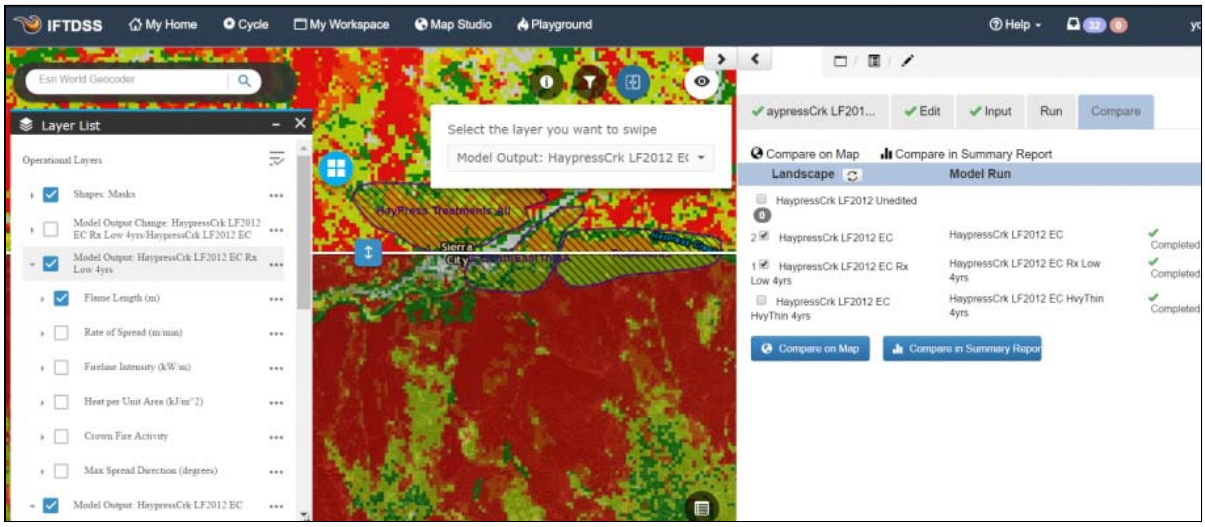
Getting Started and Comparing Treatment Alternatives

In this hypothetical scenario, we have been tasked with altering LANDFIRE data in IFTDSS to reflect the current landscape, and compare the potential effect of two fuel treatment alternatives on fire behavior under 97th percentile weather conditions for the site.

This tutorial walks through the steps of creating, evaluating, and comparing fuels treatments on an example landscape. We assume you have just logged into IFTDSS for the first time, and will proceed through these operations from start to finish. In this tutorial you will:

1. Begin a project
2. Create a landscape
3. Evaluate the landscape and edit it to reflect the current conditions on the ground using the Landscape Evaluation stage of the Planning Cycle
4. Identify a priority treatment area using the Auto97th fire behavior summary and examining wildland urban interface areas in **Map Studio**
5. Create treatment polygons in Map Studio
6. Simulate fuels treatments and compare the predicted effects on fire behavior using the Develop Treatment Alternatives task in the Strategic Planning stage of the planning cycle

   We provide all the information needed to complete this tutorial; However, you may choose to use your own area or files as well.



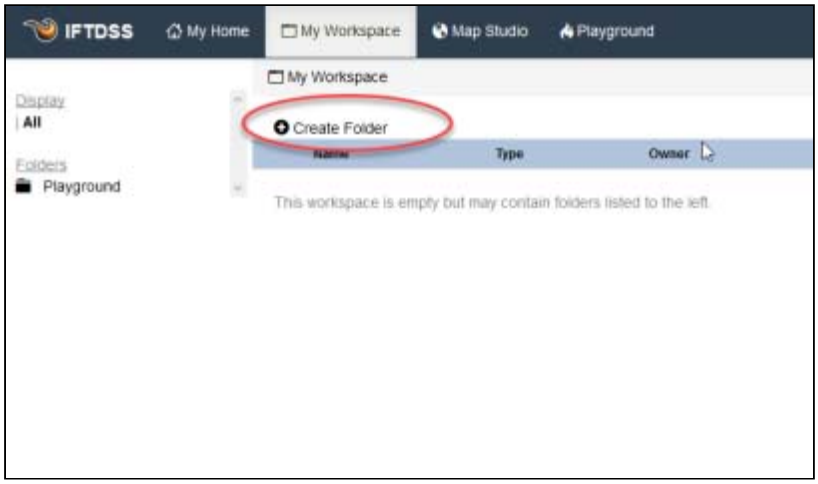
If you are unfamiliar with IIFTDSS, we recommend watching the 4 minute tour to familiarize yourself with how IFTDSS is laid out.

Beginning a Project

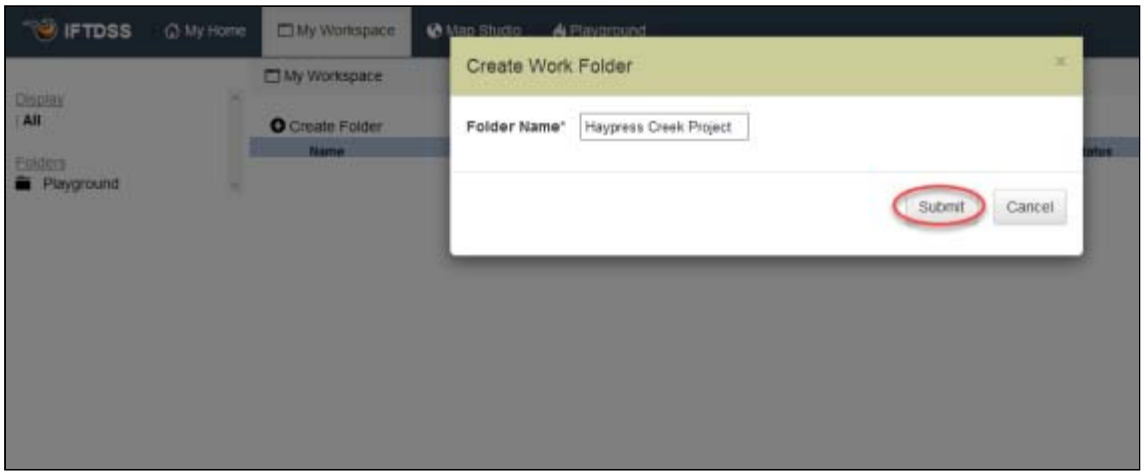
There is no formal definition of 'project' for IFTDSS, rather, the term refers to the collection of landscape files, model runs, and associated data for your specific area. Before beginning, create a folder for your project in **My Workspace**, to

help keep track of your files as they are generated. To create a folder in **My Workspace**:

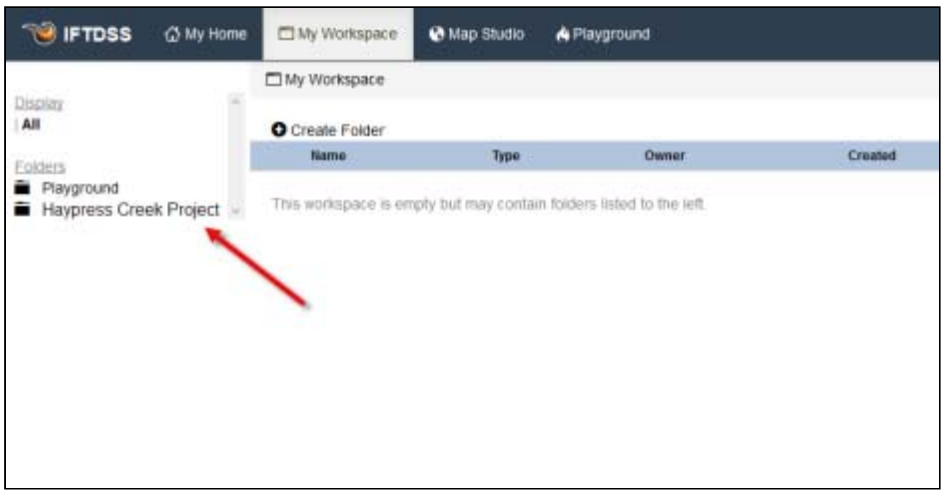
You may create a folder by clicking the **Create Folder** option at the top of the **My Workspace** page.



Give your folder a name, in this example 'Haypress Creek Project', and click **Submit**.



Your new folder will now be visible in the **Folders** list.



Create a landscape

Landscape in IFTDSS can be created in multiple ways. For example, you could go to Map Studio and create a landscape using **Landscape Tools**. But for this tutorial we'll create a new landscape by going into the Planning Cycle, Landscape Evaluation, and Landscape Summary.

We can view the landscape in **My Workspace** once its created, but hold off on looking at the landscape summary, because we know we'll want to make some edits to the landscape for this tutorial.

We will look at a portion of the Tahoe National Forest located at:

West: -120.8856 degrees

East: -120.6044 degrees

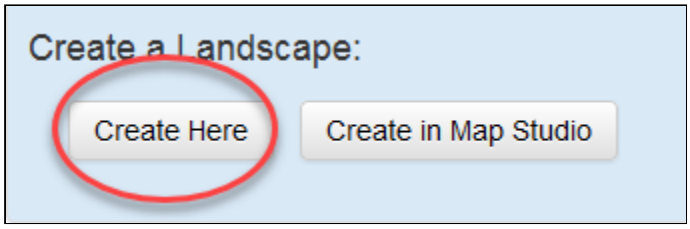
South: 39.4463 degrees

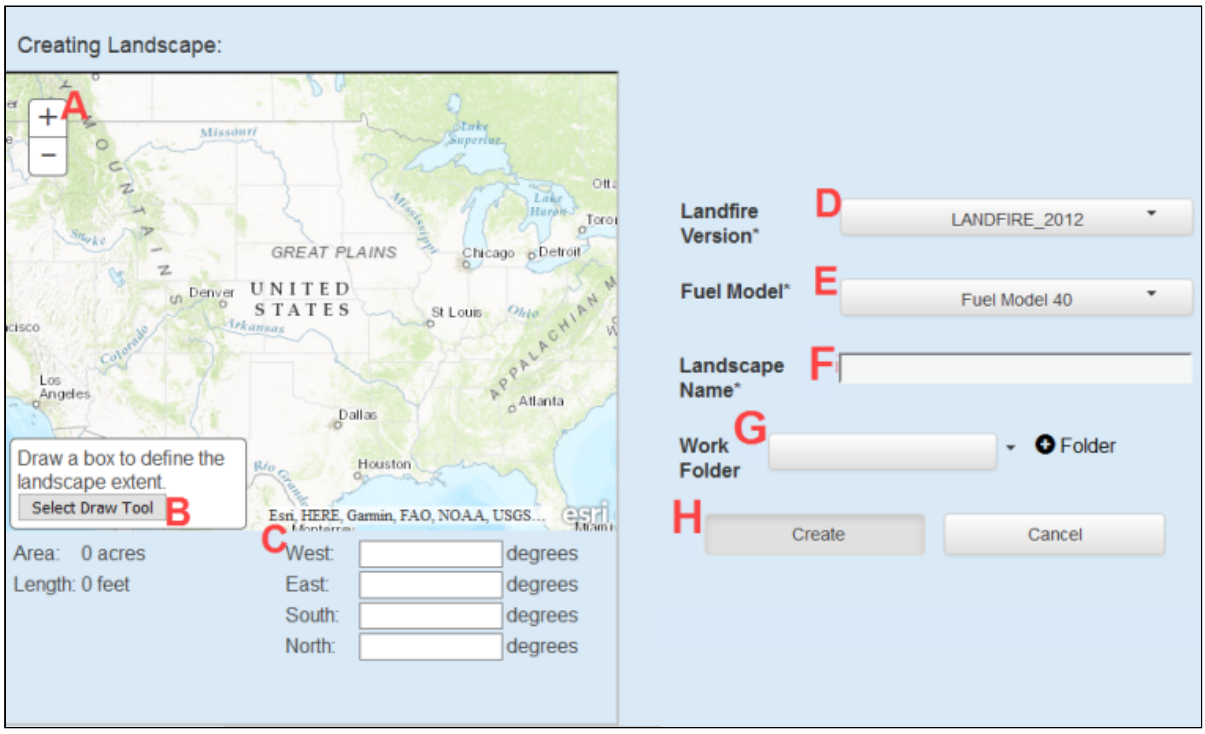
North: 39.6149 degrees

To help keep track of your data, we recommend including the LANDFIRE version in the name.

