FCCS & Consume Exercises

Using Fuel and Fire Tools- FFT

Mixed Conifer Thinning/Rx

FFT Exercise

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.

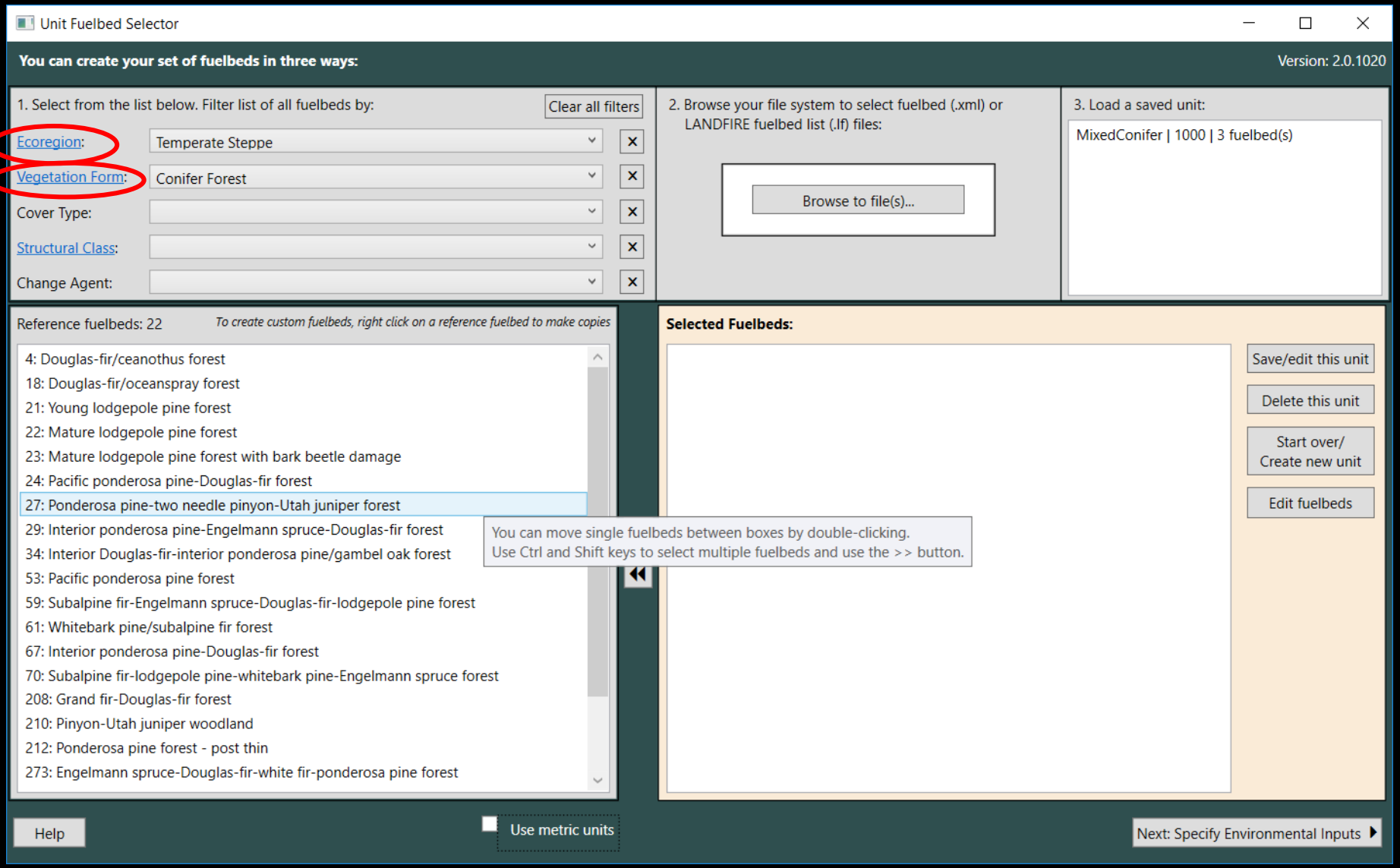
Step 1: Find a representative fuel bed:

- Open the Fuel and Fire Tools (FFT)

- Select the Baileys ecoregion (temperate steppe 330; temperate desert 340)

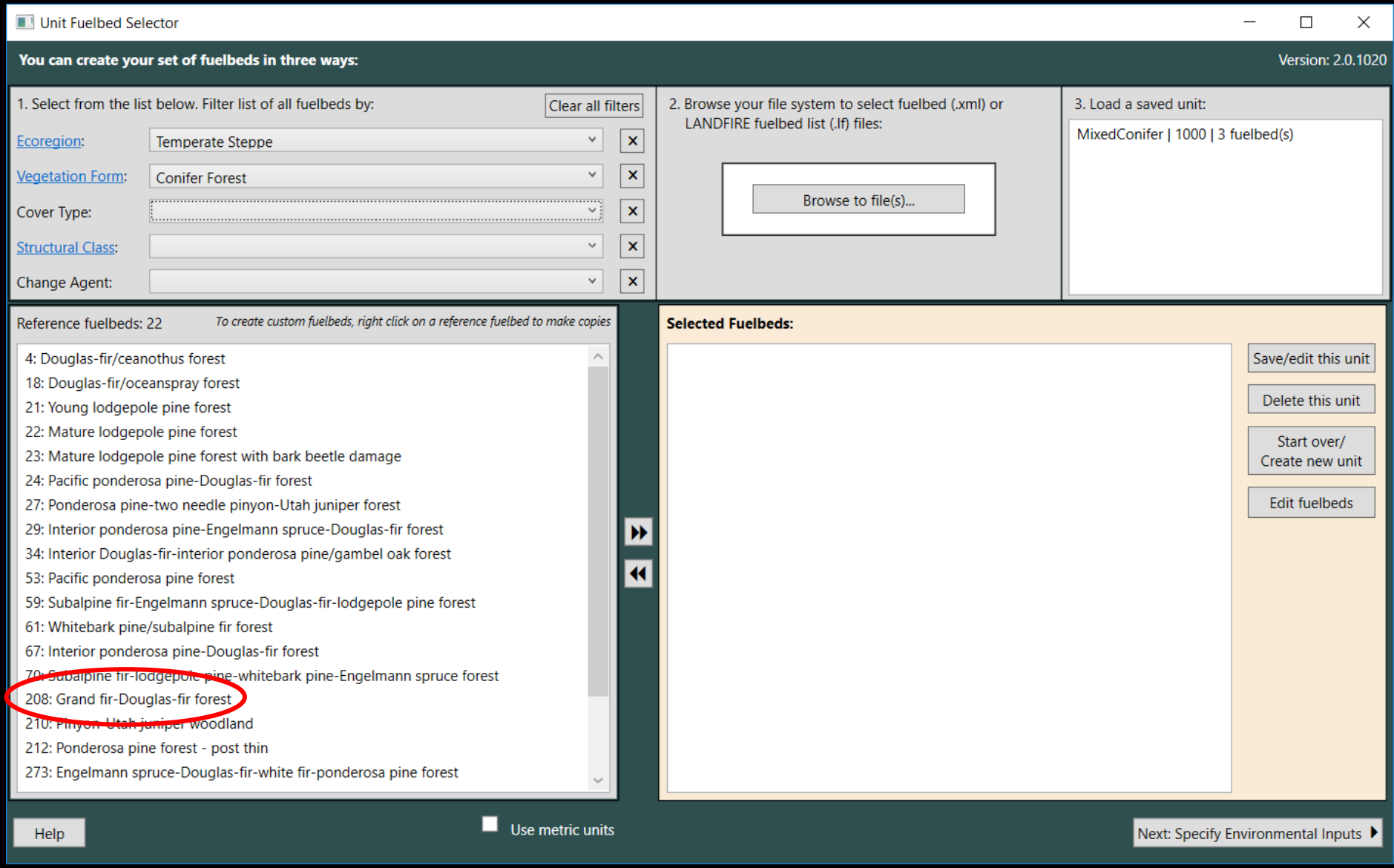
- Select vegetation form (conifer)

