

Tutorial C: How to Use IFTDSS to Prepare a Prescribed Burn Plan

The Prescribed Burn Plan module in IFTDSS allows users to populate a complete prescribe burn template, as well as import results from some other IFTDSS runs. This tutorial covers the following topics:

- Setting up a project in IFTDSS.
- Creating and filling in the burn plan template.
- Establishing burn objectives and environmental thresholds.
- Using the Prescribed Burn Planning workflow to perform the following tasks:
 - Describe what modules can be used for specific burn plan elements.
 - Model low, high, and optimal fire behavior and effects inside the burn unit.
 - Model maximum fire behavior and effects outside the burn unit.
- Download the inputs and output variables needed for the burn plan document.
- Generating the burn plan as a Microsoft Word document and customizing the plan.
 - Filling in the appendices with maps and modeling data.

Note

Before continuing with this tutorial, we recommend that you review [Tutorial B: How to Use Hazard Analysis Tools in IFTDSS for Prescribed Burn Planning](#) which can also be found in the IFTDSS online help under Tutorials>Hazard Analysis.

Note

This tutorial will take the user through building a burn plan for the Red Bull Prescribed Fire. The purpose of this tutorial is to aid the user in understand the steps and process of creating a burn plan in IFTDSS. It is not important that the user produce an exact copy of the RED Bull burn plan. The user may elect to add their own text or numbers as they build the burn plan during this tutorial. An example of the final [Red Bull Burn Plan](#) is available for download.

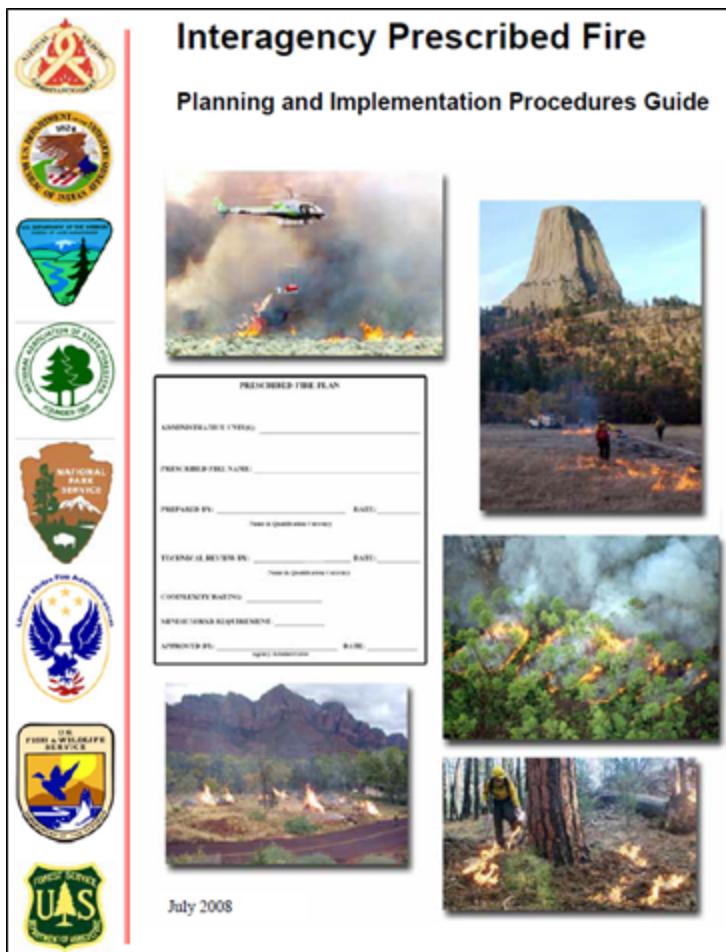
Introduction

The Prescribed Burn Plan

- is a site-specific implementation document
- is a legal document that provides the Agency Administration the information needed to approve the plan
- provides the Prescribed Fire Burn Boss with all the information needed to implement the prescribed fire

Prescribed fire projects must be implemented in compliance with the written plan

(U.S. Department of Agriculture and U.S. Department of the Interior [2014] [Inter-agency Prescribed Fire Planning and Implementation Guide](#), p. 23. Citations for this guide will be in this form: USDA and U.S. DOI, 2014.)



Note

The main reference glossary for the Interagency Prescribed Fire Planning and Implementation Procedures Guide (IPFRG) is the [National Wildfire Coordinating Group \(NWCG\) Glossary](#).

The tools provided under the IFTDSS **prescribed burn planning workflow** aid fuels treatment planners and prescribed fire planners in assessing fire behavior and effects for varying fuel and environmental conditions.

IFTDSS also contains tools for preparing and generating a burn plan document that is based on the guidelines in the

- Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide (USDA and U.S. DOI, 2014)
- [RX-341 Prescribed Fire Plan Preparation course](#). In this tutorial, we follow along with the Red Bull Prescribed Burn Plan example given in that course.

Using the tools in IFTDSS, you can

- Model fire behavior and fire effects for different fuel models and environmental scenarios.
- Create a prescribed burn plan; as part of your planning process, you can save a Word file from IFTDSS that has a number of elements filled in from your model runs.

Important

Microsoft Word 2007 or later, or Word 2003 with the Microsoft Office Compatibility Pack, is required to open the burn plan document. You can [download the compatibility pack](#) at Microsoft.com

Objectives

This tutorial:

- provides users with the skills and tools needed to prepare a prescribed burn plan in accordance with agency policy and guidelines.
- is based on the 21 required elements of a prescribed burn plan identified in the Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide (**USDA U.S. DOI 2014**).
- describes what is minimally acceptable for prescribed fire planning and implementation.
- uses the example burn plan in the RX-341 Prescribed Fire Plan Preparation course (Red Bull Prescribed Burn Plan).

[Element 1: Signature Page](#)
[Element 2, Part 1: Agency Administrator Go/No-Go Pre-Ignition Approval Checklist](#)
[Element 2, Part 2: Prescribed Fire GO/NO-GO Checklist](#)
[Element 3: Complexity Analysis Summary](#)
[Element 4: Description of Prescribed Fire Area](#)
[Element 5: Objectives](#)
[Element 6: Funding](#)
[Element 7: Prescription](#)
[Element 8: Scheduling](#)
[Element 9: Pre-Burn Consideration and Weather](#)
[Element 10: Briefing Checklist](#)
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[Element 12: Communication](#)
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[Element 20: Monitoring](#)
[Element 21: Post-Burn Activities](#)
[Appendices](#)

Note

Agencies may choose to provide more restrictive standards and policy direction, but must adhere to the **minimums** described in the *IPFRG* (USDA and U.S. DOI, 2014, p. 9).

Getting Started

To begin, click **Create a New Project** under the Home tab.

- Choose a descriptive project name.
- If desired, fill in the optional information.

Choose **Next**.

IFTDSS 2.0.1 beta

Home Collaborate Projects Data

Logged in as Wilson, Gina

Create New Project

Project Name: Red Bull

Optional Information:

Organization Name: Sonoma Technology, Inc.

Project Start Date: 1/4/13

Project End Date: 1/31/13

Project Size: 76 acres

Treatment Type: Prescribed Burn

Project Status: Planned ▾

Description:

```
BIA Crow Creek Agency
Buffalo County, South Dakota
-Burn Plan
-Fire Behavir
```

Next

Organization of Projects and Runs

In IFTDSS, a Project is like a workspace. Each Project has a geographic area of interest and may have one or more Runs associated with it.

A Run, which you will be prompted to set up on the next screen, defines the analysis activity that you would like to perform and the models, tools, or analysis steps that you will use.

```

graph TD
    Project[Project] --> Area[Area of Interest]
    Area --> Run1[Run 1]
    Area --> Run2[Run 2]
    Area --> Run3[Run 3]
    Area --> Run4[Run 4]
    Area --> Run5[Run 5]
  
```

After creating a new project, you will see the page for **choose the type of run you want to create**. The next step is to acquire LANDFIRE data, so we are going to navigate away from this page.

Access the project you created. In this example, we chose the **Red Bull** link.

The screenshot shows the IFTDSS 2.0.1 beta interface. At the top, there's a green header bar with the title "IFTDSS 2.0.1 beta". Below it is a navigation bar with tabs: Home, Collaborate, Projects (which is selected and highlighted in blue), and Data. On the right side of the header, there are links for About, Help, Feedback, and Log Out, along with a message "Logged in as Wilson, Gina". A red box highlights the "Red Bull" project name in the main content area. Below the header, a green box displays a success message: "Created project "Red Bull"" with a checkmark icon. The main content area is titled "Choose the type of run you would like to create:" and lists several options: Hazard Analysis, Risk Assessment, Fuels Treatment, Prescribed Burn Planning, and Compare landscape statistics between saved runs. To the right of these options is a detailed description box: "IFTDSS currently provides tools for Prescribed Burn Planning, Hazard Analysis, and Risk Assessment. The Prescribed Burn Planning tools allow you to model fire behavior and fire effects and develop burn plan documentation. The tools available for assessing hazard allow you to model potential fire behavior across a landscape to identify areas that may be potentially hazardous if a fire were to occur. The risk assessment tools allow you to predict the potential benefit or loss of values at risk across a landscape given current vegetation conditions and assumptions about fire weather."

Now we will acquire data from LANDFIRE.

Next, select **Acquire data from LANDFIRE**, then choose **Next**.

IFTDSS2.0.1beta

Home Collaborate Projects Data

About Help Feedback Log Out
Logged in as Wilson, Gina

Red Bull

Project Summary

[Help](#)

Information		Edit	Area of Interest	
Organization Name:	Sonoma Technology, Inc.		Define your project area of interest by:	
Project Start Date:	1/4/13		Acquiring data from LANDFIRE	
Project End Date:	1/31/13		Manually defining the project area	
Project Size:	76 acres		Uploading a LCP file	
Treatment Type:	Prescribed Burn			
Project Status:	Planned			
Description:	BIA Crow Creek Agency Buffalo County, South Dakota -Burn Plan -Fire Behavir			
Date Modified:	01/25/2016			
Date Created:	01/25/2016			

Runs					
Run Name	Pathway	Date Modified	Date Created	Actions	
No data available in table					
Filters:		(all) ▾	(all) ▾	(all) ▾	
Create New Run					

Project Data Sets						
Data Set Name	Data Type	Date Modified	Date Created	Status	Actions	Export Status
No data available in table						
(all) ▾						

IFTDSS2.0.1beta

Home Collaborate Projects Data

About Help Feedback Log Out
Logged in as Wilson, Gina

Select a Data Set and an Area of Interest for your Project

Note that the data set you select will define the area of interest for your project.

Acquire data from LANDFIRE

Use an existing data set: Moscow Mtn Ridge ▾

Upload a new data set

FTEM project setup

[Next](#)

Selecting a Project Area of Interest

Navigate to your desired location using one of these methods:

- A. Using the navigation tools located in the top left portion of the map.
- B. Using the mouse. Click and drag to move; double-click to zoom in.
- C. Entering coordinates.

Tip: For this example, enter the following coordinates

- North: 44.0826251
- East: -99.4075507
- South: 44.0486059
- West: -99.4603480

IFTDSS 2.0.1 beta

Home Collaborate Projects Data

Logged in as Wilson, Gina

Red Bull

Set Up Project Area of Interest

Data Set Name

LANDFIRE Data Layer **LANDFIRE 2010 (v 1.20)**

Fuel Model **Scott and Burgan 40**

North **46.836348357133**
West **-116.9465205923** East **-116.7251224137**
South **46.807472831594**

Define the area of interest for your project by using the Draw Box tool to select an area on the map below or by using the latitude and longitude coordinate boxes to the left. Once you define the area of interest for a project, it cannot be changed without creating a new project.

Currently, acquisition of LANDFIRE data is limited to 400,000 acres.

Navigate Map Draw Box

Selected area: 13,546.46 acres

30 meter resolution

Back Next

Name the dataset

Select a [LANDFIRE data layer](#) (LANDFIRE 2008 v1.10 or LANDFIRE Refresh v1.05)

Select a fuel model type ([Scott and Burgan 40](#) or [Anderson 13](#)).

Click on the plus sign in the upper right corner of the map to view different base layers (imagery, topo map, or street map).

Set Up Project Area of Interest

Data Set Name

LANDFIRE Data Layer

Fuel Model

North	44.0826251
West	-99.4603480
East	-99.4075507
South	44.0486059

Define the area of interest for your project by using the Draw Box tool to select an area on the map below or by using the latitude and longitude coordinate boxes to the left. Once you define the area of interest for a project, it cannot be changed without creating a new project.

Currently, acquisition of LANDFIRE data is limited to 400,000 acres.

Navigate Map Draw Box
Selected area: 3,979.07 acres

Scroll to the bottom of the page and choose **Next** to import LANDFIRE data.

Note:

Once you select a data set, the project area cannot be changed. To change the project area, you must create a new project.

There will be a short wait while the LANDFIRE data is imported.

Tip:

Select a large project area. By creating a large project area, you can view landscape data and model fire behavior and effects inside and outside the burn unit. **Maximum area:** Currently acquisition of LANDFIRE data is set to a 400,000 acre limit.

Editing Landscape Data (part 1)

After acquiring the LANDFIRE data, you are returned to the Project Summary page. We will now review and edit the landscape data for the project area.

Project Summary

Information

Organization Name: Sonoma Technology, Inc.
Project Start Date: 1/4/13
Project End Date: 1/31/13
Project Size: 76 acres
Treatment Type: Prescribed Burn
Project Status: Planned
Description: BIA Crow Creek Agency Buffalo County, South Dakota -Burn Plan -Fire Behavir
Date Modified: 01/25/2016
Date Created: 01/25/2016

Edit

Area of Interest

Northeast corner:
Latitude: 44.0577182°
Longitude: -99.4281392°

Southwest corner:
Latitude: 44.0528583°
Longitude: -99.4345037°

Total Area:
68.05 Acres
275,400 m²

Resolution: 30.0m x 30.0m

 Import Landscape data from LANDFIRE  Import Fuelbeds from LANDFIRE  Upload Landscape Data Set

Runs

Run Name	Pathway	Date Modified	Date Created	Actions
No data available in table				

Filters: (all) ▾ (all) ▾ (all) ▾

 Create New Run

Project Data Sets

Data Set Name	Data Type	Date Modified	Date Created	Status	Actions	Export Status
Red Bull Unit	IFT-LANDFIRE LCP	01/25/2016	01/25/2016	Ready	 Edit  Copy  Rename  Delete  Download	Started
(all) ▾						

 
Panel Management Committee

[Home](#) | [Collaborate](#) | [Projects](#) | [Data](#) | [About](#)

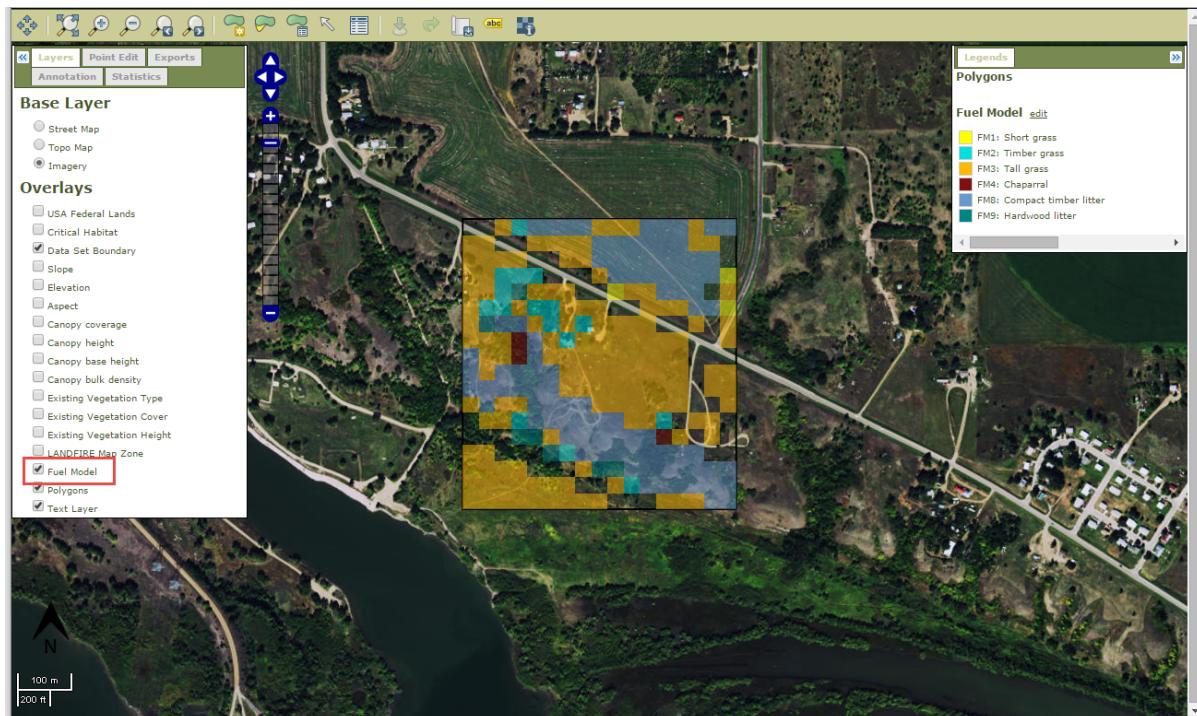
At the bottom of the **Project Summary** page, under the **Project Data** section, click on the **Action Icon**, and select **Edit**. The Data Studio window appears.

Note

Pop-up blockers must be disabled in order to open Data Studio.

Editing Landscape Data (part 2)

Now you can review your spatial landscape data using the map in Data Studio. In this example, you can see the project area classified by fuel model. If you know that land use has changed or if fires have occurred since the data layer was generated, you may want to edit the spatial data.

