

Fire Behavior



Description content for the survey

Fire or Project Name

Date Time

Date Time input fields

Location

Location input with coordinates and map view

Flame Length

Flame Height

Flame Bed Depth

Rate of Spread

Aspect



Aspect

Elevation

Slope Measurement

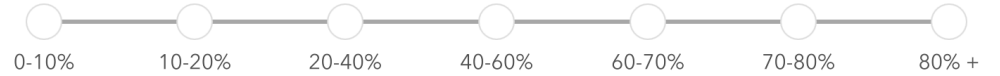
- Percent Slope
Degrees Slope

Slope

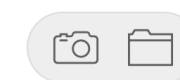
Fuel Model

Active Line

What percent of the fire line is actively burning?



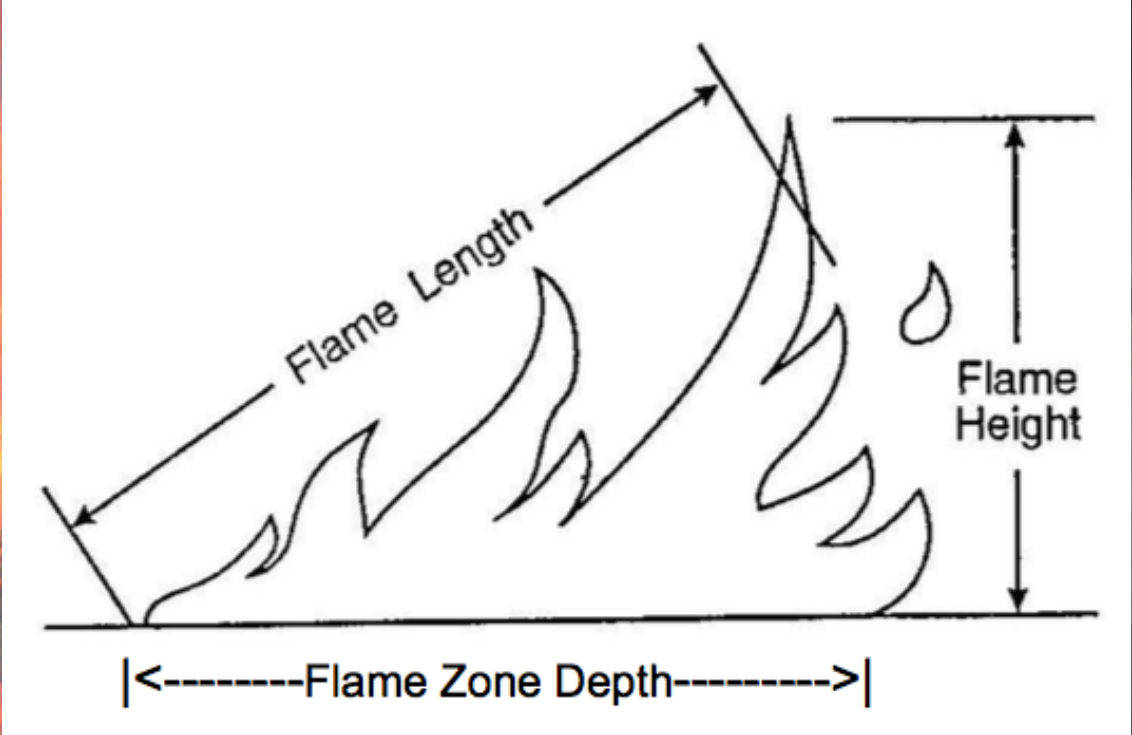
Photos



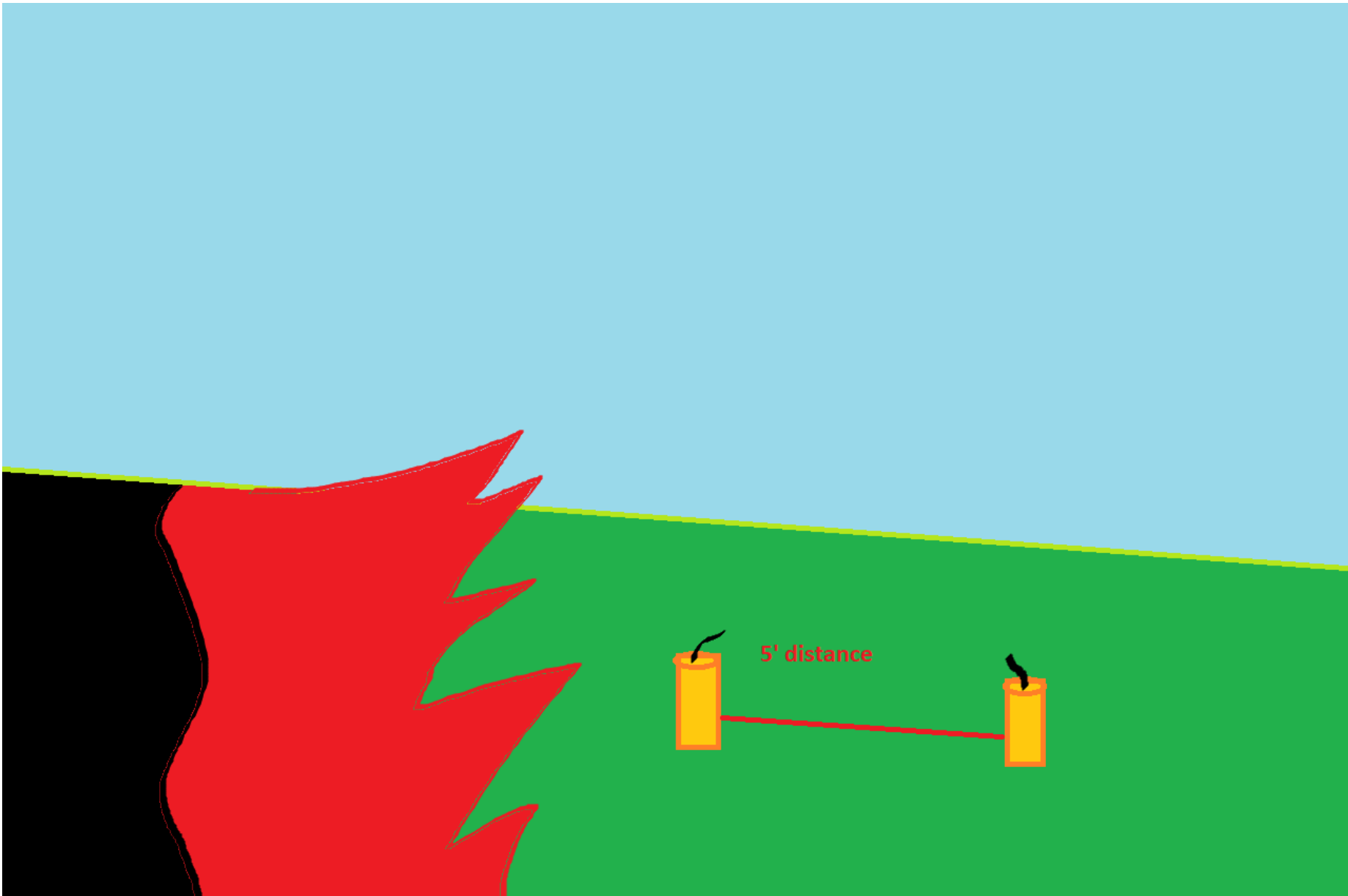
Remarks



Flame Dimensions

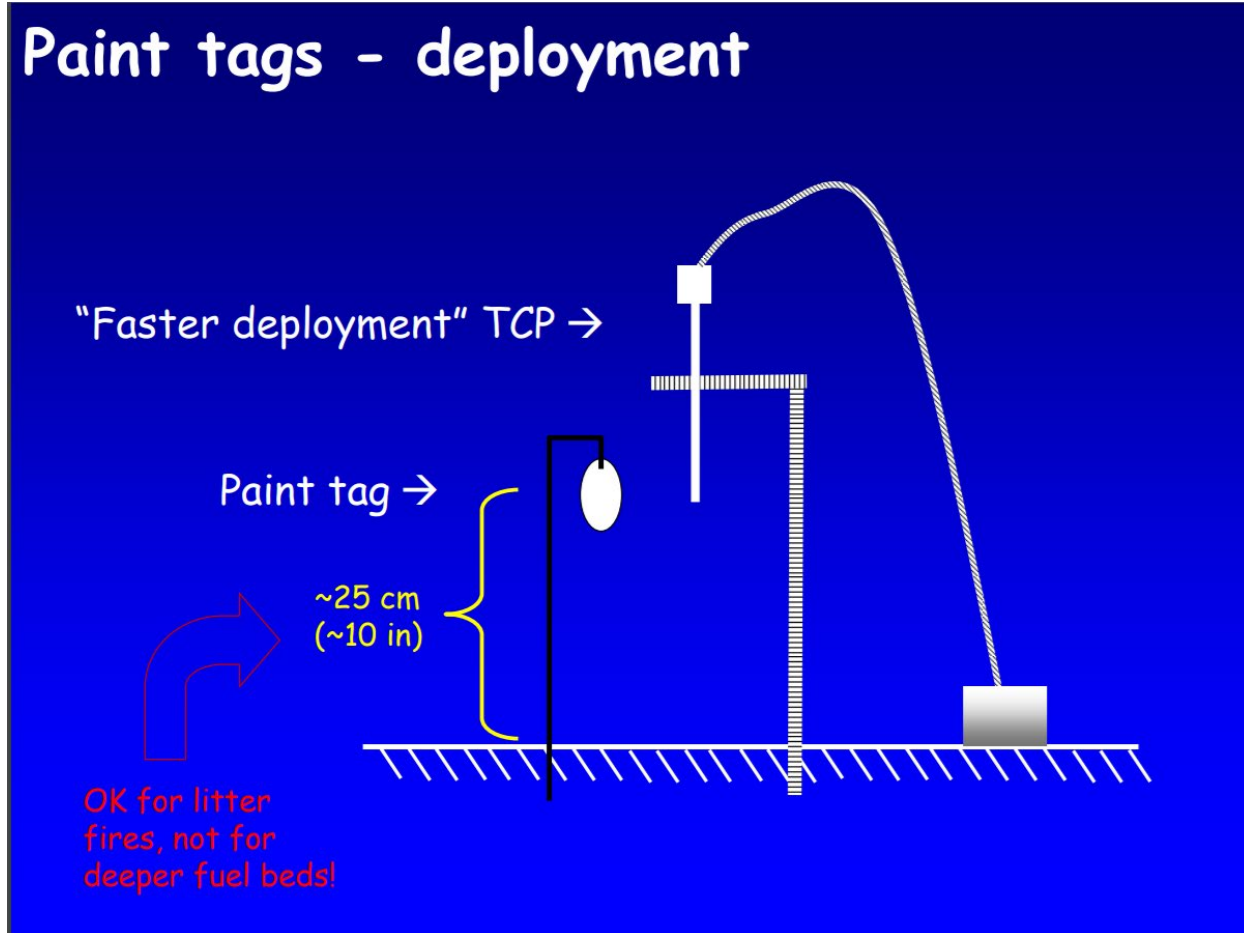
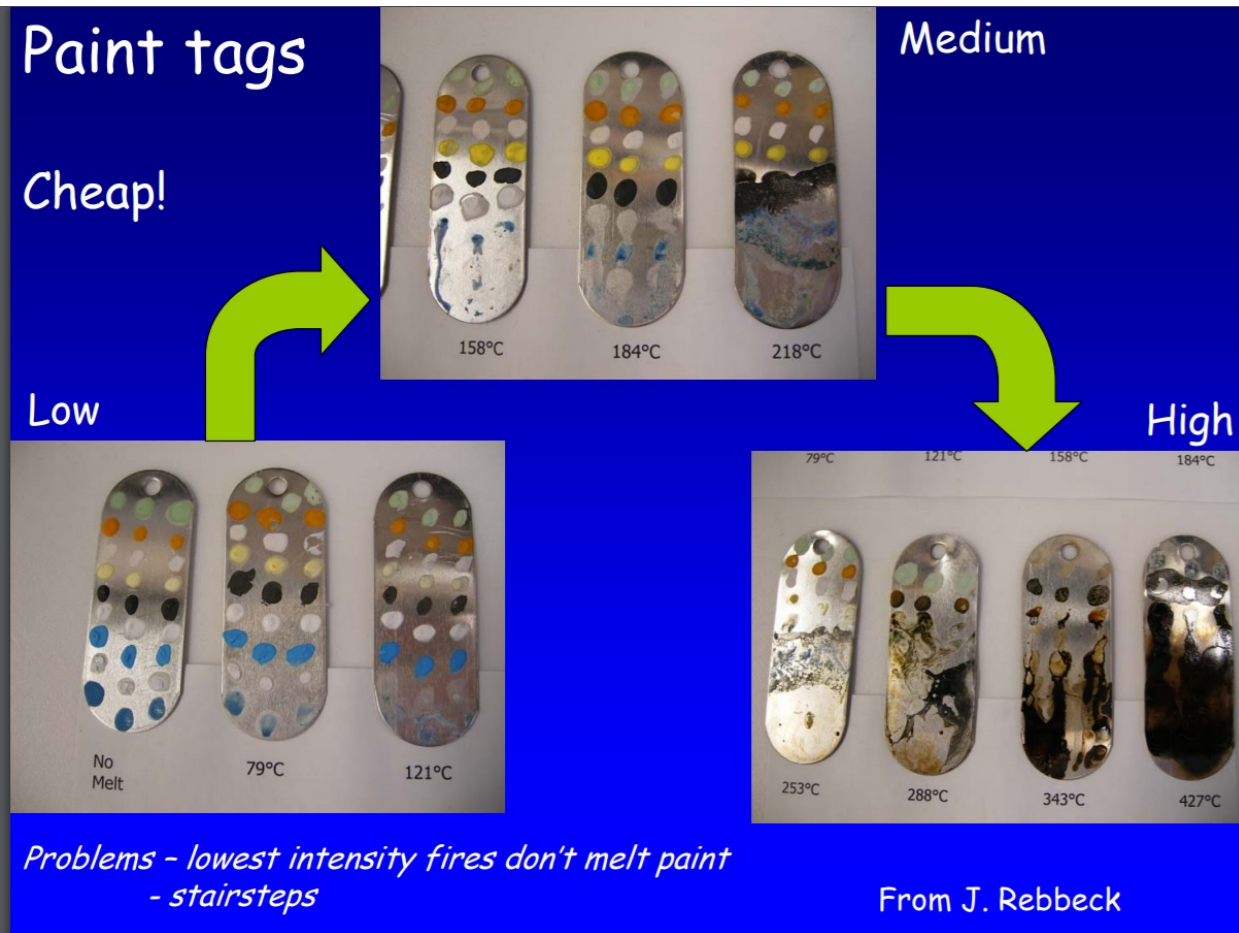