For this example landscape we are about to create, we will name it: 'HaypressCrk LF2012 Unedited'

To create a landscape within the Generate Landscape Summary task, click **Create Here**.





A. Use the zoom tools in the top left of the map to zoom to your desired location.

B. Click the **Select Draw Tool**, mouse to your location on the map, hold down the left mouse key, and draw a rectangle around your desired area, releasing the button when you are finished.

C. Alternatively, if you wish to enter exact coordinates rather than draw a box around your area, enter the coordinates, in degrees, for the west, east, south, and north bounds of your desired area.

> The maximum area for a landscape is 12,188,160 acres (138 miles x 138 miles).

D. Choose the version of LANDFIRE data you would like to use from the dropdown list

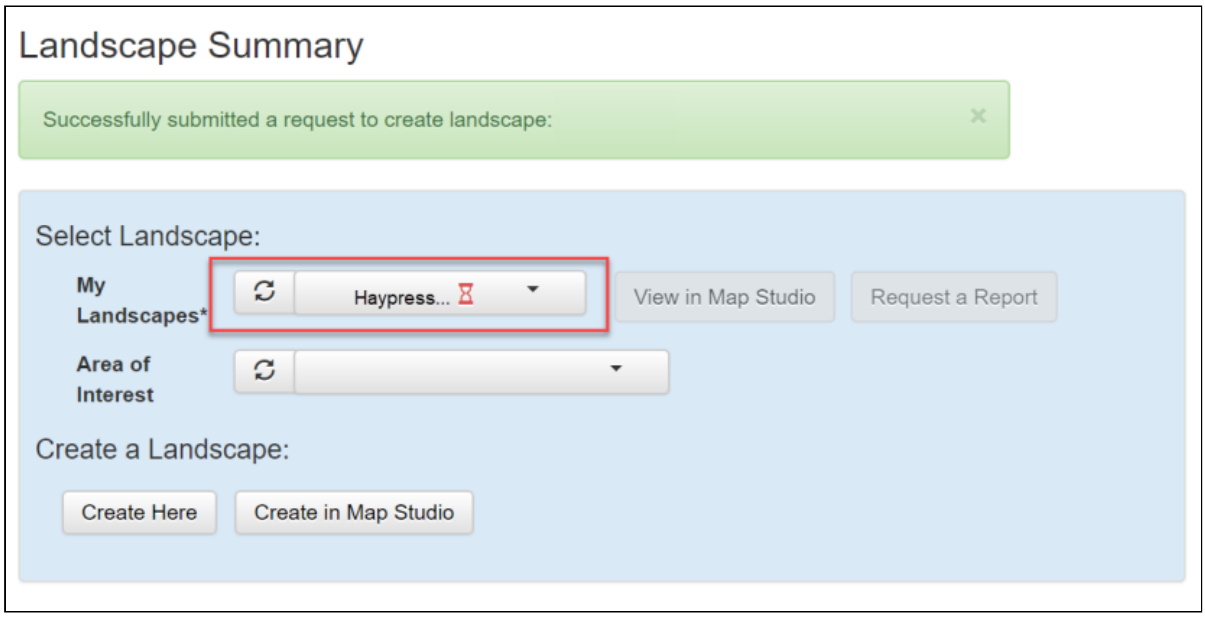
E. Choose the fire behavior fuel model (Fuel Model 40 or Fuel Model 13) to include in your landscape file from the dropdown list.

F. Give your landscape a descriptive name, this will be helpful as you accumulate more landscape files in IFTDSS.

G. Select the folder where you would like to store your landscape file, or click **+ Folder** to create and name a new folder to place your landscape file.

H. Click **Create** to generate your landscape file.

Once you click **Create**, you will be returned to the Landscape Summary task, and the field next to **My Landscapes**, displays the name of your newly created landscape, with an hourglass next to it, indicating it is being created. Once created, the hourglass is replaced by a green checkmark. You may have to use the refresh button next to the landscape name to see the green checkmark



If you prefer to create your landscape in Map Studio, you may navigate to Map Studio, create a landscape using the **Landscape Tool** , and navigating back to your desired location in IFTDSS. Visit the Creating a Landscape Topic for more details on this.

You can toggle different basemaps (using **Basemap Gallery**) and Reference Layers (using **Add Reference Layers**) in Map Studio to help you locate the area you would like to create a landscape for.

For the next step we'll go back to the Landscape Evaluation stage of the planning cycle and edit using the Landscape Edit Task

Evaluate the landscape and edit it to reflect the current conditions on the ground using the Landscape Evaluation stage of the planning cycle

Now that we have our landscape, we can make edits if necessary so it reflects our landscapes existing condition as close as possible. For your own landscape, you'll have your own editing to do, but for this hypothetical example, we'll say that we want to reduce the canopy cover in all TU5 areas by 5%.

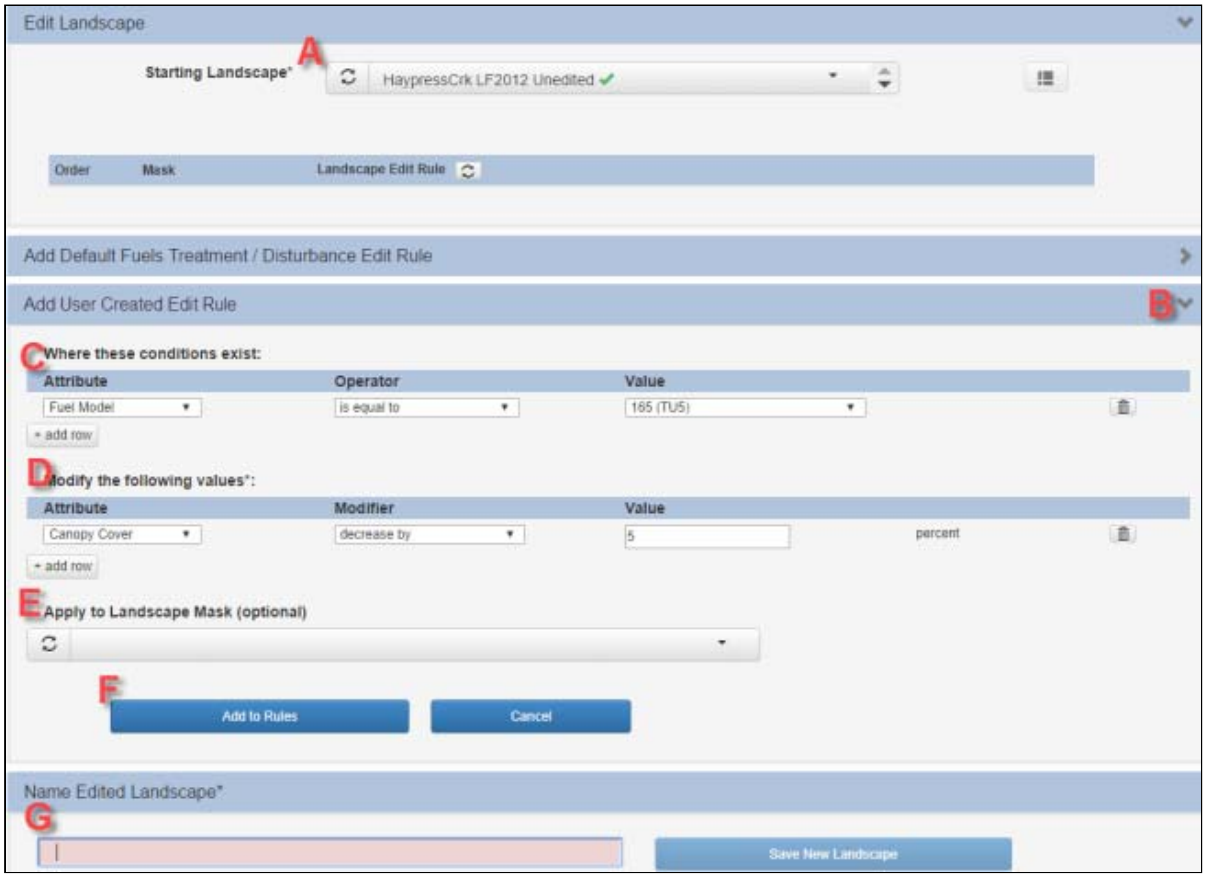
Important! Be deliberate in the rules you apply when editing landscapes:

Rules are applied based on the order in which you add them. Default Treatment/Disturbance rules are always applied *first*, in the order you have assigned them, followed by followed by User Created Edit rules in the order you have assigned them.

After applying rules to a given landscape you should always validate that your changes have been made as you intended. *If you are unsure of the effect of the rules you apply, consider saving a version of your landscape after each edit to allow for easy comparison of the changes made by each edit rule you apply*.

For further detail see the Rule Ordering Considerations and the Rule Technical Documentation Topics

To split the view and display your mapped area on the left, and this interface on the right, click the **show split map** button at the top left of the page.



A. Choose the **Starting Landscape** you want to edit, HaypressCrk LF2012 Unedited

B. View the Add User Created Edit Rule options by selecting the dropdown arrow to the far right of the **Add User Created Edit Rule** heading.

C. Specify the conditions you would like to select in the fields below **Where these conditions exist**. In this example we have selected 'Fuel Model' as the Attribute, 'is equal to' as the Operator and fire behavior fuel model '165 (TU5)' as the Value. This selected all TU5 fuel modeled areas across the landscape.

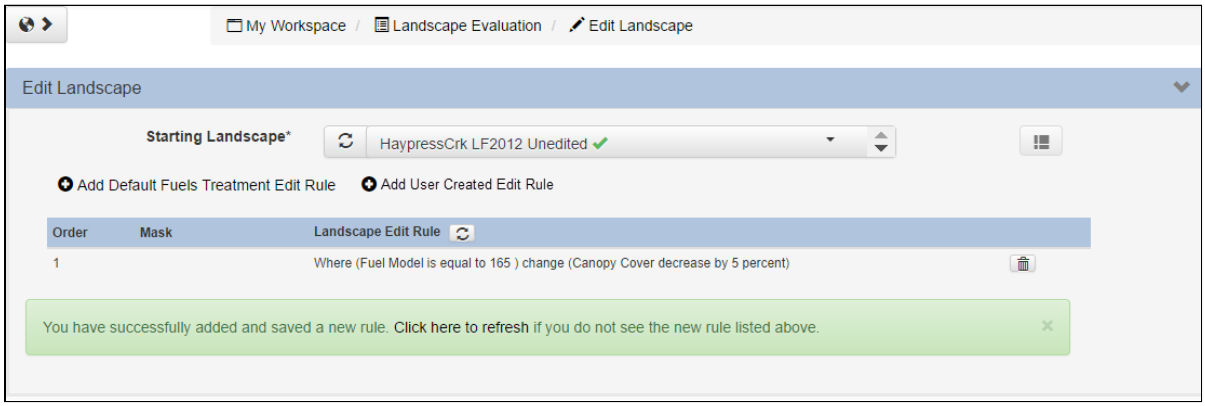
D. Specify the conditions you would like to change by populating the fields below **Modify the following values**. In this example we have selected 'Canopy Cover' as the Attribute, 'decrease by' as the Operator, and '5' (for 5 percent) as the Value. For all TU5 fuel modeled areas, the application decreases the canopy cover by 5 percent.

E. The **Apply to Landscape Mask** (optional) dropdown allows you to select a shapefile these edits will be contained. We will leave this field blank, which will apply our edit to the entire landscape.

F. When you are ready to apply this rule click **Add to Rules**. Notice the rule has been added to the list, and the order noted. You can delete rules before saving by using the delete button to the right of each rule.