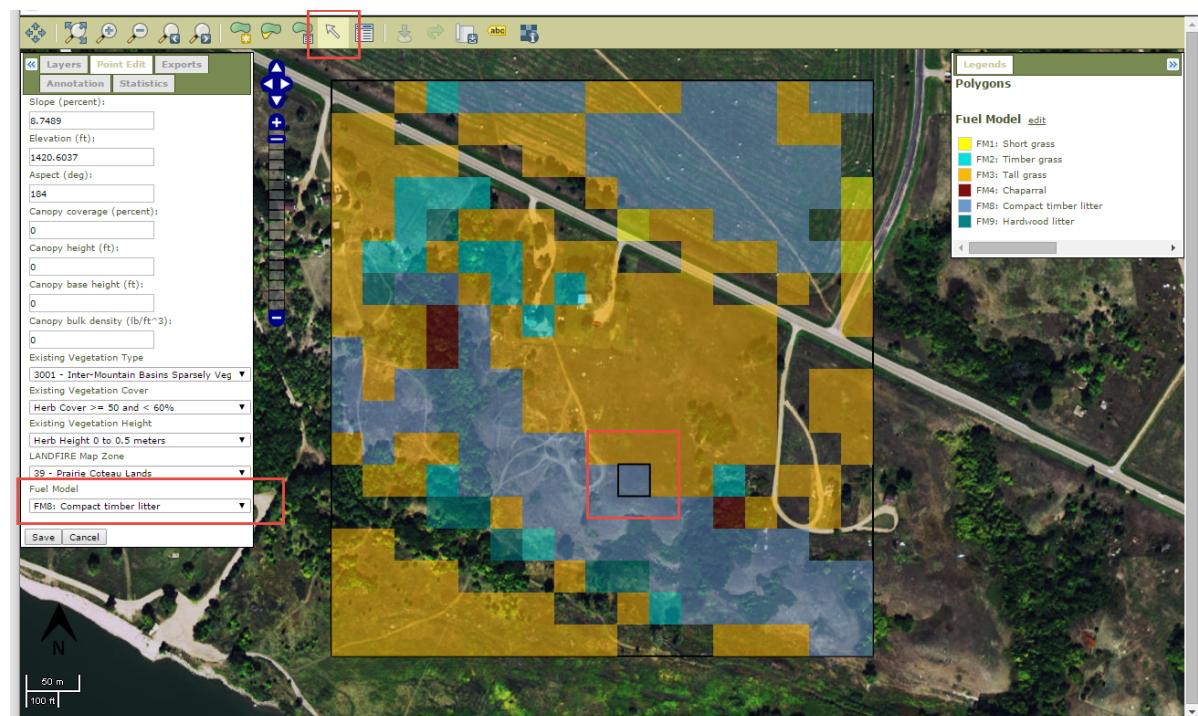


Editing Landscape Data (part 3)

After reviewing the data, you can see that several of the grid cells are labeled as **FM8: Compact Timber Litter**. These cells should be changed to **FM3: Tall Grass**.

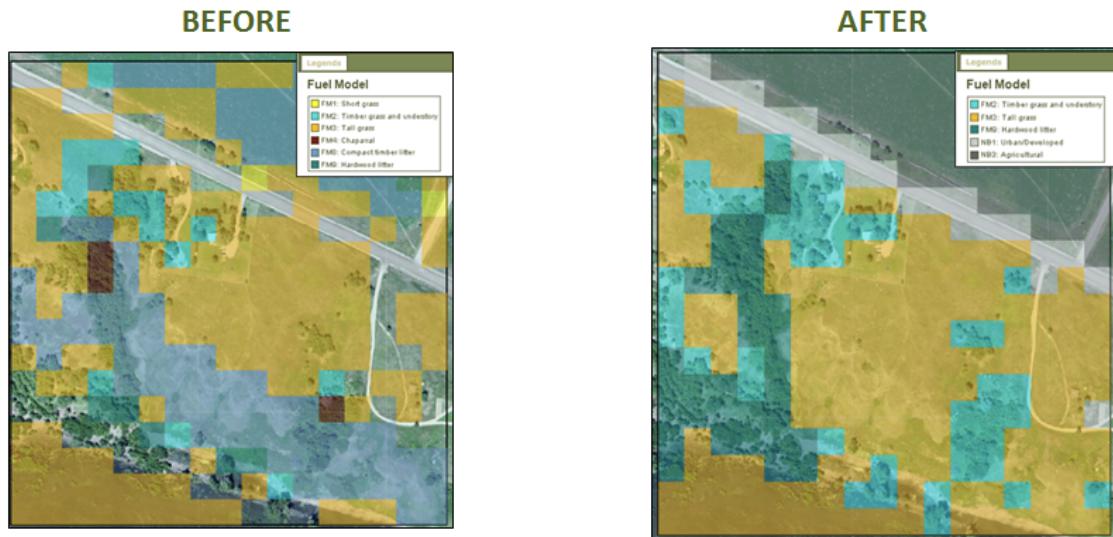
On the upper toolbar, click the **Point Edit tool**  and select the desired grid cell.

The **Point Edit** panel appears. From here, you can edit all input values. In this example, **FM3: Tall Grass** is selected from the **Fuel Model** dropdown list.



Some grid cells are labeled as **FM8: Compact Timber Litter** and **FM4: Chaparral**, which should be labeled as **FM2: Timber Grass** and **Understory or FM9: Hardwood Litter**. There is also a handful of cells with no data. These cells are edited one at a time.

You can also edit the following landscape layers: canopy base height, canopy height, canopy bulk density, canopy coverage, elevation, aspect, and slope.



In the example, we showed how grid cells can be edited one by one. There is



also an Advanced Editing tool  that you can use to edit in query format so you can change multiple cells at once.

At coordinates where:

Fuel Model
is equal to
FM8: Compact timber litter

(add more criteria)

Modify Values:

Modify
Fuel Model
by
setting to
FM2: Timber grass and understory

(modify more values)

Note

When you are done editing, choose **Save** and close the Data Studio



window. This tutorial illustrates how to edit the fuel model layer. You will also need to edit the canopy fuel layers: canopy height, canopy cover, crown base height, and crown bulk density.

Creating a New Run

Now that we have defined, reviewed, and edited our area of interest, we will create a new run.

Red Bull

Project Summary

[Help](#)

Information	Edit
Organization Name: Sonoma Technology, Inc.	
Project Start Date: 1/4/13	
Project End Date: 1/31/13	
Project Size: 76 acres	
Treatment Type: Prescribed Burn	
Project Status: Planned	
Description: BIA Crow Creek Agency Buffalo County, South Dakota -Burn Plan -Fire Behavir	
Date Modified: 01/25/2016	
Date Created: 01/25/2016	

Area of Interest

Northeast corner: Latitude: 44.0577182° Longitude: -99.4281392°
Southwest corner: Latitude: 44.0528583° Longitude: -99.4345037°
Total Area: 68.05 Acres 275,400 m ²
Resolution: 30.0m x 30.0m
Import Landscape data from LANDFIRE
Import Fuelbeds from LANDFIRE
Upload Landscape Data Set

Runs										
<table><thead><tr><th>Run Name</th><th>Pathway</th><th>Date Modified</th><th>Date Created</th><th>Actions</th></tr></thead><tbody><tr><td colspan="5">No data available in table</td></tr></tbody></table>	Run Name	Pathway	Date Modified	Date Created	Actions	No data available in table				
Run Name	Pathway	Date Modified	Date Created	Actions						
No data available in table										
Filters: (all) (all) (all)										
Create New Run										

Project Data Sets																					
<table><thead><tr><th>Data Set Name</th><th>Data Type</th><th>Date Modified</th><th>Date Created</th><th>Status</th><th>Actions</th><th>Export Status</th></tr></thead><tbody><tr><td>Red Bull Unit</td><td>IFT-LANDFIRE LCP</td><td>01/25/2016</td><td>01/25/2016</td><td>Ready</td><td>Edit</td><td>Not Started</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td>(all)</td><td>(all)</td></tr></tbody></table>	Data Set Name	Data Type	Date Modified	Date Created	Status	Actions	Export Status	Red Bull Unit	IFT-LANDFIRE LCP	01/25/2016	01/25/2016	Ready	Edit	Not Started						(all)	(all)
Data Set Name	Data Type	Date Modified	Date Created	Status	Actions	Export Status															
Red Bull Unit	IFT-LANDFIRE LCP	01/25/2016	01/25/2016	Ready	Edit	Not Started															
					(all)	(all)															

From the **Project Summary** page, choose **Create New Run**.

Creating a Burn Plan

The next step in creating a run is to choose the type of run you would like to create. In this tutorial, we are creating a burn plan, so that is the type we will choose. Choose the type of run you would like to create by choosing the following links: Prescribed Burn Planning ==> Create a burn plan document

Choose the type of run you would like to create:

Start ▶ By IFTDSS Workflows ▶

◀ Back

-  Hazard Analysis
-  Risk Assessment
-  Fuels Treatment
-  **Prescribed Burn Planning**

 Compare landscape statistics between saved runs

IFTDSS currently provides tools for Prescribed Burn Planning, Hazard Analysis, and Risk Assessment. The Prescribed Burn Planning tools allow you to model fire behavior and fire effects and develop burn plan documentation. The tools available for assessing hazard allow you to model potential fire behavior across a landscape to identify areas that may be potentially hazardous if a fire were to occur. The risk assessment tools allow you to predict the potential benefit or loss of values at risk across a landscape given current vegetation conditions and assumptions about fire weather.

Choose the type of run you would like to create:

Start ▶ By IFTDSS Workflows ▶ Prescribed Burn Planning ▶

◀ Back

-  Probability of Ignition
-  Fire Behavior
-  Fire Containment
-  Fire Effects
-  Historical Fire Weather

 Create a burn plan document

The tools available for prescribed burn planning can be used to model the probability of ignition, fire behavior and fire effects, and fire containment. These tools can also be used to develop a prescribed burn plan as outlined in the Interagency Prescribed Fire Planning and Implementation Procedures Guidelines and in the RX-341 Prescribed Fire Plan Preparation course.

Name your run and choose **Next**.

Create New Run: Create a burn plan document

Run Name

Table of Contents and Navigation

This is the Table of Contents for the burn plan. You can navigate from element to element by using any of the following:

- A. The bar at the top of the page
- B. The links located in the table of contents
- C. The **Next** button

A

Table of Contents ··· Element 1: Signature Page ··· Element 2, Part A: Agency Administrator Ignition Authorization ··· Elei ►

Red Bull Burn Plan - Create a burn plan document

The burn plan document pathway was designed based on the National Wildfire Coordinating Group's Interagency Prescribed Fire Planning and Implementation Procedures Guide (IPFP/PG, 2014) and consists of 21 elements (objectives, ignition plan, etc.). Each screen in this pathway guides the user in developing the content for one of the 21 elements identified in the Guide. At any point during the development of the burn plan, the Prescribed Fire Plan can be downloaded as a Microsoft Word document using the Generate Burn Plan button at the bottom of any page in this pathway. The Prescribed Fire Plan will include all data that the user has entered and saved. After the user has completed the burn plan pathway and has downloaded the Prescribed Fire Plan, the user can easily update and/or customize all sections of the plan using Microsoft Word. [Click here](#) for more information about this module.

B

[Element 1: Signature Page](#)
[Element 2, Part A: Agency Administrator Ignition Authorization](#)
[Element 2, Part B: Prescribed Fire Go/No-Go Checklist](#)
[Element 3: Complexity Analysis Summary](#)
[Element 4: Description of Prescribed Fire Area](#)
[Element 5: Objectives](#)
[Element 6: Funding](#)
[Element 7: Prescription](#)
[Element 8: Scheduling](#)
[Element 9: Pre-Burn Considerations and Weather](#)
[Element 10: Briefing Checklist](#)
[Element 11: Organization and Equipment](#)
[Element 12: Communication](#)
[Element 13: Public and Personnel Safety, Medical](#)
[Element 14: Test Fire](#)
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[Element 16: Holding Plan](#)
[Element 17: Contingency Plan](#)
[Element 18: Wildfire Conversion](#)
[Element 19: Smoke Management and Air Quality](#)
[Element 20: Monitoring](#)
[Element 21: Post-Burn Activities](#)
[Appendices](#)

C

[Generate Burn Plan](#)

[Next >](#)

Elements Overview

The 21 Elements in a burn plan range in difficulty.

[Element 1: Signature Page](#)

[Element 2, Part A: Agency Administrator Ignition Authorization](#)

[Element 2, Part B: Prescribed Fire Go/No-Go Checklist](#)

[Element 3: Complexity Analysis Summary](#)

[Element 4: Description of Prescribed Fire Area](#)

[Element 5: Objectives](#)

[Element 6: Funding](#)

[Element 7: Prescription](#)

[Element 8: Scheduling](#)

[Element 9: Pre-Burn Considerations and Weather](#)

[Element 10: Briefing Checklist](#)

[Element 11: Organization and Equipment](#)

[Element 12: Communication](#)

[Element 13: Public and Personnel Safety, Medical](#)

[Element 14: Test Fire](#)

[Element 15: Ignition Plan](#)

[Element 16: Holding Plan](#)

[Element 17: Contingency Plan](#)

[Element 18: Wildfire Conversion](#)

[Element 19: Smoke Management and Air Quality](#)

[Element 20: Monitoring](#)

[Element 21: Post-Burn Activities](#)

[Appendices](#)

*recreated from the Rx341 Prescribed Fire Plan Preparation course, page 0.9.

Some Elements cannot be completed until after the burn plan is finished (Elements 1, 2, 3, and 10). IFTDSS contains tools for modeling fire behavior and fire effects; these tools are useful in obtaining information needed to address Elements 3, 4, 5, 7, 15, 16, 17, and 19.

The following pages step through each Element.

Modules and Burn Plan Elements

The matrix on this page shows which IFTDSS modules can be used for specific burn plan elements. Most of the modules can be used for multiple elements. Refer back to this matrix when you are using the prescribed burn planning tools and when you are making a burn plan.

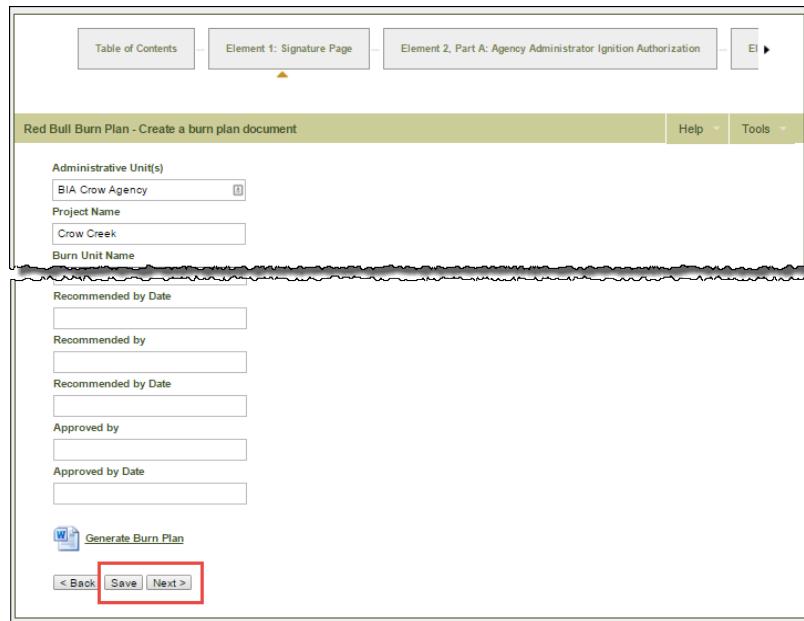
ELEMENTS	IFTDSS MODULES/TOOLS	CATEGORIES							
		Fire Behavior		Fire Effects		Fire Containment		Probability of Ignition	Data and Mapping Tools
Element 3: Complexity Analysis Summary	○	Surface fire behavior ^a	○	Surface fire behavior for FCCS fuelbeds ^b	○	Crown fire behavior ^a	○	Fire behavior for individual stands ^c	○
Element 4: Description of Prescribed Fire Area	○	○	○	○	○	○	○	Fire behavior across a landscape ^c	○
Element 5: Objectives	○	○	○	○	○	○	○	Consumption and Emission ^d	○
Element 7: Prescription	●	●	○	●	●	○	●	Tree Mortality ^d	○
Element 15: Ignition Plan	○							Crown scorch height ^a	○
Element 16: Holding Plan	○	○	○	○	○		○	Natural fuels consumption ^e	○
Element 17: Contingency Plan	○	○	○	○	○	○	○	Spotting distance ^a	○
Element 19: Smoke Management and Air Quality						●	○	Containment resources ^a	○
Appendices: Appendix A. Maps (Vicinity and Project)				●			○	Safety zone size ^a	○
							○	Fire size and spread ^a	○
							○	Probability of ignition from a firebreak ^a	○
							○	Probability of ignition from lightning ^a	○
							○	DataStudio (project area of interest maps)	●
								LANDFIRE Data (Fuel Model & Topography)	●

Signature Page (Element 1)

Navigate to Element 1: Signature Page.

The following information must be included on the signature page:

1. Administrative unit name
2. Prescribed fire name
3. At a minimum, three dated signatures are required:
 - Prescribed burn preparer
 - Technical Reviewer
 - Agency Administrator
4. Final determined complexity rating



(USDA and U.S. DOI, 2014, p. 24)

Important

You can save your progress by clicking **Save**. Clicking **Next** will both save your progress and advance you to the next screen.

Go/No-Go Checklists (Element 2, Part A and Part B)

Part A - Agency Administration

This checklist evaluates whether compliance requirements, prescribed fire plan elements, and internal and external notification(s) have been completed. Expresses the Agency Administrator's intent to implement the Prescribed Fire Plan.

(USDA and U.S. DOI, 2014, p. 24)

Part B - Prescribed Fire

Prior to all ignition operations, the Prescribed Fire Burn Boss will complete and sign this checklist.

For each day of active ignition on a prescribed fire, a separate daily Go/No-Go Checklist is required.

Note

The online burn plan template Go/No-Go checkbox lists cannot be used until after the burn plan is completed. Once the burn plan is generated, a Yes/No table replaces the checkbox list.

Complexity Analysis Summary (Element 3 and Appendix C)

The purpose of the complexity rating process is to provide:

- assignment of a complexity rating of high, moderate, or low to the prescribed fire
- a relative ranking as to the overall complexity of a specific prescribed fire project for management and implementation personnel
- a process that can be used to identify Prescribed Fire Plan elements or characteristics that may pose special problems or concerns

The [Prescribed Fire Complexity Rating Guide](#) was developed to assist personnel in determining a relative complexity of any single prescribed fire project.