- Search for fuelbeds


Unit Fuelbed Selector
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:
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
You can move single fuelbeds between boxes by double-clicking.
Use Ctrl and Shift keys to select multiple fuelbeds and use the >> button.
Selected Fuelbeds:
Save/edit this unit
Delete this unit
Start over/ Create new unit
Edit fuelbeds
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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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:
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
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18: Douglas-fir/oceanspray forest
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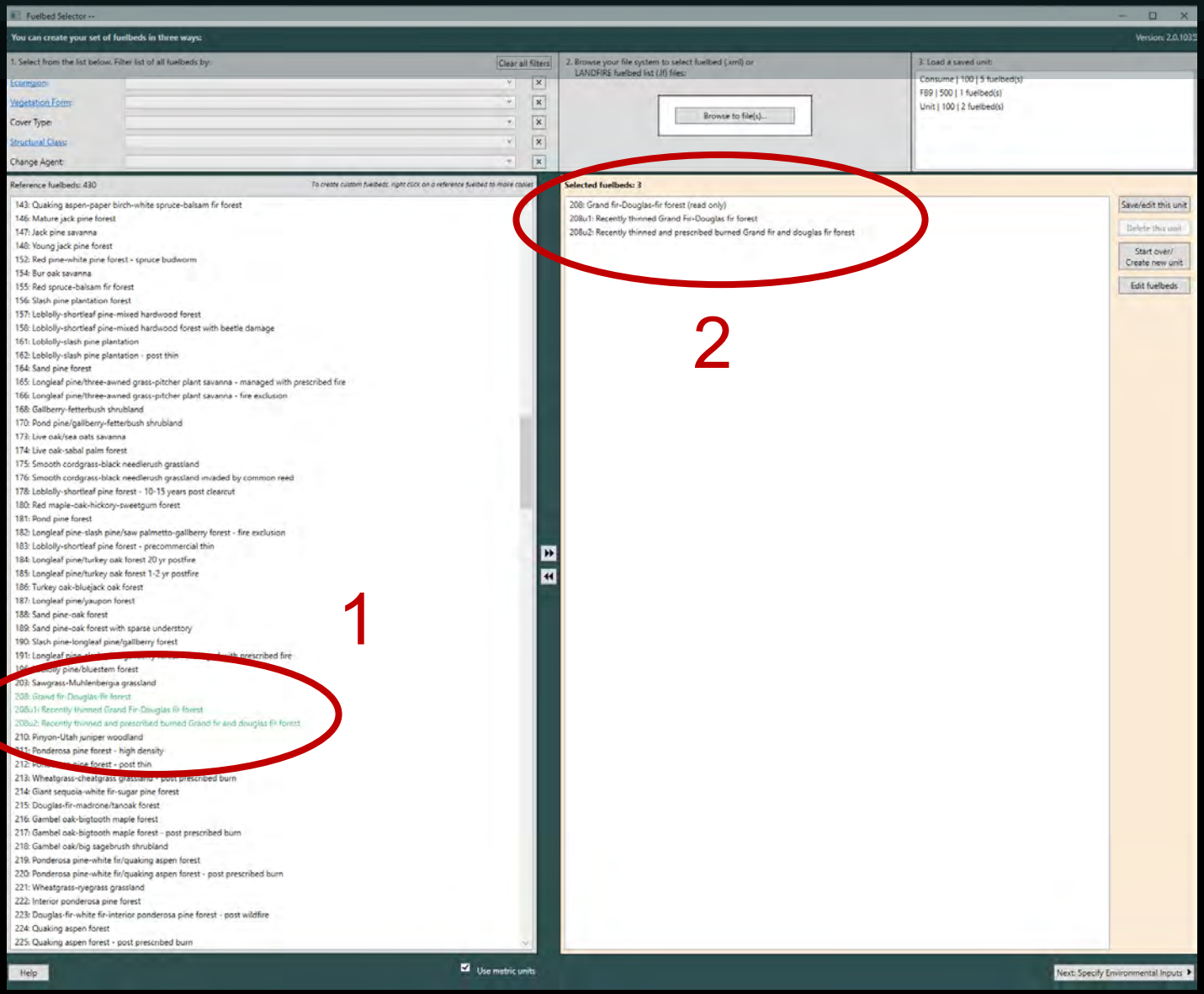
22: Mature lodgepole pine forest
23: Mature lodgepole pine forest with bark beetle damage
24: Pacific ponderosa pine-Douglas-fir forest
27: Ponderosa pine-two needle pinyon-Utah juniper forest
29: Interior ponderosa pine-Engelmann spruce-Douglas-fir forest
34: Interior Douglas-fir-interior ponderosa 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
Help
Use metric units
Next: Specify Environmental Inputs

