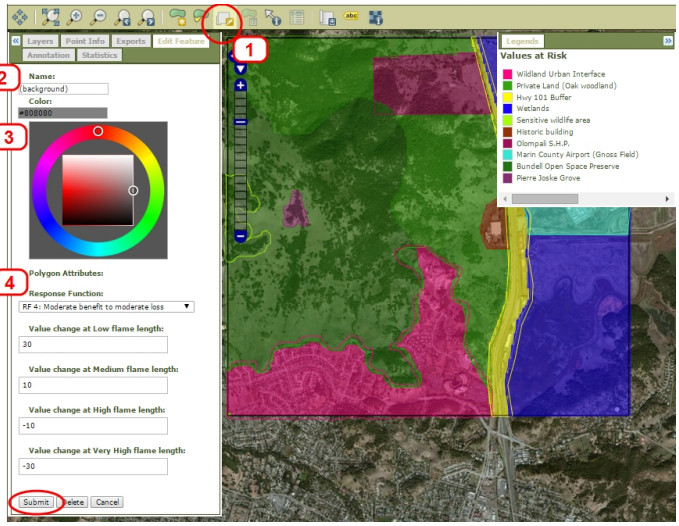
Tutorial H – Creating a Values-at-Risk Map for use in the IFTDSS Risk Assessment Workflows

IFTDSS provides two approaches for assessing fire hazard and risk across the landscape. These include the Worst-Case Flame Length Approach and Flame Length Probabilities Approaches. Both of these approaches require the user to define values-at-risk, and map these out as a series of polygons. This tutorial will walk you through the process of defining and creating a values-at-risk map. Steps covered in this tutorial include:



- Background on Values-at-Risk
- Response Functions (Definitions)
- Defining Values-at-Risk: Methods
- Defining Values-at-Risk: Using the Free-form Drawing Method to Create Values-at-Risk Polygons
- Defining Values-at-Risk: Using the Point-and-Click Method to Create Values-at-Risk Polygons
- Defining Larger Values-at-Risk
- Defining Smaller Values-at-Risk
- Editing Values-at-Risk
- Defining Values-at-Risk: Assigning a Background
- Reviewing and Saving a Values-at-Risk Map
- Review and Additional Help

Note

For this tutorial we will use the example area at the following coordinates:

- **North:** 38.155672364916
- **East:** -122.5502871142

- **South:** 38.120028050516
- **West:** -122.5986956225

Note
This tutorial focuses on the creation of a values at risk map and assumes your project is set up and a Risk Assessment run has been started.

Note
All references cited in this tutorial are in the IFTDSS online help bibliography; access it by navigating to **Reference Material > Bibliography.**

Background: Values-at-Risk

Values-at-risk, also known as highly valued resources, (HVR) are features on the landscape that are influenced positively and/or negatively by fire. A value at risk can have ecological, economic, or social importance.

Some examples of values-at-risk include:

- Airports
- Archeological sites
- Conifer forests
- Highway buffers
- Historic buildings
- Wildland-urban interface

Defining Values at Risk

In the following sections we will cover how to define values at risk using the Draw Polygon Tool in the mapping toolbar.

> **Note**
> If you already have a values-at-risk map from a previous run, it can be used by selecting it at the bottom of the **Configure** page. Another option is to upload a shapefile before your run, and assign risk functions to the polygons within that shapefile.

Once a polygon is defined as a value-at-risk you will need to specify a response function to describe the effect of fire on the values-at-risk (covered in the next step).

Response Functions (Definitions)

Response functions describe the effect of fire on the values-at-risk.

Response functions are mathematical relationships between fire characteristic (e.g., flame length) and fire outcome. There are 14 pre-defined response functions.

RESPONSE FUNCTION	DESCRIPTION	NET VALUE CHANGE MULTIPLIER BASED ON USER-DEFINED FLAME LENGTH CLASSES			
		LOW	MODERATE	HIGH	VERY HIGH
1	All fire is beneficial; strong benefit at low and moderate fire intensities and moderate benefit at high and very high intensity.	+80	+80	+40	+40
2	All fire is beneficial; moderate benefit at low fire intensity and mild benefit at higher intensity.	+50	+20	+20	+20
3	Strong benefit at low fire intensity, decreasing to a strong loss at very high intensity.	+60	+20	-20	-60
4	Moderate benefit at low fire intensity, decreasing to a moderate loss at very high fire intensity	+30	+10	-10	-30
5	Slight benefit or loss at all fire intensities	0	0	0	0
6	Mild increasing loss from slight benefit or loss at low intensity to a moderate loss at very high intensity.	0	-10	-20	-30
7	Moderate increasing loss from mild loss at low intensity to a strong loss at very high intensity.	-10	-30	-50	-80
8	Slight benefit or loss at all fire intensities, except a moderate loss at very high intensity.	0	0	0	-50
9	Slight benefit or loss at low and moderate fire intensities and a mild loss at high and very high intensities.	0	0	-20	-20
10	Mild loss at all fire intensities	-20	-20	-20	-20
11	Moderate loss from fire at all fire intensities	-50	-50	-50	-50
12	Strong loss from fire at all fire intensities.	-80	-80	-80	-80
13	Loss increases from slight loss at low intensity to strong loss at very high intensity.	-10	-60	-70	-80

14	Slight benefit or loss from fire at low and moderate intensities and a strong loss from fire at high and very high intensities.	0	0	-80	-80

(Table modified from Calkin et al., 2010a)

Defining Values-at-Risk: Methods

To create a values-at-risk map, you will draw polygons across the landscape and assign each one a response function.

There are two methods for using the map tools to draw polygons:

1. The free-form drawing method is useful when

- You want to quickly and easily draw polygons.
- You have a small area of interest.
- You can see the entire area your polygon will encompass without moving the map.

2. The point and click method is useful when

- You want to zoom in to make a detailed polygon.
- You need to move the map (using the pan tool) while you are drawing a polygon.

These polygon drawing methods are discussed in the next four steps.

