



# FCCS & Consume Exercises

Using Fuel and Fire Tools- FFT

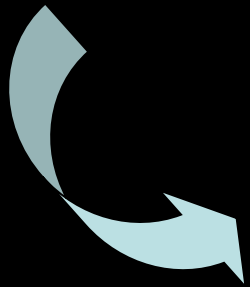
Mixed Conifer Thinning/Rx



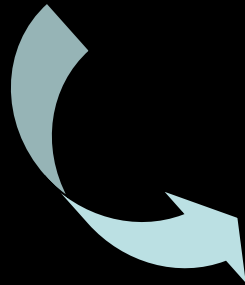
Mixed Conifer FB 208



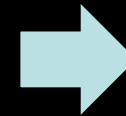
# FFT Exercise



Thin from below



Prescribed Fire



Prescribed Fire



# Situation

A fuels hazard team would like to assess the fuel bed characteristics and the potential treatment opportunities to reduce fire hazard on a grand fir/Douglas-fir forest that has been protected from wildfire for 80 years. The area is near summer homes and cabins.





# Step 1: Find a representative fuel bed:

- Open the Fuel and Fire Tools (FFT)
- Select the Baileys ecoregion (temperate steppe 330; temperate desert 340)
- Select vegetation form (conifer)
- Search for fuelbeds



You can create your set of fuelbeds in three ways:

1. Select from the list below. Filter list of all fuelbeds by:

Clear all filters

**Ecoregion:** Temperate Steppe

**Vegetation Form:** Conifer Forest

Cover Type:

**Structural Class:**

Change Agent:

2. Browse your file system to select fuelbed (.xml) or LANDFIRE fuelbed list (.lf) files:

Browse to file(s)...

3. Load a saved unit:

MixedConifer | 1000 | 3 fuelbed(s)

Reference fuelbeds: 22 *To create custom fuelbeds, right click on a reference fuelbed to make copies*

- 4: Douglas-fir/ceanothus forest
- 18: Douglas-fir/oceanspray forest
- 21: Young lodgepole pine forest
- 22: Mature lodgepole pine forest
- 23: Mature lodgepole pine forest with bark beetle damage
- 24: Pacific ponderosa pine-Douglas-fir forest
- 27: Ponderosa pine-two needle pinyon-Utah juniper forest
- 29: Interior ponderosa pine-Engelmann spruce-Douglas-fir forest
- 34: Interior Douglas-fir-interior ponderosa pine/gambel oak forest
- 53: Pacific ponderosa pine forest
- 59: Subalpine fir-Engelmann spruce-Douglas-fir-lodgepole pine forest
- 61: Whitebark pine/subalpine fir forest
- 67: Interior ponderosa pine-Douglas-fir forest
- 70: Subalpine fir-lodgepole pine-whitebark pine-Engelmann spruce forest
- 208: Grand fir-Douglas-fir forest
- 210: Pinyon-Utah juniper woodland
- 212: Ponderosa pine forest - post thin
- 273: Engelmann spruce-Douglas-fir-white fir-ponderosa pine forest

Selected Fuelbeds:

- Save/edit this unit
- Delete this unit
- Start over/  
Create new unit
- Edit fuelbeds

You can move single fuelbeds between boxes by double-clicking. Use Ctrl and Shift keys to select multiple fuelbeds and use the >> button.

Help

Use metric units

Next: Specify Environmental Inputs ▶

**For this exercise we will assume only 1 fuelbed represents the site:**

**FCCS Fuelbed 208: Grand-fir/Douglas-fir forest**



You can create your set of fuelbeds in three ways:

Version: 2.0.1020

1. Select from the list below. Filter list of all fuelbeds by:

Clear all filters

Ecoregion:  ×Vegetation Form:  ×Cover Type:  ×Structural Class:  ×Change Agent:  ×

2. Browse your file system to select fuelbed (.xml) or LANDFIRE fuelbed list (.lf) files:

3. Load a saved unit:

MixedConifer | 1000 | 3 fuelbed(s)