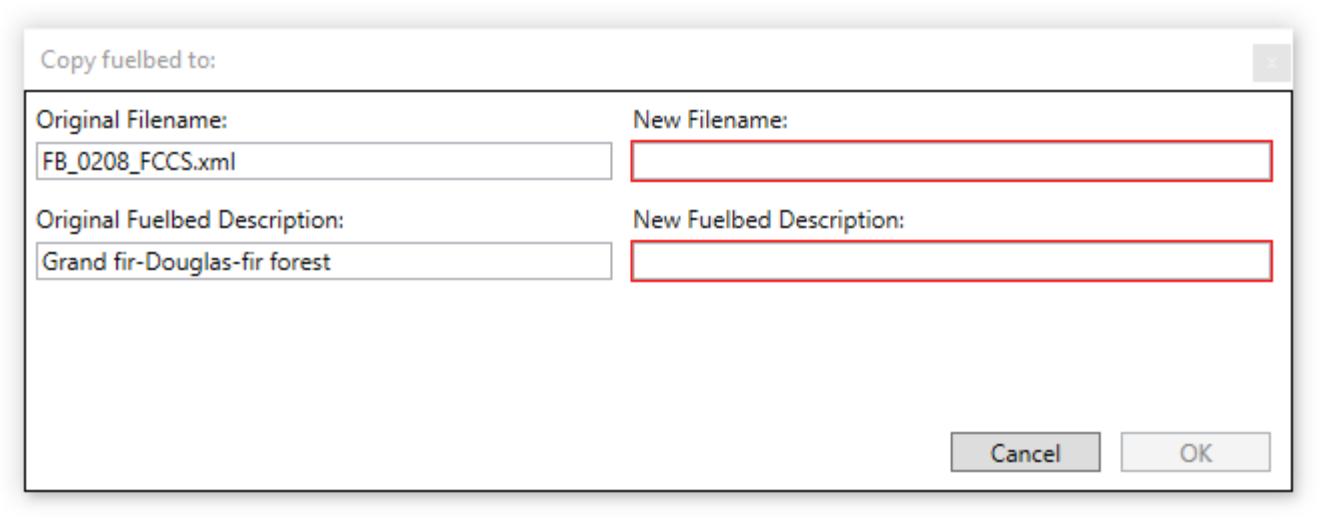
Since we are evaluating two fuel treatments, let's make two copies of this fuelbed to represent :

1) Thin from below, no treatment

2) Thin from below + Rx + Rx

Make 2 copies of FCCS 208 and move to right box

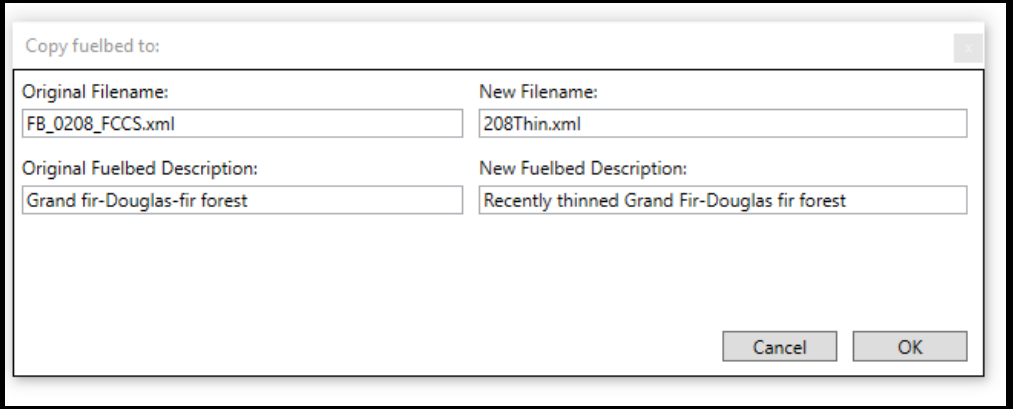


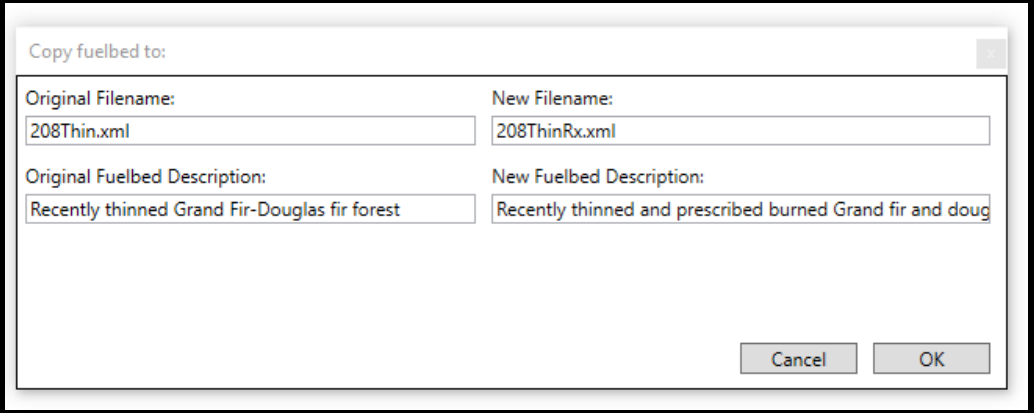


Right-click on 208 and make a copy (repeat)