Introduction to the mapping tool

Employing these methods to define values at risk requires familiarity with the **Mapping Tool** (below):

The mapping toolbar located at the top of the map provides tools navigating, creating, and editing data. The tools, and their corresponding icons, are displayed below.

Whenever you are working on a map in IFTDSS, you may hover your cursor over a tool icon and the name of icon will appear.

Tools that are disabled are faded out (for example, the **Polygon Edit** and **Advanced Edit** tools, circled here in red).

Pan
Zoom to intitial extent
Zoom in
Zoom out
Go back to previous pan/zoom
Go forward to next pan/zoom
Draw polygon
Modify polygon
Edit background
Polygon advanced edit (disabled)
Point information
Advanced edit (disabled)
Save map image
Map annotation
Map statistics
abc
Layers
Point Info
Exports
Annotation
Statistics
Base Layer
Street Map
Topo Map
Imagery
Overlays

Defining Values-at-Risk: Using The Free-form Drawing Method To Create Polygons

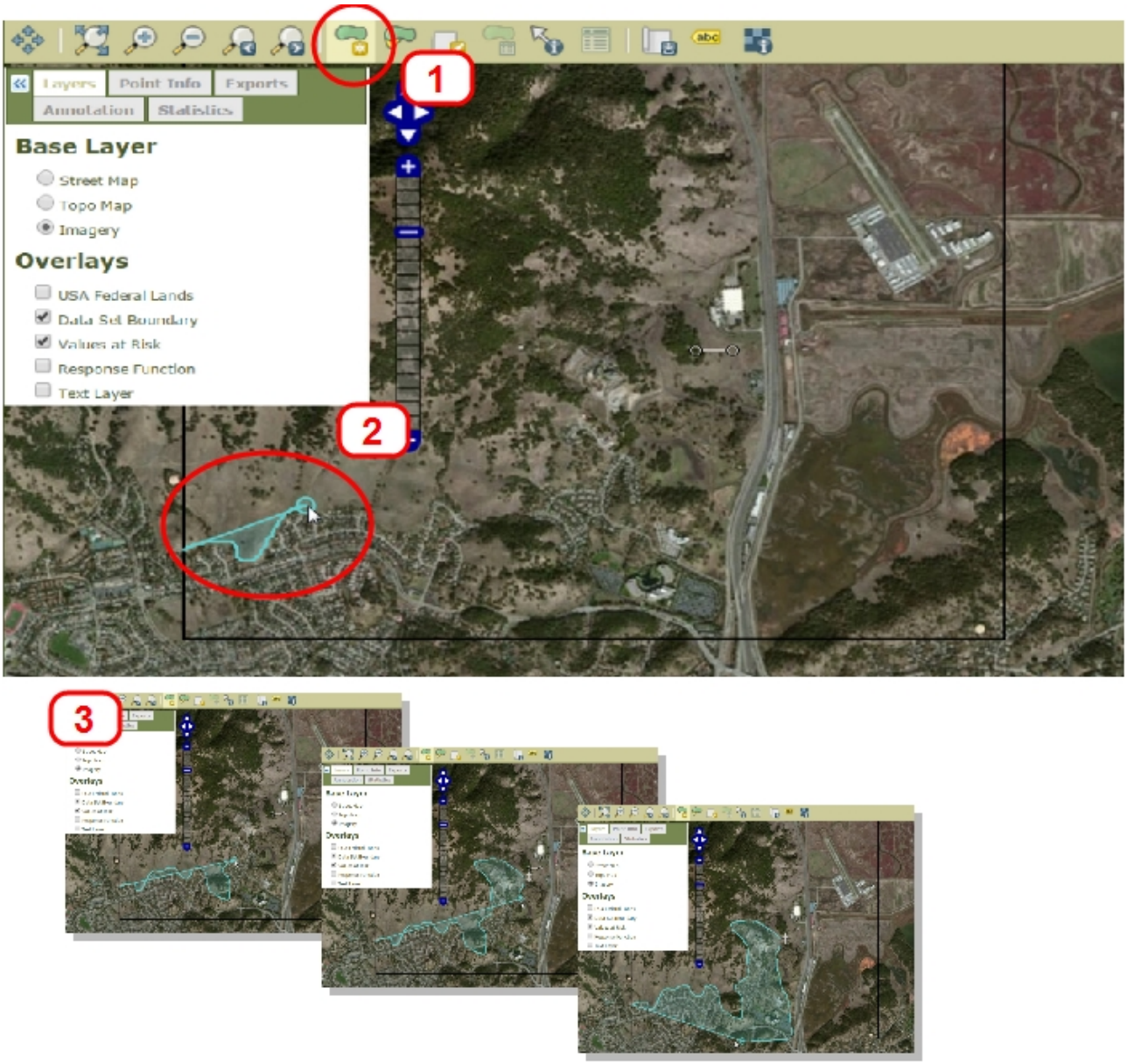
In this step, you use the free-form drawing method to **define values-at-risk** and assign each value-at-risk a response function.

In this example, you draw a polygon over the wildland-urban interface.

1. Select the **Draw Polygon** tool.
2. Hold down the **shift** key and the **left mouse button** at the map location where you want to start drawing your first polygon.
3. Continue to hold down the **shift** key and **left mouse button**. Moving the mouse as if it were a pencil, draw your polygon (outlining the wildland-urban interface).

Let go of the left mouse button and shift key when you are done drawing the polygon. This creates the polygon and opens the **Edit Feature** panel (shown in the next step).

> **Tip**
> Define your largest values at risk first (e.g., wildland-urban interface, oak woodlands).