Measuring Rate of Spread



Spread distance (ft)				ROS ch/hr
1	3	5	10	
Time in Minutes(') and Seconds('')				
3'38"	10'55"	18'10"	36'22"	0.25
1'49"	5'27"	9'05"	18'10"	0.5
55"	2'44"	4'33"	9'05"	1
36"	1'49"	3'02"	6'04"	1.5
27"	1'22"	2'16"	4'33"	2
18"	55"	1'31"	3'02"	3
14"	41"	1'08"	2'16"	4
11"	33"	55"	1'49"	5
9"	27"	45"	1'31"	6
8"	23"	39"	1'18"	7
7"	20"	34"	1'08"	8
6"	18"	30"	1'01"	9
5"	16"	27"	55"	10
4"	11"	18"	36"	15
3"	8"	14"	27"	20
2"	7"	11"	22"	25
2"	5"	9"	18"	30
2"	5"	8"	16"	35
1"	4"	7"	14"	40
1"	3"	5"	11"	50
1	3	5	10	
Spread distance (ft)				

Maximum Heat Output



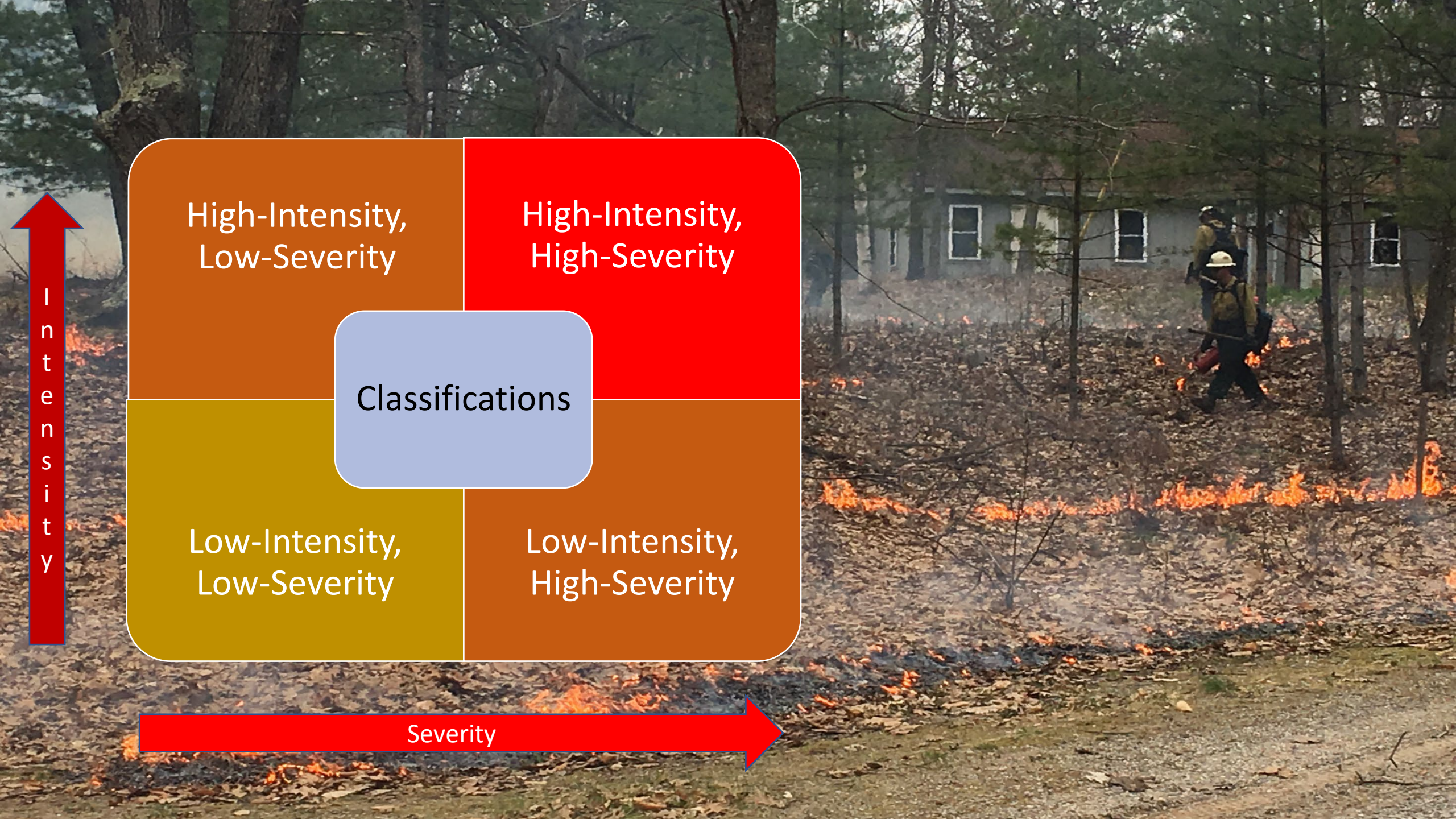
Burn Severity Mapping





Fire intensity describes the physical combustion process of energy release from organic matter, or the energy per unit volume multiplied by the velocity at which the energy is moving.

Fire severity refers to the ecosystem impacts of a **fire** such as mortality of trees or change in biodiversity.



High-Intensity,
Low-Severity

High-Intensity,
High-Severity

Classifications

Low-Intensity,
Low-Severity

Low-Intensity,
High-Severity

Severity

I
n
t
e
n
s
i
t
y

Normalized Burn Ratio

Table 1: Burn severity classes and thresholds proposed by USGS. Color coding established by UN-SPIDER.

Severity Level	dNBR Range (scaled by 10^3)	dNBR Range (not scaled)
Enhanced Regrowth, high (post-fire)	-500 to -251	-0.500 to -0.251
Enhanced Regrowth, low (post-fire)	-250 to -101	-0.250 to -0.101
Unburned	-100 to +99	-0.100 to +0.99
Low Severity	+100 to +269	+0.100 to +0.269
Moderate-low Severity	+270 to +439	+0.270 to +0.439
Moderate-high Severity	+440 to +659	+0.440 to +0.659
High Severity	+660 to +1300	+0.660 to +1.300

Severity

Unburned: Plant parts green and unaltered, no direct effect from heat.

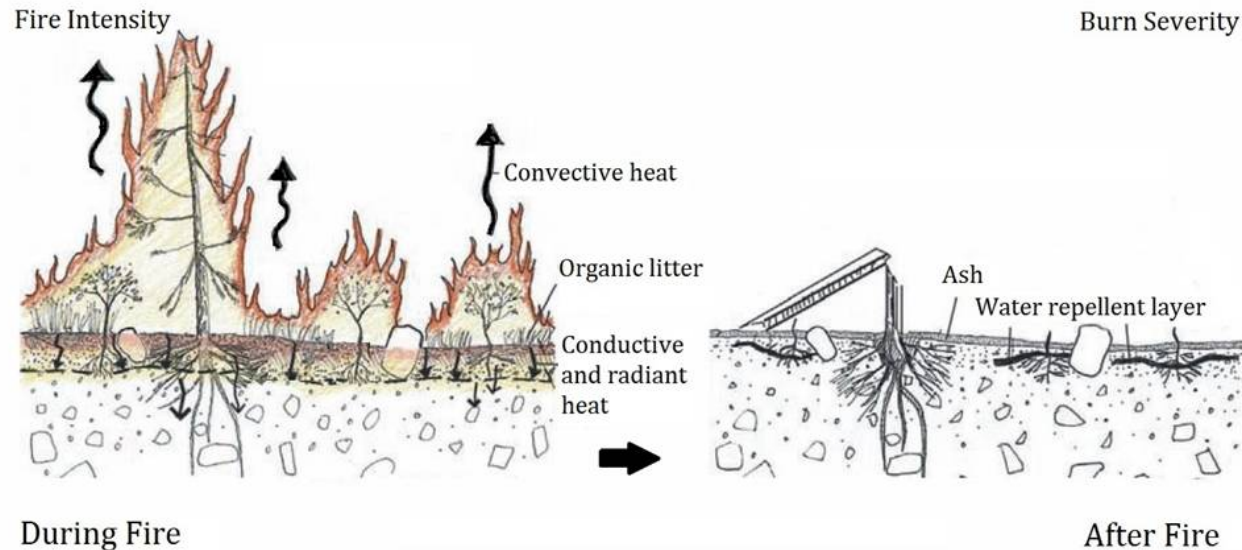
Low: Canopy trees with green needles although stems scorched.