1) **208Thin**

2) **208ThinRx**

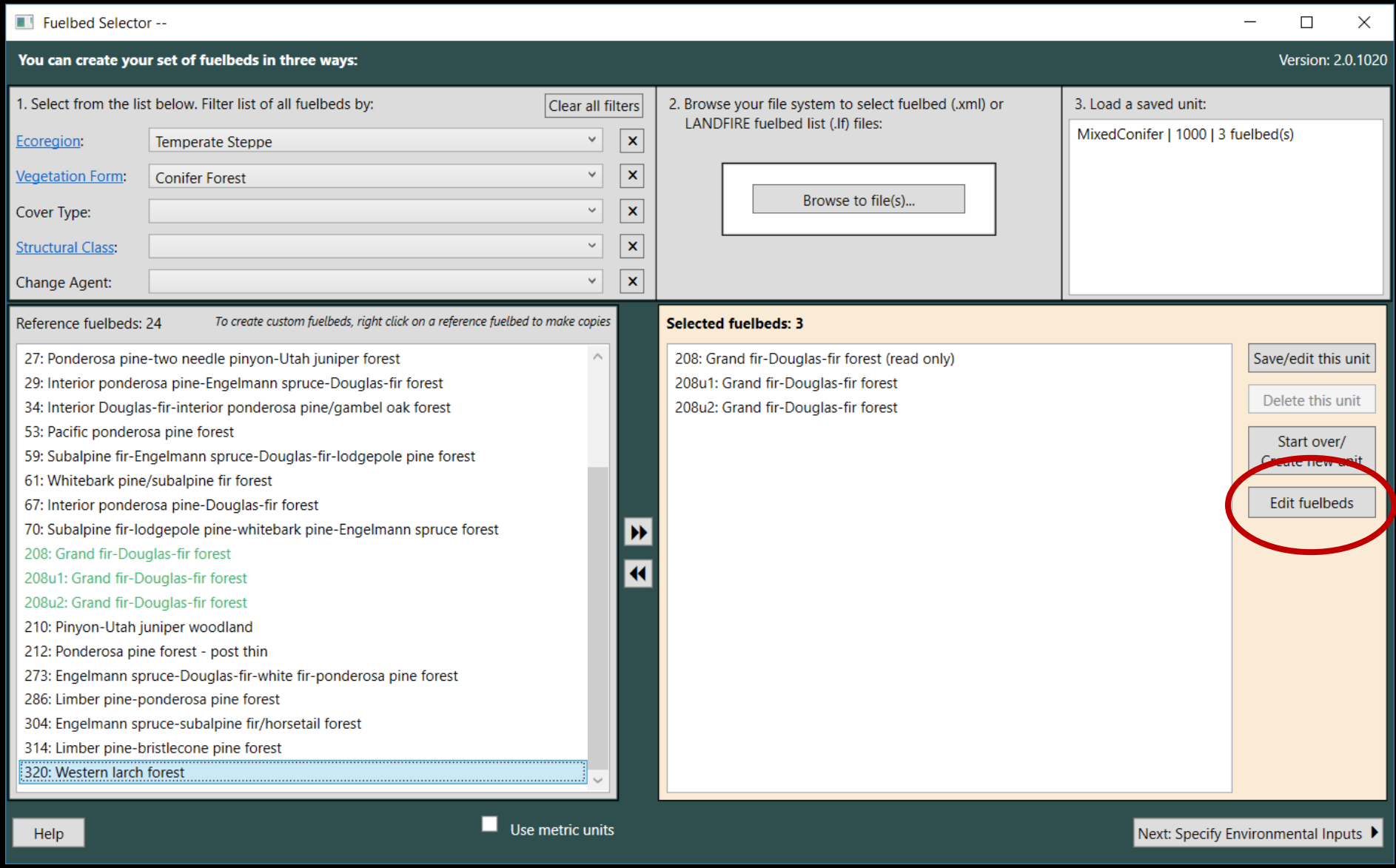




Step 1. Edit fuelbeds to represent treatment scenarios

Thin from below with no follow-up fuels treatment

Thin from below followed by prescribed fire


Fuelbed Selector --
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:
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: 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
Save/edit this unit
Delete this unit
Start over/
Edit fuelbeds
Help
Use metric units
Next: Specify Environmental Inputs