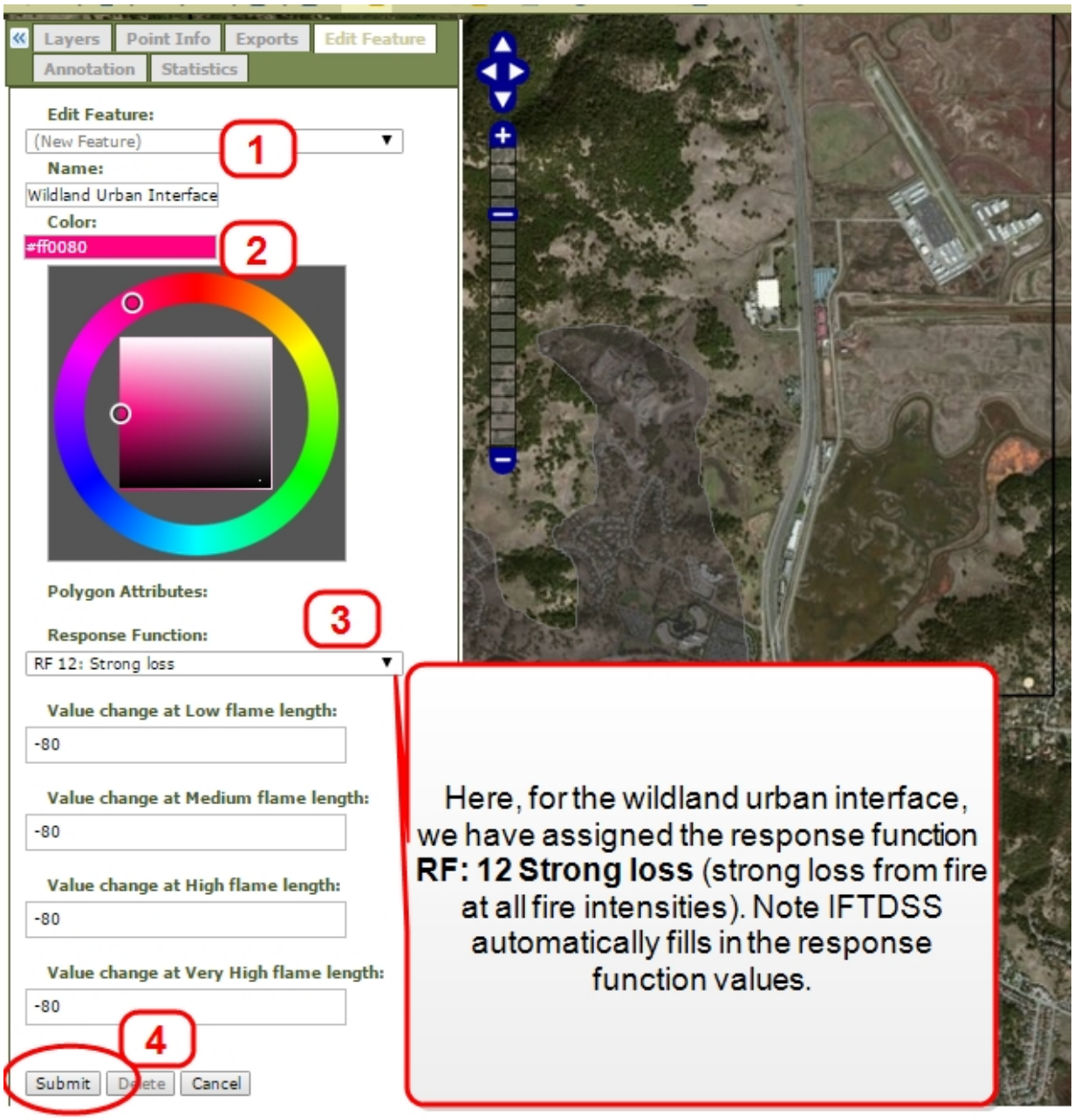


Using the edit feature panel to specify values-at-risk response functions

After you create the polygon, the **Edit Feature** panel appears. To edit the polygon:

1. Name the polygon.
2. Give the polygon a color using the color wheel and the inner box to choose the shade of the color selected.

3. Assign a response function to the polygon.
4. Choose **Submit** to save the polygon data.



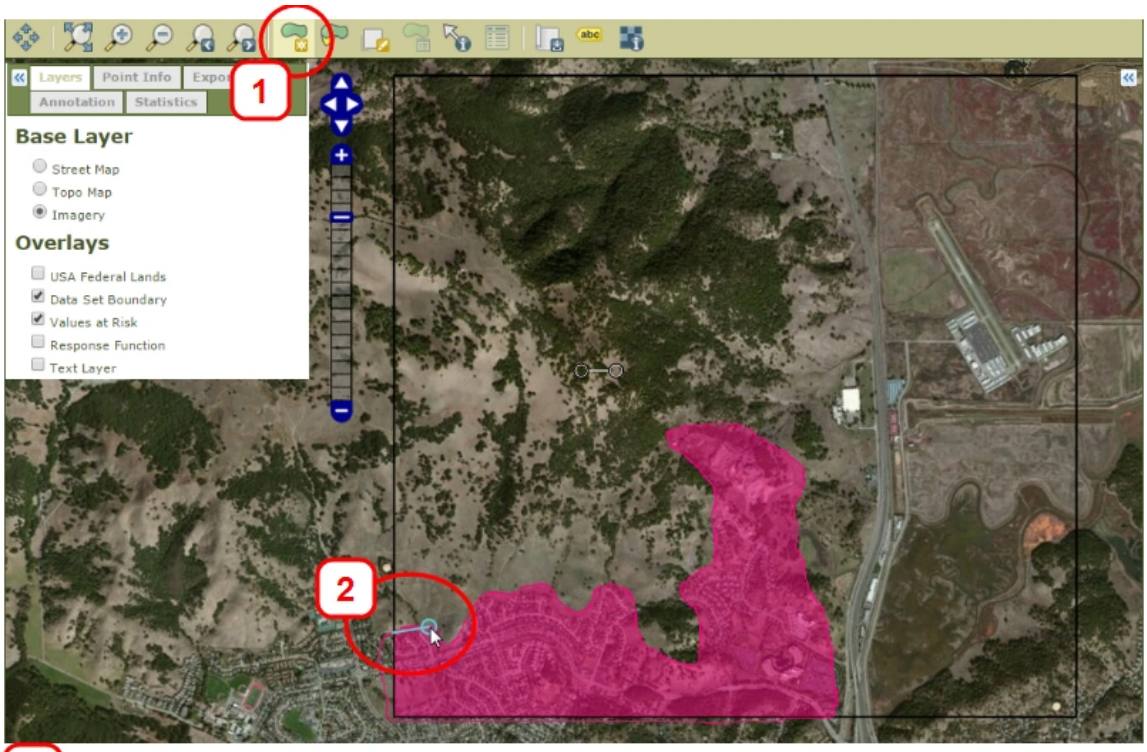
Note
Click on **Response Functions** under the **Help** dropdown menu to read a description of each response function and to find additional resources.