> Rules are applied top to bottom, first by Default Fuels Treatment / Disturbance Edit Rules then by user defined User Created Edit Rules. Currently there is no way to order your rules other than by the order in which you enter them, so be deliberate about how you apply rules and in what order you enter them.

As rules are added, they are listed at the top of the page, along with the order they were added, and a notification to let you know the new rule has been successfully saved.



G. Once you entered all the rules in the order you would like them applied, give your landscape a descriptive name. In this case we will end our landscape name with 'EC' ('Haypress Crk LF2012 EC') as a reminder that this is our existing condition landscape, not our unedited landscape. Click **Save New Landscape**. Your original landscape remains in IFTDSS, and now an edited copy is available throughout IFTDSS.

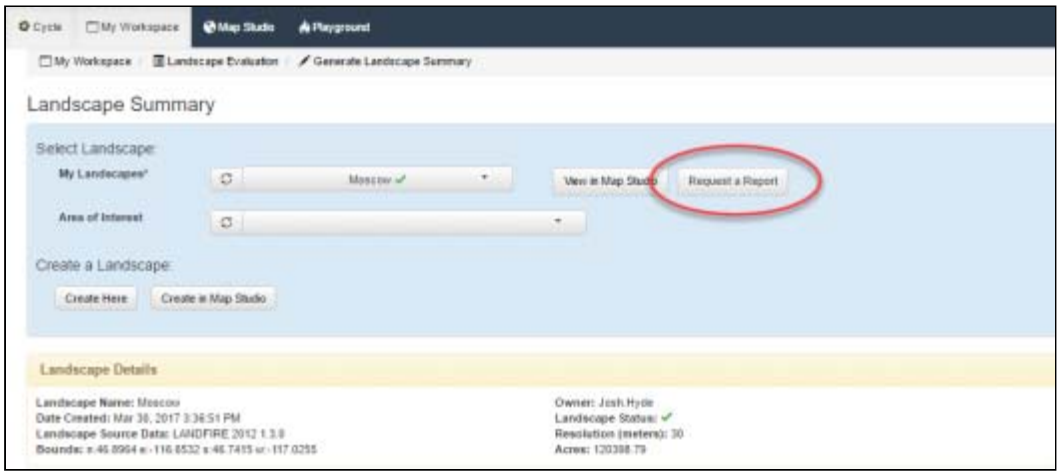
Identify a priority treatment area using the Auto97th fire behavior summary and examining Wildland Urban Interface Areas in Map Studio

To identify the areas that would be good candidates for treatment, we'll create a summary report using the Auto 97th Summary, this will automatically populate a Landscape Fire Behavior model with 97th percentile moisture conditions based on the Remote Automatic Weather Station (RAWS) nearest our area (see Auto 97th Technical details for more information on this process). This will generate both a report, and a mapped output. We'll look at the mapped output.

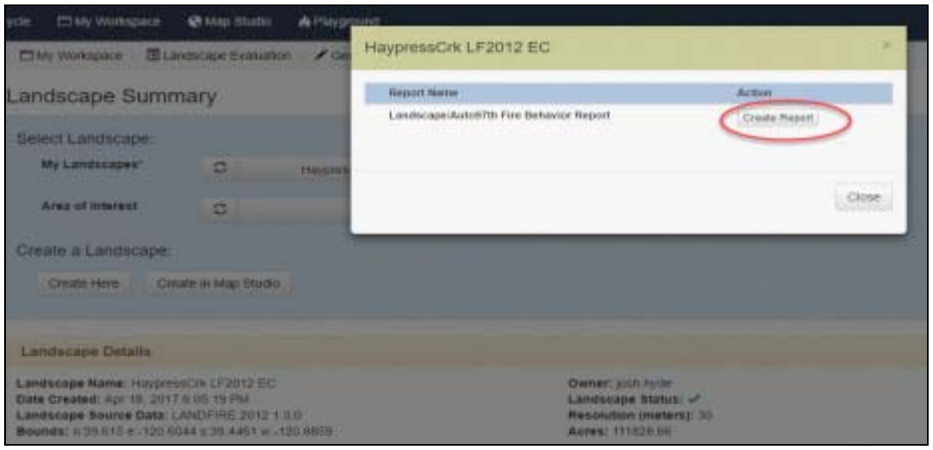
To begin, go back to the Landscape Evaluation stage of the planning cycle, and click the Landscape Summary task:

For your Landscape, specify a starting landscape to represent fie behavior on an untreated landscape as it currently exists. For this tutorial, we'll select the Existing Condition landscape we just created: 'HaypressCrkLF2012EC'

After you have specified your landscape, and (optional) Area of Interest, click **Request a Report**.



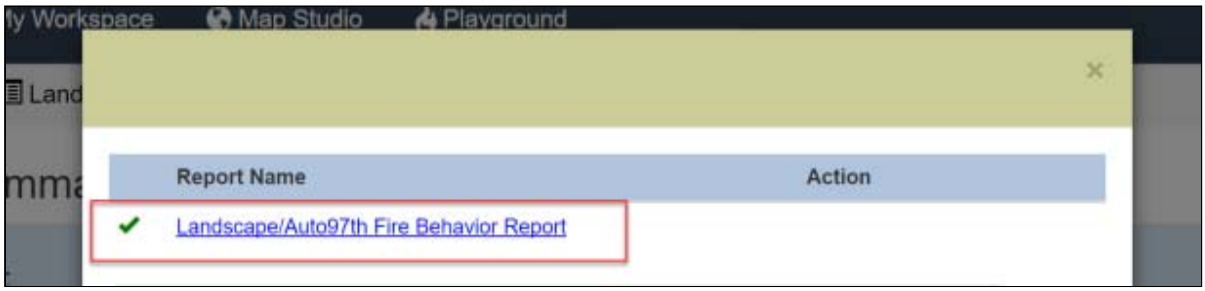
A prompt appears with the name of your landscape across the top. Click **Create Report** to generate the Summary Report.



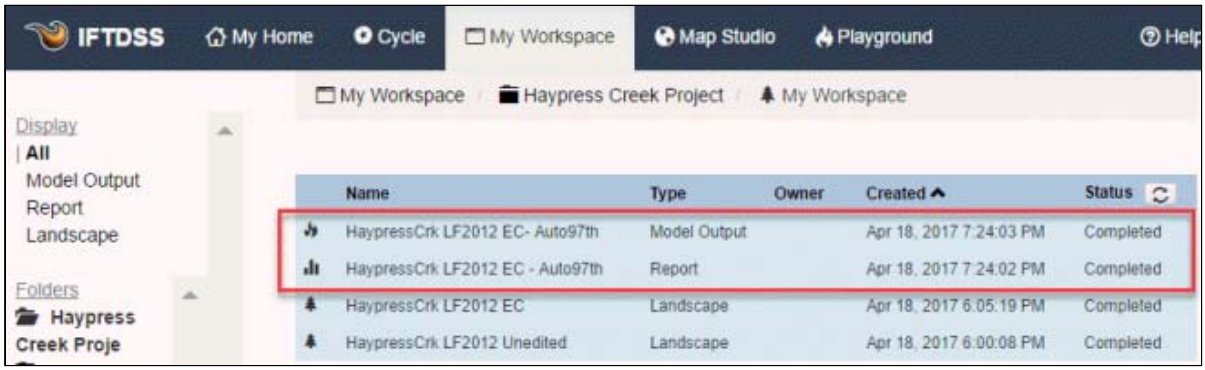
The  icon indicates the Summary Report is being generated. You can refresh and check the status by clicking the refresh button  .

Depending upon landscape size, your summary may take a few minutes to complete.

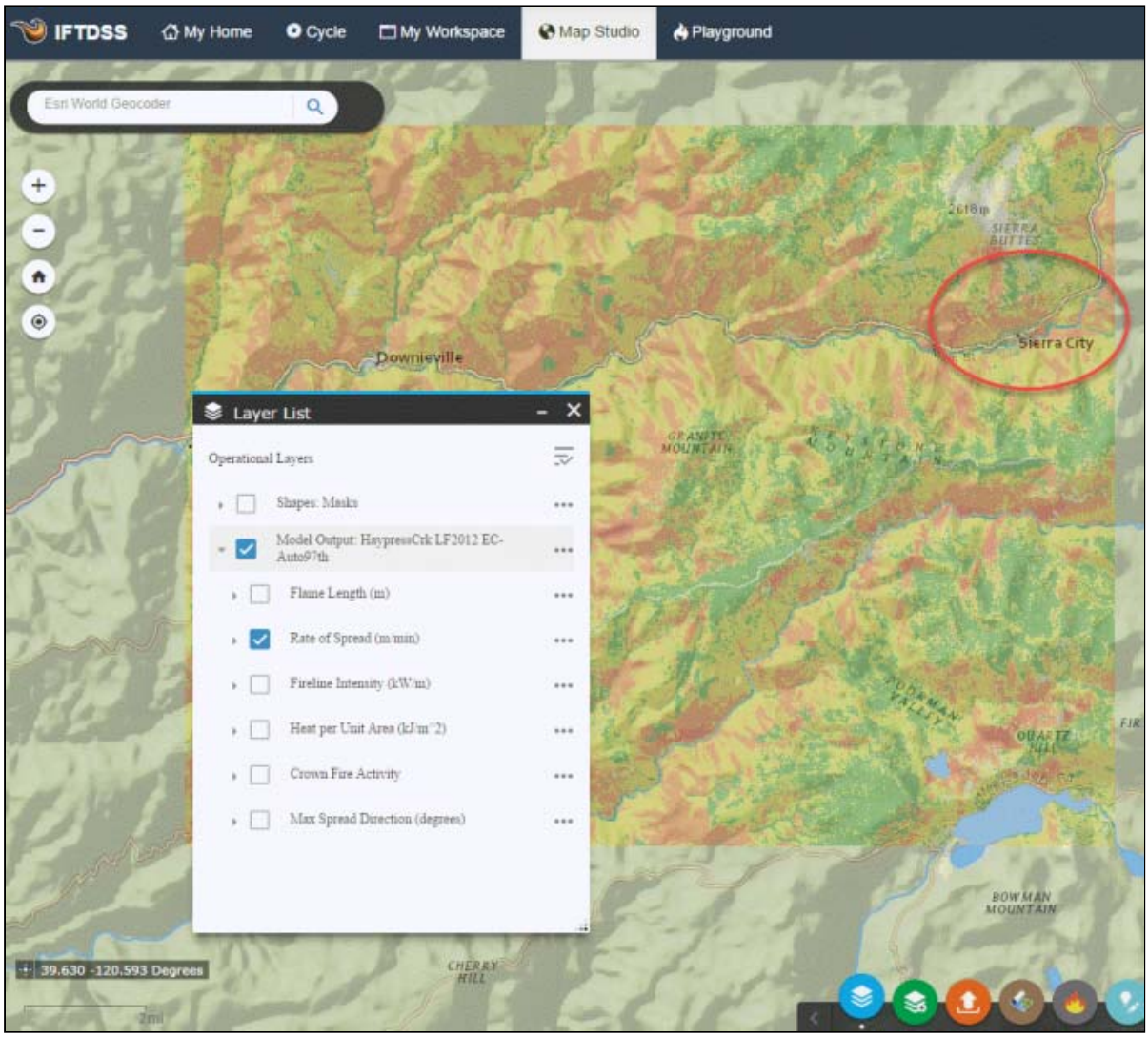
When finished your Summary Report will be available by clicking on the report name in the confirmation dialogue box.



It may also be viewed from **My Workspace**, in the same folder as the landscape you chose to summarize. You may also view your report outputs in Map Studio.

