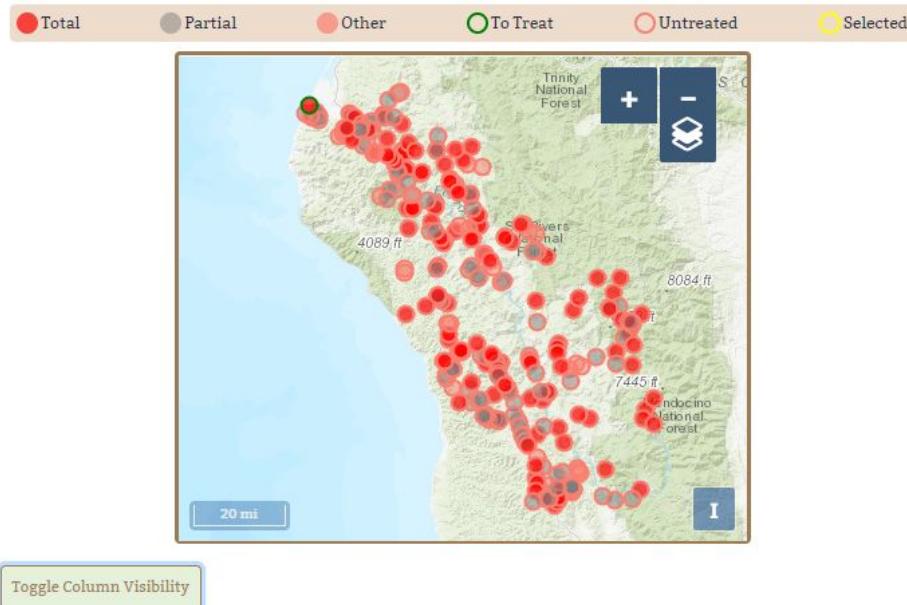
Filter Parameters:

Spatial Focus: HUC8
 Target Areas: 18010103, 18010104, 18010105, 18010106
 Downstream Treatment: Non-adjustable
 Cost Type: Estimated Mitigation Costs in \$USD

Pre-Passability Overrides:

Default Cost/Postpass Overrides:

Barrier Overrides:



Resizing the browser will dock the map above the table.

Exporting and Printing the report

The report web page is designed to be printable directly from the browser. In most browsers, a user may access the print menu using the keyboard shortcut Ctrl+P or Cmd+P. From the menu,

the report may be sent directly to a printer, or saved as PDF. This PDF may then be shared via the user's preferred method (e.g., email or web-based file hosting service).

Additionally, the user may opt to download the full or filtered results as a .CSV file (delimited text file that uses a comma to separate values; this can be read by many software programs, including Excel). These files contain all of the information in the report web page, and allows for additional functionality such as sorting, editing, and searching the data.

Sharing the report

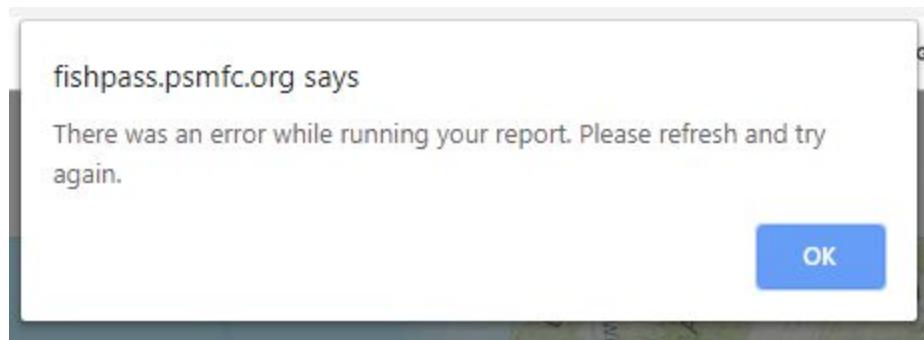
A report may be shared by copying the report page URL and sharing it through the user's preferred method (e.g., email). This report is viewable by users logged in under different accounts, as well as users that are not logged in at all. The URL includes the optimization run's unique ID, which will direct anyone following the link to the report page for the most up-to-date results for that run. If a user edits an optimization run, the unique ID and report URL remain the same. An example report can be seen

https://fishpass.psmfc.org/fishpass/get_report/fishpass_project_125/. (This report may no longer be available if upgrades have been made to the tool.)

Troubleshooting

If the tool returns more barriers than were listed in your optimization run, this is likely because it is including downstream barriers. During the filtering process, the tool only lists the barriers in the spatial focus regions selected. In the results, downstream barriers may be included if the Downstream Treatment "Adjustable" or "Non-Adjustable" is selected.

If you are running a large number of barriers, it may take some time -- several minutes -- for the results to run and load. If the process takes too long and causes the process to fail, an error message will display:



Detail: error message.

If this occurs, try to either reduce the scope of your query, or work through the optimization process more slowly. Specifically, wait for the rotating arrows next to the "Potential Mitigation Projects" count in the upper left, light-blue bar to disappear.

 aziller



Set Pre-Mitigation Passability	Set Barrier Mitigation Cost
Potential Mitigation Projects 288	

Edit 'Map functionality'

Select criteria to filter your results

Check the box below to select from a list of barrier owner types.

Filter By Ownership

For more information on these criteria, see the [User Guide](#).



Detail: The rotating arrows appear when the tool is working behind-the-scenes.

If this does not address your problem, please contact info@cafishpassageforum.org.

More information

This tool was created by Ecotrust in 2019 for the California Fish Passage Forum with funding from the National Fish Habitat Partnership, US Fish & Wildlife Service, and the Pacific States Marine Fisheries Commission.