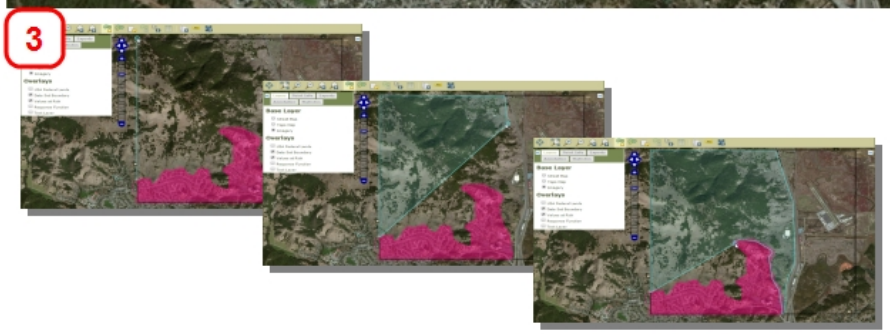
Defining Values-at-Risk: Using The Point And Click Method To Create Values-at-Risk Polygons

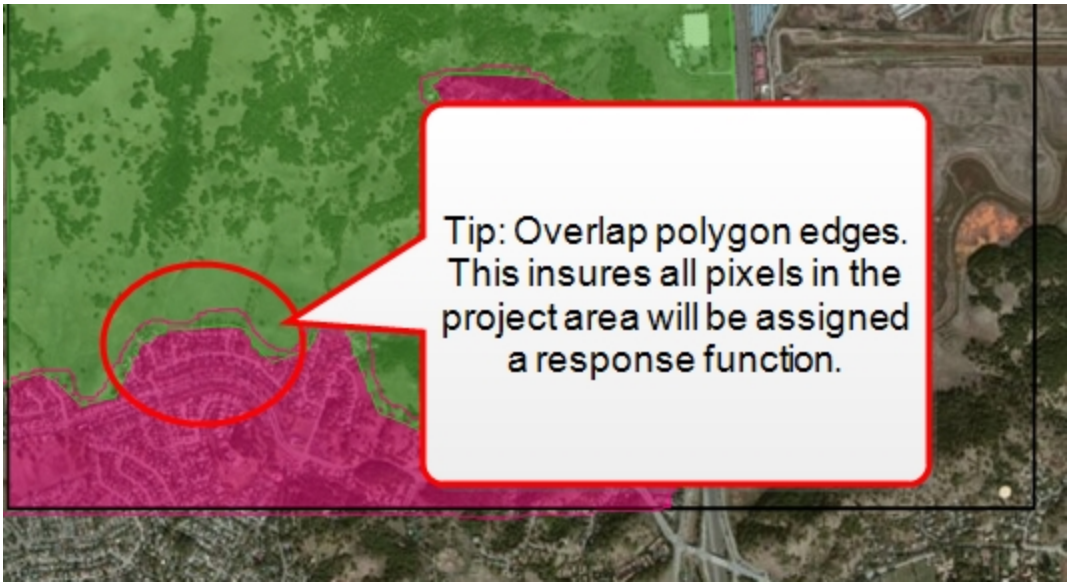
In this example, use the **point and click method** to draw a polygon over the oak woodlands north of the wildland-urban interface.

1. Select the **Draw Polygon** tool.
2. Click on the map and release to start drawing your first polygon.
3. Move the mouse to a new point and click to add another point. Before moving on, make sure the point is established (by moving the mouse away from the point). Continue this process until you are done drawing your polygon.

Double-click when you are done drawing the polygon to create the polygon and to open the **Edit Feature** panel.