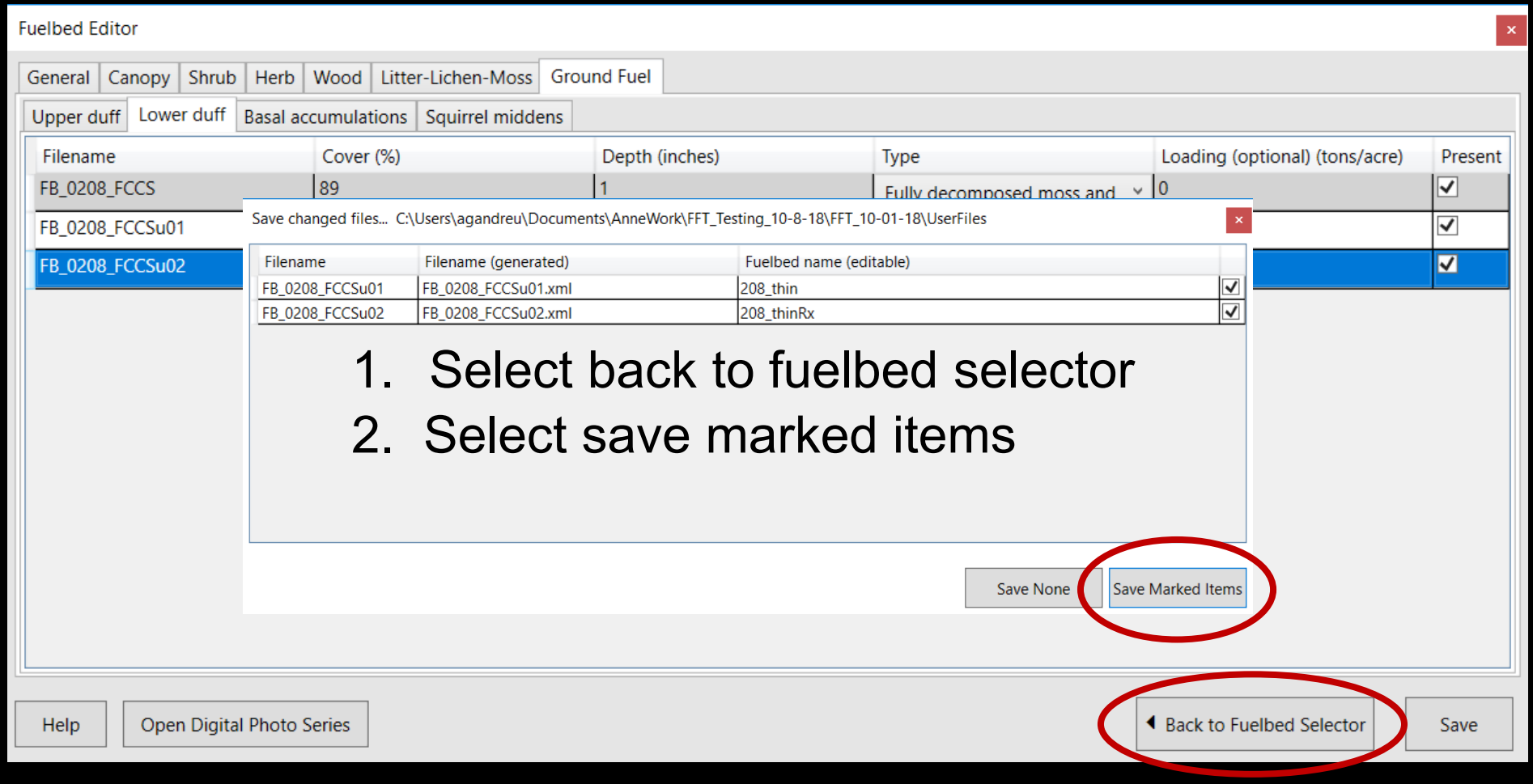
Input Data

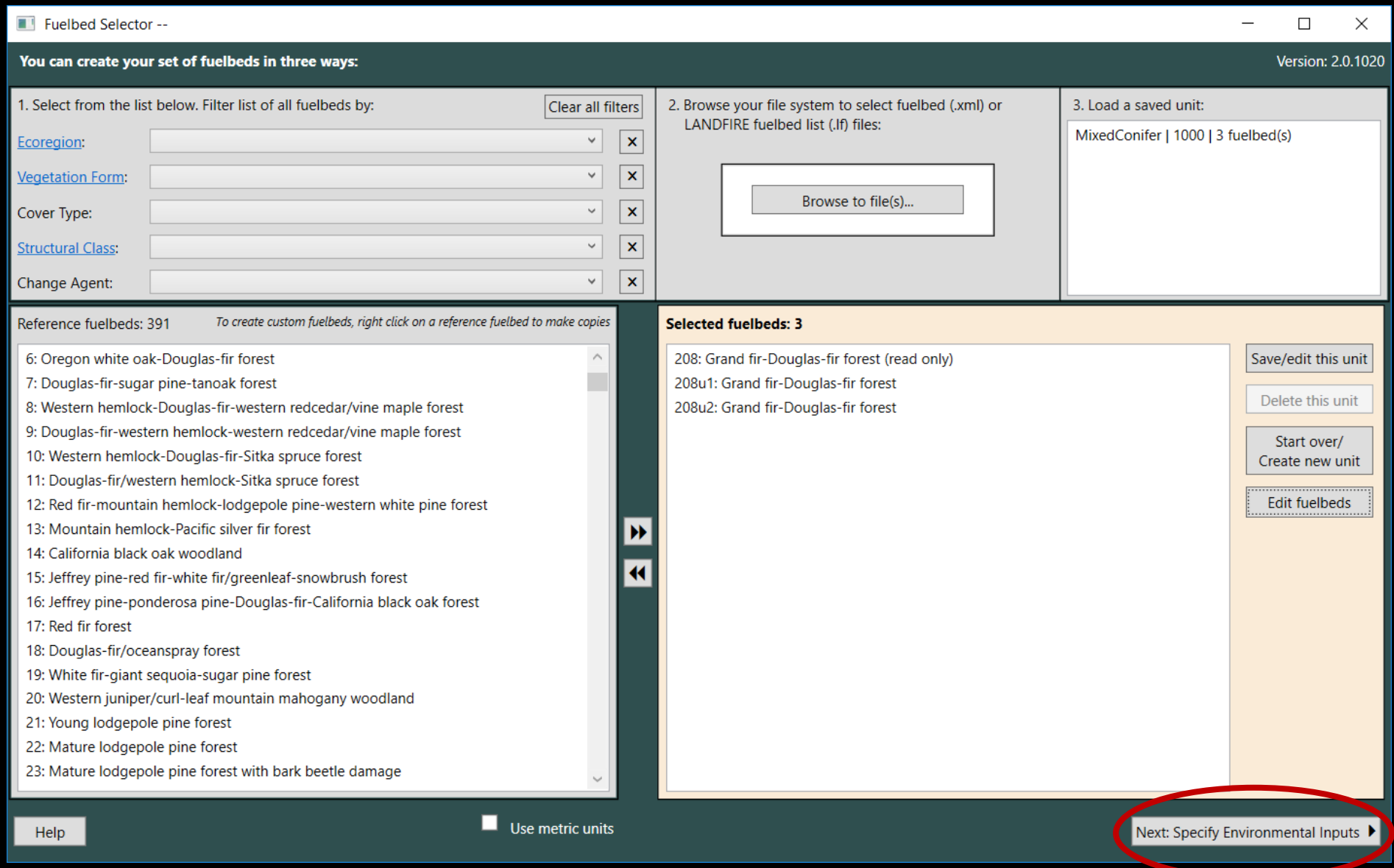
OVERSTORY	Total Cover	Percent Cover (%)	Height (ft)	HLC (ft)	Density (tree/acre)	DBH (in)	CLASS 2 SNAG Density (#/acre)	CLASS 3 SNAG Density (#/acre)	Ladder Fuels
Fuelbed 208	75	20	115	35	24	27	30	40	Yes
Fuelbed 208_Thin	40	15	80	45	20	25	10	10	No
Fuelbed 208_Rx	40	15	80	45	20	25	10	10	No

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

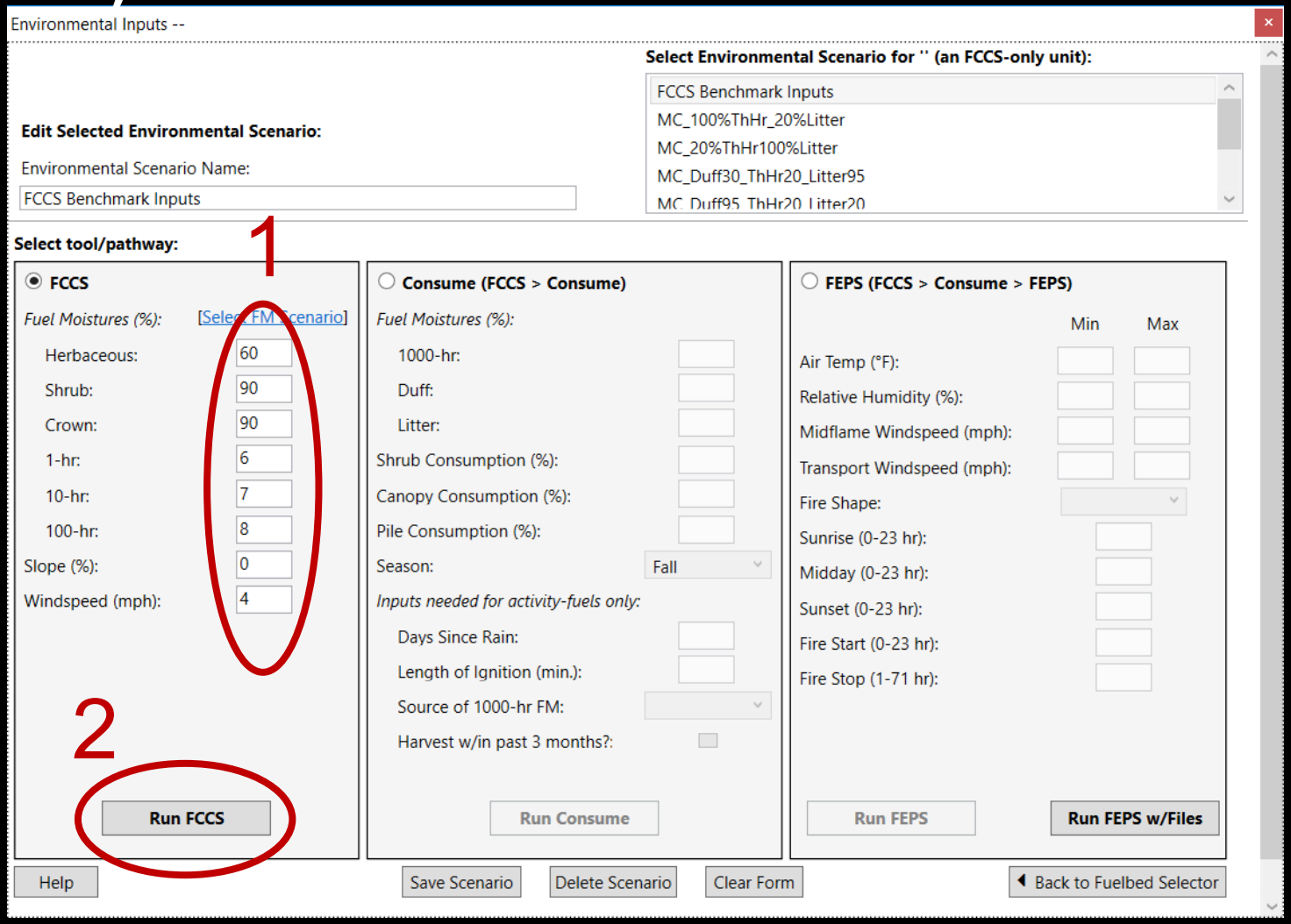
	Litter			Upper duff			Lower duff	
LITTER/DUFF	Percent Cover (%)	Depth (in)		Percent Cover (%)	Depth (in)		Percent Cover (%)	Depth (in)
Fuelbed 208	89	0.4		89	1		89	1
Fuelbed 208_Thin	95	0.6		89	0.9		89	0.9
Fuelbed 208_Rx	10	0.0		70	0.4		80	0.7