Reference fuelbeds: 22

*To create custom fuelbeds, right click on a reference fuelbed to make copies*

- 4: Douglas-fir/ceanothus forest
- 18: Douglas-fir/oceanspray forest
- 21: Young lodgepole pine forest
- 22: Mature lodgepole pine forest
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- 24: Pacific ponderosa pine-Douglas-fir forest
- 27: Ponderosa pine-two needle pinyon-Utah juniper forest
- 29: Interior ponderosa pine-Engelmann spruce-Douglas-fir forest
- 34: Interior Douglas-fir-interior ponderosa pine/gambel oak forest
- 53: Pacific ponderosa pine forest
- 59: Subalpine fir-Engelmann spruce-Douglas-fir-lodgepole pine forest
- 61: Whitebark pine/subalpine fir forest
- 67: Interior ponderosa pine-Douglas-fir forest
- 70: Subalpine fir-lodgepole pine-whitebark pine-Engelmann spruce forest
- 208: Grand fir-Douglas-fir forest
- 210: Pinyon-Utah juniper woodland
- 212: Ponderosa pine forest - post thin
- 273: Engelmann spruce-Douglas-fir-white fir-ponderosa pine forest



Selected Fuelbeds:

 Use metric units

Next: Specify Environmental Inputs ▶

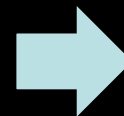
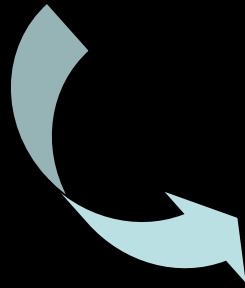
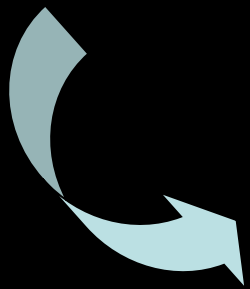


A photograph of a mixed conifer forest with tall, thin trees and a dense undergrowth of shrubs and grasses.

Mixed Conifer FB 208

Since we are evaluating two fuel treatments, let's make two copies of this fuelbed to represent :

- 1) Thin from below, no treatment
- 2) Thin from below + Rx + Rx



# Make 2 copies of FCCS 208 and move to right box

The screenshot displays the 'Fuelbed Selector' software interface, version 2.0.1025. It is divided into three main sections:

- 1. Select from the list below:** A list of 430 reference fuelbeds. A red circle highlights fuelbed 208, 'Grand fir-Douglas-fir forest', and its two variants (208u1 and 208u2). A large red number '1' is placed to the right of this list.
- 2. Browse your file system:** A section with a 'Browse to file(s)...' button. A red circle highlights the 'Selected fuelbeds: 3' list, which contains the three fuelbeds selected in step 1. A large red number '2' is placed below this section.
- 3. Load a saved unit:** A section showing a list of saved units: 'Consumer | 100 | 5 fuelbed(s)', 'F89 | 500 | 1 fuelbed(s)', and 'Unit | 100 | 2 fuelbed(s)'.

At the bottom of the interface, there are buttons for 'Help', 'Use metric units', and 'Next: Specify Environmental Inputs'.

Copy fuelbed to:

Original Filename:

FB\_0208\_FCCS.xml

New Filename:

Original Fuelbed Description:

Grand fir-Douglas-fir forest

New Fuelbed Description:

Cancel

OK

**Right-click on 208 and  
make a copy (repeat)**

**1) 208Thin**

**2) 208ThinRx**

Copy fuelbed to:

Original Filename:

FB\_0208\_FCCS.xml

New Filename:

208Thin.xml

Original Fuelbed Description:

Grand fir-Douglas-fir forest

New Fuelbed Description:

Recently thinned Grand Fir-Douglas fir forest

Cancel

OK

Copy fuelbed to:

Original Filename:

208Thin.xml

New Filename:

208ThinRx.xml

Original Fuelbed Description:

Recently thinned Grand Fir-Douglas fir forest

New Fuelbed Description:

Recently thinned and prescribed burned Grand fir and doug

Cancel

OK

# Step 1. Edit fuelbeds to represent treatment scenarios

**Thin from below with no follow-up fuels treatment**



**Thin from below followed by prescribed fire**



You can create your set of fuelbeds in three ways:

Version: 2.0.1020

1. Select from the list below. Filter list of all fuelbeds by:

Clear all filters

**Ecoregion:**

**Vegetation Form:**

**Cover Type:**

**Structural Class:**

**Change Agent:**

2. Browse your file system to select fuelbed (.xml) or LANDFIRE fuelbed list (.lf) files:

3. Load a saved unit:

MixedConifer | 1000 | 3 fuelbed(s)

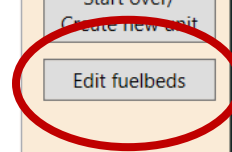
Reference fuelbeds: 24 *To create custom fuelbeds, right click on a reference fuelbed to make copies*

- 27: Ponderosa pine-two needle pinyon-Utah juniper forest
- 29: Interior ponderosa pine-Engelmann spruce-Douglas-fir forest
- 34: Interior Douglas-fir-interior ponderosa pine/gambel oak forest
- 53: Pacific ponderosa pine forest
- 59: Subalpine fir-Engelmann spruce-Douglas-fir-lodgepole pine forest
- 61: Whitebark pine/subalpine fir forest
- 67: Interior ponderosa pine-Douglas-fir forest
- 70: Subalpine fir-lodgepole pine-whitebark pine-Engelmann spruce forest
- 208: Grand fir-Douglas-fir forest
- 208u1: Grand fir-Douglas-fir forest
- 208u2: Grand fir-Douglas-fir forest
- 210: Pinyon-Utah juniper woodland
- 212: Ponderosa pine forest - post thin
- 273: Engelmann spruce-Douglas-fir-white fir-ponderosa pine forest
- 286: Limber pine-ponderosa pine forest
- 304: Engelmann spruce-subalpine fir/horsetail forest
- 314: Limber pine-bristlecone pine forest
- 320: Western larch forest



Selected fuelbeds: 3

- 208: Grand fir-Douglas-fir forest (read only)
- 208u1: Grand fir-Douglas-fir forest
- 208u2: Grand fir-Douglas-fir forest



Help

Use metric units

Next: Specify Environmental Inputs ▶

# Input Data

OVERSTORY	Total Cover	Percent Cover (%)	Height (ft)	HLC (ft)	Density (tree/acre)	DBH (in)	CLASS 2 SNAG Density (#/acre)	CLASS 3 SNAG Density (#/acre)	Ladder Fuels
Fuelbed 208	75	20	115	35	24	27	30	40	Yes
Fuelbed 208_Thin	40	15	80	45	20	25	10	10	No
Fuelbed 208_Rx	40	15	80	45	20	25	10	10	No

MIDSTORY		Percent Cover (%)	Height (ft)	HLC (ft)	Density (tree/acre)	DBH (in)
Fuelbed 208		40	75	30	90	15
Fuelbed 208_Thin		5	65	35	10	12
Fuelbed 208_Rx		5	65	35	10	12

## Sound

## Rotten

SOUND & ROTTEN WOOD	Fine Wood Cover (%)	Fine Wood Depth (in)	1-hr (t/a)	10-hr (t/a)	100-hr (t/a)	1000-hr (t/a)	10,000-hr (t/a)	>10,000-hr (t/a)	1000-hr (t/a)	10,000-hr (t/a)	>10,000-hr (t/a)
Fuelbed 208	81	4	0.5	1.6	3.3	4.3	8.9	3.4	0.8	1.6	0.6
Fuelbed 208_Thin	95	8	2.5	5	6	10	12	4	5	11	0.5
Fuelbed 208_Rx	5	0.5	0.1	0.2	0.2	3	7.8	3.8	1.5	7.2	0.5

## Litter

## Upper duff

## Lower duff

LITTER/DUFF	Percent Cover (%)	Depth (in)		Percent Cover (%)	Depth (in)		Percent Cover (%)	Depth (in)
Fuelbed 208	89	0.4		89	1		89	1
Fuelbed 208_Thin	95	0.6		89	0.9		89	0.9
Fuelbed 208_Rx	10	0.0		70	0.4		80	0.7