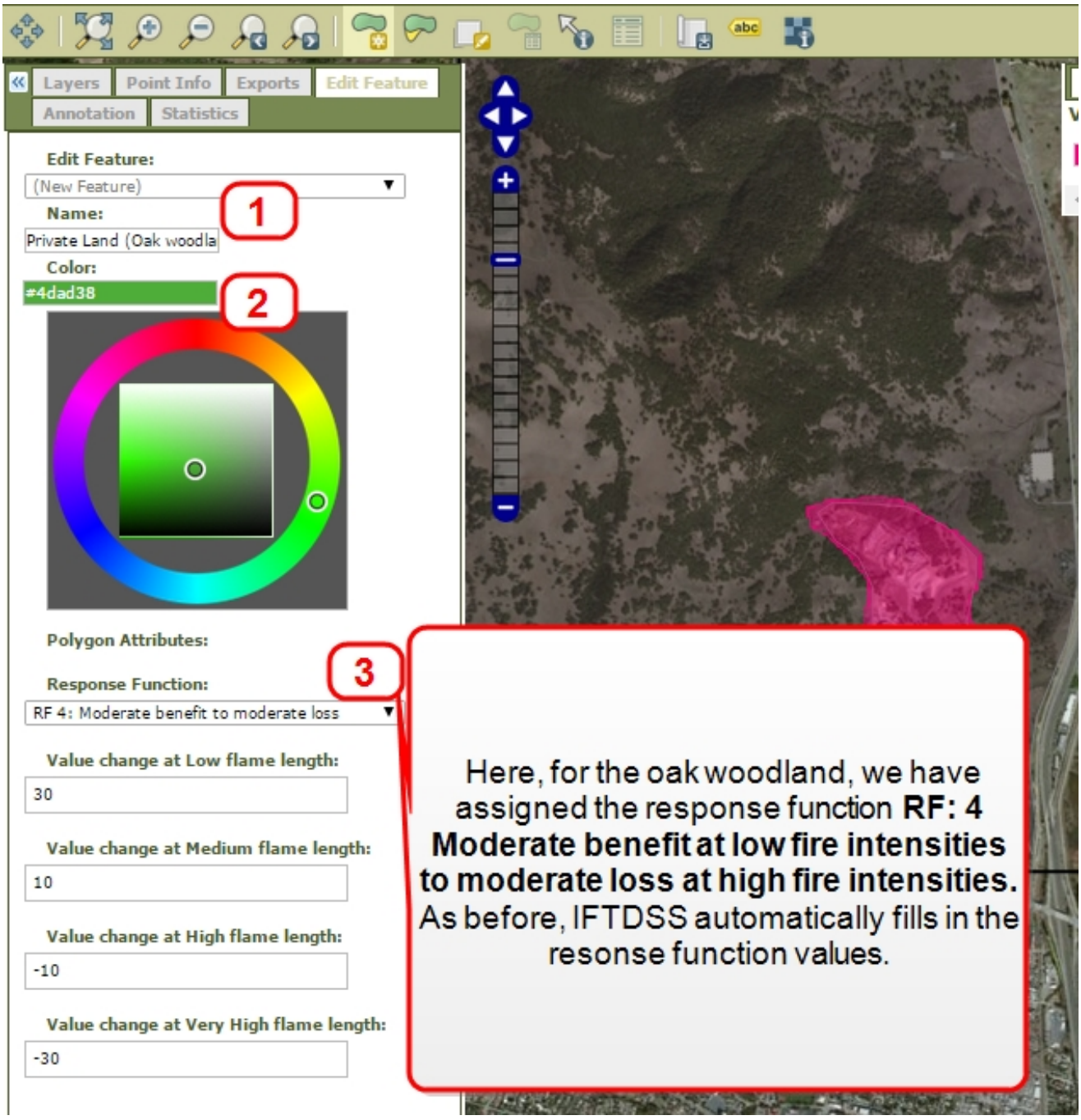

Layers
Point Info
Annotation
Statistics
Base Layer
Street Map
Topo Map
Imagery
Overlays
USA Federal Lands
Data Set Boundary
Values at Risk
Response Function
Text Layer
1
2


3


Tip: Overlap polygon edges. This insures all pixels in the project area will be assigned a response function.

Using the edit feature panel to specify values-at-risk response functions

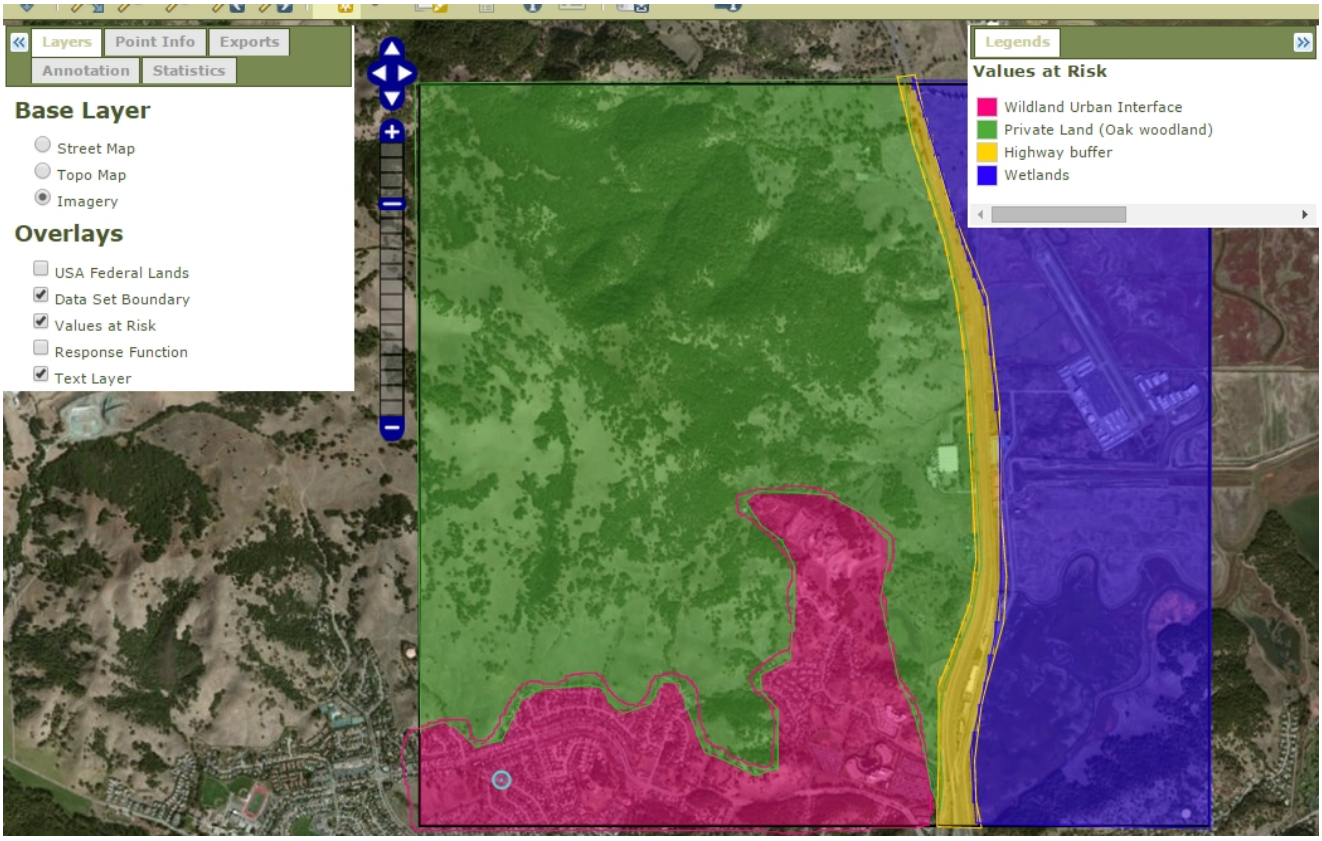
1. Name the polygon.
2. Give the polygon a color using the color wheel and the inner box to choose the shade of the color selected.
3. Assign a response function to the polygon (see the response function table for explanations). Here we have assigned to the oak woodland the response function RF 4: Moderate benefit at low fire intensities to moderate loss at high fire intensities. As before, IFTDSS automatically fills in the response function values.