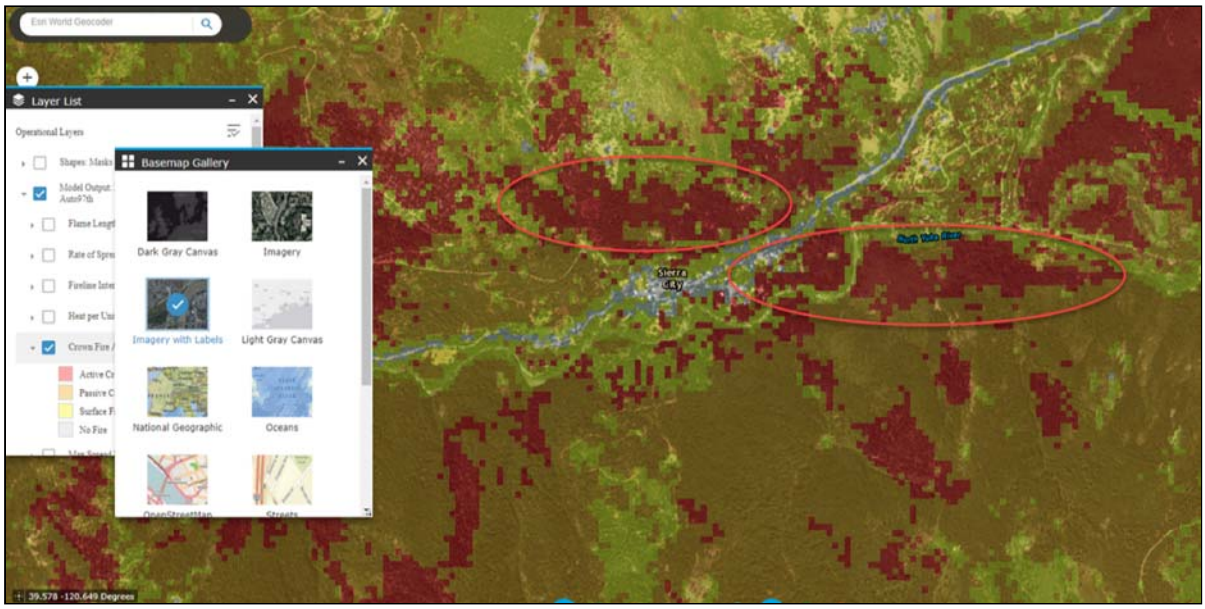


Once your summary is created, navigate to **My Workspace**, and view the fire behavior outputs in Map Studio by selecting the 'Haypress LF2012 EC - Auto97th model output file. Use the **Layer List** and **Zoom** to evaluate fire behavior across your landscape. For this example we'll focus on the Sierra City wildand urban interface in the northeast area of the map.



As you evaluate your landscape you may find it helpful to adjust the layer transparency using the **more options** button ••• to the right of your fire behavior layer, and the different **basemap gallery** options.

Toggling through the fire behavior attributes of flame length, and canopy fire, we can see some areas north of town, and east between the North Yuba River and some scattered structures that could make good candidates for treatment. In this example you'll notice the circled areas indicate potentially high flame lengths, rates of spread, active crown fire, and a max spread direction moving north to northeast.



You may also use the **Landscape Tools** button to add the landscape file to Map Studio, and the **Swipe** tool to view the different landscape layers and fire behavior attributes.

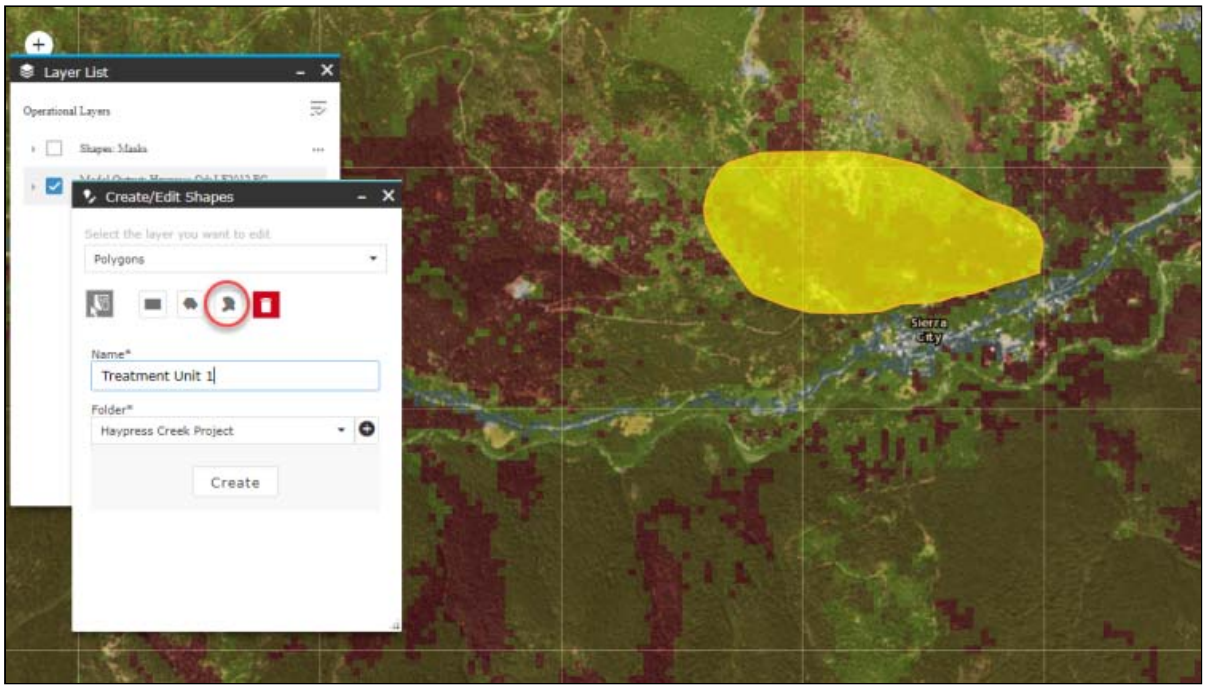
In the next steps, we'll create shapefiles for these areas, then use those shapefiles to specify which part of the landscape to simulate our treatment alternatives for comparison.

Creating Treatment Polygons

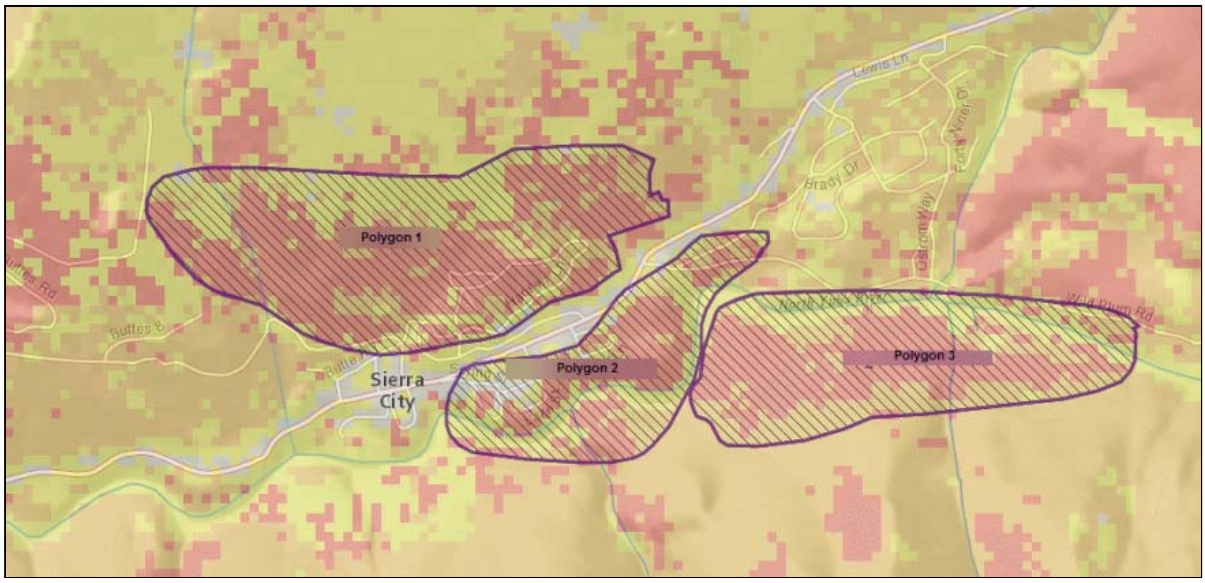
To simulate and evaluate the impact of treatments, we'll delineate our planned treatment areas with shapefiles in Map Studio. First we will create a polygon for each treatment area, next we will combine those into one shapefile so we can use the combined file in our comparison.

First, we'll create three individual shape files:

Open **Create/Edit Shapes** , select your method, in this case the freehand draw method, and draw your polygon.



You can use the **delete button** to remove the polygon before saving, or edit it by single left clicking and moving the vertices. When you are satisfied with your first polygon, give it a name, select a project folder and click **Create**. Once created, polygons will appear on the map in purple. Continue this for the three treatment areas as shown below.

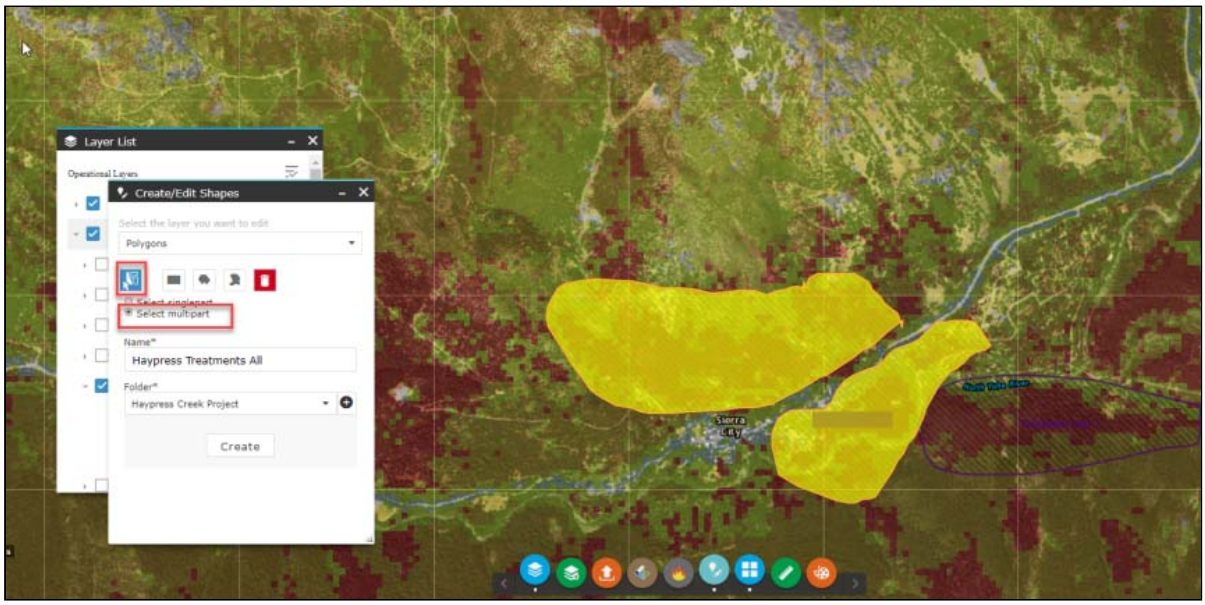


Note that your polygons do not have be an exact match with ones pictured above.

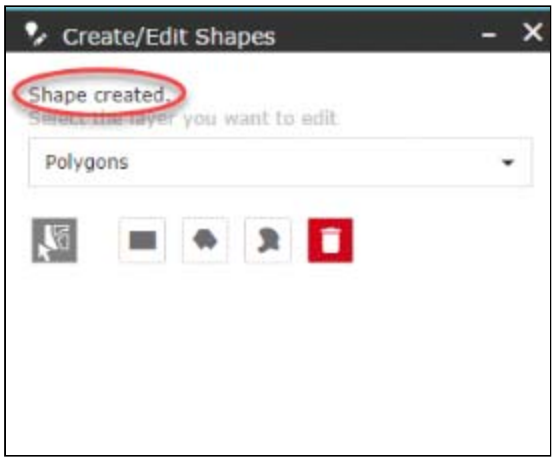
(You may also upload shapefiles if you prefer)

Repeat this step for two additional treatment areas, similar to those in the image above.