Fuelbed Editor
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
FB_0208_FCCSu01
FB_0208_FCCSu02
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
FB_0208_FCCSu02
FB_0208_FCCSu02.xml
208_thinRx
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


Fuelbed Selector --
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)



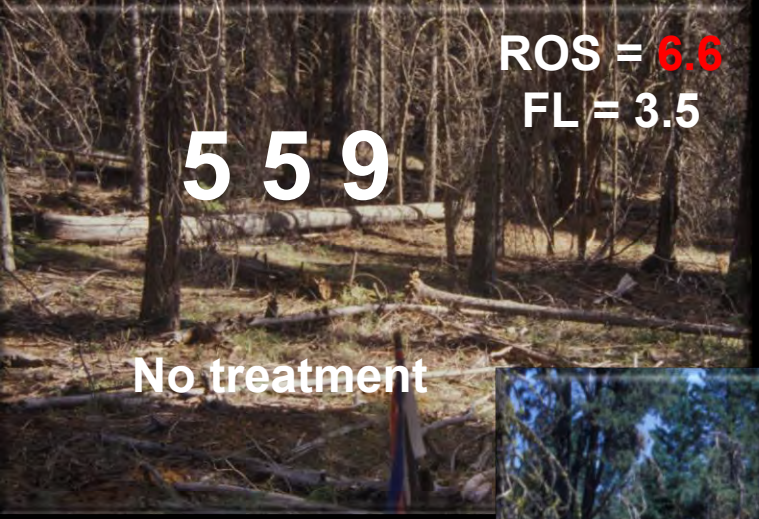
Fire Potentials

Variable	Fuelbed 208	Fuelbed 208_Thin	Fuelbed 208 Thin_Rx
	Potentials (0-9)	**Potentials (0-9)**	**Potentials (0-9)**
Surface Fire Behavior Potential	**5**	**7**	**1**
Reaction	3.8	5.9	2.0
Spread	5.1	6.6	1.4
Flame length	3.8	5.4	1.5
Crown Fire Potential	**5**	**3**	**1**
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
Available Fuel Potential	**9**	**9**	**6**
Flame Available	3.7	3.6	1.6
Smolder Available	2.8	3.5	1.8
Residual Available	5.0	2.9	2.3
FCC Potential	**559**	**739**	**116**

Surface Fire Behavior Potential at Benchmark Conditions

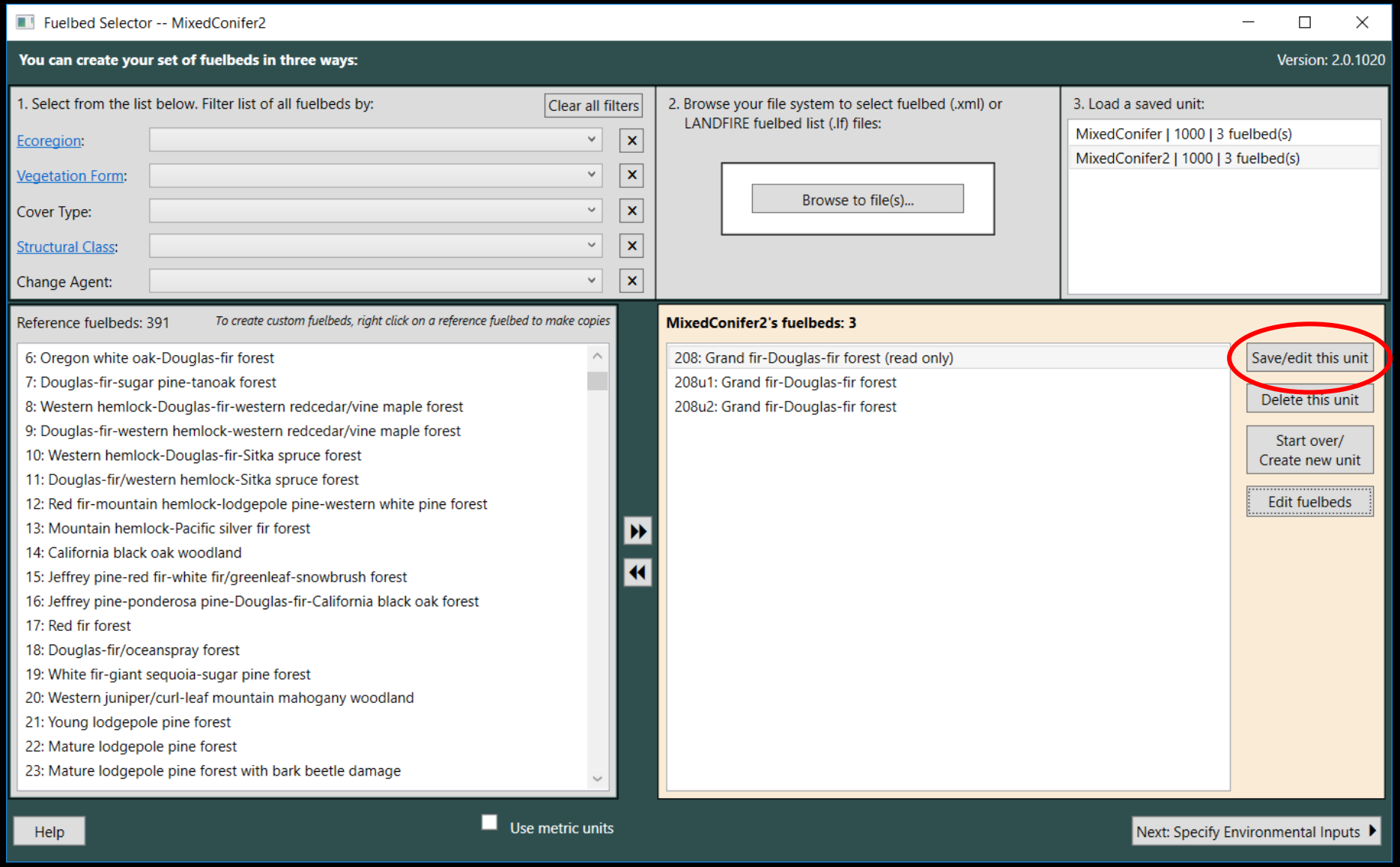
Variable	Fuelbed 208	Fuelbed 208_Thin	Fuelbed 208 Thin_Rx
Rate of Spread (ft/min)	6.6	10.8	0.5
Flame Length (ft)	3.5	7.4	0.5
Reaction Intensity BTUs/ft^2-min	2,270	5,381	653
FBFM (original 13)	9 (Timber)	12 (Slash)	8 (Timber)
Standard 40	TL9 (Timber-Litter)	SB3 (Slash)	TL3 (Timber-Litter)