Layers
Point Info
Exports
Edit Feature
Annotation
Statistics
Edit Feature:
(New Feature)
1
Name:
Private Land (Oak woodla
Color:
#4dad38
2
Polygon Attributes:
3
Response Function:
RF 4: Moderate benefit to moderate loss
Value change at Low flame length:
30
Value change at Medium flame length:
10
Value change at High flame length:
-10
Value change at Very High flame length:
-30
Here, for the oak woodland, we have assigned the response function **RF: 4 Moderate benefit at low fire intensities to moderate loss at high fire intensities.** As before, IFTDSS automatically fills in the resonse function values.

Defining Larger Values-at-Risk

Continue to fill your entire area of interest with polygons representing the larger values-at-risk. Define your largest values-at-risk first (e.g., wildland-urban interface, oak woodlands).

Try it out: Define your own large values-at-risk, using both of the polygon drawing methods, and assign those values-at-risk a variety of response functions.

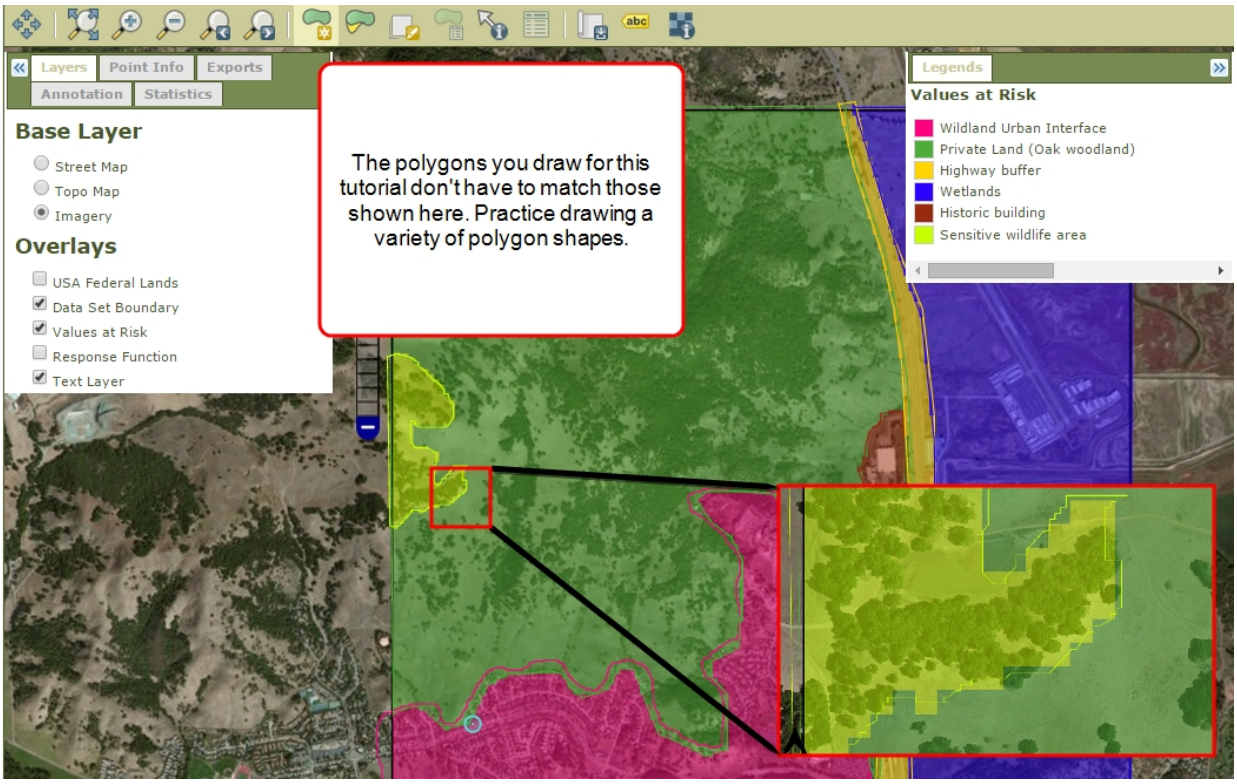


Creating Smaller Values-at-Risk

After defining your larger values-at-risk, draw smaller values of risk (e.g., archeological sites, endangered species habitat, structures) on top of the larger values-at-risk.

The smaller polygons replace the larger polygons beneath.

> **Tip**
> Creating a detailed values-at-risk map (with multiple response functions) produces better outputs.



Once you create a polygon, the data area is rasterized. If your polygon line encompasses less than half of a pixel, that pixel will not be included in your polygon. If your polygon line encompasses more than half of a pixel, that pixel will be included in your polygon.