The Summary Complexity Rating Rationale:

- will clearly justify the summary rating for prescribed fire organization and Prescribed Fire Burn Boss level
- must identify those risks from the Complexity Analysis (Appendix C) that are rated high and cannot be mitigated and will provide a discussion of the risks associated

Element	Risk	Potential Consequences	Technical Difficulty
1. Potential for escape	Low	Moderate	Low
2. Number and dependence of activities	Moderate	Moderate	Moderate
3. Offsite values	Moderate	Moderate	Moderate
4. Onsite values	Moderate	Moderate	Moderate
5. Fire behavior	Moderate	Moderate	Low
6. Management organization	Moderate	Low	Moderate
7. Public and political interest	Moderate	Moderate	Low
8. Fire treatment objectives	Low	Moderate	Moderate
9. Constraints	Low	Low	Low
10. Safety	Moderate	Moderate	Moderate
11. Ignition procedures/methods	Moderate	Moderate	Low
12. Interagency coordination	Low	Low	Low
13. Project logistics	Moderate	Moderate	Low
14. Smoke management	Low	Low	Low

(USDA and U.S. DOI, 2014, p. 25)

Description of the Prescribed Fire Area (Element 4)

This section describes the physical features in and around the prescribed fire project area. There are 8 different text boxes to help you describe your project area. They include:

Physical Description

The physical description provides information on the various physical aspects of the area where the prescribed burn is to be made.

Location: Narrative description of the location of the prescribed fire project, including a legal description, UTM and/or latitude/longitude, county, and state.

Size: Area, in acres, of the prescribed fire project, with a breakdown by prescribed fire unit and/or ownership if applicable.

Topography: Identifies the upper and lower range of elevation, slopes (max/min/avg), and aspect(s).

Project Area: Defines the area where fire will be ignited and may be allowed to burn. Describes the physical, natural, and/or human made boundaries .Defines through maps; may include narratives.

(USDA and U.S. DOI, 2014, pp. 26 and 27)

Location

Buffalo County, South Dakota T107N, R72W, Sect. 23 & 24 Latitude: 44.0015, Longitude: -99.2526

Provide a narrative description of the location of the prescribed fire project area and ignition unit(s), including a legal description, UTM coordinates and/or latitude/longitude, county, and state.

Location Size

Project size: 37 acres Acres to be burned: 28

Area, in acres, of the prescribed burn project site, with a breakdown by ignition unit and/or ownership if applicable.

Topography

Elevation: Top: 1465 ft, Bottom: 1375 ft Aspect: South Slope % (Average):
5% - upper (north side) flats,
40% - south third, flat bottom - 50 ft average north of the south project boundary

Identify the upper and lower range of elevation, slope (maximum, minimum, and average), and aspect(s) of the project area.

Project Area

Gingway housing, and approximately .2 miles west of East housing (see attached map). Some portions of the unit are adjacent to resident properties and three structures are within the burn unit, with one being an abandoned, dilapidated house. The unit is bordered by predominantly U.S. Corps of Engineers land to the south, with the Missouri River to the south of that, private property to the east, tribal lands to the northeast, private property (cropland) to the north and northwest, with a 2.5 acre home-site in the northwest corner of the project area and predominately U.S. Corps of Engineers land on the west border of the burn unit. The entire project area is within the boundaries of the Crow Creek Reservation on Tribal lands.

Vegetation/Fuels Description

Describe the structure and composition of the vegetation type(s) and fuel characteristics.

Describe the percent of the unit composed of each vegetation type and the corresponding fuel model(s).

Identify conditions (fuels, slope, aspect) in and adjacent to boundaries that may be a potential threat for escaped fire.

Onsite Fuels

Onsite fuels data: Fuel model 3 (over 75%) and 1, with grass as the primary carrier, and small inclusions of hardwoods, characterized as a fuel model 9. Fuel model 3 best represents fire behavior inside of the burn unit. The burn site is dominated by smooth bromé, big bluestem, and other native grasses. Coverage is continuous with only minor breaks.
8-1/4 in. 1-hour fuels: ~3 tons/acre
Fuel height: 3 ft.
Duff depth: 1/2 in.

Describe the structure and composition of the vegetation type(s) and fuel characteristics. Describe the percent of the unit composed of each vegetation type and the corresponding fuel model(s).

Adjacent Fuels

Adjacent fuels data: Fuel models 1, 3 and 9, scattered along all the boundaries. On the lower edge are scattered stands of hardwood tree species and narrow wooded draws to the east and west, best described by fuel model 9. Fuel model 3 best represents fire behavior outside of the burn unit.

Identify vegetation and fuels adjacent to the boundaries.

Vegetation Percent Cover and Fuel Models

Describe the percent of the ignition unit composed of each vegetation type and the corresponding fuel model(s).

Unique Features, Natural Resources, Values

The burn unit has structures within it that will need to be protected prior to burning. A dirt road accesses the structures from the middle of the north side of the unit. A fence line runs in an east-west direction thru the middle of the prescribed fire unit. Power poles, wooden fence poles, and old deep sites are areas that will be protected or excluded from the burn. Two archaeology sites are located along the east boundary and north, middle flat that do not require any special protection, other than to make sure that no equipment drives over these sites.

Special considerations: The only smoke receptors of concern are the homes within and adjacent to the burn unit,

List and discuss special features, natural resources, values, hazards, regulations, issues, constraints, etc.



< Back Save Next >

Description of Unique Features

List and discuss special features, hazards, regulations, issues, constraints, etc.

(USDA and U.S. DOI, 2014, p.27)

Note

Acquire LANDFIRE data and use the IFTDSS Data Studio to visualize the spatial features of the burn unit.

Resource and Prescribed Fire Objectives (Element 5)

It is important to establish burn objectives prior to fire behavior and effects modeling.

Describe in clear, concise statements the specific measureable resource and fire objectives for your prescribed fire.

Objectives must be measurable and quantifiable so prescription elements can be developed to meet those objectives and the success of the project can be determined following implementation.

(USDA and U.S. DOI, 2014, p. 28)

Red Bull Objectives

In the Red Bull example, the objectives fall under two categories:

Resource Objectives

Reduce the risk of future wildland urban interface fire from destroying homes/-structures or other special features.

Prescribed Fire Objectives

Burn at least 90% of the target area.

Reduce the fine dead herbaceous fuel loading by 90% or more immediately following the completion of ignition.

Here, the objectives from the Red Bull example have been entered in IFTDSS.

Create a burn plan document Help Tools

Describe in clear, concise statements the specific measurable resource and prescribed fire objectives. Objectives are well-defined statements describing how a treatment accomplishes project goals as described through the NEPA process and documented in the decision document. Objectives should be specific, measurable, attainable, realistic, and time-sensitive (SMART), and used as a measure of project success. Objectives need to be measurable and quantifiable so prescription elements can be developed to meet them ([IPFPIPG](#), 2014, p. 28).

Resource Objectives

Reduce the risk of future wildland urban interface fire from destroying homes/structures or other special features.

Prescribed Fire Objectives

a. Burn at least 90% of the target area. b. Reduce the fine dead herbaceous fuel loading by 90% or more immediately following the completion of ignition.



Generate Burn Plan

< Back Save Next >

Tip:

Click and drag the corner of the text box to modify the size of the box.

Funding (Element 6)

Identify the funding source(s) and estimated cost(s) of the prescribed fire.

As shown here, some prescribed burns are conducted in phases; Element 6 can be itemized by phase if desired. (USDA and U.S. DOI, 2014, p. 28)

The screenshot shows a software application window titled "Red Bull Burn Plan. - Create a burn plan document". At the top, there is a navigation bar with four tabs: "Element 6: Funding", "Element 7: Prescription", "Element 8: Scheduling", and "Element 9: Pre-Burn Consideration and Weather". Below the tabs, a section titled "Model Information" is visible. The main content area contains instructions: "Identify the funding source(s) and estimated cost(s) of the prescribed fire. Itemize by phase if desired (IPFRG, 2008, p. 21)." A table is provided for entering costs:

Prescribed Fire Phase	Cost	Funding Source
Administration	\$240.00	WUI Program
Planning	\$840.00	WUI Program
Implementation (Personnel)	\$2150.00	WUI Program
Implementation (Equipment)	\$225.00	WUI Program

Total of all estimated costs:
\$3,455.00

[Generate Burn Plan](#)

< Back Next >

This is followed by an optional field in which expense tracking may be documented.

Environmental and Fire Behavior Prescription (Element 7)

Prescription is defined as “the measurable criteria that define a range of conditions during which a prescribed fire may be ignited and held as a prescribed fire.”

The burn plan environmental prescription will describe:

- a range of low to high limits for the environmental (weather, topography, fuels, etc.) parameters
- a set of maximum fire behavior parameters in case of escape
 - hottest, driest, windiest prescription limits
 - Most extreme environmental conditions (slope, aspect)
- a range of optimal fire behavior parameters

(USDA and U.S. DOI, 2014, p. 28)

Now that the burn objectives are established, we can create a range of environmental parameters that will be used when modeling potential fire behavior and effects.

Each module has its own set of unique environmental input parameters.

The next step is to navigate to **Element 7: Prescription**, in the “Create a burn plan document” template.

Once you navigate to **Element 7: Prescription**, fill in the Environmental Prescription.

Now that the objectives (Element 5) are established, we can use the **Prescribed Burn Planning Workflow** to model potential fire behavior and effects.

Run 1 - Create a burn plan document Help Tools

Prescription is defined as the measurable criteria that define a range of conditions during which a prescribed fire may be ignited and held as a prescribed fire. Parameters are quantitative variables expressed as a range that result in acceptable fire behavior and smoke management. Separate prescriptions may be needed for multiple fuel model conditions to address seasonal differences and/or types of ignition (IPFRG, 2008, pp. 21-22).

Import Data

You have no available data sets to import data from. To provide data for filling out this element, you must mark simulations appropriately in the 'Outputs' step of one or more the following pathways:

- Prob of Ignition from Firebrand (IFT-Ignite)
- Prob of Ignition from Lightning (IFT-Ignite)
- Surface Fire Behavior for Individual Stands (IFT-FlamMap)
- Surface Fire Behavior (IFT-Surface)
- Surface Fire Behavior (FCCS)
- Surface Fire Behavior, Size, and Spread Distance (IFT-Surface+Size)
- Spotting Distance from Wind Driven Surface Fire (IFT-Spot)
- Spotting Distance from Torching Trees (IFT-Spot)
- Spotting Distance from a Burning Pile (IFT-Spot)
- Crown Scorch Height (IFT-Scorch)

Prescription - Environmental

	Low Fire Behavior (within unit)	High Fire Behavior (within unit)	Optimal Fire Behavior (within unit)	Maximum Fire Behavior (outside unit)
Temperature (F)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Relative Humidity (%)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Mid-flame wind speed (mi/h)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Note

Burning when all environmental prescription variables are at or near the prescription extremes will likely exceed desired prescribed fire behavior characteristics, and should be considered out of the range of conditions that meet the prescription (USDA and U.S. DOI, 2014, p. 28).

Element 7 has an “Import Data” feature. While using the Prescribed Burn Planning Workflow to model potential fire behavior and effects, you can tag the outputs of your model runs for use in Element 7.

After creating and tagging model runs, return to Element 7 of the prescribed burn plan and populate your environmental and fire behavior prescription with the model run outputs.

Import Data

You have no available data sets to import data from. To provide data for filling out this element, you must mark simulations appropriately in the 'Outputs' step of one or more the following pathways:

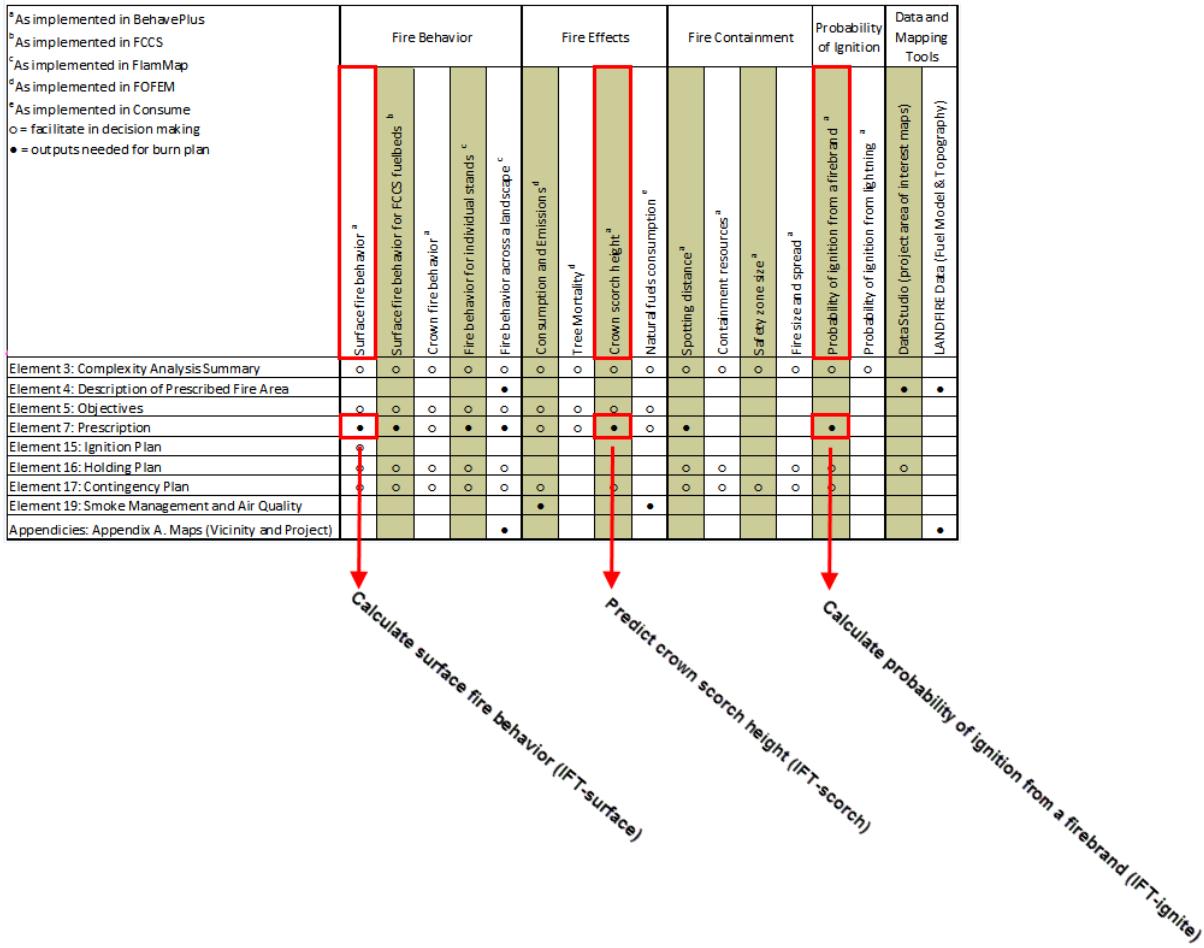
*Prob of Ignition from Firebrand (IFT-Ignite)
Prob of Ignition from Lightning (IFT-Ignite)
Surface Fire Behavior for Individual Stands (IFT-FlamMap)
Surface Fire Behavior (IFT-Surface)
Surface Fire Behavior (FCCS)
Surface Fire Behavior, Size, and Spread Distance (IFT-Surface+Size)
Spotting Distance from Wind Driven Surface Fire (IFT-Spot)
Spotting Distance from Torching Trees (IFT-Spot)
Spotting Distance from a Burning Pile (IFT-Spot)
Crown Scorch Height (IFT-Scorch)*

Note

Only runs within your prescribed burn project will be available for data import.

You have several tools to choose from for fire behavior and effects modeling.

In this example, we use Surface fire behavior (IFT-surface), Crown scorch height (IFT-scorch), and probability of ignition (IFT-ignite) for our Prescription (Element 7).



Modeling Potential Fire Behavior and Effects

To start modeling potential fire behavior and effects, we will leave the burn plan open, right-click on your Project link, **Red Bull**, and select **Open a New Tab**.

The screenshot shows the IFTDSS 2.0 beta software interface. At the top, there is a navigation bar with links for Home, Collaborate, Projects (which is the active tab), and Data. On the far right of the top bar, it says "Logged in as Banwell, Erin". Below the top bar, there is a breadcrumb trail: "Red Bull, > Red Bull Burn Plan - Create a burn plan document". The main content area has a horizontal navigation bar with five tabs: "Prescribed Fire Area" (disabled), "Element 5: Objectives", "Element 6: Funding", "Element 7: Prescription" (disabled), and "Element 8: Scheduling". Below this, there is a sub-navigation bar with "Red Bull Burn Plan - Create a burn plan document" on the left and "Help" and "Tools" on the right. The main content area contains a section titled "Import Data" with the following text: "You have no available data sets to import data from. To provide data for filling out this element, you must mark simulations appropriately in the 'Outputs' step of one or more the following pathways:" followed by a list of simulation types.

Prescription is defined as the measurable criteria that define a range of conditions during which a prescribed fire may be ignited and held as a prescribed fire. Parameters are quantitative variables expressed as a range that result in acceptable fire behavior and smoke management. Separate prescriptions may be needed for multiple fuel model conditions to address seasonal differences and/or types of ignition (IPFRG, 2008, pp. 21-22).

Import Data

You have no available data sets to import data from. To provide data for filling out this element, you must mark simulations appropriately in the 'Outputs' step of one or more the following pathways:

- Prob of Ignition from Firebrand (IFT-Ignite)
- Prob of Ignition from Lightning (IFT-Ignite)
- Surface Fire Behavior for Individual Stands (IFT-FlamMap)
- Surface Fire Behavior (IFT-Surface)
- Surface Fire Behavior (FCCS)
- Surface Fire Behavior, Size, and Spread Distance (IFT-Surface+Size)
- Spotting Distance from Wind Driven Surface Fire (IFT-Spot)
- Spotting Distance from Torching Trees (IFT-Spot)
- Spotting Distance from a Burning Pile (IFT-Spot)

In your browser's window, select the new tab you opened.

Now we are on the Project Summary page. Choose **Create New Run**.

IFTDSS 2.0 beta

Home Collaborate Projects Data

About Help Feedback Log Out
Logged in as Banwell, Erin

[Create New Run](#)

Red Bull.