Final Fire Assessment



Consume 4.2:

Predicting consumption & emissions


Fuelbed Selector -- MixedConifer2
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)
MixedConifer2 | 1000 | 3 fuelbed(s)
Reference fuelbeds: 391
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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
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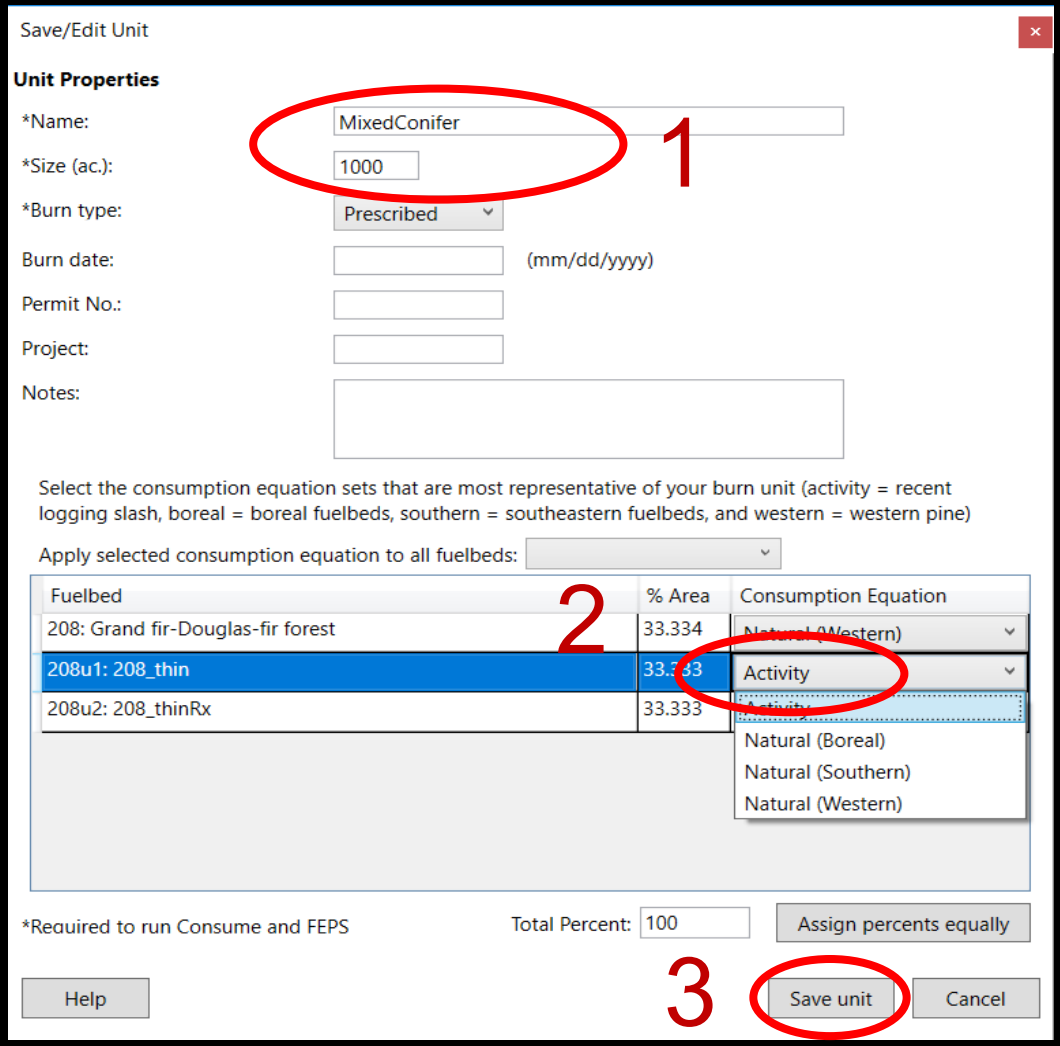
15: Jeffrey pine-red fir-white fir/greenleaf-snowbrush forest
16: Jeffrey pine-ponderosa pine-Douglas-fir-California black oak forest
17: Red fir forest
18: Douglas-fir/oceanspray forest
19: White fir-giant sequoia-sugar pine forest
20: Western juniper/curl-leaf mountain mahogany woodland
21: Young lodgepole pine forest
22: Mature lodgepole pine forest
23: Mature lodgepole pine forest with bark beetle damage
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