Editing Values-at-Risk

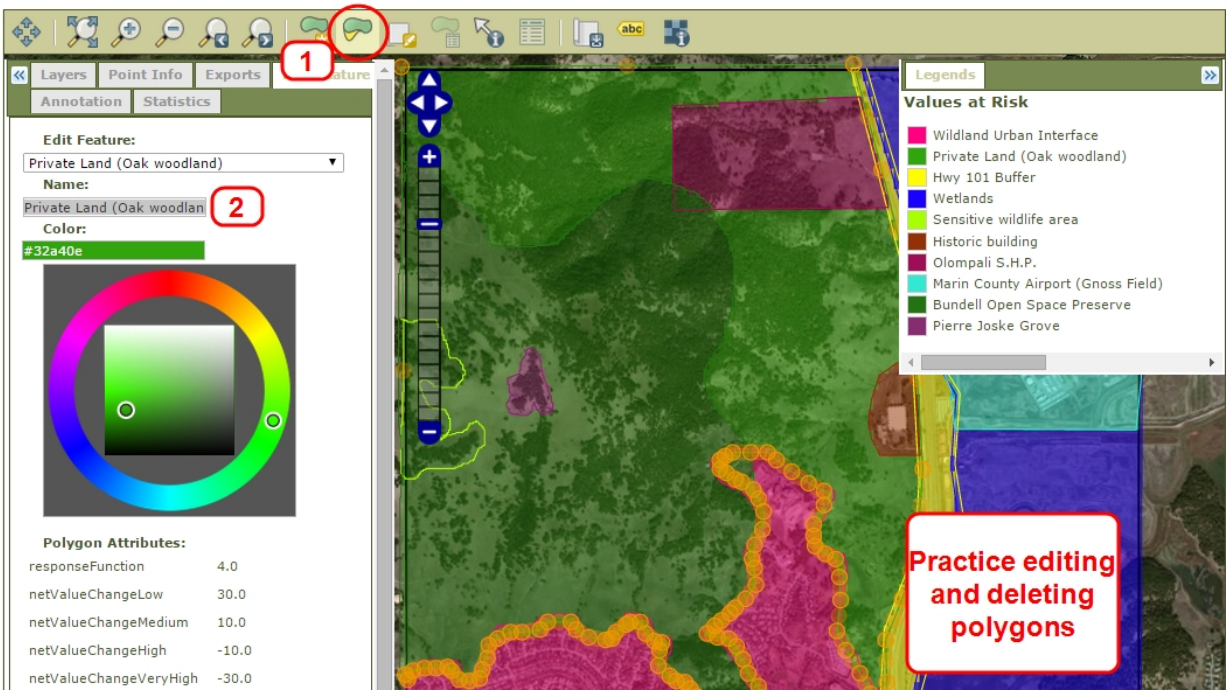
You can also edit your polygons using the Modify Polygon tool.

1. Select the **Modify Polygon** tool.
2. Select the polygon you would like to edit by clicking on it.
3. Select the feature (value-at-risk) you would like to edit using the **Edit Feature** drop-down list.

In the **Edit Feature** panel, you can edit the polygon's name, color, or response function.

You can also delete a polygon using the **Delete** button at the bottom of the panel.

If you delete a polygon, the assigned background will replace the deleted polygon.

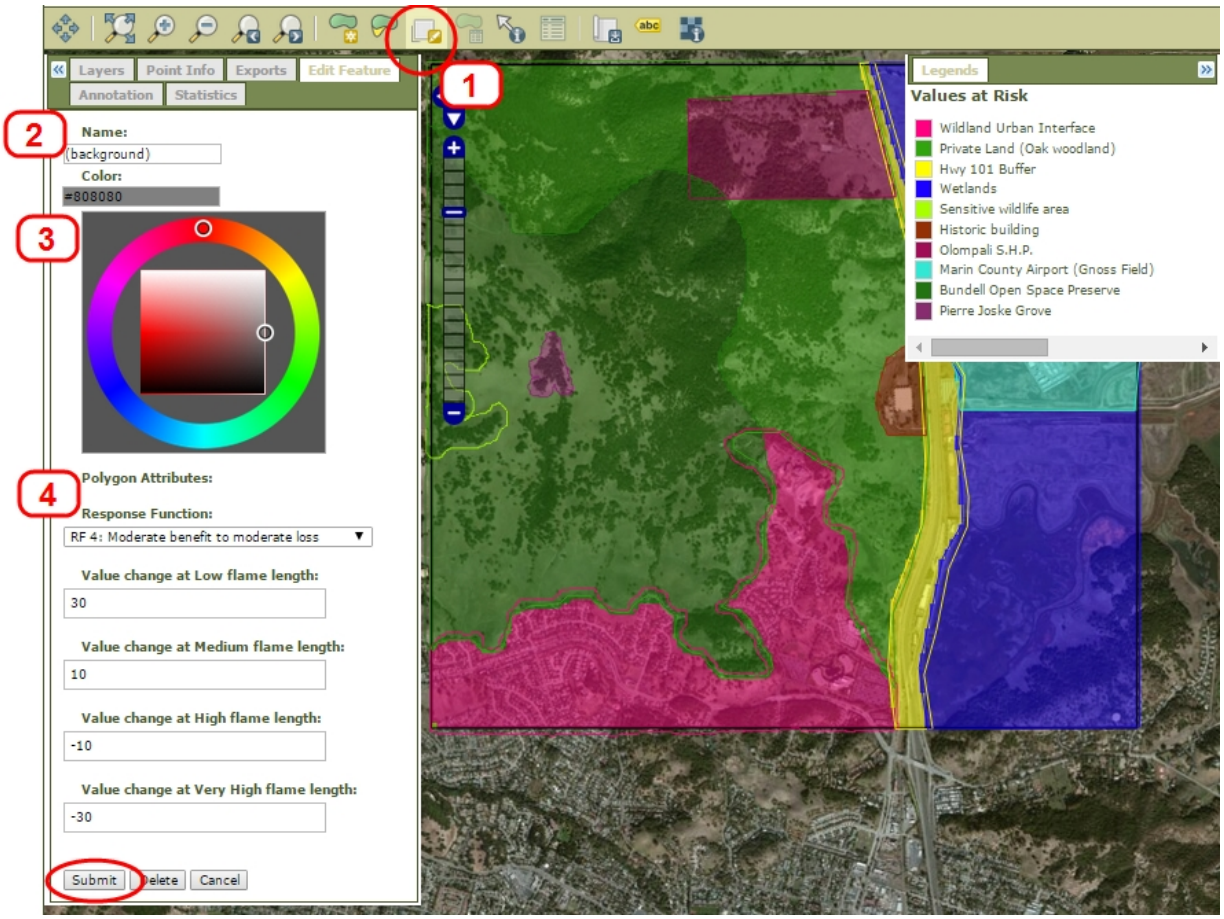


Defining Values-at-Risk: Assigning A Background

In order for IFTDSS to calculate an output in the risk pathways, every grid cell within the area of interest needs a response function. To fill this requirement without having to define values at risk for every pixel, you can assign a background to your values-at-risk map. To ensure every grid cell is assigned a response function, assign a response function to the background using the following steps:

1. Select the **Edit Background tool**.
2. The **Edit Feature** panel will appear. If you prefer, you can change the background's name from background).
3. Assign the background a color.
4. Assign the background a response function.