Moderate-Low or moderate surface burn: Surface litter, mosses, and herbs charred and soil with little or no impact.

Moderate-High: Soil organic layer largely intact and charring limited to a few mm depth. Trees with some canopy cover killed, but needles not consumed. All understory plants charred or consumed. Fine dead twigs on soil surface consumed and logs charred or consumed. Pre-fire soil organic layer largely consumed.

High or crown fire: Canopy trees killed and needles consumed

Surface litter of all sizes and soil organic layer largely consumed White ash deposition and charred organic matter to several cm depth.



Burn Severity Mapping

The screenshot displays the Google Earth Engine web interface. At the top, the Google Earth Engine logo and a search bar are visible. The main interface is divided into several panels:

- Scripts Panel (Left):** Shows a list of scripts under the user 'users/huronwfm/Severity'. The script 'Brittle Fire Area' is selected.
- Script Editor (Center):** Displays a JavaScript script for mapping burn severity. The script includes comments and code for selecting Landsat imagery by time and location. Line 86, `var area = ee.FeatureCollection(geometry);`, is highlighted in red, indicating an error.
- Inspector/Console Panel (Right):** Shows the console output. The first two lines are: 'Data selected for analysis: Landsat 8' and 'Fire incident occurred between 2017-01-18 and 2017-02-20'. A red error message at the bottom reads 'Line 86: geometry is not defined'.
- Map (Bottom):** Shows a map of the United States with state boundaries and names. Major cities like Los Angeles, Chicago, New York, and Houston are labeled. The map is centered on the United States.

```
80 var pl = Landsat 8 ;
81 }
82 print(ee.String('Data selected for analysis: ').cat(pl));
83 print(ee.String('Fire incident occurred between ').cat(prefire_end).cat(' and ').cat(postfire_start));
84
85 // Location
86 var area = ee.FeatureCollection(geometry);
87
88 // Set study area as map center.
89 Map.centerObject(area);
90
91 //----- Select Landsat imagery by time and location -----
92
93 var imagery = ee.ImageCollection(ImCol);
94
95 // In the following lines imagery will be collected in an ImageCollection, depending on the
96 // location of our study area, a given time frame and the ratio of cloud cover.
97 var prefireImCol = ee.ImageCollection(imagery
98   // Filter by dates.
99   .filterDate(prefire_start, prefire_end)
100  // Filter by location
```

Scripts Docs Assets

Filter scripts... NEW Refresh

Owner (1)

- users/huronwfm/Severity
 - Brittle Fire Area
 - Brittle Fire21
 - Corsair04
 - HS_STORM20
 - Warbler 4
 - Williams Fork

Writer

No accessible repositories. Click Refresh to check again.

Reader

No accessible repositories. Click Refresh to check again.

Archive

No accessible repositories. Click Refresh to check again.

Examples

Link b455ba8cf4b5bee822bb7ff8935e6209 *

Get Link Save Run Reset Apps

```

30 // CAREFUL: Under geometry imports (top left in map pane) uncheck the
31 // geometry box, so it does not block the view on the imagery later.
32
33 //*****
34 // SET TIME FRAME
35
36 // Set start and end dates of a period BEFORE the fire. Make sure it is long enough for
37 // Sentinel-2 to acquire an image (repetition rate = 5 days). Adjust these parameters, if
38 // your ImageCollections (see Console) do not contain any elements.
39 var prefire_start = '2016-12-20';
40 var prefire_end = '2017-01-18';
41
42 // Now set the same parameters for AFTER the fire.
43 var postfire_start = '2017-02-20';
44 var postfire_end = '2017-03-28';
45
46 //*****
47 // SELECT A SATELLITE PLATFORM
48
49 // You can select remote sensing imagery from two available satellite sensors.
50 // Consider details of each mission below to choose the data suitable for your needs.
51
52

```

Inspector Console Tasks

Use print(...) to write to this console.

Data selected for analysis: Landsat 8 JSON

Fire incident occurred between 2017-01-18 and 2017-02-20 JSON

Line 86: geometry is not defined



Scripts Docs Assets

Filter scripts... NEW Refresh

- Owner (1)
 - users/huronwfm/Severity
 - Brittle Fire Area
 - Brittle Fire21
 - Corsair04
 - HS_STORM20
 - Warbler 4
 - Williams Fork
- Writer
 - No accessible repositories. Click Refresh to check again.
- Reader
 - No accessible repositories. Click Refresh to check again.
- Archive
 - No accessible repositories. Click Refresh to check again.
- Examples