Project Summary

[Help](#)

Information		Area of Interest	
Organization Name:	Sonoma Technology, Inc.	Northeast corner:	Latitude: 44.0577182° Longitude: -99.4281392°
Project Start Date:	1/4/13	Southwest corner:	Latitude: 44.0528583° Longitude: -99.4345037°
Project End Date:	1/31/13	Total Area:	68.05 Acres 275,400 m ²
Project Size:	76 acres	Resolution:	30.0m x 30.0m
Treatment Type:	Prescribed Burn	Import Landscape data from LANDFIRE	
Project Status:	Planned	Import Fuelbeds from LANDFIRE Upload Landscape Data Set	
Description:	BIA Crow Creek Agency Buffalo County, South Dakota -Burn Plan -Fire Behavior and Effects Modeling		
Date Modified:	01/10/2013		
Date Created:	01/10/2013		

Runs

Run Name	Pathway	Date Modified	Date Created	Actions
Red Bull Burn Plan	Create a burn plan document	01/10/2013	01/10/2013	
Filters:	(all)	(all)	(all)	
Create New Run				

Project Data Sets

Data Set Name	Date Modified	Date Created	Status	Actions
---------------	---------------	--------------	--------	---------

Prescribed Burn Planning Workflow - Surface Fire Behavior

This workflow contains tools needed to model potential fire behavior and effects for the burn plan document.

These tools also facilitate in the decision making for ignition, holding, and contingency plans, as well as smoke management and air quality.

Follow the steps shown in the images and choose **Calculate surface fire behavior (IFT-Surface)**.

Choose the type of run you would like to create:

Start ▶ By IFTDSS Workflows ▶

📁 Hazard Analysis

📁 Risk Assessment

📁 Fuels Treatment

📁 **Prescribed Burn Planning**

▶ Compare landscape statistics between saved runs

📁 Probability of Ignition

📁 **Fire Behavior**

📁 Fire Containment

📁 Fire Effects

📁 Historical Fire Weather

▶ Create a burn plan document

▶ Calculate crown fire behavior (IFT-crown)

▶ Calculate fire behavior across a landscape (IFT-FlamMap)

▶ Calculate fire behavior for individual stands (IFT-FlamMap)

▶ Calculate minimum travel time (IFT-MTT)

▶ Calculate surface fire behavior (FCCS)

▶ **Calculate surface fire behavior (IFT-surface)**

▶ Fuelbed Crosswalk from LANDFIRE Existing Vegetation Type

▶ Predict surface fire behavior, size, and spread distance (IFT-surface+size)

▶ Surface fire behavior (multiple fuelbeds, single scenario, FCCS)

Modeling Surface Fire Behavior (Element 7)

Setting up the run

Tip

Run the surface fire behavior module before running other modules, as some inputs for the other modules are outputs from the surface fire behavior module.

First, give your run a descriptive name and click **Next**.

Create New Run: Calculate surface fire behavior (IFT-surface)

Run Name

Prescription 1 surface fire behavior

Next

Specify the number of simulations to calculate. For this example, specify 4 simulations in order to generate fire behavior for low, high, optimal, and maximum prescription conditions. When finished, click **Next**.

Prescription 1 surface fire behavior - Calculate surface fire behavior (IFT-surface)

The surface fire behavior module computes surface fire spread and intensity. Input variables include slope. Output variables include fire behavior characteristics for head, backing, and flanking fires

Number of stands or simulations

4

Next >

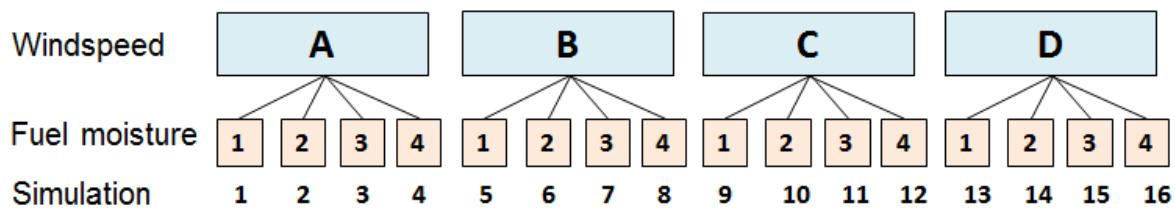
Tip

In IFTDSS, the Prescribed Burn Plan template and associated fire behavior modules allow the user to create and populate up to 3 different prescriptions per one burn plan.

Note

IFTDSS supports a maximum of 25 simulations.

Knowing the number of simulations to specify makes it easy to conduct comparisons of different conditions. For example, if you want to evaluate the effects of four different fuel moistures under one windspeed to determine the minimum allowable 1 hour fuel moisture for your prescription, you would specify 4 runs, one for each fuel moisture under that windspeed. Likewise If you wanted to evaluate the effects of four different fuel moistures, under one of four windspeeds, you would specify 16 simulations,



Note

It is likely you will have to evaluate multiple conditions for your prescription plans. When running IFT-surface, you can either conduct one run with several simulations, as described above, or multiple runs, each representing a prescription level (conditions for low behavior, optimum, maximum, etc.). When populating a burn plan for a project, you may import outputs from any completed IFT-Surface runs contained within that project.

Populating Environmental Parameters for the Run

On the **Inputs** page you will populate the environmental inputs with data from your Environmental Prescription (Element 7).

In this scenario you are populating each simulation as follows:

- Simulation 1: Represent the low end of the prescription
- Simulation 2: Represent the highest acceptable fire behavior allowed
- Simulation 3: Represent optimal fire behavior required to meet objectives
- Simulation 4: Represent maximum fire behavior, or fire behavior expected if fire leaves the burn unit.

For this exercise you are given pre-determined parameters to populate, view the [Element 7 Environmental parameters handout](#) for a list of these.

2016 Red Bull Plan IFT Surface - Calculate surface fire behavior (IFT-surface)

Inputs

Parameter	Unit	Simulation #1	Simulation #2	Simulation #3	Site
Fire Behavior Fuel Model		FM3: Tall grass	FM3: Tall grass	FM3: Tall grass	Flame
1-hr Fuel Moisture	percent	14	6	8	4
10-hr Fuel Moisture	percent	16	8	10	6
100-hr Fuel Moisture	percent	20	12	14	8
Live Herbaceous Fuel Moisture	percent	100	90	90	80
Live Woody Fuel Moisture	percent	180	170	170	160
Midflame Wind Speed	mi/h	3.00	11.00	5.00	15
Wind Direction (from North)	deg	290	290	290	290
Slope	percent	5	5	5	40
Aspect	deg	180	180	180	180
Flanking Fire Direction		90 degrees	90 degrees	90 degrees	90
Elapsed Time	h	1.00	1.00	1.00	1.

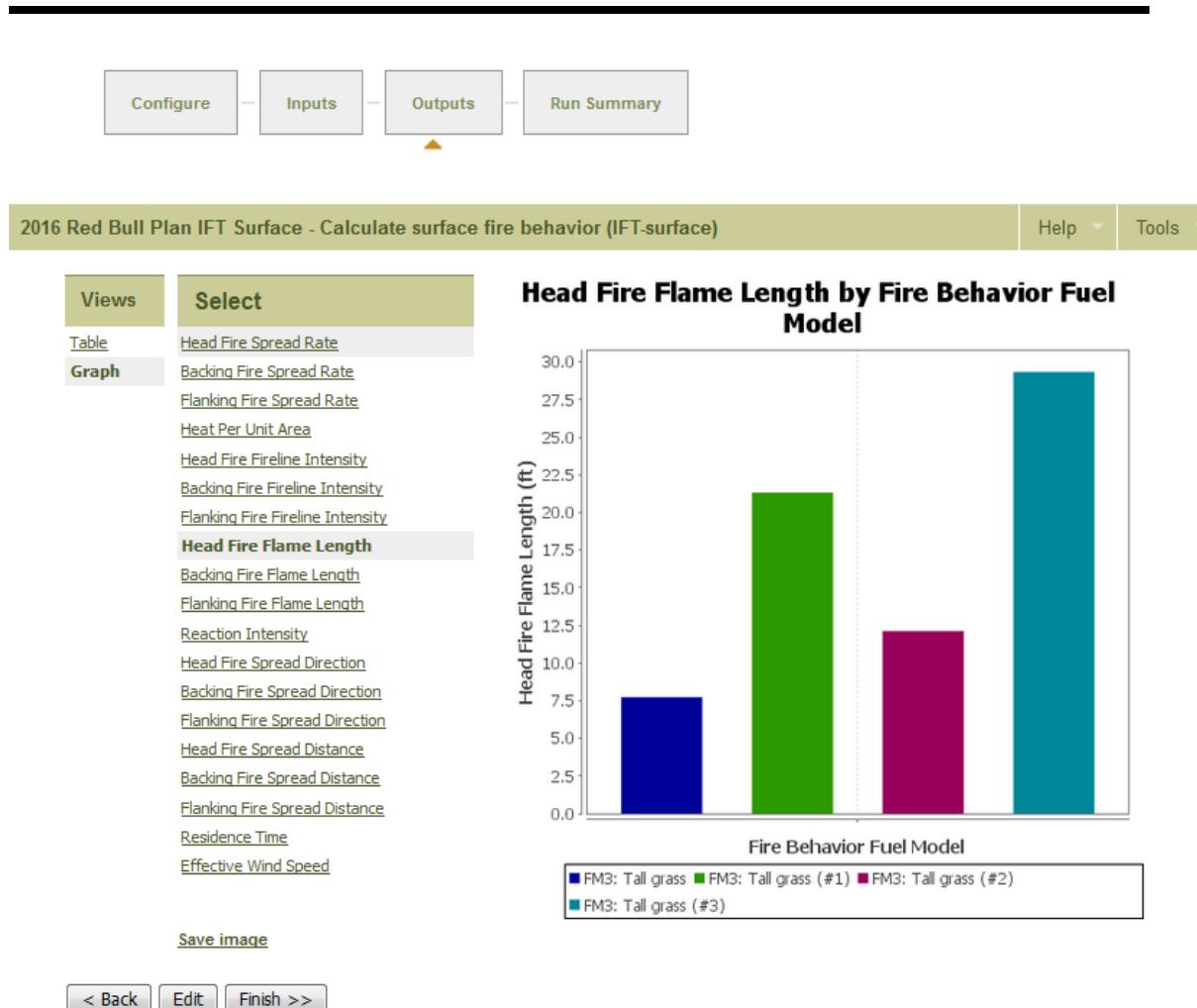
< Back Edit Next >

US Customary Units

Once you have populated your inputs, click **Next** to run IFT-Surface.

IFT-Surface Outputs

The first box on this page is the Mark Simulations box, which will be explained shortly. The second box is the **Outputs** box. Here, you can evaluate your outputs in tabular and graphical form by toggling the **Views** selections to the left of the screen. It is in the tabular display that you can select which, if any, of the 4 Simulations you created get included in the burn plan.



The tabular display is organized by Simulation (along the top), and parameter (vertically on the far left). Notice each parameter is listed for heading, backing, and flanking fires.

Take some time to evaluate outputs by reviewing both the tabular and graphical displays to determine at what point fire behavior will be in excess or too minimal to meet objectives and maintain control.

We will not do it in this example, but you have the option of exporting outputs to a CSV file if desired, by selecting the Export Table option at the bottom of the page above the Save button.



Preparing Outputs for import

Once you have determined which if any of the outputs you would like to use in your plan, scroll back up to the **Mark Simulations** box. This box is used to label outputs so they can be easily located and imported into Element 7 of the burn plan.

If you do not want to use any outputs, you may leave the **Mark Simulations** box blank, and not import any of the data. For this example, we will use the data, and continue working in the Mark Simulations box so these outputs can be imported into the burn plan.

Tip:

Remember, Simulation 1 represents the Low end of the prescription, Simulation 2 represents the High end of the prescription, Simulation 3 represents the Optimal prescription, and Simulation 4 represents the Maximum expected fire behavior.

Use the drop down **Prescription** boxes to select which prescription (1, 2, or 3) and which type of fire behavior prescription level (low, high, optimal, and maximum) you would like to import into your plan. For this scenario, we will be only populating one prescription. This plan does not require more than one prescription as the burn unit is comprised of one primary fuel model.

Note

IFTDSS allows the user to populate up to three fire behavior prescriptions. Multiple prescriptions may be desired if the prescribed burn unit is comprised of multiple fuel models.

Use the drop down **Fire Behavior** boxes to specify the fire behavior for each simulation. Earlier, we determined that Simulation 1, 2, 3, and 4 outputs will represent the Low, High, Optimal, and Maximum prescription levels, respectively. Therefore, populate the drop down boxes as shown below and click **Save**, then **Finish**.

2016 Red Bull Plan IFT Surface - Calculate surface fire behavior (IFT-surface) Help ▾ Tools ▾

Views

Mark simulations for use with Burn Plan (Element 7)

Parameter	Simulation #1	Simulation #2	Simulation #3	Simulation #4
Prescription	Prescription 1 ▾	Prescription 1 ▾	Prescription 1 ▾	Prescription 1 ▾
Fire Behavior	Low Fire Behavior ▾	High Fire Behavior ▾	Optimal Fire Behavior ▾	Maximum Fire Behavior ▾

Outputs

Parameter	Unit	Simulation #1	Simulation #2	Simulation #3	Simulation #4
Head Fire Spread Rate	chains/h	41.63	322.78	101.99	574.16
Backing Fire Spread Rate	chains/h	4.11	5.95	5.61	6.65
Flanking Fire Spread Rate	chains/h	7.48	11.69	10.64	13.14
Heat Per Unit Area	Btu/ft ²	635.18	742.42	688.94	835.12
Head Fire Fireline Intensity	Btu/ft/s	484.76	4,393.37	1,288.23	8,790.60
Backing Fire Fireline Intensity	Btu/ft/s	47.84	81.05	70.88	101.76
Flanking Fire Fireline Intensity	Btu/ft/s	87.09	159.17	134.37	201.18
Head Fire Flame Length	ft	7.74	21.33	12.13	29.34
Backing Fire Flame Length	ft	2.67	3.40	3.19	3.77
Flanking Fire Flame Length	ft	3.51	4.64	4.29	5.16

Note the flame length outputs for the heading, backing, and flanking fires. We will use these to populate the next run.

After clicking **Finish** you will be taken to the **Run Summary** page, which contains downloadable files from the run.

Next, return to the Project Summary page by scrolling down and clicking the **Back to Project Button**.

Showing 1 to 10 of 37 entries

Back to Project

Copy This Run

Creating a New Run to Predict Scorch Height using IFT-Scroch

From the Project Summary page, scroll to the bottom and choose **Create New Run**.

2016 Red Bull Burn Plan

Project Summary

[Help](#)

Information	
Organization Name:	Edit
Project Start Date:	
Project End Date:	
Project Size:	
Treatment Type:	
Project Status:	Planned
Description:	This plan will replace the old Red Bull plan in IFTDSS help with updated interface.
Date Modified:	02/04/2016
Date Created:	01/28/2016

Area of Interest	
	<p>Northeast corner: Latitude: 44.0826251° Longitude: -99.4075507°</p> <p>Southwest corner: Latitude: 44.0486059° Longitude: -99.4603480°</p> <p>Total Area: 3,951.05 Acres 15,989,400 m²</p>
Resolution: 30.0m x 30.0m	
Import Landscape data from LANDFIRE	
Import Fuelbeds from LANDFIRE Upload Landscape Data Set	

Runs					
Run Name	Pathway	Date Modified	Date Created	Actions	
2016 Red Bull Burn Plan	Create a burn plan document	01/28/2016	01/28/2016		
2016 Red Bull Plan IFT Surface	Calculate surface fire behavior (IFT-surface)	02/04/2016	01/28/2016		
Filters:	(all)	(all)	(all)	(all)	
Create New Run					

Prescribed Burn Planning Workflow - Predict Crown Scorch Height

Follow the steps shown in the images, and choose **Predict crown scorch height (IFT-scorch)**.

Choose the type of run you would like to create:

Start ► By IFTDSS Workflows ►

📁 Hazard Analysis

📁 Risk Assessment

📁 Fuels Treatment

📁 **Prescribed Burn Planning**

▶ Compare landscape statistics between saved runs

📁 Probability of Ignition

📁 **Fire Behavior**

📁 Fire Containment

📁 Fire Effects

📁 Historical Fire Weather

▶ Create a burn plan document

▶ Calculate consumption and emissions (IFT-FOFEM)

▶ Calculate fire effects across a landscape (IFT-Consume)

▶ Calculate tree mortality (IFT-FOFEM)

▶ Consume (activity fuelbeds)

▶ Consume (manual loadings, activity fuelbeds)

▶ Consume (manual loadings, natural fuelbeds)

▶ Consume (natural fuelbeds)

▶ **Predict crown scorch height (IFT-scorch)**

Modeling Crown Scorch Height with IFT-Scorch

Setting up simulations in IFT-Scorch

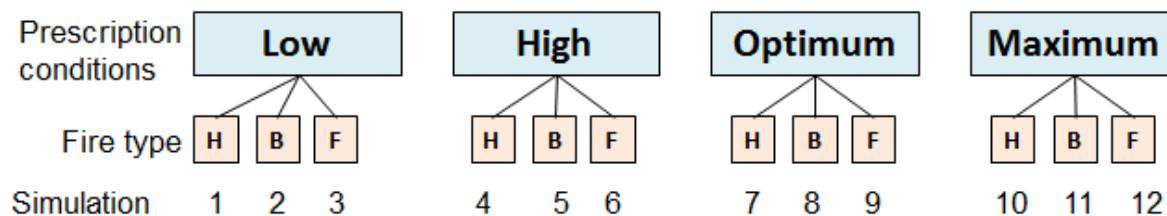
Give your run a descriptive name, in this case we include the four prescription conditions from Element 7 in the name. When this is done, click **Next**.

Create New Run: Predict crown scorch height (IFT-scorch)

Run Name

Next

Next, specify the number of simulations to calculate. For example, if you wanted to simulate crown scorch under low, high, optimum, and maximum prescription condition, and for heading, backing, and flanking fires under each of those conditions, you would specify 12 simulations.



Schorch Height (low, high, opt, max) - Predict crown scorch height (IFT-scorch)

The crown scorch height model estimates scorch height based on surface fire flame lengths. temperature. [Click here](#) for more information about this model.