General Canopy Shrub Herb Wood Litter-Lichen-Moss Ground Fuel

Upper duff Lower duff Basal accumulations Squirrel middens

Filename	Cover (%)	Depth (inches)	Type	Loading (optional) (tons/acre)	Present
FB_0208_FCCS	89	1	Fully decomposed moss and	0	<input checked="" type="checkbox"/>
FB_0208_FCCSu01					<input checked="" type="checkbox"/>
FB_0208_FCCSu02					<input checked="" type="checkbox"/>

Save changed files... C:\Users\agandreu\Documents\AnneWork\FFT\_Testing\_10-8-18\FFT\_10-01-18\UserFiles

Filename	Filename (generated)	Fuelbed name (editable)	
FB_0208_FCCSu01	FB_0208_FCCSu01.xml	208_thin	<input checked="" type="checkbox"/>
FB_0208_FCCSu02	FB_0208_FCCSu02.xml	208_thinRx	<input checked="" type="checkbox"/>

1. Select back to fuelbed selector
2. Select save marked items

Save None

Save Marked Items

Help

Open Digital Photo Series

◀ Back to Fuelbed Selector

Save

You can create your set of fuelbeds in three ways:

Version: 2.0.1020

1. Select from the list below. Filter list of all fuelbeds by:

Clear all filters

Ecoregion:  ×

Vegetation Form:  ×

Cover Type:  ×

Structural Class:  ×

Change Agent:  ×

2. Browse your file system to select fuelbed (.xml) or LANDFIRE fuelbed list (.lf) files:

Browse to file(s)...

3. Load a saved unit:

MixedConifer | 1000 | 3 fuelbed(s)

Reference fuelbeds: 391 *To create custom fuelbeds, right click on a reference fuelbed to make copies*

- 6: Oregon white oak-Douglas-fir forest
- 7: Douglas-fir-sugar pine-tanoak forest
- 8: Western hemlock-Douglas-fir-western redcedar/vine maple forest
- 9: Douglas-fir-western hemlock-western redcedar/vine maple forest
- 10: Western hemlock-Douglas-fir-Sitka spruce forest
- 11: Douglas-fir/western hemlock-Sitka spruce forest
- 12: Red fir-mountain hemlock-lodgepole pine-western white pine forest
- 13: Mountain hemlock-Pacific silver fir forest
- 14: California black oak woodland
- 15: Jeffrey pine-red fir-white fir/greenleaf-snowbrush forest
- 16: Jeffrey pine-ponderosa pine-Douglas-fir-California black oak forest
- 17: Red fir forest
- 18: Douglas-fir/oceanspray forest
- 19: White fir-giant sequoia-sugar pine forest
- 20: Western juniper/curl-leaf mountain mahogany woodland
- 21: Young lodgepole pine forest
- 22: Mature lodgepole pine forest
- 23: Mature lodgepole pine forest with bark beetle damage



Selected fuelbeds: 3

- 208: Grand fir-Douglas-fir forest (read only)
- 208u1: Grand fir-Douglas-fir forest
- 208u2: Grand fir-Douglas-fir forest

Save/edit this unit

Delete this unit

Start over/  
Create new unit

Edit fuelbeds

Help

Use metric units

Next: Specify Environmental Inputs ▶



# FCCS Instructions for Fire Behavior Outputs

## Step 1: Specify environmental variables (keep defaults)

Environmental Inputs --

Select Environmental Scenario for " (an FCCS-only unit):

- FCCS Benchmark Inputs
- MC\_100%ThHr\_20%Litter
- MC\_20%ThHr100%Litter
- MC\_Duff30\_ThHr20\_Litter95
- MC\_Duff95\_ThHr20\_Litter20

Edit Selected Environmental Scenario:

Environmental Scenario Name: FCCS Benchmark Inputs

Select tool/pathway:

**FCCS**

Fuel Moistures (%): [\[Select FM Scenario\]](#)

Herbaceous:

Shrub:

Crown:

1-hr:

10-hr:

100-hr:

Slope (%):

Windspeed (mph):

**Consume (FCCS > Consume)**

Fuel Moistures (%):

1000-hr:

Duff:

Litter:

Shrub Consumption (%):