Brittle Fire Area Get Link Save Run Reset Apps Settings

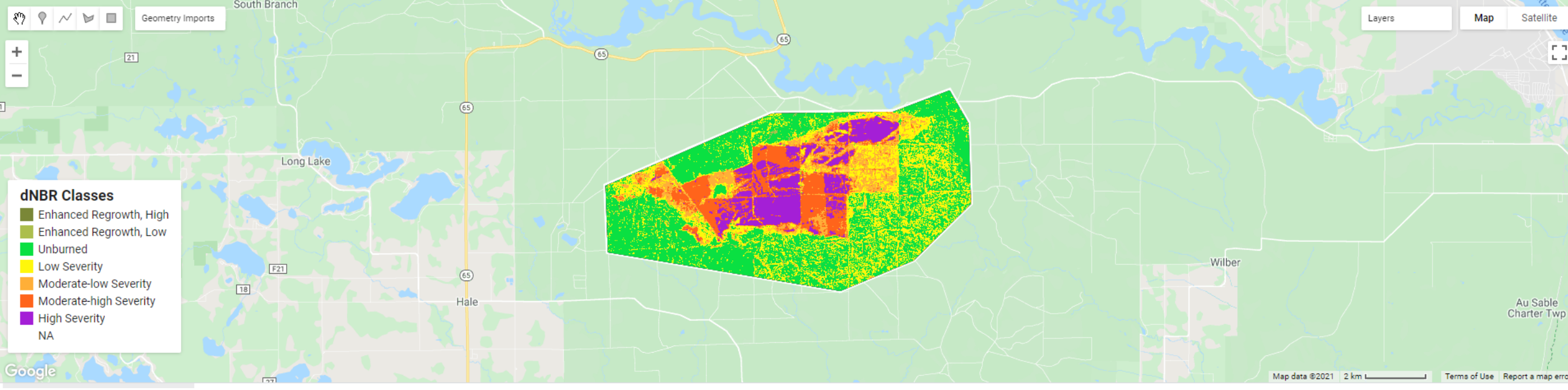
```
Imports (1 entry)
  var geometry: Polygon, 9 vertices

1 //-----
2 //                BURN SEVERITY MAPPING USING THE NORMALIZED BURN RATIO (NBR)
3 //-----
4 // Normalized Burn Ratio will be applied to imagery from before and after a wild fire. By
5 // calculating the difference afterwards (dNBR) Burn Severity is derived, showing the spatial
6 // impact of the disturbance. Imagery used in this process comes from either Sentinel-2 or
7 // Landsat 8.
8 //-----
9
10 //:::
11 //                RUN A DEMO (optional)
12
13 // If you would like to run an example of mapping burn severity you can use the predefined
14 // geometry below as well as the other predefined parameter settings. The code will take you
15 // to Empredado, Chile where wildfires devastated large forested areas in January and February
16 // of 2017.
17 // --> Remove the comment-symbol (//) below to so Earth Engine recognizes the polygon.
18
19
```

Inspector Console **Tasks**

Use print(...) to write to this console.

- Data selected for analysis: Landsat 8 JSON
- Fire incident occurred between 2021-04-22 and 2021-04-... JSON
- Pre-fire Image Collection: JSON
 - ImageCollection LANDSAT/LC08/C01/T1_SR (6 elements) JSON
- Post-fire Image Collection: JSON
 - ImageCollection LANDSAT/LC08/C01/T1_SR (1 element) JSON
- Pre-fire True Color Image: JSON
 - Image (12 bands) JSON





Date
Date

Litter and Duff Depths
Litter Depth
Duff Depth
1 of 1

Soil Texture

Slope %
0-20% 21-75% 76-150% 151%+
Aspect
North East South West

Pe-Fire Vegetation Type
Grass
Shrub / Brush
Timber
Slash



Table 1: Burn severity classes and thresholds proposed by USGS. Color coding established by UN-SPIDER.

Severity Level	dNBR Range (scaled by 10 ³)	dNBR Range (not scaled)
Enhanced Regrowth, high (post-fire)	-500 to -251	-0.500 to -0.251
Enhanced Regrowth, low (post-fire)	-250 to -101	-0.250 to -0.101
Unburned	-100 to +99	-0.100 to +0.99
Low Severity	+100 to +269	+0.100 to +0.269
Moderate-low Severity	+270 to +439	+0.270 to +0.439
Moderate-high Severity	+440 to +659	+0.440 to +0.659
High Severity	+660 to +1300	+0.660 to +1.300



15:45 Mon May 31

65%



Fire Severity



Severity

Unburned: Plant parts green and unaltered, no direct effect from heat.

Low: Canopy trees with green needles although stems scorched.

Moderate-Low or moderate surface burn: Surface litter, mosses, and herbs charred and soil with little or no impact.

Moderate-High: Soil organic layer largely intact and charring limited to a few mm depth. Trees with some canopy cover killed, but needles not consumed. All understorey plants charred or consumed. Fine dead twigs on soil surface consumed and logs charred or consumed. Pre-fire soil organic layer largely consumed.

High or crown fire: Canopy trees killed and needles consumed

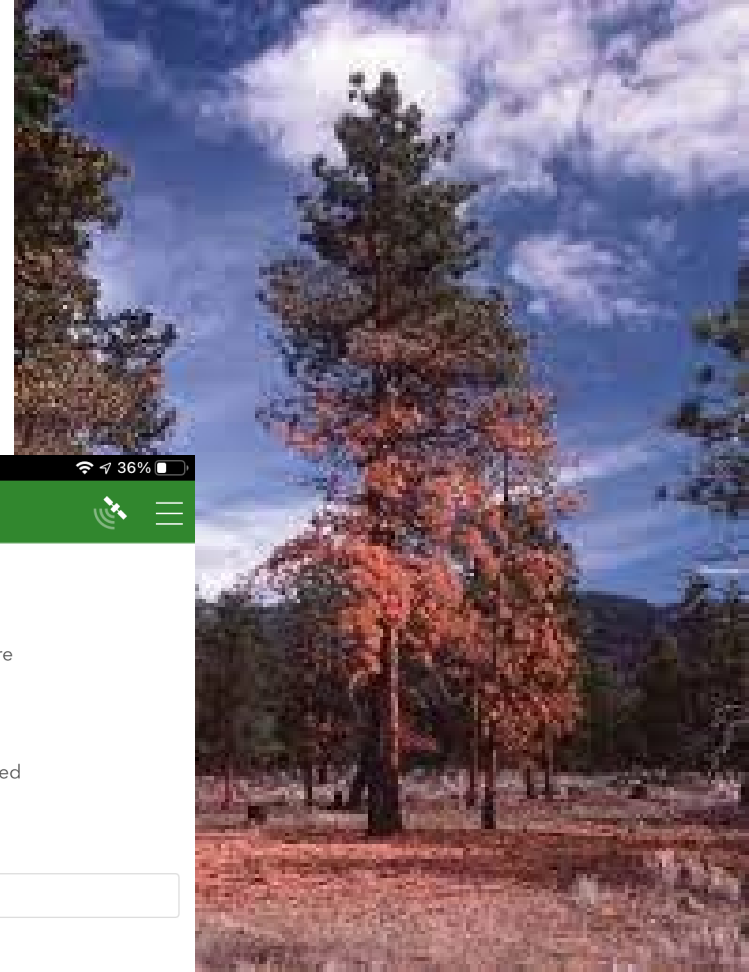
Surface litter of all sizes and soil organic layer largely consumed White ash deposition and charred organic matter to several cm depth.