Number of stands or simulations

Next >

When you are finished, click **Next**.

Populating Input Parameters

Now you are on the Inputs step. Use the midflame windspeed and air temperature from [your prescription parameters](#) to populate those inputs.

Weather	Low Fire Behavior	High	Optimal	Maximum
Temperature	50	80	70	80
Mid-flame wind speed (mi/h)	3	11	5	15

To populate flame length, use the outputs from the Surface fire Behavior Run

Outputs					
Parameter	Unit	Simulation #1	Simulation #2	Simulation #3	Simulation #4
Head Fire Flame Length	ft	7.74	21.33	12.13	29.34
Backing Fire Flame Length	ft	2.67	3.40	3.19	3.77
Flanking Fire Flame Length	ft	3.51	4.64	4.29	5.16

In this run, organize the simulations such that :

- Simulation #1: Low fire behavior (head)
- Simulation #2: Low fire behavior (backing)
- Simulation #3: Low fire behavior (flanking)
- Simulation #4: High fire behavior (head)
- Simulation #5: High fire behavior (backing)
- ...
- Simulation #12: Maximum fire behavior (flanking)

Parameter	Unit	Simulation #1	Simulation #2	Simulation #3	Simulation #4	Simulation #5	Simulation #6
Midflame Wind Speed	mi/h	3.00	3.00	3.00	11.00	11.00	11.00
Air Temperature	Fahrenheit	50.00	50.00	50.00	80.00	80.00	80.00
Flame Length	ft	7.74	2.67	3.51	21.33	3.40	4.64

< Back Edit **Next >** US Customary Units ▾ Change Units

When finished, select **Next**.

Tip

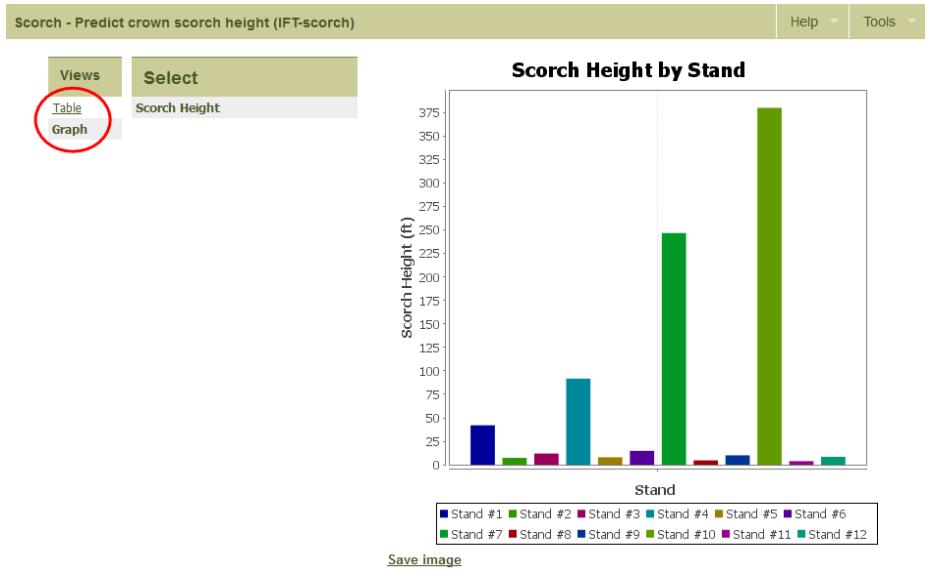
It is important that you remember how you classified each simulation in your IFT-surface run (low, optimal, high, and maximum) and how those simulation outputs translate into inputs for simulations in successive runs.

Viewing Outputs

On the outputs page you can evaluate your outputs in tabular and graphical form. It is in the tabular display that you can select which, if any, of the Simulations (out of the 12 you created on the Configure page) you might want to include in your burn plan. When finished, toggle the **Views** setting back to **Table**.

Note

IFTDSS allows the user to populate up to three fire behavior prescriptions. Multiple prescriptions may be desired if the prescribed burn unit is comprised of multiple fuel models. In this example we are only using one prescription.



Preparing Outputs for import

To prepare the outputs for import into Element 7, make the following specifications within the **Mark Simulations** box. This box is used to label outputs so they can be easily located and imported into Element 7 of the burn plan.

The outputs for each of the 12 simulations in this run represent a different combination of environmental parameters and fire behavior outputs (Temperature, Mid-Flame wind speed, and flame length) that in this case, represent the low, high, optimal, and maximum prescription levels for each of the three fire types of head, flanking, and backing fire. For IFT-schorch, the 12 combinations are organized horizontally and are named by simulation number as described in the input step.

If you recall from your inputs, Simulation 1 represents the Low/Head, Simulation 2 represents low/flanking, Simulation 3 represents low/backing, Simulation 4 represents optimal/head, Simulation 5 represents optimal/flanking, and so on. Ensure each simulation is correctly labeled for this example.

- Simulation 1: Prescription 1, Low Fire Behavior, Head
- Simulation 2: Prescription 1, Low Fire Behavior, Backing
- Simulation 3: Prescription 1, Low Fire Behavior, Flanking
- Simulation 4: Prescription 1, High Fire Behavior, Head
- Simulation 5: Prescription 1, High Fire Behavior, Backing
- Simulation 6: Prescription 1, High Fire Behavior, Flanking
- Simulation 7: Prescription 1, Optimal Fire Behavior, Head

- Simulation 8: Prescription 1, Optimal Fire Behavior, Backing
- Simulation 9: Prescription 1, Optimal Fire Behavior, Flanking
- Simulation 10: Prescription 1, Maximum Fire Behavior, Head
- Simulation 11: Prescription 1, Maximum Fire Behavior, Backing
- Simulation 12: Prescription 1, Maximum Fire Behavior, Flanking

Take some time to evaluate outputs by reviewing both the tabular and graphical displays to determine if scorch heights are at an acceptable limit for each of the 4 fire behavior levels.

When finished, click **Finish**.

Parameter	Unit	Simulation #1	Simulation #2	Simulation #3	Simulation #4	Simulation #5	Simulation #6	Simulation #7
Scorch Height	ft	42.07	7.39	12.00	246.84	4.72	10.10	101.75

[Export Table \(CSV\)](#)

< Back [Save](#) [Finish >>](#) US Customary Units [Change Units](#)

After clicking Finish you will be taken to the Run summary page, which contains downloadable files from the run.

Next, return to the Project Summary page by scrolling down and clicking the **Back to Project Button**.

Showing 1 to 10 of 37 entries

[Back to Project](#)

[Copy This Run](#)

Creating a New Run to Determine Probability of Ignition

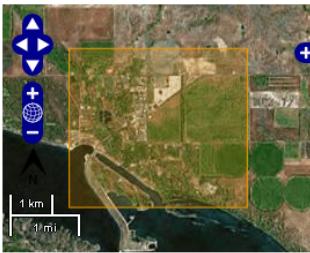
From the Project Summary page, scroll to the bottom and choose **Create New Run**.

2016 Red Bull Burn Plan

Project Summary

[Help](#)

Information	
Organization Name:	Edit
Project Start Date:	
Project End Date:	
Project Size:	
Treatment Type:	
Project Status:	Planned
Description:	This plan will replace the old Red Bull plan in IFTDSS help with updated interface.
Date Modified:	02/04/2016
Date Created:	01/28/2016

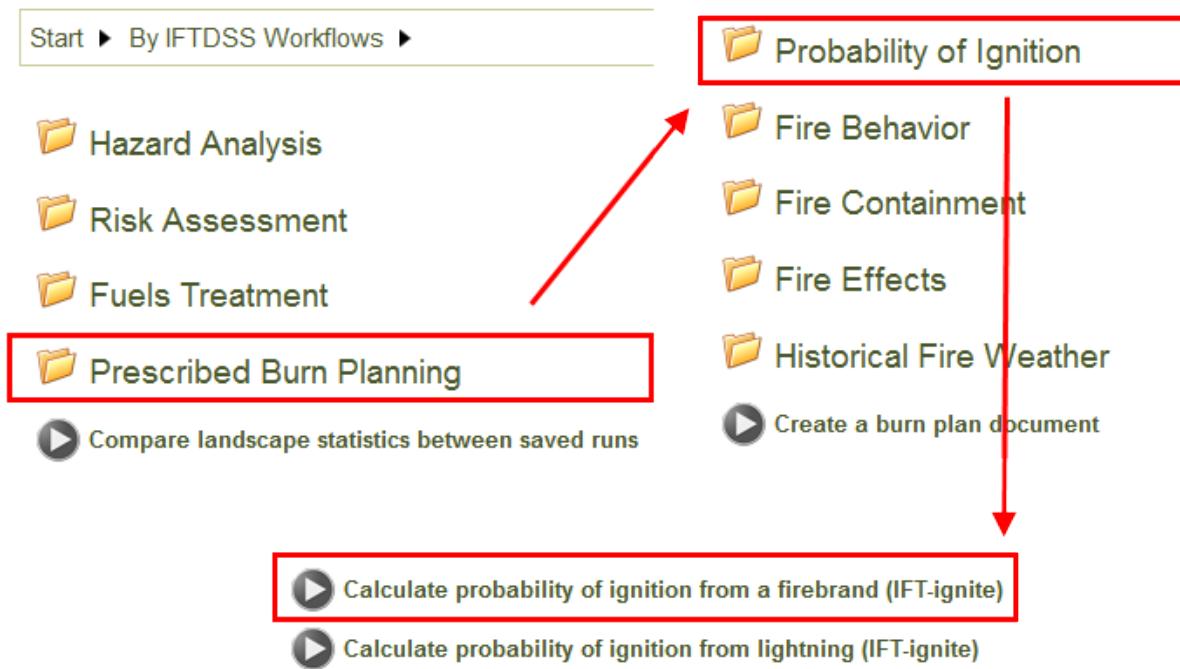
Area of Interest	
	<p>Northeast corner: Latitude: 44.0826251° Longitude: -99.4075507°</p> <p>Southwest corner: Latitude: 44.0486059° Longitude: -99.4603480°</p> <p>Total Area: 3,951.05 Acres 15,989,400 m²</p>
Resolution: 30.0m x 30.0m	
Import Landscape data from LANDFIRE	
Import Fuelbeds from LANDFIRE Upload Landscape Data Set	

Runs					
Run Name	Pathway	Date Modified	Date Created	Actions	
2016 Red Bull Burn Plan	Create a burn plan document	01/28/2016	01/28/2016		
2016 Red Bull Plan IFT Surface	Calculate surface fire behavior (IFT-surface)	02/04/2016	01/28/2016		
Filters:	(all)	(all)	(all)	(all)	
 Create New Run					

[<<Back: Scorch Height Outputs | Next: Creating a Probability of Ignition Run](#)
[Cont.>>](#)

Prescribed Burn Planning Workflow - Probability of Ignition

Follow the steps shown in the images, and choose **Prescribed Burn Planning > Probability of Ignition >** and **Calculate probability of ignition from a firebrand (IFT-ignite)**.



Running the Probability of Ignition Module

Setting up the run

First, give the run a descriptive name and click **Next**.

Create New Run: Calculate probability of ignition from a firebrand (IFT-ignite)

Run Name

Specify the number of simulations to calculate. For this example, specify 4 simulations in order to generate the probability of ignition from low, high, optimal, and maximum prescription conditions. When finished, click **Next**.



Prescription 1 probability of ignition - Calculate probability of ignition from a fire...

The probability of ignition from a firebrand is an indication of the likelihood that a firebrand will ignite given specific environmental conditions. This model uses temperature, fuel shading from the sun, and 1-hour fuel moisture. The model will output the probability of ignition for each condition.

Number of stands or simulations

Populating Environmental Parameters for the Run

To run IFT-ignite you will need to populate the inputs on the Inputs page. Insert data from your [Element 7 Environmental parameters handout](#) into the inputs as shown below.

Weather	Low	High	Optimal	Maximum
Temperature	50	80	70	80
Fuel shading from sun (%)	100	0	0	0
1 hour fuel moisture (%)	14	6	8	4

In this scenario you are populating Simulation 1 to represent the low end of the prescription, Simulation 2 to represent the highest acceptable fire behavior allowed, Simulation 3 to represent optimal fire behavior required to meet objectives, and Simulation 4 to represent maximum fire behavior, or fire behavior expected if fire leaves the burn unit.

Parameter	Unit	Simulation #1	Simulation #2	Simulation #3	Simulation #4
1-hr Moisture	percent	14	6	8	4

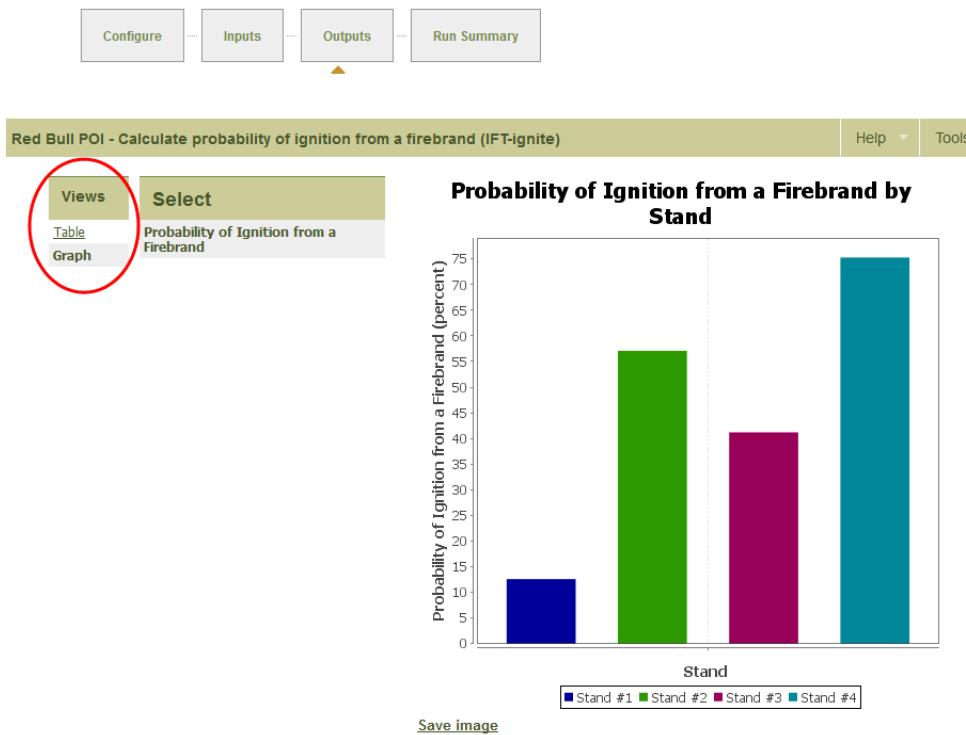
Parameter	Unit	Simulation #1	Simulation #2	Simulation #3	Simulation #4
Air Temperature	Fahrenheit	50	80	70	80
Fuel Shading from Sun	percent	100	0	0	0

Once finished, click **Next**.

Run Outputs

On the outputs page you can evaluate your outputs in tabular and graphical form by toggling the **Views** option on the left of the screen. The example below depicts the graphical view.

Take some time to evaluate outputs by reviewing both the tabular and graphical displays to determine if probability of ignition outputs are at an acceptable limit for each of the 4 fire behavior levels.



Once you have determined which, if any of the outputs you would like to use in your burn plan, toggle to the table view, and go to the **Mark Simulations** box to label each simulation for import into Element 7. If you recall from your inputs, Simulation 1 represents the Low, Simulation 2 represents High, Simulation 3 represents Optimal, and Simulation 4 represents Maximum.

Red Bull POI - Calculate probability of ignition from a firebrand (IFT-ignite)

Help Tools

Views

Table

Graph

Mark simulations for use with Burn Plan (Element 7)

Parameter	Simulation #1	Simulation #2	Simulation #3	Simulation #4
Prescription	Prescription 1	Prescription 1	Prescription 1	Prescription 1

Parameter	Unit	Simulation #1	Simulation #2	Simulation #3	Simulation #4
Probability of Ignition from a Firebrand	percent	13	57	41	75

Export Table (CSV)

< Back Save Finish >> US Customary Units Change Units

Once this is complete, select **Finish** to proceed to the **Run Summary** page, which contains downloadable files from the run. Return to the **Project Summary** page by scrolling to the bottom of the screen and clicking **Back to Project**.

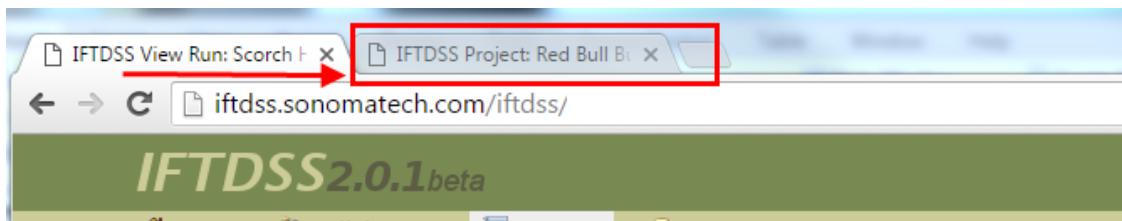
Showing 1 to 10 of 37 entries

[Back to Project](#) [Copy This Run](#)

[**<< Back Probability of Ignition Workflow:**](#) | [**Next: Return to Burn Plan Element 7 >>**](#)

Environmental and Fire Behavior Prescription (Element 7)

Now that the information in your new runs is completed, click on your browser tab for Element 7 of the burn plan, which you left open when you created a new run. You may have to refresh the page. Once back on Element 7 of the burn plan, you may close the other tab in your browser.



There are two methods to enter data into Element 7. This first is to manually copy and paste data from run summaries, or CSV files exported from runs. The second method, described below, is to import the data within IFTDSS. We will use the second method to import data from the runs we just completed.

Under the **Import Data** section, the pathways and runs that you tagged on the output steps will be visible in the drop downs.

2016 Red Bull Burn Plan - Create a burn plan document

The prescription is the measurable criteria during which a prescribed fire may be ignited to meet the prescribed burn objectives. It describes a range of low-to-high limits for the environmental and/or fire behavior parameters required to meet the objectives (pp. 28-29).