Canopy Consumption (%):

Pile Consumption (%):

Season:

Inputs needed for activity-fuels only:

Days Since Rain:

Length of Ignition (min.):

Source of 1000-hr FM:

Harvest w/in past 3 months?:

**FEPS (FCCS > Consume > FEPS)**

	Min	Max
Air Temp (°F):	<input type="text"/>	<input type="text"/>
Relative Humidity (%):	<input type="text"/>	<input type="text"/>
Midflame Windspeed (mph):	<input type="text"/>	<input type="text"/>
Transport Windspeed (mph):	<input type="text"/>	<input type="text"/>
Fire Shape:	<input type="text"/>	
Sunrise (0-23 hr):	<input type="text"/>	<input type="text"/>
Midday (0-23 hr):	<input type="text"/>	<input type="text"/>
Sunset (0-23 hr):	<input type="text"/>	<input type="text"/>
Fire Start (0-23 hr):	<input type="text"/>	<input type="text"/>
Fire Stop (1-71 hr):	<input type="text"/>	<input type="text"/>

Help Save Scenario Delete Scenario Clear Form Back to Fuelbed Selector

**1**

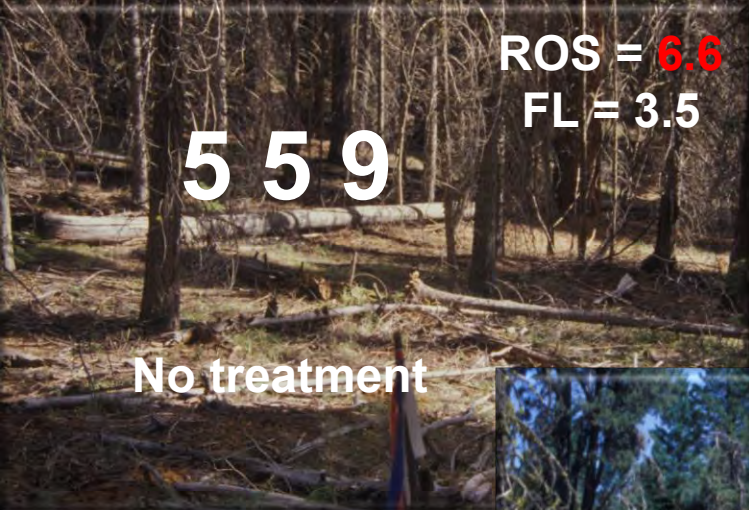
**2**

# Fire Potentials

Variable	Fuelbed 208	Fuelbed 208_Thin	Fuelbed 208 Thin_Rx
	Potentials (0-9)	Potentials (0-9)	Potentials (0-9)
<b>Surface Fire Behavior Potential</b>	<b>5</b>	<b>7</b>	<b>1</b>
Reaction	3.8	5.9	2.0
Spread	5.1	6.6	1.4
Flame length	3.8	5.4	1.5
<b>Crown Fire Potential</b>	<b>5</b>	<b>3</b>	<b>1</b>
Crown fire initiation	3.6	3.3	1.1
Crown-to-crown transmissivity	8.5	0.0	0.0
Crown fire spread	5.2	2.7	0.9
<b>Available Fuel Potential</b>	<b>9</b>	<b>9</b>	<b>6</b>
Flame Available	3.7	3.6	1.6
Smolder Available	2.8	3.5	1.8
Residual Available	5.0	2.9	2.3
<b>FCC Potential</b>	<b>559</b>	<b>739</b>	<b>116</b>

# Surface Fire Behavior Potential at Benchmark Conditions

Variable	Fuelbed 208	Fuelbed 208_Thin	Fuelbed 208 Thin_Rx
Rate of Spread (ft/min)	6.6	10.8	0.5
Flame Length (ft)	3.5	7.4	0.5
Reaction Intensity BTUs/ft <sup>2</sup> -min	2,270	5,381	653
FBFM (original 13)	9 (Timber)	12 (Slash)	8 (Timber)
Standard 40	TL9 (Timber-Litter)	SB3 (Slash)	TL3 (Timber-Litter)