- Enhanced Regrowth High
- Enhanced Regrowth Low
- Unburned
- Low Severity
- Moderate Low Severity
- Moderate High Severity
- High Severity

Fire Severity

Hydrophobic soils?

- Yes
- No



15:43 Tue Jun 1 📶 36% 🔋

✕ Fire Severity 📶 ☰

Observations

Fire Type

Surface Fire Crown and Surface Fire Independent Crown Fire

Roots

Have the roots been altered from the pre-fire condition?

No change Scorched Very fine roots consumed

Bole Char Min Height

Lowest point of bole char

Bole Char Max Height

Highest point of bole char

Min Crown Scorch (ft)

Estimate the percent of the crown that has turned brown or black.

Max Crown Scorch (ft)

Severity

Unburned: Plant parts green and unaltered, no direct effect from heat.

< 3 of 3 ✓

Fire Severity

Ground Cover

Estimate the percent of cover of effective organic material that pertains to mitigation of erosion. Include litter, duff, and woody material.

Percent Color Green

Estimate the % cover of each color in the plot square

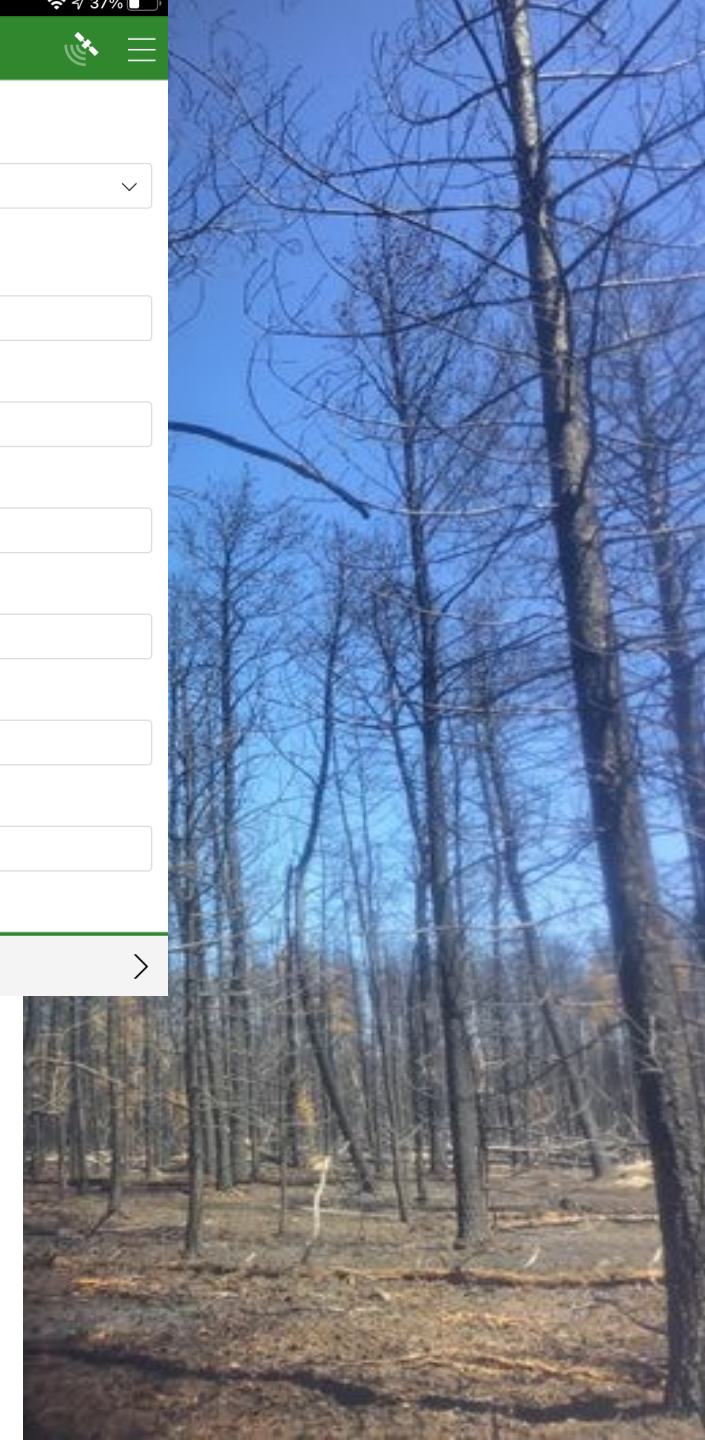
Percent Color Brown

Percent Color Grey

Percent Color Black

Percent Color White

Percent Color Orange



O Horizon Depth

A Horizon Depth

E Horizon Depth

B Horizon Depth



3 of 3



Horizons

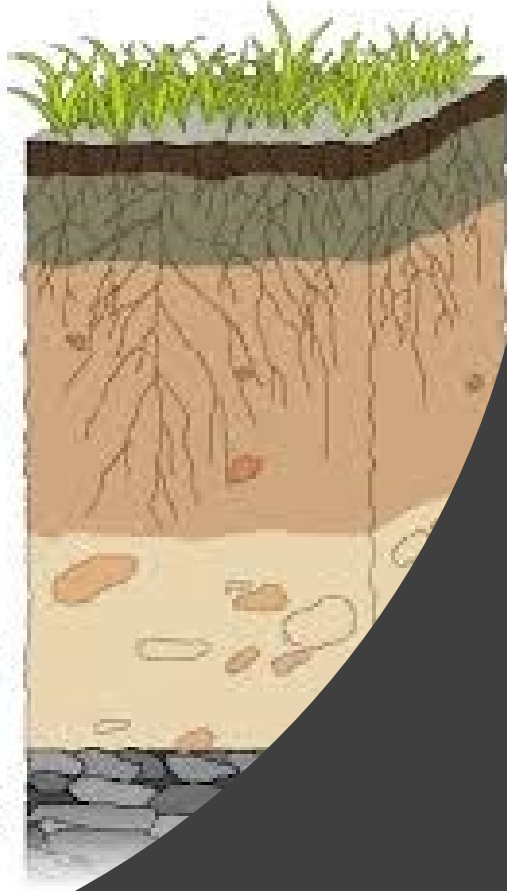
O (Organic)

A (Surface)

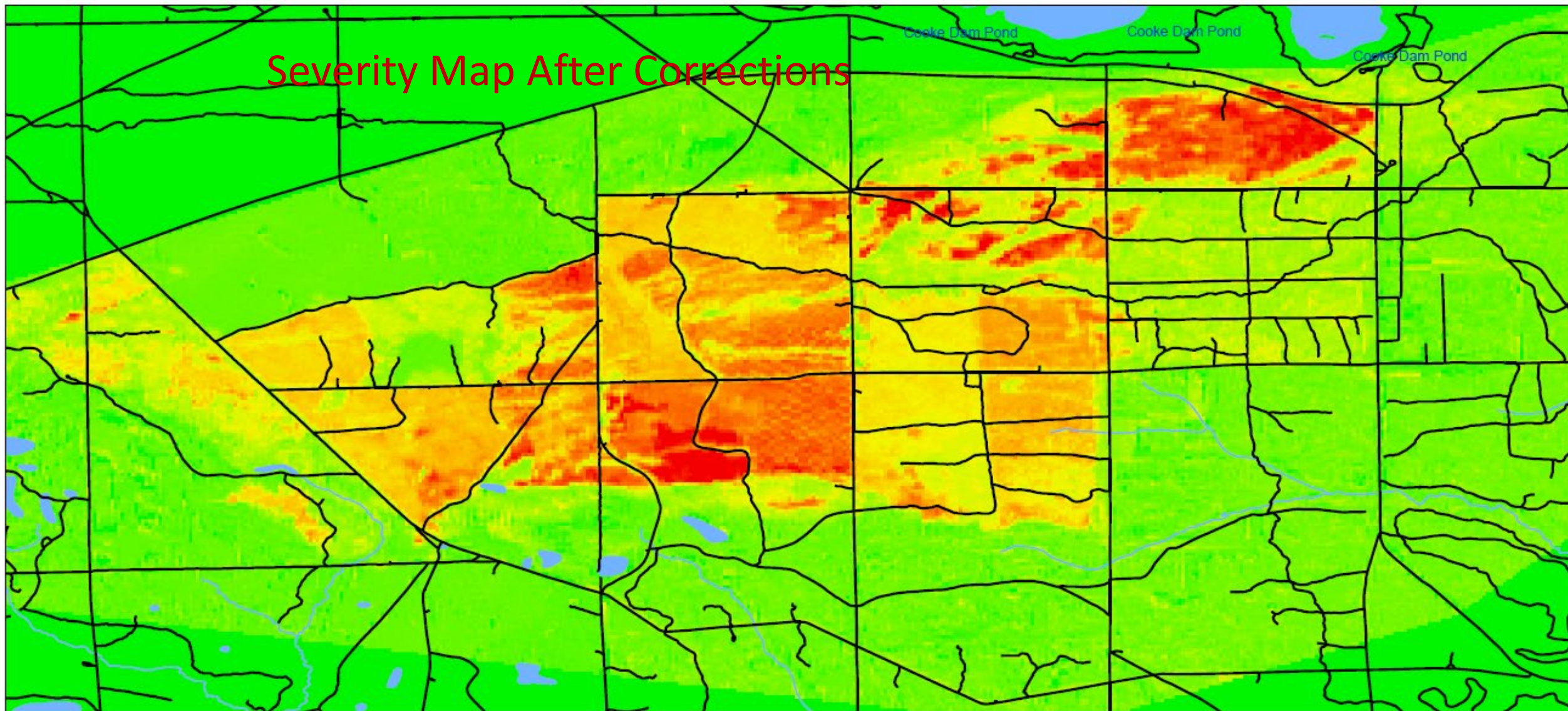
B (Subsoil)

C (Substratum)

R (Bedrock)

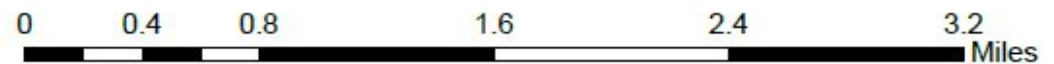
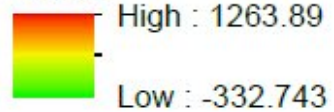


Severity Map After Corrections



Legend

dNBRBritt.tif Value



QUESTIONS?