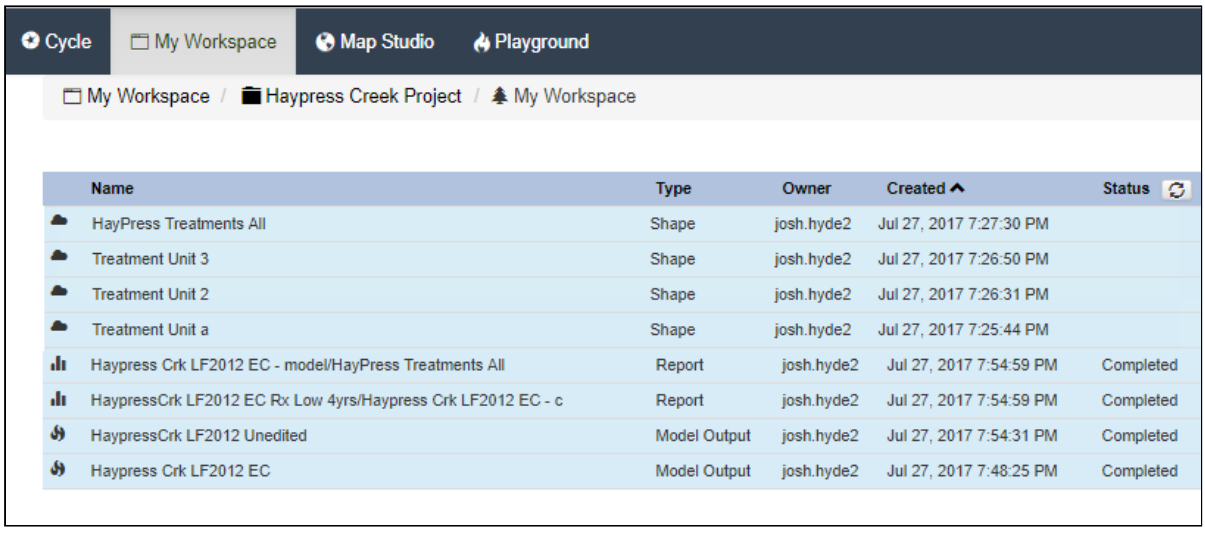
To combine these into one file, click the **Copy from Existing Features** button , make sure the **Select multipart** option under the button is selected, and left mouse click your first polygon. It will appear highlighted once selected. Continue this process, each time clicking the **Copy from Existing Features** button , and highlighting the next polygon, until all are selected. When finished, give the set a name, specify a folder to save it in (in this case our Haypress Creek Project folder), and click **Create**.



Once the new shapefile has been successfully created, you will see 'Shape Created' Appear in **Create/Edit Shapes**.



Shapes are available in **My Workspace** in the folder you selected (in this case the Haypress Creek Project folder).



Name	Type	Owner	Created	Status
HayPress Treatments All	Shape	josh.hyde2	Jul 27, 2017 7:27:30 PM	
Treatment Unit 3	Shape	josh.hyde2	Jul 27, 2017 7:26:50 PM	
Treatment Unit 2	Shape	josh.hyde2	Jul 27, 2017 7:26:31 PM	
Treatment Unit a	Shape	josh.hyde2	Jul 27, 2017 7:25:44 PM	
Haypress Crk LF2012 EC - model/HayPress Treatments All	Report	josh.hyde2	Jul 27, 2017 7:54:59 PM	Completed
HaypressCrk LF2012 EC Rx Low 4yrs/Haypress Crk LF2012 EC - c	Report	josh.hyde2	Jul 27, 2017 7:54:59 PM	Completed
HaypressCrk LF2012 Unedited	Model Output	josh.hyde2	Jul 27, 2017 7:54:31 PM	Completed
Haypress Crk LF2012 EC	Model Output	josh.hyde2	Jul 27, 2017 7:48:25 PM	Completed

Simulate a fuels treatments and compare their predicted effect on fire behavior using the Develop Treatment Alternatives task in the Strategic Planning stage of the planning cycle

Now that we have some priority treatment areas, we'll evaluate the potential effect of the treatments on fire behavior, using the Strategic Planning stage of the cycle, and the Develop Treatment Alternatives task.

Developing Treatment Alternatives facilitates evaluation of fuel treatment alternatives and their spatial arrangement on the landscape. It allows you to create several edited versions of a landscape or treatment area, run a fire behavior simulation for some or all of the edited landscapes, and compare the results for each treatment on fire behavior spatially, and create reports with charts and tables if desired. The task is divided into five steps:

Pick a landscape and (optional) area of interest

Edit the landscape

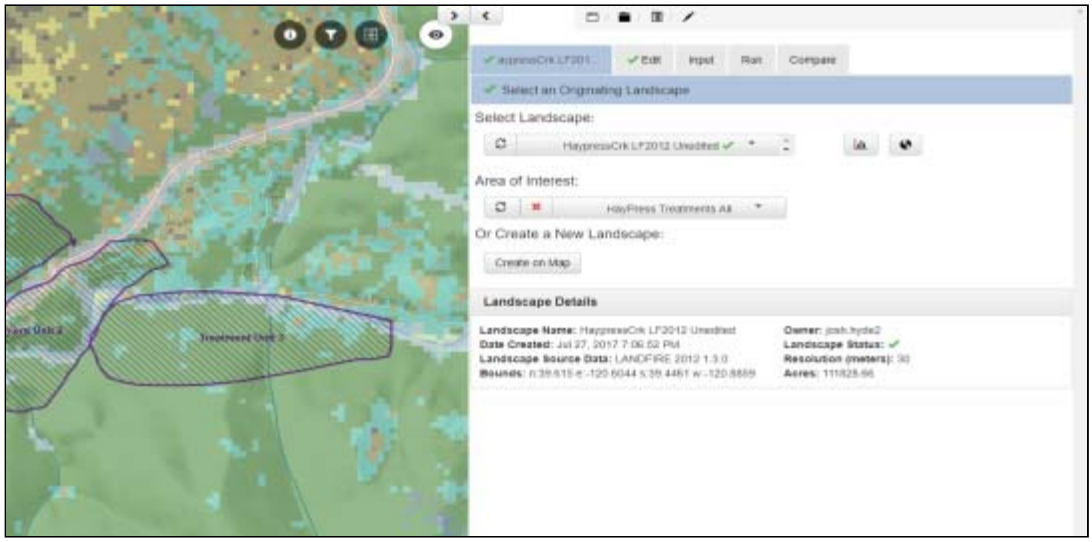
Enter model inputs

Run the model for some or all of the edited landscapes

Compare model outputs for your treatment alternatives

We'll progress through each of these steps as you complete this final part of the tutorial.

Pick a landscape

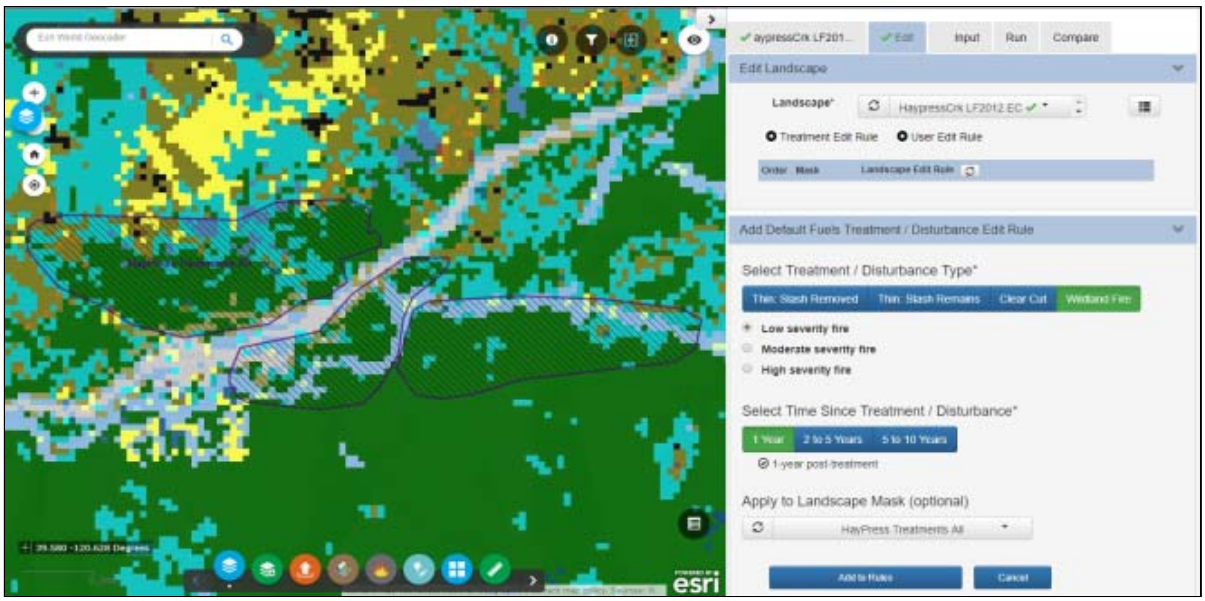


Use the **Pick a Landscape** tab to create or choose a starting unedited landscape. The landscape chosen or created in this step initiates your comparison session and will be marked with “0” throughout the workflow. The “0” indicates the original landscape extracted from LANDFIRE that has not been edited. In subsequent tabs, all landscapes that match this extent will be available for you to work with. In the next tab, the **Edit Landscape** tab, you may edit any of these landscapes. You may use the area of Interest field to constrain your analysis to a specific area within the landscape.

For this tutorial, select the 'Haypress LF2012 Unedited' file we created at the start. Our Existing landscape version of that file will become available during subsequent steps. Next, select 'Haypress Treatments All' to constrain the area of interest to the treatment units we created earlier. When we generate reports later, doing this constrain our report summaries to the area within our treatment area. As we proceed to the edit step, we'll focus solely on creating treatment alternatives; However, if we had not created any files in IFTDSS, we could have started here at this **Pick a landscape** step, and use the next step (edit) to both create our existing landscape (Haypress LF2012 EC), and create treatment alternatives from that existing landscape.

Edit the landscape

Here you will edit landscapes to develop your treatment alternatives. The landscape(s) available here will include:



- your unedited LANDFIRE landscape chosen or created in the previous step (these will be referred to as the “0” landscape)
- and any landscapes matching that extent.

Create your treatment alternatives by altering your your Existing Condition landscape.

You may use Default Treatment/Disturbance Rules to edit and create your alternatives, or custom rules to create your alternatives.