ROS = 6.6  
FL = 3.5

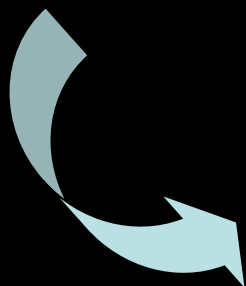
5 5 9

# Final Fire Assessment



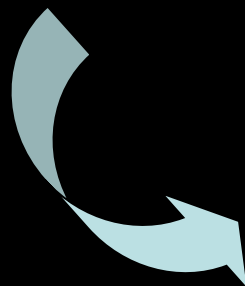
ROS = 10.8  
FL = 7.4


7 3 9



ROS = 0.5  
FL = 0.5

1 1 6



A photograph of a forest fire in a coniferous forest. The ground is covered with fallen logs and branches, and a fire is burning in the foreground. Smoke is rising from the fire, and the background shows a dense forest of tall trees. The text "Consume 4.2: Predicting consumption & emissions" is overlaid on the right side of the image.

# Consume 4.2: Predicting consumption & emissions

You can create your set of fuelbeds in three ways:

1. Select from the list below. Filter list of all fuelbeds by:

Clear all filters

Ecoregion:  X

Vegetation Form:  X

Cover Type:  X

Structural Class:  X

Change Agent:  X

2. Browse your file system to select fuelbed (.xml) or LANDFIRE fuelbed list (.lf) files:

Browse to file(s)...

3. Load a saved unit:

MixedConifer | 1000 | 3 fuelbed(s)

MixedConifer2 | 1000 | 3 fuelbed(s)

Reference fuelbeds: 391 *To create custom fuelbeds, right click on a reference fuelbed to make copies*

- 6: Oregon white oak-Douglas-fir forest
- 7: Douglas-fir-sugar pine-tanoak forest
- 8: Western hemlock-Douglas-fir-western redcedar/vine maple forest
- 9: Douglas-fir-western hemlock-western redcedar/vine maple forest
- 10: Western hemlock-Douglas-fir-Sitka spruce forest
- 11: Douglas-fir/western hemlock-Sitka spruce forest
- 12: Red fir-mountain hemlock-lodgepole pine-western white pine forest
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- 16: Jeffrey pine-ponderosa pine-Douglas-fir-California black oak forest
- 17: Red fir forest
- 18: Douglas-fir/oceanspray forest
- 19: White fir-giant sequoia-sugar pine forest
- 20: Western juniper/curl-leaf mountain mahogany woodland
- 21: Young lodgepole pine forest
- 22: Mature lodgepole pine forest
- 23: Mature lodgepole pine forest with bark beetle damage



MixedConifer2's fuelbeds: 3

- 208: Grand fir-Douglas-fir forest (read only)
- 208u1: Grand fir-Douglas-fir forest
- 208u2: Grand fir-Douglas-fir forest

Save/edit this unit

Delete this unit

Start over/  
Create new unit

Edit fuelbeds

Help

Use metric units

Next: Specify Environmental Inputs ▶

# Consume Instructions

## Step 1: Create a burn unit (MixedConifer)

- Size = 1000 acres
- Change 208Thin consumption equation to “Activity”
- Click Save unit

Save/Edit Unit

**Unit Properties**

\*Name:  1

\*Size (ac.):

\*Burn type:

Burn date:  (mm/dd/yyyy)

Permit No.:

Project:

Notes:

Select the consumption equation sets that are most representative of your burn unit (activity = recent logging slash, boreal = boreal fuelbeds, southern = southeastern fuelbeds, and western = western pine)

Apply selected consumption equation to all fuelbeds:

Fuelbed	% Area	Consumption Equation
208: Grand fir-Douglas-fir forest	33.334	Natural (Western)
208u1: 208_thin	33.333	Activity
208u2: 208_thinRx	33.333	Activity

\*Required to run Consume and FEPS

Total Percent:

3

# Consume Instructions

## Step 2: Enter environmental variables

FCCS	INPUT
Herb FM (%)	30
Shrub FM (%)	60
Crown FM (%)	60
1-hr FM (%)	6
10-hr FM (%)	8
100-hr FM (%)	10
Slope (%)	10
Wind (mph)	4