Consume Instructions

Step 2: Enter environmental variables

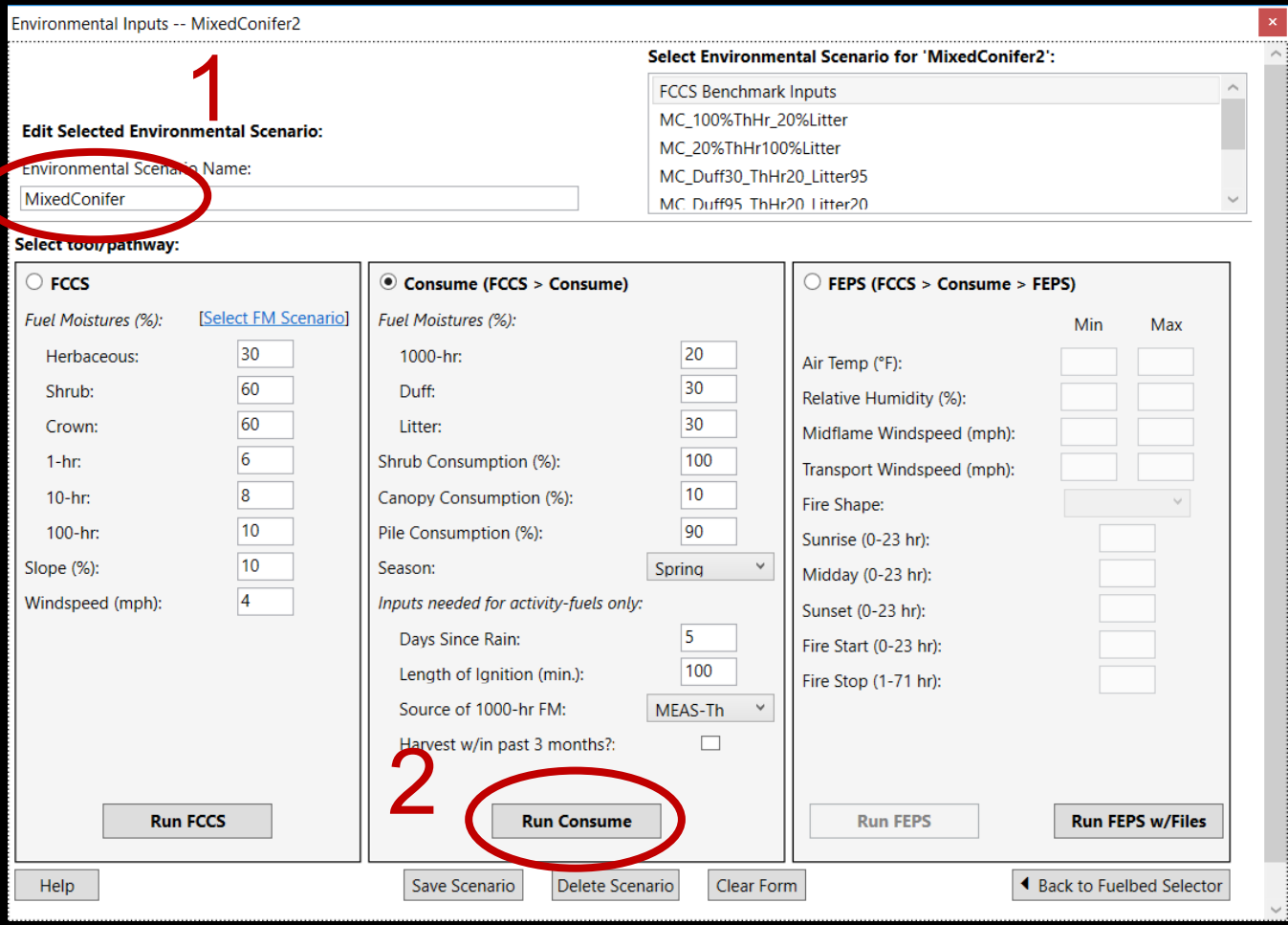
FCCS	INPUT
Herb FM (%)	30
Shrub FM (%)	60
Crown FM (%)	60
1-hr FM (%)	6
10-hr FM (%)	8
100-hr FM (%)	10
Slope (%)	10
Wind (mph)	4

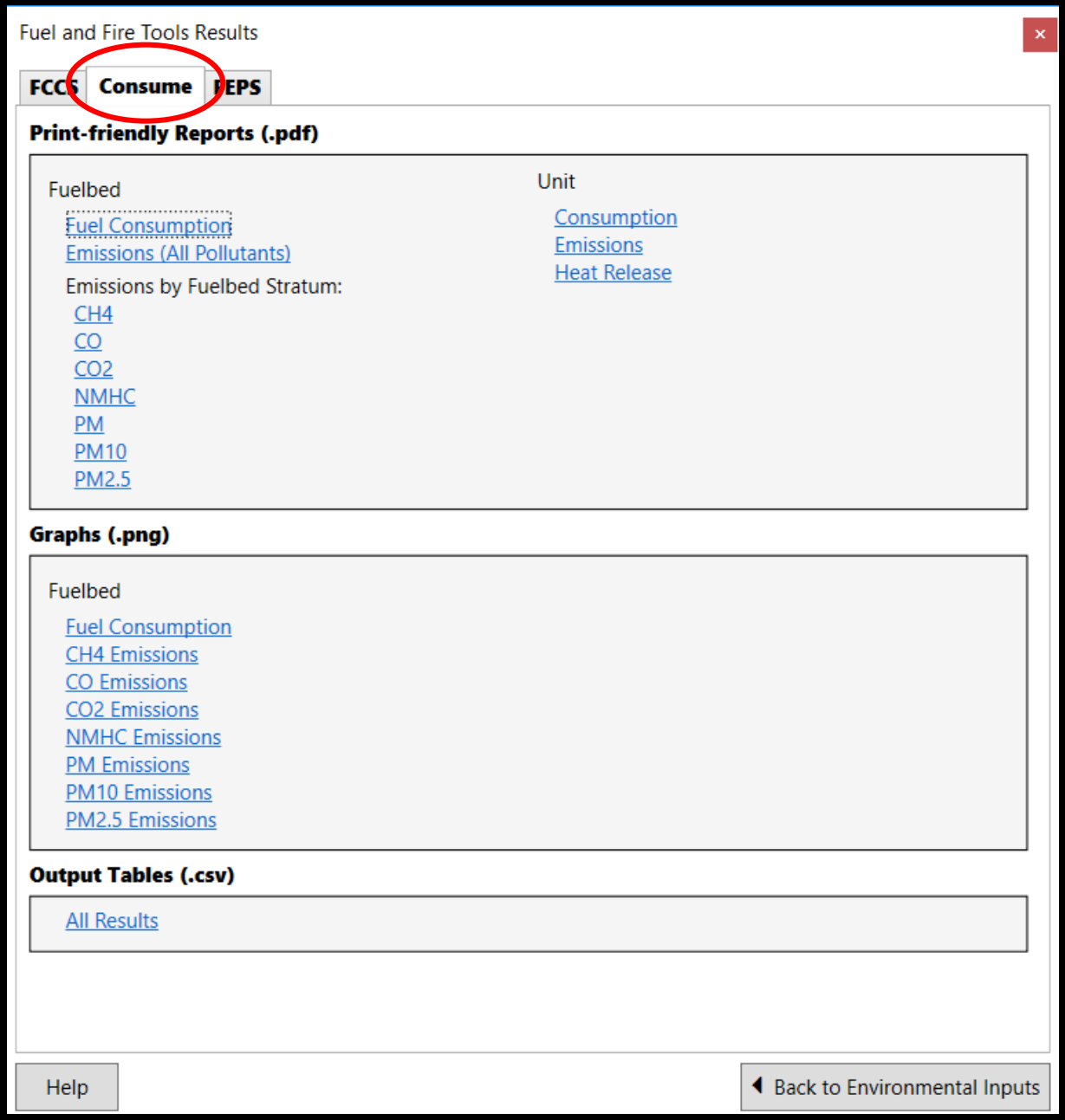
CONSUME	INPUT
1000-hr FM (%)	20
Duff FM (%)	30
Litter FM (%)	30
Shrub cons (%)	100
Canopy cons (%)	10
Pile cons (%)	90
Season	Spring
Days since rain	5
Length ignition (min)	100
Source 1000-hr FM	Meas-Th
Harvest within 3 months?	Unchecked (no)

Consume Instructions

Step 3:

- Save Scenario as Mixed Conifer
- Run Consume




Fuel and Fire Tools Results
FCCS
Consume
FEPS
Print-friendly Reports (.pdf)
Fuelbed
Fuel Consumption
Emissions (All Pollutants)
Emissions by Fuelbed Stratum:
CH4
CO
CO2
NMHC
PM
PM10
PM2.5
Unit
Consumption
Emissions
Heat Release
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?