Import Data

Select a run and a value for each of the 3 labels, then click "Import Data" to import data tagged with that category. Note that the Fire Type selection will be ignored for some imports.

From Pathway: Calculate probability of ignition from a firebrand (IFT-ignite) ▾
From Run: Calculate surface fire behavior (IFT-surface)
Predict crown scorch height (IFT-scorch)
From Labels: Calculate probability of ignition from a firebrand (IFT-ignite)

Check the **Import environmental conditions from this simulation** box and choose **Import Data**. Continue to select each fire behavior category (low, high, optimal, and maximum) and then click **Import Data** for each category.

Import Data

Select a run and a value for each of the 3 labels, then click "Import Data" to import data tagged with that combination of labels from the selected run. Note that the Fire Type selection will be ignored for some imports.

From Pathway: Predict crown scorch height (IFT-scorch) ▾

From Run: Scorch ▾

From Labels:

Prescription Number Prescription 1 ▾

Fire Behavior Low Fire Behavior ▾

Fire Type Head ▾

Import environmental conditions from this simulation

Replace existing values

Import Data

Note

for any IFT-Surface run, you can disregard the "Fire Type" drop down, because IFT-Surface calculates head, backing, and flanking fire outputs, and all three of these fire types will be imported into Element 7 regardless of the fire type selected in the drop down.

After each data import, a green box will show you the parameters that were populated into Element 7.

- Imported data into 22 fields:
Set Fire Behavior Fuel Model to FM3: Tall grass in Prescription 1, Low Fire Behavior
Set Head Fire Flame Length to 7.74 in Prescription 1, Low Fire Behavior, Head
Set Backing Fire Flame Length to 2.67 in Prescription 1, Low Fire Behavior, Backing
Set Flanking Fire Flame Length to 3.51 in Prescription 1, Low Fire Behavior, Flanking
Set Head Fire Spread Rate to 41.63 in Prescription 1, Low Fire Behavior, Head
Set Backing Fire Spread Rate to 4.11 in Prescription 1, Low Fire Behavior, Backing
Set Flanking Fire Spread Rate to 7.48 in Prescription 1, Low Fire Behavior, Flanking
Set Head Fire Fireline Intensity to 484.76 in Prescription 1, Low Fire Behavior, Head
Set Backing Fire Fireline Intensity to 47.84 in Prescription 1, Low Fire Behavior, Backing
Set Flanking Fire Fireline Intensity to 87.09 in Prescription 1, Low Fire Behavior, Flanking
Set Reaction Intensity to 2,481.15 in Prescription 1, Low Fire Behavior
Set Heat Per Unit Area to 635.18 in Prescription 1, Low Fire Behavior
Set Midflame Wind Speed to 3.00 in Environmental Prescription, Low Fire Behavior
Set Wind Direction (from North) to 290 in Environmental Prescription, Low Fire Behavior
Set Wind Direction (from North) to 290 in Environmental Prescription, Low Fire Behavior
Set Aspect to 180 in Environmental Prescription, Low Fire Behavior
Set Slope to 5 in Environmental Prescription, Low Fire Behavior
Set 1-hr Fuel Moisture to 14 in Environmental Prescription, Low Fire Behavior
Set 10-hr Fuel Moisture to 16 in Environmental Prescription, Low Fire Behavior
Set 100-hr Fuel Moisture to 20 in Environmental Prescription, Low Fire Behavior
Set Live Woody Fuel Moisture to 180 in Environmental Prescription, Low Fire Behavior
Set Live Herbaceous Fuel Moisture to 100 in Environmental Prescription, Low Fire Behavior



After you are done importing all of the data from your IFT-surface run, scroll down to review the populated environmental and fire behavior prescription.

Prescription - Environmental

	Low Fire Behavior (within unit)	High Fire Behavior (within unit)	Optimal Fire Behavior (within unit)	Maximum Fire Behavior (outside unit)
Temperature (F)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Relative Humidity (%)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Mid-flame wind speed (mi/h)	3.00	11.00	5.00	15.00
Mid-flame wind direction (deg)	290	290	290	290
20-ft wind speed (mi/h)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
20-ft wind direction (deg)	290	290	290	290
Cloud cover (%)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Fuel shading (%)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Aspect (deg)	180	180	180	180
Slope (%)	5	5	5	40
1-hr fuel moisture (%)	14	6	8	4
10-hr fuel moisture (%)	16	8	10	6
100-hr fuel moisture (%)	20	12	14	8
1000-hr sound fuel moisture (%)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Next, we will import data from the IFT-scorch run.

Select the pathway **Predict crown scorch height (IFT-Scorch)**. First, populate Prescription 1, low Fire behavior, Head. Click **Import**.

Import Data

Select a run and a value for each of the 3 labels, then click "Import Data" to import data tagged with that combination of labels from the selected run. Note that the Fire Type selection will be ignored for some imports.

From Pathway: Predict crown scorch height (IFT-scorch) ▾

From Run: Prescription 1 scorch ▾

From Labels:

Prescription Number Prescription 1 ▾

Fire Behavior Low Fire Behavior ▾

Fire Type Head ▾

Import environmental conditions from this simulation

Replace existing values

Import Data

Repeat this process for Backing and Flanking Fire behavior, then change the Fire Behavior to high, and import the data for each Fire Type under that behavior (head, backing, and flanking). Do the same for optimal and maximum Fire Behaviors until all 12 combinations of Fire Behavior and Fire Type have been entered.

Next, import the data from IFT-ignite for low, high, optimum, and maximum fire behaviors.

When finished, click **Next** to save your imports and advance to the next burn plan element.

Note

For burn units dominated by more than one fuel model, create multiple runs with descriptive names.

Note

There are multiple Fire Behavior Prescriptions in the burn plan for extra fuel models.

Modeling Considerations

Models are based on simplified assumptions, such as uniform fuel and steady-state fire spread.

Rather than basing your burn plan prescription solely on modeling, the USDA and U.S. DOI (2014) allows for the use of empirical evidence (historical evidence or researched data) and judgment. These can be used to identify or corroborate prescriptions.

Weaknesses in modeling can be overridden, but must be justified with empirical evidence and/or verified actual fire behavior.

(USDA and U.S. DOI, 2014, p. 28)

Scheduling; Pre-burn Considerations and Weather; Briefing (Elements 8, 9, and 10)

Scheduling

Identify the general ignition time frame(s) (i.e., time of day, duration of ignition) or season(s) and note any dates on which the project may not be conducted.

Pre-burn Considerations and Weather

Describe the onsite and offsite actions to be conducted and considerations to be addressed prior to implementation. Describe any fuel sampling and weather data that may need to be obtained.

The plan will include a list of organizations and individuals that are notified prior to ignition, with contact information for each organization and individual.

Briefing

All assigned personnel must be briefed at the beginning of each operational period to ensure personnel safety.

Prescribed fire objectives and operations must be clearly defined and understood.

The briefing checklist should list briefing topics only, not re-state what is listed in the Prescribed Fire Plan for that element.

The Prescribed Fire Burn Boss is to ensure that any new personnel arriving at the prescribed fire site receives a briefing prior to assignment.

(USDA and U.S. DOI, 2014, pp. 29-31)

Organization and Equipment; Communication; Safety and Medical (Elements 11, 12 and 13)

Organization and Equipment

Specify the minimum required implementation organization needed to meet the capabilities (line production rates, etc.) by position, equipment, and the supplies needed for all phases of the prescribed fire until the fire is declared out.

Communication

Develop a communications plan specific to the project's implementation to address safety and tactical resource management needs.

Public and Personnel Safety, Medical

Describe provisions to be made for public and personnel safety. Identify and analyze the safety hazards unique to the individual prescribed fire project and specify personnel safety and emergency procedures.

Identify and analyze the safety hazards unique to the individual prescribed fire project and specify personnel safety and emergency procedures.

(USDA and U.S. DOI, 2014, pp. 31-32)

Test Fire and Ignition Plan (Elements 14 and 15)

Test Fire

Provisions for a test fire are required and results must be recorded. The test fire must be ignited in a representative location and in an area that can be easily controlled.

The purpose of the test fire is to verify that the prescribed fire behavior characteristics will meet management objectives, and to verify predicted smoke dispersion.

The screenshot shows a software application window titled "Run 1 - Create a burn plan document". At the top, there is a navigation bar with buttons for "and Personnel Safety, Medical", "Element 14: Test Fire" (which is highlighted in green), "Element 15: Ignition Plan", "Element 16: Holding Plan", and "Element 17: Smoke Dispersion". Below the navigation bar is a toolbar with "Help" and "Tools" dropdown menus. The main content area contains several text input fields and sections. One section, "Planned Locations and Specific Instructions", contains a rich text editor with the following content:

This prescribed fire unit may be divided into five ignition phases with ignition sequence to be determined by the Burn Boss, depending on site weather conditions during implementation. See Appendix A-Ignition/Holding Maps, Phase(s) 1-5 for a sample ignition plan, given north to northwest winds. Planned location: A test burn will be conducted for each ignition phase. For the example in Appendix A and assuming a north to northwest wind, the test burns will be ignited in the southeast corner of each

Below this are sections for "Weather Conditions On Site", "Test Fire Results", and "Comments", each with a text input field.

Ignition Plan

Describe planned ignition operations.

Maps showing proposed firing patterns may be included.

Multiple prescriptions and ignition operations may require identifying and developing multiple ignition organizations.

◀ Element 13: Public and Personnel Safety, Medical ⋯ Element 14: Test Fire ⋯ Element 15: Ignition Plan ⋯ Element 16: Holding Plan ▶

Run 1 - Create a burn plan document Help Tools

Describe planned ignition operations. Maps showing proposed firing patterns may be included ([IPFPIPG](#), 2014, p. 33).

Firing Methods (including techniques, sequences, and patterns)

Firing Boss. Techniques: On the flat areas of the burn, and depending on fire behavior of the backing fires, multiple strips may be lit, across slope and uphill, with spacing to be determined by the Burn/Firing Boss, in order to ensure a wide black line on the leeward side of the phased units. If

Devices

Handheld drip torches

Minimum Ignition Staffing

Three igniters under the direct supervision of the Firing Boss, unless otherwise directed by the Burn/Firing Boss. Most phases only require two igniters, so igniters will rotate as directed by the Firing Boss.

(USDA and U.S. DOI, 2014, p.33)

Holding and Contingency Plans (Elements 16 and 17)

Holding and contingency plans must be developed with the consideration of the predicted fire behavior outside the project boundary(s).

Holding Plan: describes general procedures to be used for operations to maintain the fire within the project area and meet the project objectives until the fire is declared out (USDA and U.S. DOI, 2014, p. 34).

Describe general procedures to be used for operations to maintain the fire within the project area and meet project objectives until the fire is declared out. This may include mop-up and/or patrol procedures. Describe critical holding points (if any) and mitigation actions (IPFPIPG, 2014, p. 34).

General Procedures for Holding

~~Holding Procedures: A lookout will be designated and positioned in an area that allows for good viewing of the area outside of the project boundary. All holding personnel will monitor areas outside of the project boundary as able.~~

~~Engines will be assigned to coordinate with igniters. Holding resources will be stationed near the structures and other specific locations based on their capabilities and considering wind direction, fuel loading, fire behavior and weather factors. Slopovers and spot fires will need to be attacked quickly (to minimize fire spread and fire establishment into a running head fire) and will generally be attacked along the flanks, anchoring from the back, unless otherwise directed by the Holding Specialist. If a slopover or spot fires begin to overwhelm the holding~~

Critical Holding Points and Actions

~~Potential Holding Problems and Strategy to Handle: The heavily vegetated and debris filled draws (Fuel Model 9 areas adjacent to east and west ignition unit boundaries) that run north to south from the flat towards the Missouri River present the most potential for holding problems. The other potential problems are with the structures within and adjacent to the burn unit. These potential holding problem areas will be handled by close coordination between ignition and holding personnel. Holding engines will be stationed near the structures and draws in the event that fire behavior or spotting becomes a concern. (see Holding Map)~~

~~Protection of Sensitive Features (see Holding Map and Element 9, Pre-Burn Considerations for additional information). All features will be protected including houses, buildings, other structural improvements, power~~

Minimum Organization or Capabilities Needed

~~Holding:
1 Single Resource Boss (preferably Engine Boss) + 6 Holding Personnel
1 Type 4 Engine & 4 Type 6 Engines, minimum of 2 & 1 personnel/engine respectively
1 Type 4 Tender~~

~~Mop-up:
1 FFT1 + Holding Personnel as assigned by Burn Boss
Engines as specified by the Burn Boss~~

Contingency Plan: considers the possible but unlikely events and the actions needed to mitigate those events (USDA and U.S. DOI, 2014, p. 34).

Fire behavior characteristics for fuel models within the maximum spotting distance and/or adjacent to the project boundaries must be considered and modeled.

These predictions must be modeled using the:

- Hottest, driest, windiest prescription limits
- Most extreme environmental conditions (slope, aspect)

Designator and Description
Fire Behavior
Condition
Fire behavior is outside acceptable range as detailed in Element 7. Spot fires exceed capabilities of onsite resources.
Management Intent
Manage prescribed burn within allowable prescription parameters as outlined in Element 7 in order to meet resource objectives and maintain control of the prescribed burn. Control spot fires within 12 hours
Recommended Action(s) to Consider
Consider stopping ignition until fire spread outside of the unit is controlled. Consider contacting law enforcement if evacuations are possible. Consider ordering contingency resources.
Recommended Resources
Type 6 Engines - 2, with a half hour maximum response time Type 4 Engine - 1, with a half hour maximum response time Tractor with Plow - 1, with a one hour maximum response time Availability of the above
Time Frame
Engines-half hour or less
Description of Consequences of Not Taking Action(s)
Fire could threaten adjacent WUI. Holding problems could escalate.
Responsibility
Burn Boss/Agency Administrator

Date Each Action Is Initiated

(USDA and U.S. DOI, 2014, p. 34)

Note

IFTDSS Tutorial B: How to Use Hazard Analysis Tools in IFTDSS for Prescribed Fire Planning demonstrates how to use a fire behavior module to determine areas of concern inside and outside the burn unit.

Wildfire Conversion, Smoke Management and Air Quality (Elements 18 and 19)

A prescribed fire must be declared a wildfire by those identified in the burn plan when that person(s) determines that the contingency actions have failed or are likely to fail and cannot be mitigated by the end of the next burning period.

Describe the actions to be taken when a prescribed fire is declared a wildfire. This description is to include

- Wildfire declaration
- IC assignment
- Notifications

Wildfire Will Be Declared by (i.e., who has the authority to declare?)

Burn Boss after consulting with Agency Administrator if time allows

Incident Commander (IC) Assignment

Burn Boss will become the initial attack IC. If the wildfire exceeds their qualifications/comfort level, a qualified IC will be ordered

Notifications

Burn Boss will notify the local dispatch, the FMO, and the superintendent of the wildfire declaration. Burn Boss will also have the local dispatch notify the North Great Plains Dispatch, Tribal Law Enforcement, and County Law Enforcement.

Extended Attack Actions and Opportunities to Aid in Fire Suppression

The IC will order needed resources thru the local Dispatch. Tribal/County Law Enforcement personnel will be used for traffic control along the BIA #4 road and others as necessary. They will also be used to notify adjacent landowners of the wildfire situation, impending suppression actions and the potential need for evacuation. A Wildland Fire Situation Analysis must be prepared by the FMO or designee if the declared wildfire goes beyond initial attack or if complexities require extended attack operations and organizations. The same two contingency lines identified in element 17B can be used as opportunities to aid in the suppression of the declared wildfire.

Smoke Management and Air Quality

Described how the project will comply with local community, county, state, tribal, and federal air quality regulations.

Identify what permits, if any, need to be obtained.

Identify smoke sensitive receptors and potentially impacted areas (population centers, recreation areas, hospitals, airports, schools, etc.).

Include modeling outputs and mitigation strategies and techniques to reduce the impacts of smoke production.

Compliance and Permits Needed

Compliance: The BIA Crow Creek Agency Fire Management has directed that smoke management for this burn is not a concern. The people of the community are more concerned about removing hazardous fuels from near their homes and property than the short-term effects of smoke. Burn Boss or designee will coordinate this prescribed burn with South Dakota Air Quality (605-773-6706/3151) by notifying them at least one day in advance of the start of ignition operations.

Smoke-Sensitive Receptors

None

Smoke-sensitive receptors can be population centers, recreation areas, hospitals, airports, transportation corridors, schools, nonattainment areas, Class I areas, and restricted areas.

Potentially Impacted Areas

The burn area is approximately .3 miles east of Gingway housing and approximately .2 miles west of East Housing. Some portions of the unit are adjacent to resident properties and three structures are within the burn unit. BIA 4 (a paved highway) borders the unit on the north side and BIA 18 runs north to south and intersects BIA 4 near the center of the north side of the unit.

Mitigation Strategies and Techniques for Reducing Smoke Impacts

Any direction for the transport winds is allowed. Place smoke signs and provide road monitors/traffic controllers if wind direction causes smoke to lie over the local roads, as directed by the Burn Boss (see Appendix A-Holding Map for proposed locations of traffic signs with "Smoke Ahead").

Smoke is anticipated to dissipate very quickly minimizing any impacts to adjacent housing. No residual smoke impacts are anticipated due to the rapid burn out of this grass fuel model. Any smoke impacts that may occur can be mitigated fairly quickly by cutting off ignition operations. See Appendix A-Smoke Vectors Map.

(USDA and U.S. DOI, 2014, pp. 36)

Tip:

For more information on smoke management, visit the [National Inter-agency Fire Center](#) website or [BlueSky Playground](#)

Monitoring and Post-burn Activity (Elements 20 and 21)

Monitoring

Describe the monitoring that will be required to ensure that Prescribed Fire Plan objectives are met.

For the prescribed fire, at a minimum, specify the weather (forecast and observed), fire behavior and fuels information, and smoke dispersal monitoring required during all phases of the project and the procedures for acquiring this information (including who and when).

Data tables will appear in the generated word document for tracking and monitoring information for the burn.

Required Fuels Information and Procedures

Fuel moisture will be documented for at least five days prior to commencing ignition operations, and until ignition operations are completed.

A Pre-Burn Conditions data table will appear in the generated burn plan document to provide a space for measurements to be recorded.