Assigning the background a response function of 4 tells IFTDSS to assume that the areas without a polygon will burn with a moderate benefit under low flame lengths to a moderate loss under very high flame lengths.

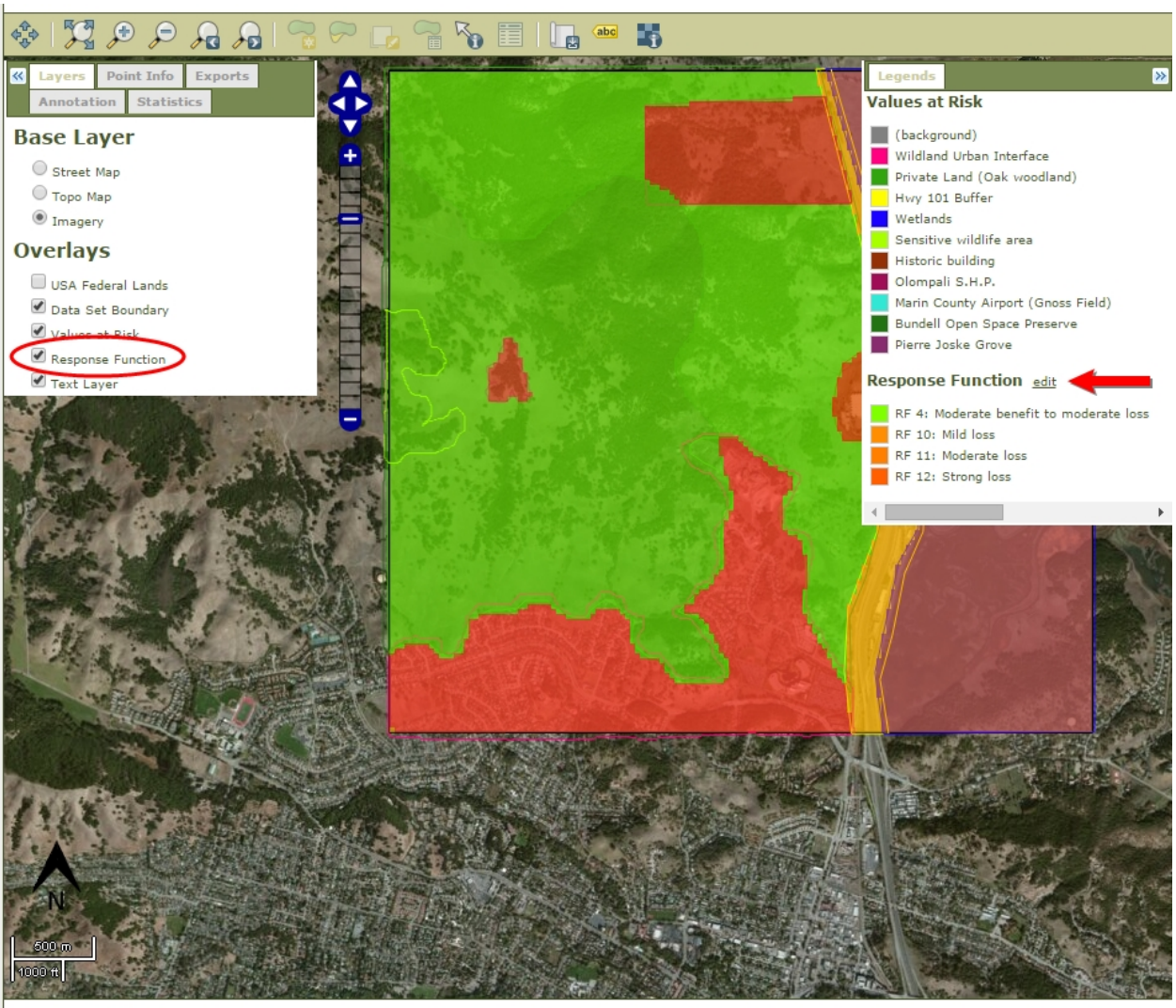

1
2
3
4
Layers
Point Info
Exports
Edit Feature
Annotation
Statistics
Name:
(background)
Color:
#808080
Polygon Attributes:
Response Function:
RF 4: Moderate benefit to moderate loss
Value change at Low flame length:
30
Value change at Medium flame length:
10
Value change at High flame length:
-10
Value change at Very High flame length:
-30
Submit
Delete
Cancel
Legends
Values at Risk
Wildland Urban Interface
Private Land (Oak woodland)
Hwy 101 Buffer
Wetlands
Sensitive wildlife area
Historic building
Olompali S.H.P.
Marin County Airport (Gnoss Field)
Bundell Open Space Preserve
Pierre Joske Grove

Reviewing And Saving Your Values-at-Risk Map

You can use the Layers panel to view your values at risk or the response functions that you assigned to your values-at-risk.

To save your values-at-risk map for use in future runs, type a descriptive name into the **Save Polygons As** text box.

To continue the risk assessment pathway, when your values-at-risk map is complete, choose **Next**.



To save the Values at Risk polygons, enter a data set name (optional).

Save Polygons As: Olompali Val. at Risk

< Back | Edit | Next > | US Customary Units | Change Units

Review And Wrap-Up

In this tutorial we covered the process of defining and creating a values-at-risk map. Steps covered in this tutorial included:

- Background on Values-at-Risk
- Response Functions (Definitions)
- Defining Values-at-Risk: Methods
- Defining Values-at-Risk: Using the Free-form Drawing Method to Create Values-at-Risk Polygons
- Defining Values-at-Risk: Using the Point-and-Click Method to Create Values-at-Risk Polygons
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- Defining Smaller Values-at-Risk
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- Reviewing and Saving a Values-at-Risk Map

For Additional Help

To navigate to additional tutorials in the IFTDSS online help content,

- Click the **Help** button.
- Then select **Getting Started (Tutorials and Videos)** from the side menu.

On that page, you'll find links to tutorials and videos on such topics as hazard analysis, prescribed burn planning, fuels treatment, spatial analysis across a landscape, and many more.