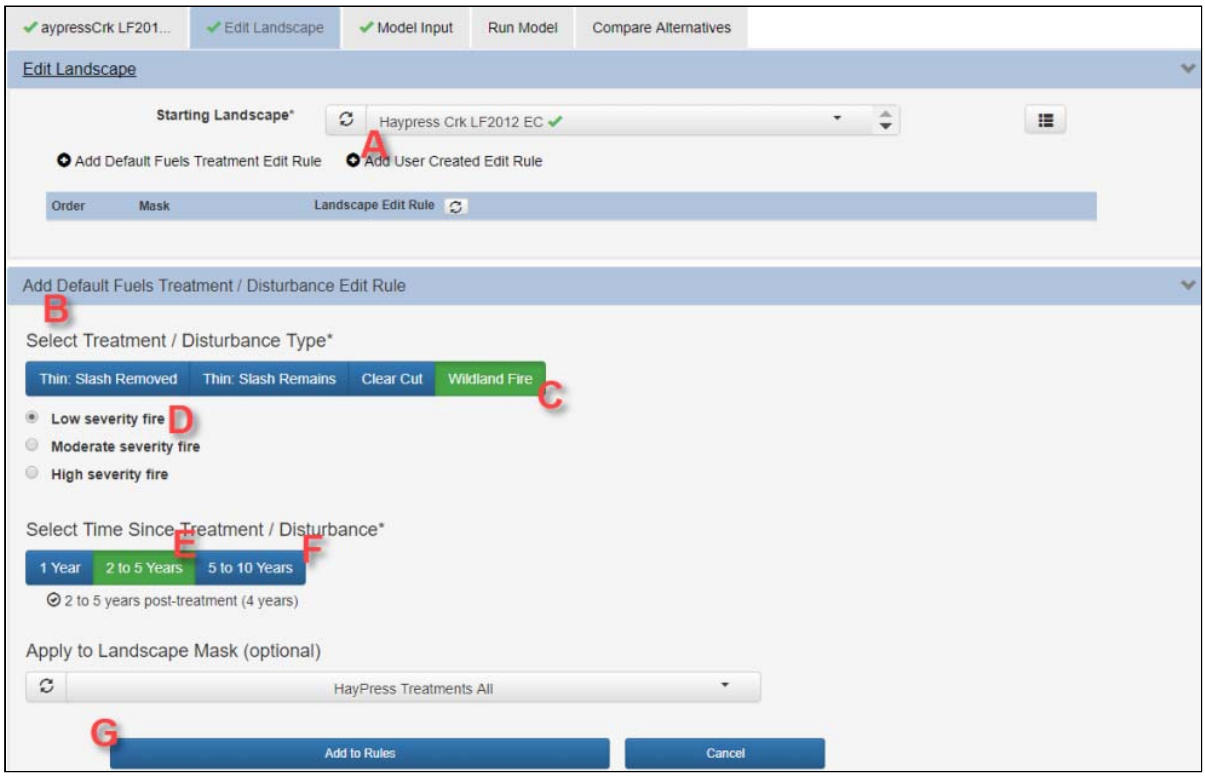
Each option is described in detail in the Editing a Landscape to Develop Treatment Alternatives Topic.

For this example we'll use the Default Treatment/Disturbance option to create two treatment alternatives.

- One will simulate the treatment area 2-5 years after a low severity prescribed fire in which less than 25% of the above ground vegetation is killed.
- A second will simulate the treatment area 2-5 years after a heavy thin and pile burn (where the stand is thinned to 35% of its current density by removing material with no upper diameter limit, and the material is burned in piles)

To learn more about the Default rules, visit the Treatment Rule Background Topic.

For the first treatment alternative we'll look at low severity prescribed fire:



A. Select HaypressCrk LF2012 EC as our starting landscape.
B. Use the **Add Default Fuels Treatment / Disturbance Edit Rule** dropdown
C. Select a Treatment Type of 'Wildland Fire'
D. Make sure 'low severity' is selected
E. For Time Since Treatment, select '2-5 years'.
F. We'll apply this to the treatment polygons we created earlier, so under **Apply Landscape Mask**, select 'Haypress Treatments All'
G. Click **Add to Rules**

Now, choose a name for the new landscape: 'HaypressCrk LF2012 EC Rx Low 4yrs' and click **Save**

Next, while still in the edit step, repeat this process, again starting with HaypressCrk LF2012 EC. This time select the 'Thin: Slash Removed', 'Heavy Thinning: Pile Burning' and '2-5 years' since disturbance. Specify the Landscape Mask as 'HayPress Treatments All' and add the rule and name the landscape 'HaypressCrk LF2012 EC HvyThin 4yrs'.

Next we'll select model inputs to run fire behavior with these treatments

Enter model inputs

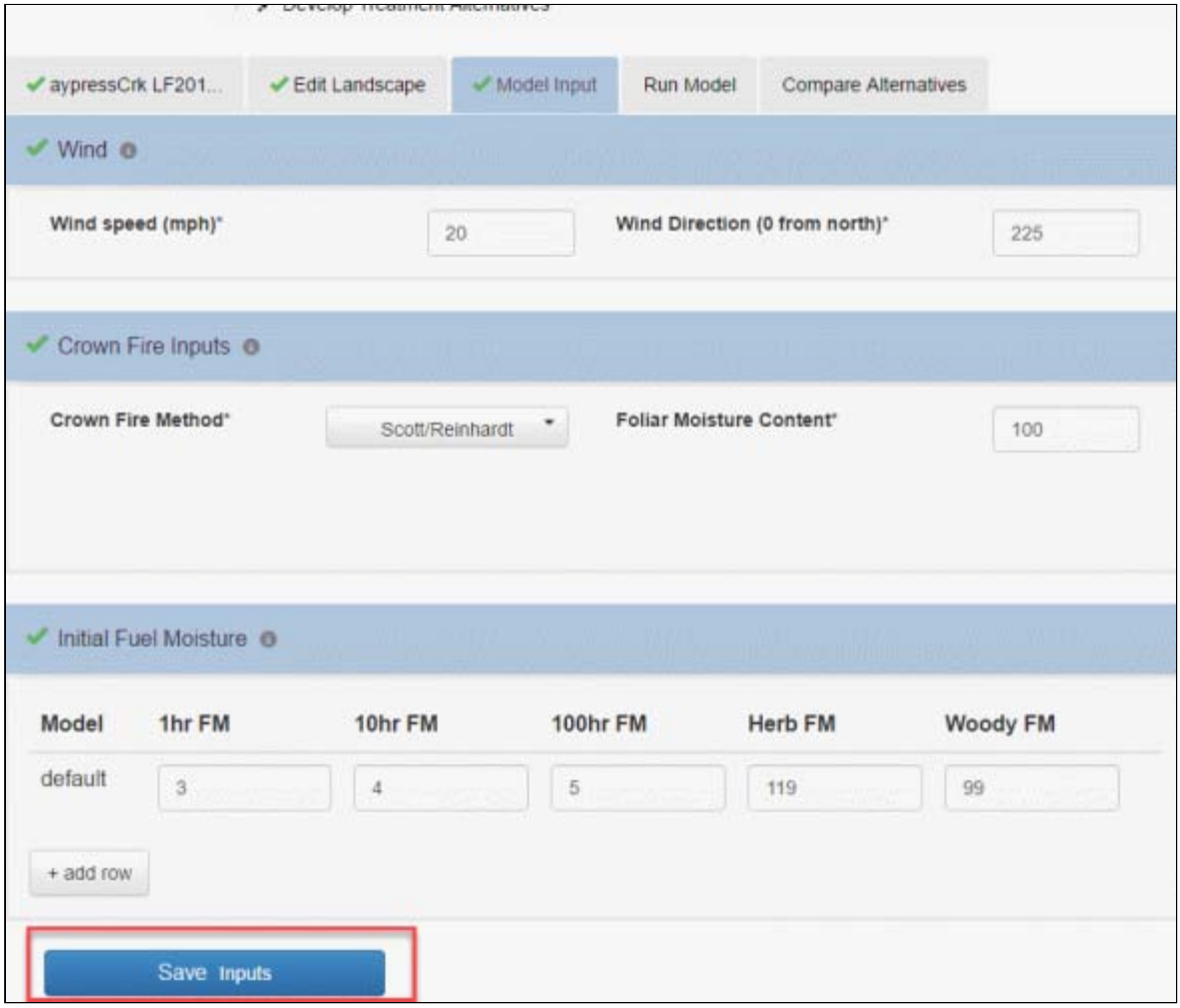
> Once a model is run in Landscape Comparison, it is permanent, there is no way to re-run that model. For this reason, testing out various modeling inputs in **My Modeling Playground** before proceeding with the rest of **Landscape Comparison** is recommended.

You may use any inputs, but for this example we'll use the conditions that were used in the Auto97th summary that we generated in the very beginning of this tutorial, when we created our landscape. To get these, navigate to **My Modeling Playground**.

> Don't worry about losing progress, you can navigate back to the comparison steps later and your data will remain.

Select 'HaypressCrk LF2012 EC - Auto97th', and **View Input** from the dropdown. This will take you to a page displaying wind, crown fire inputs, and initial fuel moistures used to model the behavior during the auto97th summary. When you have these values, navigate back to the comparison task and select Haypress as your landscape again. If you wait a couple seconds you will see green checkmarks appear as IFTDSS retrieves the data.

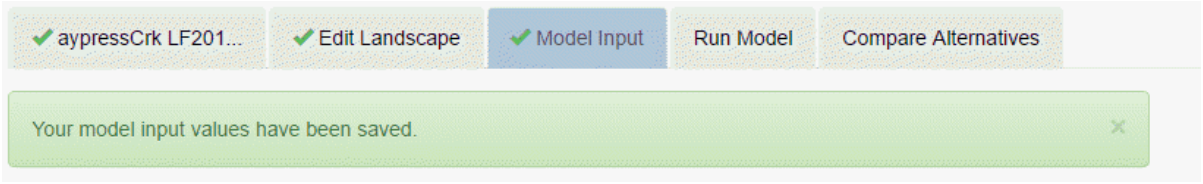
> You may double check this by clicking the **Run Model** tab, which will list all the available landscapes, this should include the two edited treatment alternatives we created.



In **Model Input**, enter the following values, and click **Save Inputs** when finished.

Wind speed: 20 mph
Wind Direction: 225 degrees
Crown Fire Method: Scott/Reinhardt
Fuel Moisture Content: 100
Initial Fuel Moistures of
1 hr FM: 3
10 hr FM: 4
100 hr FM: 5
Herb FM: 119
Woody FM: 99

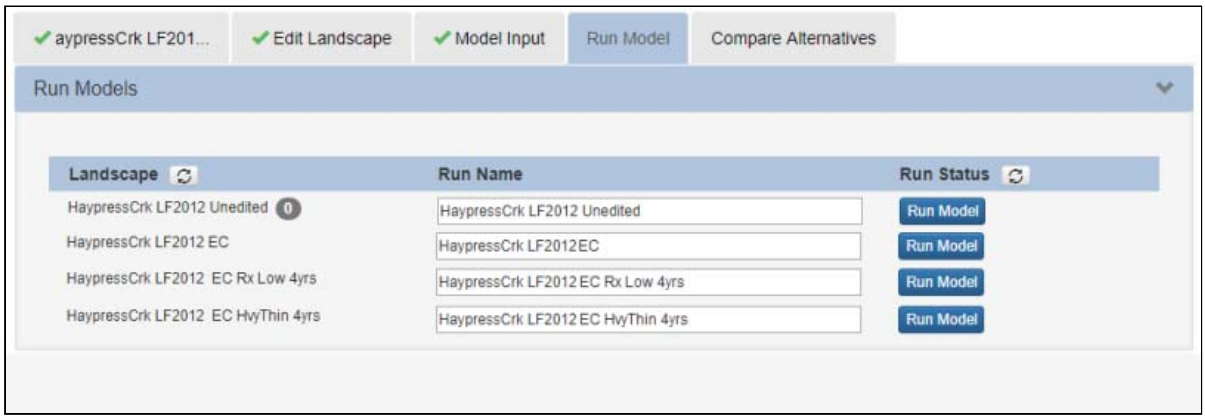
When you save your inputs a verification will appear at the top of the screen to confirm your inputs have been saved