Weather Monitoring

General weather forecasts will be monitored for at least five days prior to operations. Site weather conditions will be documented, as specified in the above and below tables and for specified time frames. Spot weather request data and forecasts will also be in the prescribed fire project file.

Required Fire Behavior Monitoring and Procedures

The below data must be collected for all days of ignition.

A Fire Behavior Monitoring data table will appear in the generated burn plan document to provide a space for conditions to be recorded.

Required Monitoring to Ensure Prescribed Fire Plan Objectives are Met

Fire effects/objective accomplishments will be documented with pre- and post-burn photos of the monitoring plots with an attached narrative discussing post objective estimates.

Required Smoke Dispersal Monitoring and Procedures

Smoke dispersal and transport will be monitored by the FEMO and Burn Boss during burn operations for compliance.

A Smoke Dispersal Monitoring data table will appear in the generated burn plan document to provide a space for conditions to be recorded.

Post-burn Activity

Describe the post-burn activities that must be completed.

These activities include

- The post-burn report
- Safety mitigation measures
- Rehabilitation needs

Describe the post-burn activities that must be completed, including the person responsible for completing them and the timeframe for completion. Post-burn activities may include preparing a post-burn report, finalizing the project file, implementing safety mitigation measures, close-out of applicable pre-burn considerations, close-out of NEPA mitigation, and rehabilitation needs (USFS/DOE, 2014, p. 37).

Post-Burn Activities that Must Be Completed		
Post-Burn Activity	Who is Responsible	Timeframe
Report Acres Burned	ZFMO	Within 30 days of complete
Compile Burn Document	Burn Boss	Within 5 days of complete
Estimate Implementation	Burn Boss	Within 5 days of complete

Note

There are other burn activities that can be required and it is up to the burn preparer to determine those, list them and add who is responsible to each as well as the timeframe.

(USDA and U.S. DOI, 2014, p. 37)

Appendices

The following **Appendices** are created once the Burn Plan is generated and exported into a Microsoft Word document:

- A. Maps
- B. Technical review checklist
- C. Complexity analysis
- D. Agency-specific job hazard analysis
- E. Fire behavior modeling documentation and/or empirical documentation
- F. Smoke Management Plan and Smoke Modeling Documentation (optional)



Run 1 - Create a burn plan document Help ▾ Tools

The following appendices will be created once the burn plan is generated into a Microsoft Word document:

- A. Maps
- B. Technical Reviewer Checklist
- C. Complexity Analysis
- D. Agency-Specific Job Hazard Analysis or Risk Assessment
- E. Fire Behavior Modeling Documentation or Empirical Documentation
- F. Smoke Management Plan and Smoke Modeling Documentation (Optional)



< Back Finish >>

(USDA and U.S. DOI, 2014, p. 38)

Generating the Burn Plan

At the bottom of **any** Burn Plan page, choose **Generate Burn Plan**, then open the document with Microsoft Word.



[**< Back**](#) [**Save**](#) [**Next >**](#)

Customizing the Burn Plan

After downloading the burn plan into a Microsoft Word document, you can easily customize the burn plan.

You can fill out Elements in the online burn plan template located within the IFTDSS website, and/or after generating the burn plan into a Word document.

For an example of a generated and customized Red Bull burn plan, navigate here in the IFTDSS online help: **Prescribed Burn Planning > Tutorials > RedBull RX-341 Burn Plan**.

Note

The online burn plan template has a 6,000-character limit per text box.

If you need more characters, generate the burn plan into a Word document (which has no character limit), and continue editing.

Burn Plan Template in IFTDSS

◀ Element 5: Objectives ▶ Element 6: Funding ▶ Element 7: Prescription ▶ Element 8: Scheduling ▶ Element 9: Pre- ▶

Model Information

Red Bull Burn Plan. - Create a burn plan document Help Tools

Describe in clear, concise statements the specific measurable resource and fire objectives for this prescribed fire. Objectives will be measurable and quantifiable so prescription elements can be developed to meet those objectives and the success of the project can be determined following implementation (IPFRG, 2008, p. 21).

Resource Objectives

Reduce the risk of future wildland urban interface fire from destroying homes/structures or other special features

Prescribed Fire Objectives

Burn at least 90% of the target area
Reduce the fine dead herbaceous fuel loading by 90% or more immediately following the completion of ignition .ai

 [Generate Burn Plan](#)

< Back Next >

Generated Word Document

Element 5: Objectives	
Element 5: Objectives	Project Name: Crow Creek
	Burn Unit Name: Red Bull
Specific, Measurable, and Attainable Resource and Fire Objectives	
Resource Objectives	
Reduce the risk of future wildland urban interface fire from destroying homes/structures or other special features.	
Fire Objectives	
a. Burn at least 90% of the target area. b. Reduce the fine dead herbaceous fuel loading by 90% or more immediately following the completion of ignition.	

Appendix A: Maps

Map Requirements

At a minimum, the plan will include a **vicinity** and **project map**.

The number of maps, map size and scale, legend, and level of detail should be appropriate for the complexity of the project.

All maps will include the following standard map elements

- Title
- Name of Preparer(s)
- Date
- North Arrow
- Scale
- Legend

(USDA and U.S. DOI, 2014, p. 27)

Vicinity Map

Map scale will be such that the burn units can be located on the ground and in sufficient detail to guide implementation.

Project Map

Identifies features in sufficient detail to guide and assist in operational implementation of the prescribed fire.

Note

In the generated burn plan, maps are located in Appendix A. The process of how to save a map image to your local computer and how to edit a map in the generated Burn Plan are discussed in the following pages.

Appendix A: Maps con't

The following pages show how to

- Open Data Studio to view your Project Area.
- Add the burn unit polygon to the map
- Save a map image to your local computer.
- Paste a map into the generated burn plan in Microsoft Word.

These steps assume LANDFIRE data has already been acquired earlier in this tutorial. However, if you have not already downloaded it, instructions on how to [acquire LANDFIRE data](#) are available.

For step-by-step instructions on how to export maps to Google Earth for advanced editing, please see [Exporting Maps to Google Earth](#).

Appendix A: Maps (2)

Navigate back to your Red Bull **Project Summary** page. To do so, you can either

- A. Click on the **Red Bull** link at the top left of the page, or
- B. Access the **Projects** tab and navigate to your project (in this example, **Red Bull**).

The screenshot shows a software interface with a navigation bar at the top. The 'Projects' tab is highlighted with a red circle. Below the navigation bar, a breadcrumb trail shows 'Red Bull » Red Bull - Create a burn plan document'. A horizontal navigation bar below the breadcrumb trail includes links for 'Management and Air Quality', 'Element 20: Monitoring', 'Element 21: Post-Burn Activities', and 'Appendices'. The 'Appendices' link is also circled in red. The main content area has a title 'Red Bull - Create a burn plan document' with a red circle around it. Below the title, text states: 'The following appendices will be created once the burn plan is generated into a Microsoft Word document:' followed by a list of six items: A. Maps, B. Technical Reviewer Checklist, C. Complexity Analysis, D. Agency-Specific Job Hazard Analysis or Risk Assessment, E. Fire Behavior Modeling Documentation or Empirical Documentation, and F. Smoke Management Plan and Smoke Modeling Documentation (Optional).

The following appendices will be created once the burn plan is generated into a Microsoft Word document:

- A. Maps
- B. Technical Reviewer Checklist
- C. Complexity Analysis
- D. Agency-Specific Job Hazard Analysis or Risk Assessment
- E. Fire Behavior Modeling Documentation or Empirical Documentation
- F. Smoke Management Plan and Smoke Modeling Documentation (Optional)

Appendix A: Maps (3)

At the bottom of the **Project Summary** page, under the **Project Data** section, click the gear icon and select **Edit**.

The **Data Studio** window appears.

Project Summary

[Help](#)

Information	
Organization Name:	Edit
Project Start Date:	
Project End Date:	
Project Size:	
Treatment Type:	
Project Status: Planned	
Description: This plan will replace the old Red Bull plan in IFTDSS help with updated interface.	
Date Modified: 01/28/2016	
Date Created: 01/28/2016	

Area of Interest	
 Northeast corner: Latitude: 44.0826251° Longitude: -99.4075507° Southwest corner: Latitude: 44.0486059° Longitude: -99.4603480° Resolution: 30.0m x 30.0m	Total Area: 3,951.05 Acres 15,989,400 m ²

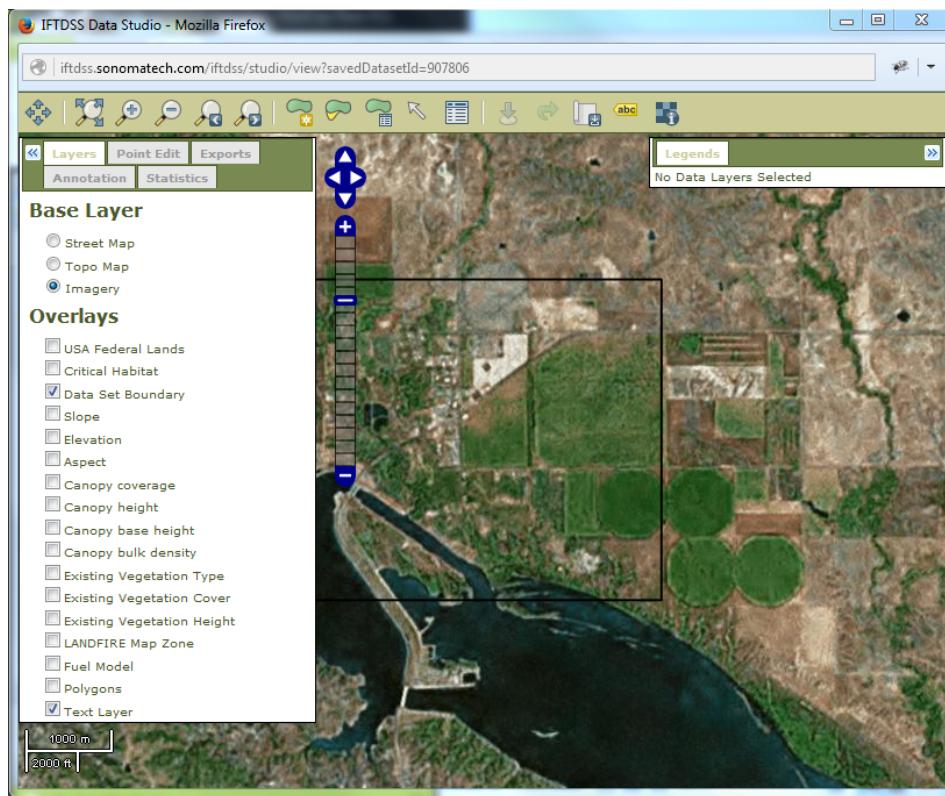
[Import Landscape data from LANDFIRE](#) [Import Fuelbeds from LANDFIRE](#) [Upload Landscape Data Set](#)

Runs					
Run Name	Pathway	Date Modified	Date Created	Actions	
2016 Red Bull Burn Plan	Create a burn plan document	01/28/2016	01/28/2016	Edit	

Project Data Sets						
Data Set Name	Data Type	Date Modified	Date Created	Status	Actions	Export Status
2016 Red Bull Bu...	IFT-LANDFIRE LCP	02/02/2016	01/28/2016	Ready	Edit	Started

  PROTECTING COMMUNITIES & ENVIRONMENTS
Fuel Management Committee

[Edit](#) [Copy](#) [Rename](#) [Delete](#) [Download](#)



Note

Pop-up blockers must be disabled in order to open Data Studio.

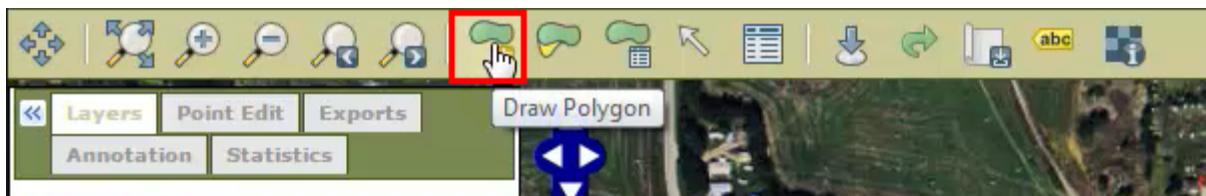
Appendix A: Maps (Drawing polygons and saving map images)

In Data Studio, you can save an image of your project area and the surrounding area for your Vicinity Map. We will draw the burn unit polygon (below).

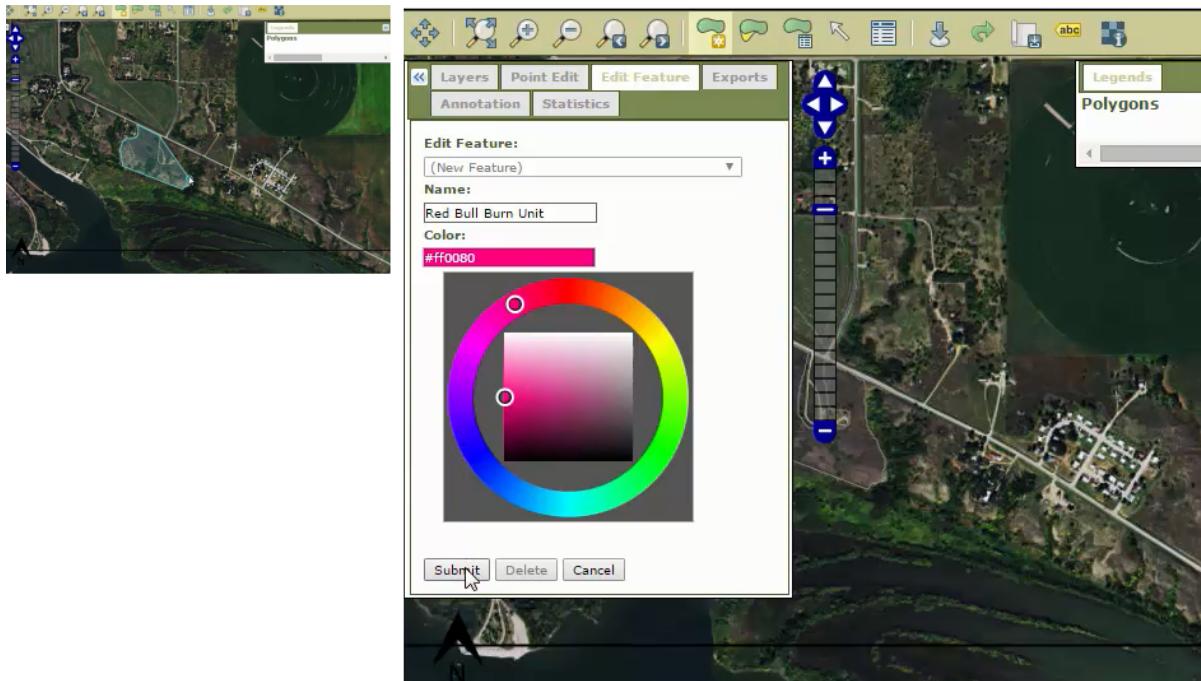


In the next steps, the **Draw Polygon**, **Map Annotation**, and **Save Map Image** buttons on the Mapping Toolbar are used. (See the [Mapping Toolbar page](#) to see a description of all the Map Toolbar buttons). The next steps will not require you to make changes to the map legend. If you are interested in working with map legends, see the [Edit Map Legends page](#).

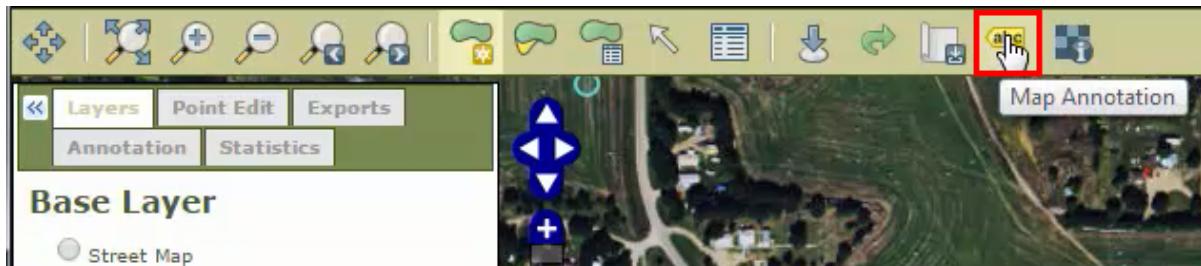
To begin drawing the burn polygon, select the **Draw Polygon** tool in the mapping toolbar.



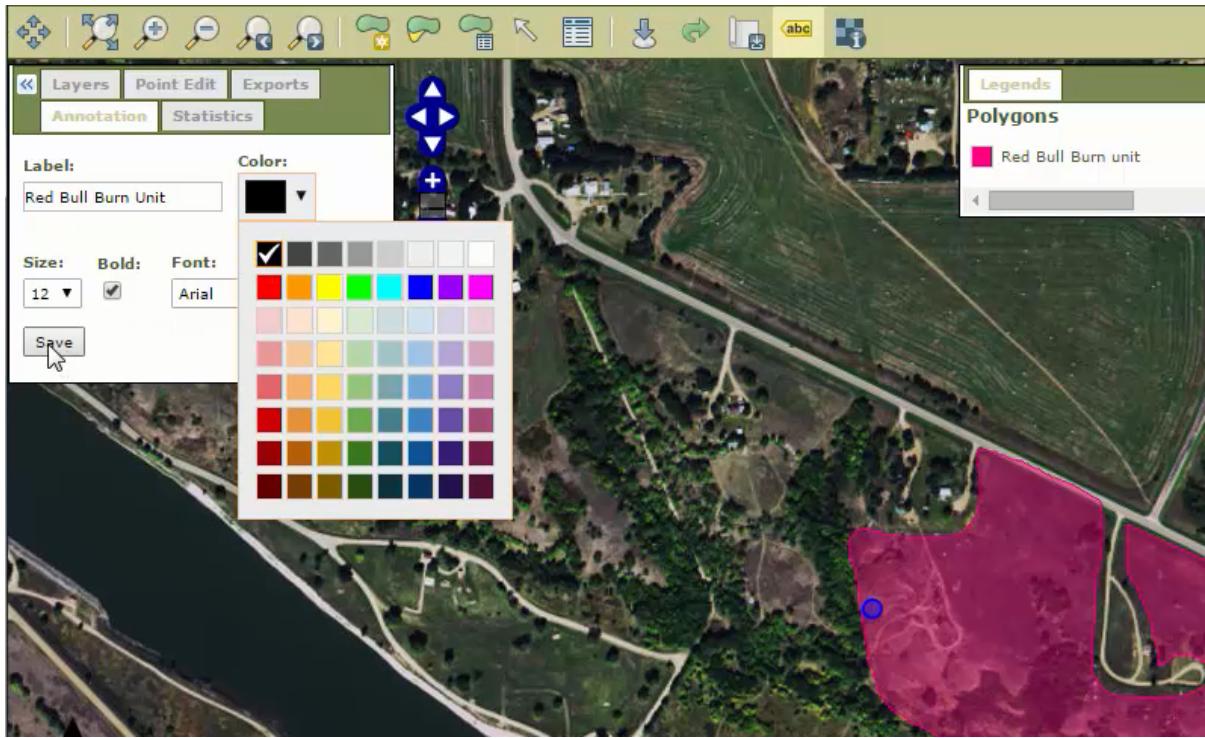
Next, move to the burn unit, and holding down the **Shift** and **left mouse key**, outline the unit. Release both keys when you are finished and a Polygon dialogue box will appear. Name your polygon and click **Submit**.