Bibliography

O'Hanley, J.R. (2015) OptiPass: The Migratory Fish Passage Optimization Tool, Version 1.1 User Manual. Ecotelligence LLC, Portland, OR (USA). <https://kar.kent.ac.uk/46455/>¹

Map layer bibliography

California Department of Fish and Wildlife. *Chinook Salmon California Coastal Distribution, 2005 [ds981]*. California Department of Fish and Wildlife. Web mapping service. Accessed March 28, 2019.

https://map.dfg.ca.gov/arcgis/rest/services/Project BIOS_Public/q BIOS_Public_pointslines09/MapServer/6

---. *Chinook Salmon Central Valley Spring-run Distribution, 2005 [ds982]*. California Department of Fish and Wildlife. Web mapping service. Accessed March 28, 2019.

https://map.dfg.ca.gov/arcgis/rest/services/Project BIOS_Public/q BIOS_Public_pointslines09/MapServer/7

---. *Coho Distribution [ds326]*. California Department of Fish and Wildlife. Web mapping service. Accessed March 28, 2019.

https://map.dfg.ca.gov/arcgis/rest/services/Project BIOS_Public/q BIOS_Public_pointslines03/MapServer/33

---. *Fish Passage Assessment Database*. California Department of Fish and Wildlife. Web mapping service. Accessed March 28, 2019.

<https://map.dfg.ca.gov/arcgis/rest/services/Project PAD/PAD/MapServer>

---. *Pacific Lamprey Historical Range and Current Distribution - USFWS [ds2673]*. California Department of Fish and Wildlife. Web mapping service. Accessed March 28, 2019.

¹ This document is not available online as of April 2019. For a copy, either make a request to the University of Kent through the form provided via the link above, or contact the PAD administrator via <http://www.calfish.org/pad/>

https://map.dfg.ca.gov/arcgis/rest/services/Project BIOS_Public/q BIOS_Public_pointsline26/MapServer/5

---. *Summer Steelhead Distribution [ds341]*. California Department of Fish and Wildlife.

Web mapping service. Accessed March 28, 2019.

https://map.dfg.ca.gov/arcgis/rest/services/Project BIOS_Public/q BIOS_Public_pointsline03/MapServer/35

---. *Winter Steelhead Distribution [ds340]*. California Department of Fish and Wildlife. Web mapping service. Accessed March 28, 2019.

https://map.dfg.ca.gov/arcgis/rest/services/Project BIOS_Public/q BIOS_Public_pointsline03/MapServer/34

California Department of Forestry and Fire Protection. *Land Ownership*. California Department of Forestry and Fire Protection. Web mapping service. Accessed March 28, 2019.

<https://egis.fire.ca.gov/arcgis/rest/services/FRAP/ownership/MapServer/0>

Elston, Anne. *FISHPass Regions v6*. Sacramento, CA: Pacific States Marine Fisheries Commission. December 4, 2018. Vector digital dataset.

Esri. ArcGIS Online World Topographic Map. Redlands, CA: Esri. Basemap. Accessed March 28, 2019.

<http://www.arcgis.com/home/item.html?id=30e5fe3149c34df1ba922e6f5bbf808f>

Holycross, Brett. *FISHPass Scope*. Portland, OR: Pacific States Marine Fisheries Commission. Unpublished. Vector digital dataset.

OpenStreetMap contributors. *OpenStreetMap Basemap*. OpenStreetMap. Basemap.

<https://www.openstreetmap.org>

Pacific States Marine Fisheries Commission. *Baseline Fish Habitat*. Pacific States Marine Fisheries Commission. Web mapping service. Accessed March 28, 2019.

https://maps.psmfc.org/server/rest/services/CFPF/CFPF_FISHPass/MapServer/2

---. *Upstream Trace Reaches*. Pacific States Marine Fisheries Commission. Web mapping service. Accessed March 28, 2019.

https://maps.psmfc.org/server/rest/services/CFPF/CFPF_FISHPass/MapServer/3

Rocky Mountain Research Station – Air, Water, & Aquatic Environments. *2040 NorWeST modeled summer stream temperature scenarios for the western U.S.* USDA Forest Service. Web mapping service. Accessed March 28, 2019.

https://apps.fs.usda.gov/fsgisx02/rest/services/rmrs/RMRSAWE_NorWeSTPredictedStreamTemperatures_2040_01/MapServer

---. *2080 NorWeST modeled summer stream temperature scenarios for the western U.S.* USDA Forest Service. Web mapping service. Accessed March 28, 2019.

https://apps.fs.usda.gov/fsgisx02/rest/services/rmrs/RMRSAWE_NorWeSTPredictedStreamTemperatures_2080_01/MapServer

---. *Historical NorWeST modeled summer stream temperature scenarios for the western U.S.* USDA Forest Service. Web mapping service. Accessed March 28, 2019.

https://apps.fs.usda.gov/fsgisx02/rest/services/rmrs/RMRSAWE_NorWeSTPredictedStreamTemperatures_MeanAugust_01/MapServer

U.S. Department of Commerce, U.S. Census Bureau, Geography Division. *TIGER/Line Shapefile, 2009, nation, U.S., Current county and Equivalent National Shapefile*. Washington, DC: U.S. Department of Commerce. 2009. Vector digital data.

<https://www.census.gov/geo/maps-data/data/tiger.html>

U.S. Geological Survey (USGS), U.S. Department of Agriculture - Natural Resource Conservation Service (NRCS), U.S. Environmental Protection Agency (EPA). *National Watershed Boundary Dataset*. Washington, DC: USGS. December 16, 2015. Vector digital dataset. Accessed February 18, 2019.

<https://www.usgs.gov/core-science-systems/ngp/national-hydrography/access-national-hydrography-products>