Run the model for some or all of the edited landscapes

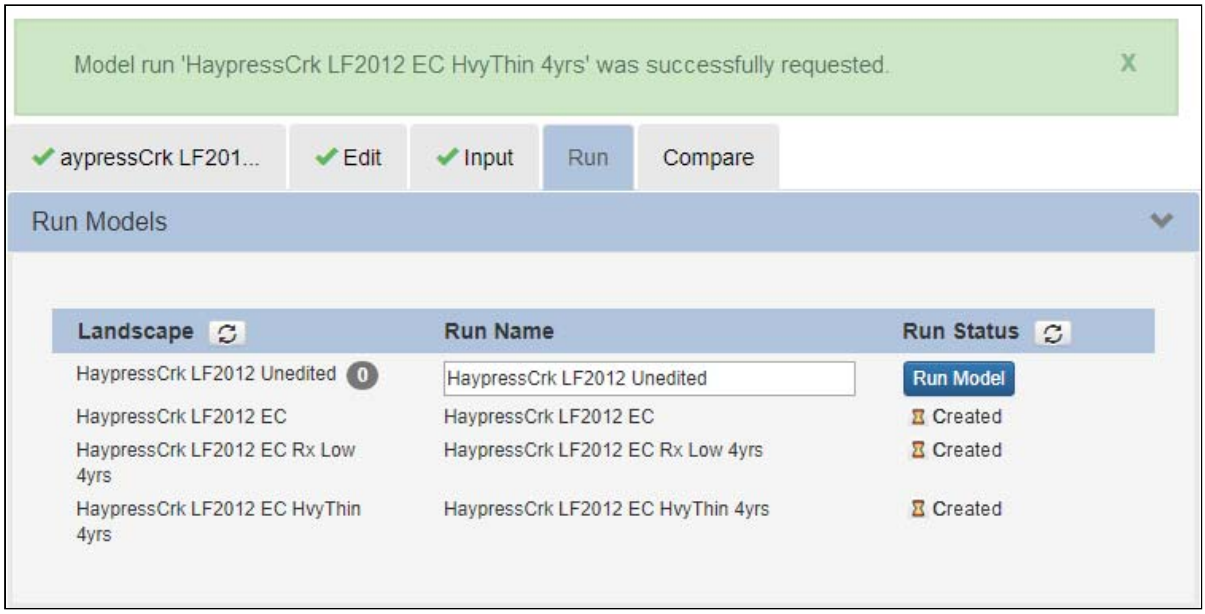
Now that we have our inputs, we can run the fire behavior model. For this example we'll run models for:

HaypressCrk LF2012 EC - Our existing condition landscape
HaypressCrk LF2012 EC Rx Low 4yrs - Our prescribed burn treatment alternative
HaypressCrk LF2012 EC HvyThin 4yrs - Our heavy thin treatment alternative



Click **Run Model** next to the three landscaped indicated above

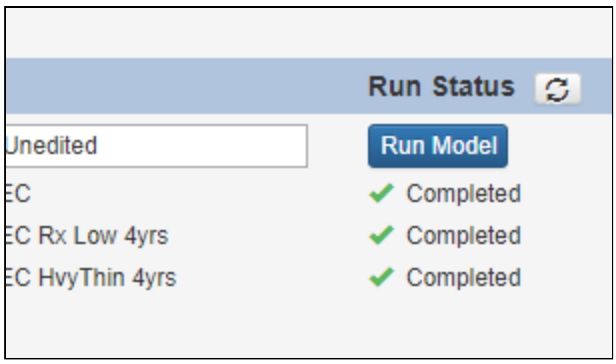
Note if your last edit landscape is not visible, you may need to click the refresh button next to 'Landscapes'



A green verification box, and hourglass next to each landscape will let you know the model is running

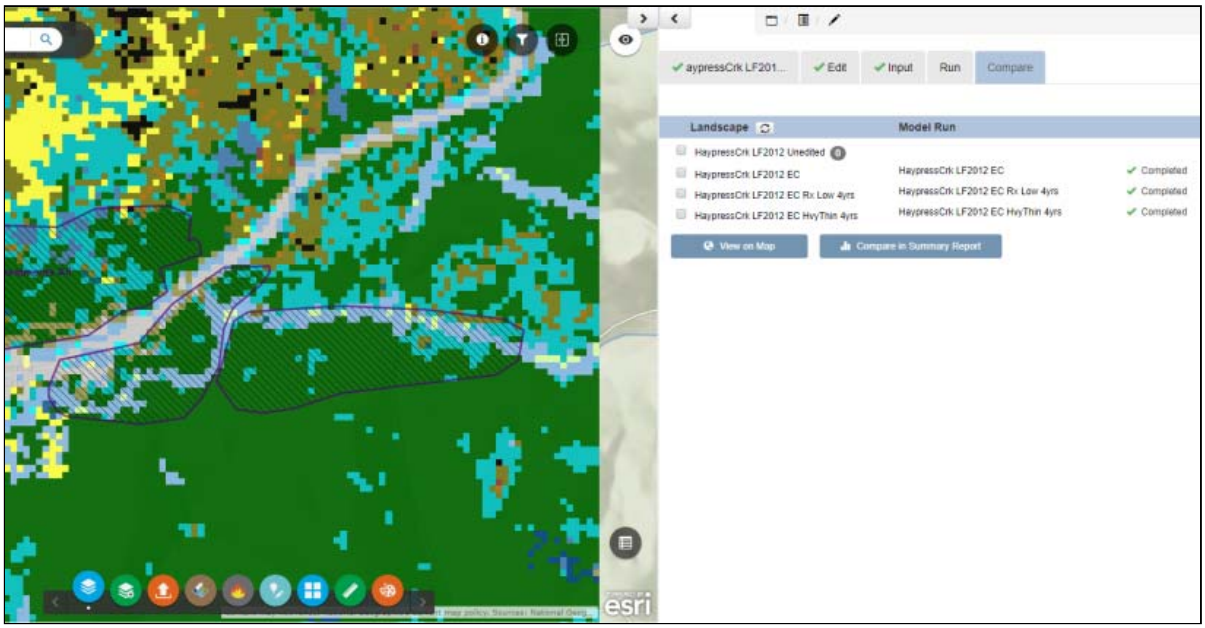
> It may take a few minutes for the models to run depending on the number of landscapes modeled and their size. You may use the refresh button to the right of **Run Status** to check their progress.

Once the model has completed, you will see a green check mark, and the word 'completed' next to each landscape.



Compare model outputs for your treatment alternatives

The **Compare Alternatives** tab lists all the landscapes we have included in the comparison process. Note landscapes that have had fire behavior runs modeled for them are indicated with green checkmarks.



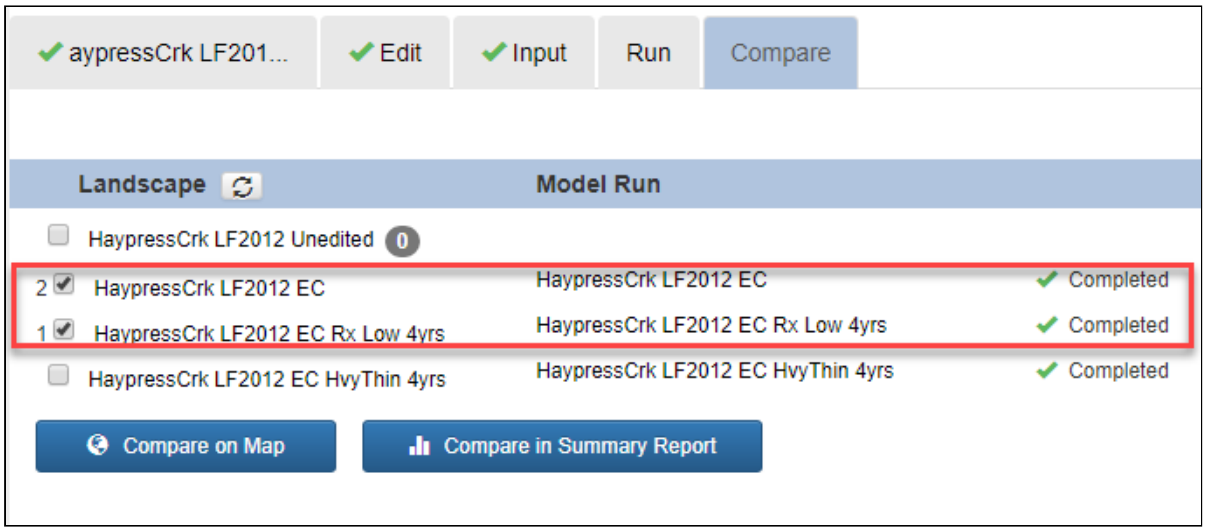
To compare these landscapes, use the checkboxes next to the landscapes you wish to compare:

Select the checkbox for *two* landscapes and model runs you would like to compare

The first box you check will be tagged with “1” and should represent your “treated” landscape.

The second box you check will be tagged with “2” and should represent the initial landscape you are comparing against, such as the untreated existing condition landscape.

To begin, select the low severity prescribed fire treatment, which will be tagged with a "1", then our existing landscape, which will be tagged with a "2". The comparison display the difference in landscape features and fire behavior between the two landscapes. When finished, click **View in Map**.



Why 2-1? The use of "1" and "2" in the comparison tool is product of how IFTDSS calculates the comparison. For example, if we are interested in the change in flame length between a Treatment and the Existing landscape, we'd select the Treatment first (it gets assigned "1") and the Existing condition landscape second (it gets assigned "2"). IFTDSS calculates landscape change as:

1-2=landscape change

For example, if flame lengths in the treated area are 3 feet (landscape “1”) , and flame lengths in the untreated area are 8 feet (landscape “2”), the resulting comparison landscape will show a value of -5, or a reduction in flame length of 5 feet:

3ft-8ft = -5 ft.

Once **View on Map** is selected, the left side of the screen will show the map interface. You will notice the map contains landscape and model output layers for both the EC and prescribed fire treated landscapes, as well as a layer for model outputs and landscape features indicating the degree of change between each. Specifically, the map will have:

Modeled Output Change: HaypressCrk LF2012 EC Rx Low 4yrs/HaypressCrk LF2012EC

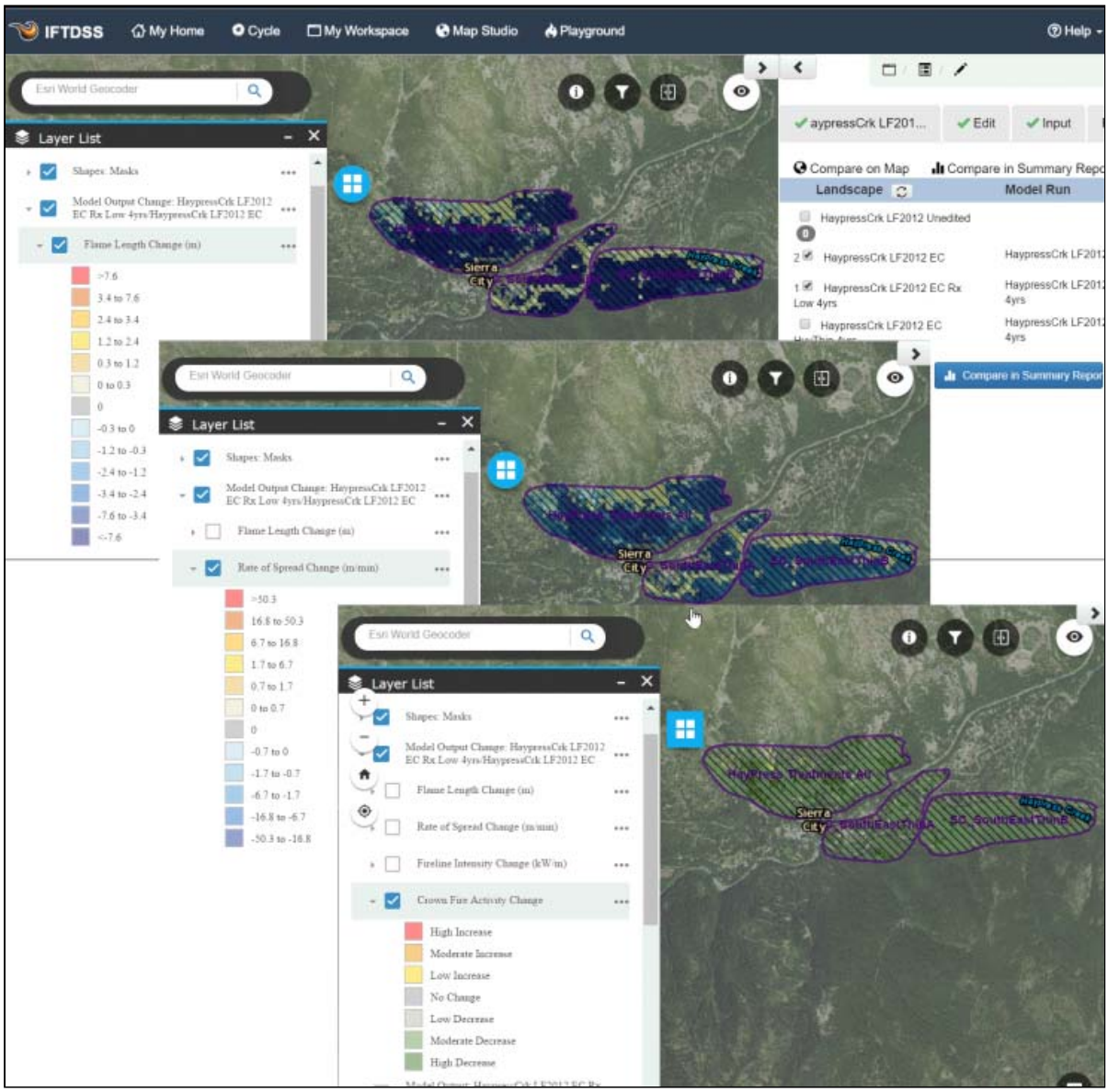
Modeled Output: HaypressCrk LF2012 EC Rx Low 4yrs