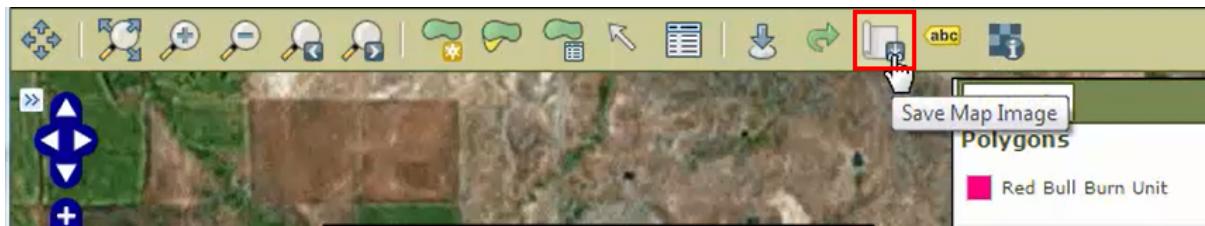
Next, name the burn unit by clicking on the **Map Annotation** button in the mapping toolbar, moving the cursor over the burn unit and **left-clicking**.



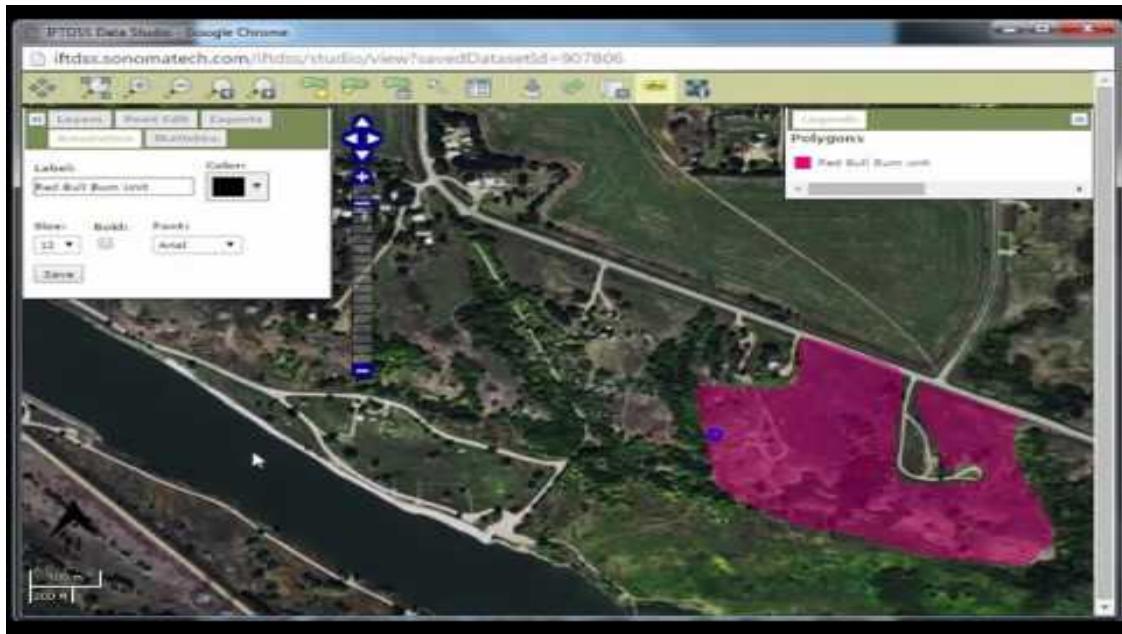
A dialogue box will appear in which the name of the unit may be entered, and the font style and size specified. Once this is complete, click **Save**.



After clicking **Save**, you will see your polygon displayed on the map. To save the map image, first ensure that the **Draw Polygon** button is not active/highlighted. Next, click the **Save Map Image** button on the mapping toolbar to save a .png map image to your computer.



For a short 1.5 minute video of this polygon creation and map saving process, you may view the video below:



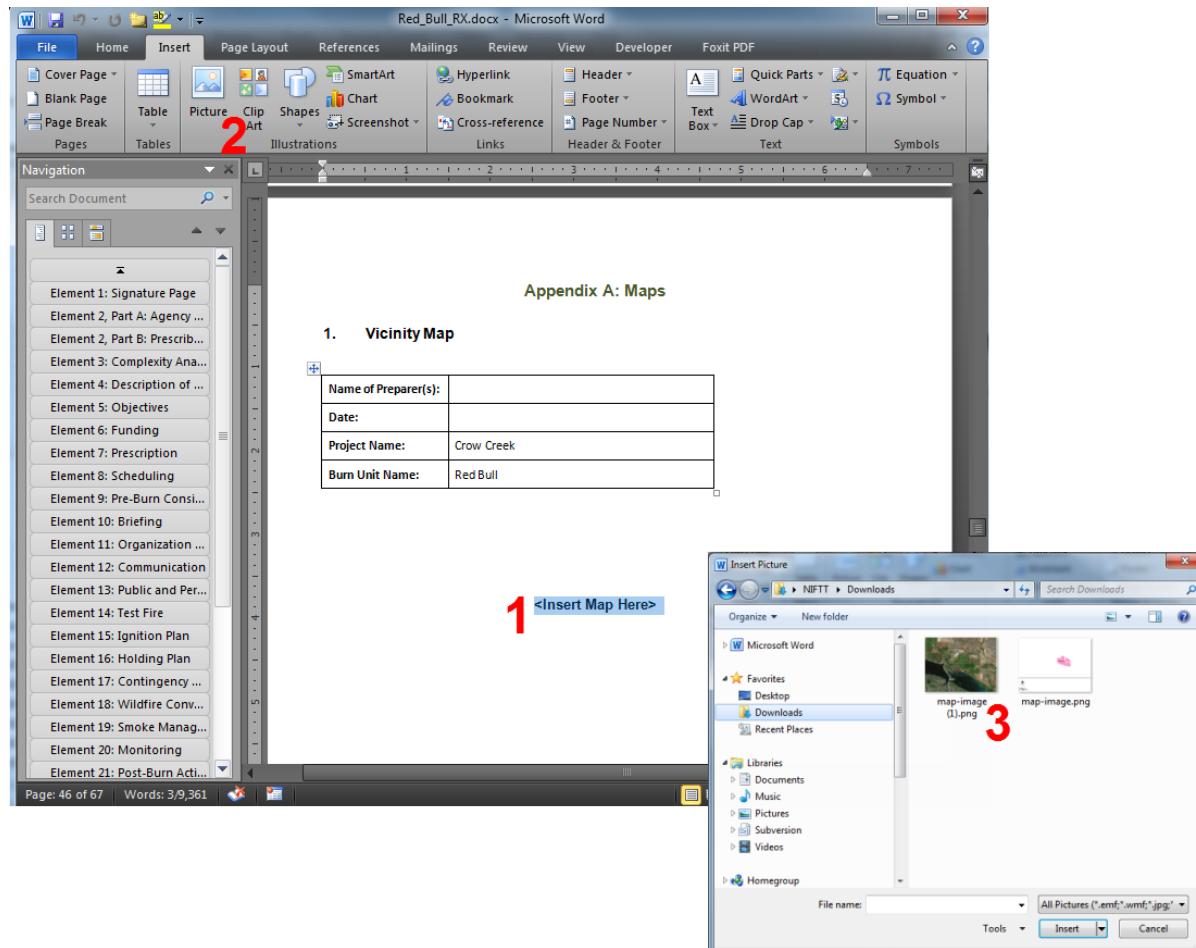
To save changes to your map, click the Save All button on the mapping toolbar before exiting.



Appendix A: Maps (Inserting a Saved Map Image into Word)

To insert a saved map image into a Microsoft Word document,

1. Highlight the <Insert Map Here> text.
2. Access the Insert tab and select Picture.
3. Navigate to your saved map image and select Insert.



Appendix B: Technical Reviewer Checklist

The technical reviewer

- Ensures that prescribed burn plans meet policies.
- Ensures that the complexity analysis accurately reflects the project(s).
- Ensures that the prescription parameters meet the resource and control objectives.
- Ensures that the ignition, holding, and contingency plans are consistent with the predicted fire behavior.
- Completes and signs the Technical Reviewer Checklist and the Prescribed Burn Plan Signature Page.

Appendix B: Technical Reviewer Checklist		
Prescribed Fire Plan Elements	S/U	Comments
1. Signature page	S	
2. GO/NO-GO Checklists	S	
3. Complexity Analysis Summary	S	
4. Description of the Prescribed Fire Area	S	
5. Objectives	S	see objective additions
6. Funding	S	
7. Prescription	S	clarify questions in narrative
8. Scheduling	S	
9. Pre-burn Considerations and Weather	S	
10. Briefing	S	
11. Organization and Equipment	S	clarify tender operation question
12. Communication	S	
13. Public and Personnel Safety, Medical	S	
14. Test Fire	S	see clarification
15. Ignition Plan	S	
16. Holding Plan	S	see clarification
17. Contingency Plan	S	
18. Wildfire Conversion	S	
19. Smoke Management and Air Quality	S	
20. Monitoring	S	
21. Post-burn Activities	S	
Appendix A: Maps	S	
Appendix B: Technical Review Checklist	S	subject to changes and answering comments – plan signed by each tech reviewer
Appendix C: Complexity Analysis	S	
Appendix D: Agency-Specific Job Hazard Analysis	S	
Appendix E: Fire Prediction Modeling Runs or Empirical Documentation	S	
Other	S	

S = Satisfactory U = Unsatisfactory
Recommended for Approval: _____ Not Recommended for Approval: _____

 Approval is recommended subject to the completion of all requirements listed in the comments section, or in the Prescribed Fire Plan.

Appendix C: Complexity Analysis

The Complexity Analysis contains 14 elements with three factors to consider for each element:

- Factor 1 is **Risk**: the probability an adverse event will occur.
- Factor 2 is **Potential Consequences**: the measure of

Appendix C: Complexity Analysis		
Instructions: This worksheet is designed to be used with the Prescribed Fire Complexity Rating descriptors on Page 6 of the Prescribed Fire Complexity Rating System Guide .		
1. Potential for Escape		
Risk	Rationale	
Preliminary Rating: <input type="checkbox"/> Low <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> High	Although holding forces have access around the entire unit, PI is at 60% at the hot end of the prescription	
Final Rating: <input type="checkbox"/> Low <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> High	Ignition procedures won't create intense fire until adequate buffers are in place. Grass fuels will not hold fire longer than the day of ignition. Fire behavior calculations and procedures for ignition, holding, mopup and patrol are outlined in the burn plan.	
Potential Consequences	Rationale	
Preliminary Rating: <input type="checkbox"/> Low <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> High	Potential for multiple simultaneous spot fires can propagate at moderate rates of spread but can be held by skilled and prompt holding actions. Contingency forces must be available on call-up commensurate with local wildfire standards.	
Final Rating: <input type="checkbox"/> Low <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> High	Mow lines and wet lines will be constructed around the burn unit. Fire control resources will be placed at key locations on and adjacent to residential property. Lookouts will be placed at key locations to watch for slopovers and spot fires. Slow methodical backfiring techniques will be used along all burn unit boundaries to reduce the risk of escape. Engines will patrol the area after ignition to extinguish any remaining hot spots.	
Technical Difficulty	Rationale	
Preliminary Rating: <input type="checkbox"/> Low <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> High	Holding operations will be supervised at the Single Resource Boss level. The entire burn unit is accessible to holding resources. No abnormal weather is anticipated and all key implementation personnel will be from the local area or from within the Great Plains Region.	
Final Rating: <input type="checkbox"/> Low <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> High	Ignition and holding procedures and organization are outlined in the burn plan.	

C-

ost/result of an adverse event.

- Factor 3 is **Technical Difficulty**: the skill needed to implement the burn and deal with potential adverse events.

Values are assigned for each of the factors: low, moderate, or high.

Refer to the [Prescribed Fire Complexity Rating System Guide](#) for more details.

This information can be entered into Element 3 of the burn plan.

Appendix D: Agency-Specific Job Hazard Analysis

A job hazard analysis is a technique that focuses on job tasks as a way to identify hazards before they occur.

This analysis focuses on the relationship between the worker, the task, the tools, and the work environment.

Ideally, after you identify uncontrolled hazards, you will take steps to eliminate or reduce those hazards to an acceptable risk level.

Appendix D: Agency-Specific Job Hazard Analysis		
JOB/ACTIVITY:	AGENCY NAME:	NAME OF ANALYST:
Prescribed Burning	Crow Creek	Xxxxx Xxxxxxx
JOB TITLE OF ANALYST:	DATE PREPARED:	NAME OF RX-BURN:
Ign. Spec./ Burn Boss Trainee	3/10/2004	Red Bull Prescribed Burn
TASK	HAZARDS	ABATEMENT ACTIONS
Vehicle travel to, on and from the worksite.	Poor driving; mechanical malfunctions; slippery road surfaces; soft shoulders; unimproved or narrow roadways; inclement weather; improper backing or parking; obstructed visibility from crooked roads, heavy vegetation, time-of-day or smoke.	Drive defensively. Use seat belts and headlights. Identify road conditions prior to travel and during briefings. Post road guards. Mark hazards. Perform pre-use inspections on all vehicles. Scout ahead to identify vehicle turnouts. Maintain communication. Provide road system maps. Use backers and spotters. Leave keys in the ignition and park vehicles where and how they are most easily driven out in an emergency.
Pre-burn briefing.	Lack of communications; reluctance to ask questions.	Conduct a thorough pre-burn briefing to clarify safety concerns, burn objectives, position assignments and responsibilities, expected weather and fire behavior.
Functioning as qualified in any position on a prescribed burn.	Injury due to lack of experience and/or qualifications.	Employees must meet the physical and qualification requirements for their respective positions as established in Wildland and Prescribed Fire Qualifications System Guide, PMS 310-1.
Preparing drip torch fuel.	"Hot Mix" burns from improper fuel mixture ratio or unwanted ignitions; Fuel-saturated clothing from spills.	Use approved containers and pour spouts. Mix and fill on the ground in secure locations. Avoid fuel contact with skin, clothing and boots. Mix 4 parts diesel to 1 part gasoline. No smoking or cell phone use within 25 ft. of mixing and fueling area.

Appendix E: Documentation

You can paste the exported Microsoft Excel table(s) into the Word document in **Appendix E. Fire Behavior Modeling Documentation or Empirical Evidence.**

Appendix E: Fire Behavior Modeling Documentation or Empirical Documentation

Table 1. Surface Fire Behavior (IFT-surface) Inputs and Outputs.

Parameters	Low	High	Fire Behavior Optimal	Maximum	Units
Outputs	Head Fire Spread Rate	41.93	323.24	128.9	309.72
	Backing Fire Spread Rate	4.11	5.95	5.6	3.42
	Flanking Fire Spread Rate	7.49	11.69	10.74	6.77
	Heat Per Unit Area	635.18	742.42	688.94	516.1
	Head Fire Fireline Intensity	488.31	4,399.59	1,628.08	2,930.51
	Backing Fire Fireline Intensity	47.89	81.03	70.76	32.38
	Flanking Fire Fireline Intensity	87.23	159.13	135.63	64.05
	Head Fire Flame Length	7.76	21.34	13.51	17.7
	Backing Fire Flame Length	2.67	3.4	3.19	2.23
	Flanking Fire Flame Length	3.51	4.63	4.31	3.05
	Reaction Intensity	2,481.15	2,900.07	2,691.17	3,741.72
	Head Fire Spread Direction	110	110	110	111
	Backing Fire Spread Direction	290	290	290	291
	Flanking Fire Spread Direction	200	200	200	201
	Head Fire Spread Distance	41.93	323.24	128.9	309.72
	Backing Fire Spread Distance	4.11	5.95	5.6	3.42
	Flanking Fire Spread Distance	7.49	11.69	10.74	6.77
Inputs	Residence Time	0.26	0.26	0.26	0.14
	Effective Wind Speed	3.01	11.01	6.01	15.24
	Fire Behavior Fuel Model	FM3: Tall grass	FM3: Tall grass	FM3: Tall grass	FM2: Timber grass and understory
	1-hr Fuel Moisture	14	6	8	4
	10-hr Fuel Moisture	16	8	10	6
	100-hr Fuel Moisture	20	10	12	8
	Live Herbaceous Fuel Moisture	100	90	95	80
	Live Woody Fuel Moisture	180	170	175	160
	Midflame Wind Speed	3	11	6	15
	Wind Direction (from North)	290	290	290	290
Slope	5	5	5	40	percent
Aspect	327	327	327	327	deg
Flanking Fire Direction	90 degrees	90 degrees	90 degrees	90 degrees	deg
Elapsed Time	1	1	1	1	h

Appendix F: Smoke Management Plan and Smoke Modeling Information

Delete this text and replace it with your own content.

Additional Help

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

1. Click the Help button
2. 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.



[<< Back: Appendix E](#)