CONSUME	INPUT
1000-hr FM (%)	20
Duff FM (%)	30
Litter FM (%)	30
Shrub cons (%)	100
Canopy cons (%)	10
Pile cons (%)	90
Season	Spring
Days since rain	5
Length ignition (min)	100
Source 1000-hr FM	Meas-Th
Harvest within 3 months?	Unchecked (no)



# Consume Instructions

## Step 3:

- Save Scenario as Mixed Conifer
- Run Consume

Environmental Inputs -- MixedConifer2

**1**

**Edit Selected Environmental Scenario:**

Environmental Scenario Name:

**Select Environmental Scenario for 'MixedConifer2':**

- FCCS Benchmark Inputs
- MC\_100%ThHr\_20%Litter
- MC\_20%ThHr100%Litter
- MC\_Duff30\_ThHr20\_Litter95
- MC\_Duff95\_ThHr20\_Litter20

**Select tool/pathway:**

FCCS

Fuel Moistures (%): [\[Select FM Scenario\]](#)

Herbaceous:

Shrub:

Crown:

1-hr:

10-hr:

100-hr:

Slope (%):

Windspeed (mph):

**Consume (FCCS > Consume)**

Fuel Moistures (%):

1000-hr:

Duff:

Litter:

Shrub Consumption (%):

Canopy Consumption (%):

Pile Consumption (%):

Season:

*Inputs needed for activity-fuels only:*

Days Since Rain:

Length of Ignition (min.):

Source of 1000-hr FM:

Harvest w/in past 3 months?:

**2**

FEPS (FCCS > Consume > FEPS)

Min Max

Air Temp (°F):

Relative Humidity (%):

Midflame Windspeed (mph):

Transport Windspeed (mph):

Fire Shape:

Sunrise (0-23 hr):

Midday (0-23 hr):

Sunset (0-23 hr):

Fire Start (0-23 hr):

Fire Stop (1-71 hr):

**FCCS** **Consume** **TEPS**

**Print-friendly Reports (.pdf)**

Fuelbed	Unit
<a href="#">Fuel Consumption</a>	<a href="#">Consumption</a>
<a href="#">Emissions (All Pollutants)</a>	<a href="#">Emissions</a>
Emissions by Fuelbed Stratum:	<a href="#">Heat Release</a>
<a href="#">CH4</a>	
<a href="#">CO</a>	
<a href="#">CO2</a>	
<a href="#">NMHC</a>	
<a href="#">PM</a>	
<a href="#">PM10</a>	
<a href="#">PM2.5</a>	

**Graphs (.png)**

- Fuelbed
- [Fuel Consumption](#)
  - [CH4 Emissions](#)
  - [CO Emissions](#)
  - [CO2 Emissions](#)
  - [NMHC Emissions](#)
  - [PM Emissions](#)
  - [PM10 Emissions](#)
  - [PM2.5 Emissions](#)

**Output Tables (.csv)**

[All Results](#)

Help

◀ Back to Environmental Inputs

# Fuel Consumption

Variable	Fuelbed 208	Fuelbed 208 Thin	Fuelbed 208 ThinRx
Preburn loading (tons/acre)	131.14	111.07	69.16
Total Consumption (tons/acre)	31.77	44.99	20.96
Canopy (tons/acre)	2.71	0.87	0.87
Shrub (tons/acre)	2.21	2.21	2.21
Herb (tons/acre)	0.06	0.06	0.06
Wood (tons/acre)	12.5	32.31	11.17
LLM (tons/acre)	0.65	1.74	0.0
Ground fuels (tons/acre)	13.66	7.8	6.66

# Pollutant Emissions

Variable	Fuelbed 208	Fuelbed 208 Thin	Fuelbed 208 ThinRx
CH4 (lbs/acre)	331	289	235
CO (lbs/acre)	6,810	4,698	4,762
CO2 (lbs/acre)	99,318	150,990	64,928
NMHC (lbs/acre)	236	249	164
PM total (lbs/acre)	1,203	1,112	835
PM 10 (lbs/acre)	878	670	614
PM 2.5 (lbs/acre)	810	579	568

Questions?