Model Output: HaypressCrk LF2012EC

Landscape Change: HaypressCrk LF2012 EC Rx Low 4yrs/HaypressCrk LF2012EC

Landscape: HaypressCrk LF2012 EC Rx Low 4yrs

Landscape: HaypressCrk LF2012EC



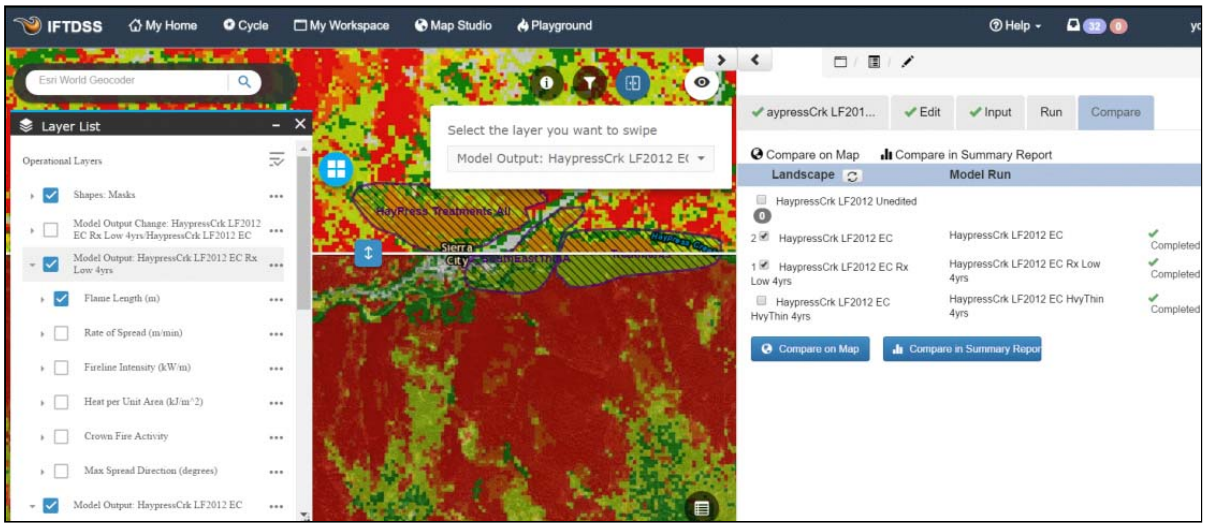
Looking at the 'Model Output Change' layer, we can see flame length and rate of spread both decreased substantially in the treatment areas, and crown fire activity also decreased.

Using the **Swipe** tool, you can swipe back and forth between layers:

For example, turn off all layers except the two model outputs for 'Modeled Output: HaypressCrk LF2012 EC Rx Low 4yrs', and

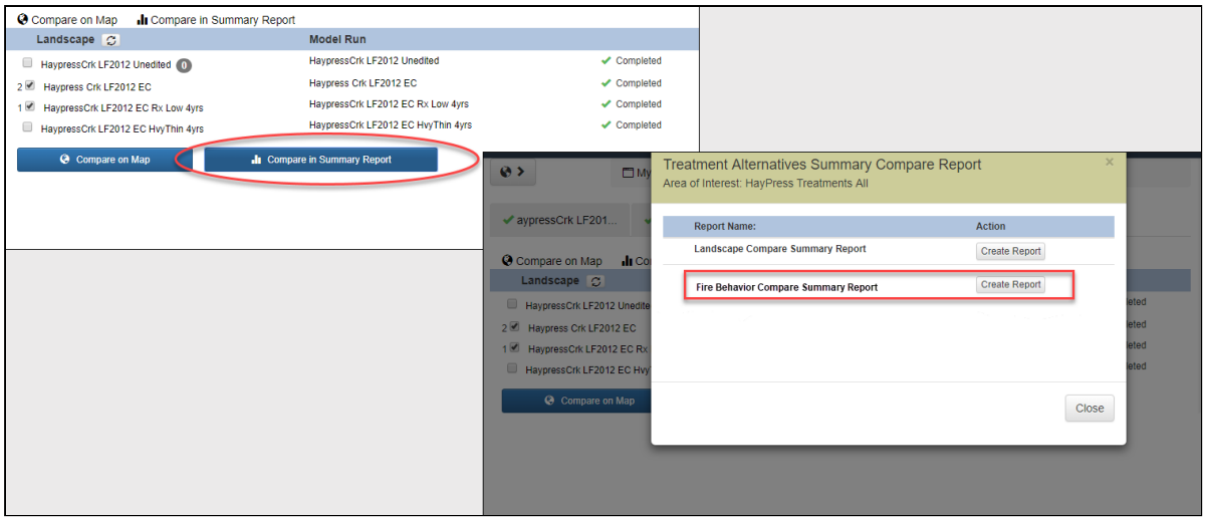
'Model Output: HaypressCrk LF2012EC'.

Make sure the same feature in each one is selected (in this case flame length). Select the **Swipe** tool  in the top right of the map interface. In the tool dropdown, select the EC layer, which will place the EC at the top of the slider (the other layer will be on the bottom).

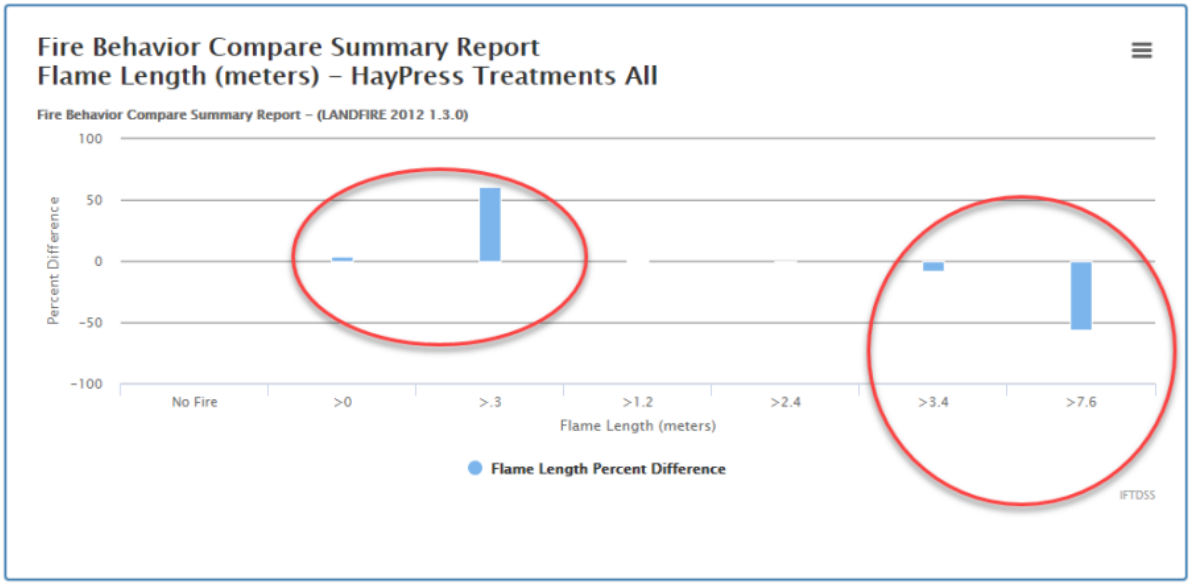


As you swipe back and forth you will notice the EC flame lengths in the top portion, and the prescribed layer flame lengths revealed on the bottom portion when swiping back and forth. For details on specific pixels, you may use the **Identify** tool  in the top left as well.

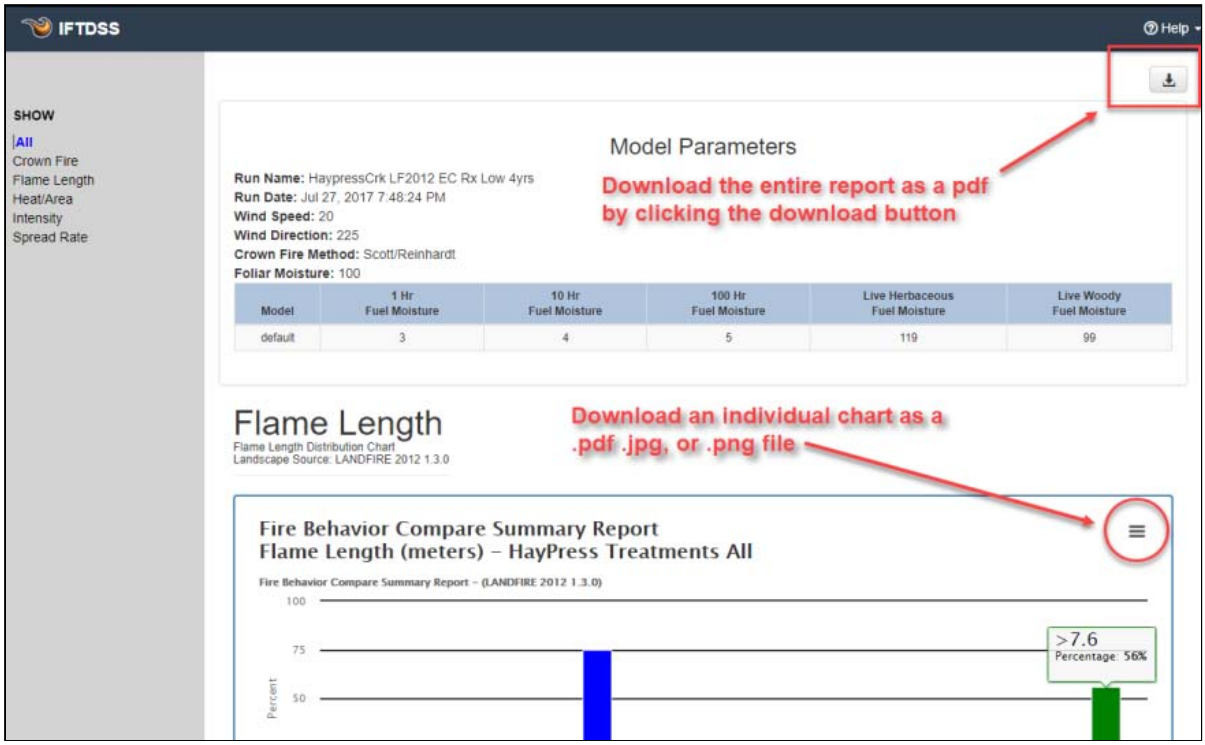
With these same landscapes selected generate a fire behavior summary report, click the **Compare in Summary Report** button. Next to the Fire Behavior Compare Summary Report option, click **Create Report**



Because you selected an area of interest when you picked your landscape, this report reflects the changes in fire behavior within that area. Scroll through the comparative bar chart, table, pie chart, and percent difference columns. We scrolling through the report we can see the effects of the landscape treatment, which includes a decrease in flame length (depicted below) and fire spread.



You can download the entire report using the download button in the top right, or an individual chart by using the 'hamburger' icon in the right of each chart



Try it yourself! You may also compare the thinning treatment to your Existing Condition landscape, or even the two treated landscapes to each other.