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Options for Initiating CO-FPS

Center of Excellence for Advanced Technology Aerial Firefighting

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Introduction

- The interface between the Colorado Fire Prediction System (CO-FPS), housed at NCAR, and the Colorado Wildfire Information Management System (CO-WIMS), housed at Intterra, is being developed now

- Feedback on the specifications of the CO-WIMS interface can be incorporated into design work both for this year, and for future versions of the system

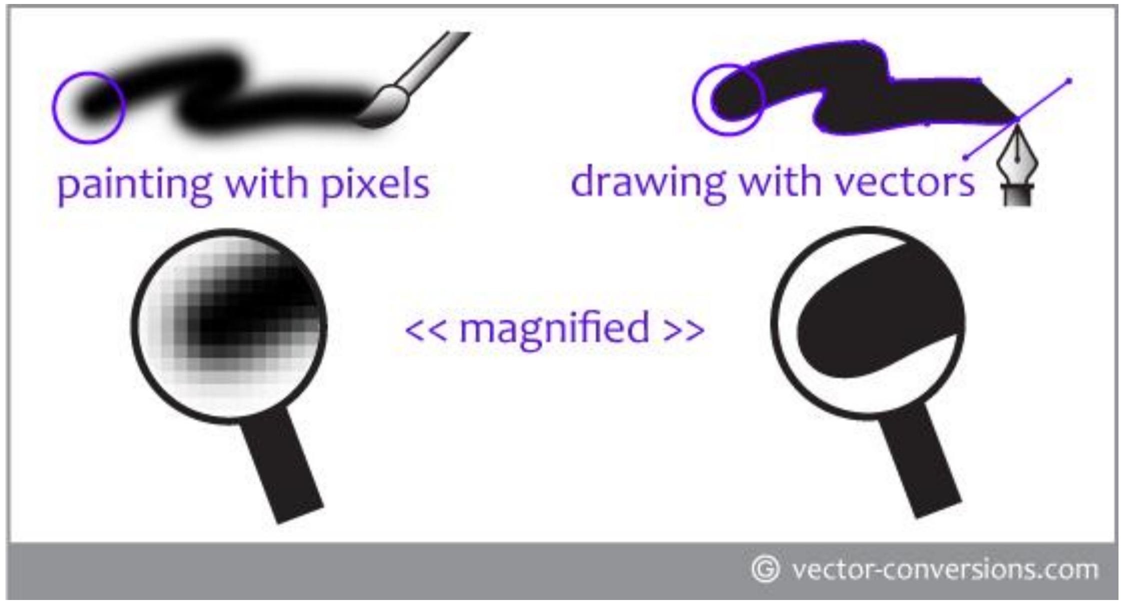
- As you view the proposed designs, consider the strengths and deficiencies of current modelling systems and provide feedback how to optimize this system!

The Shape of Things to Come…

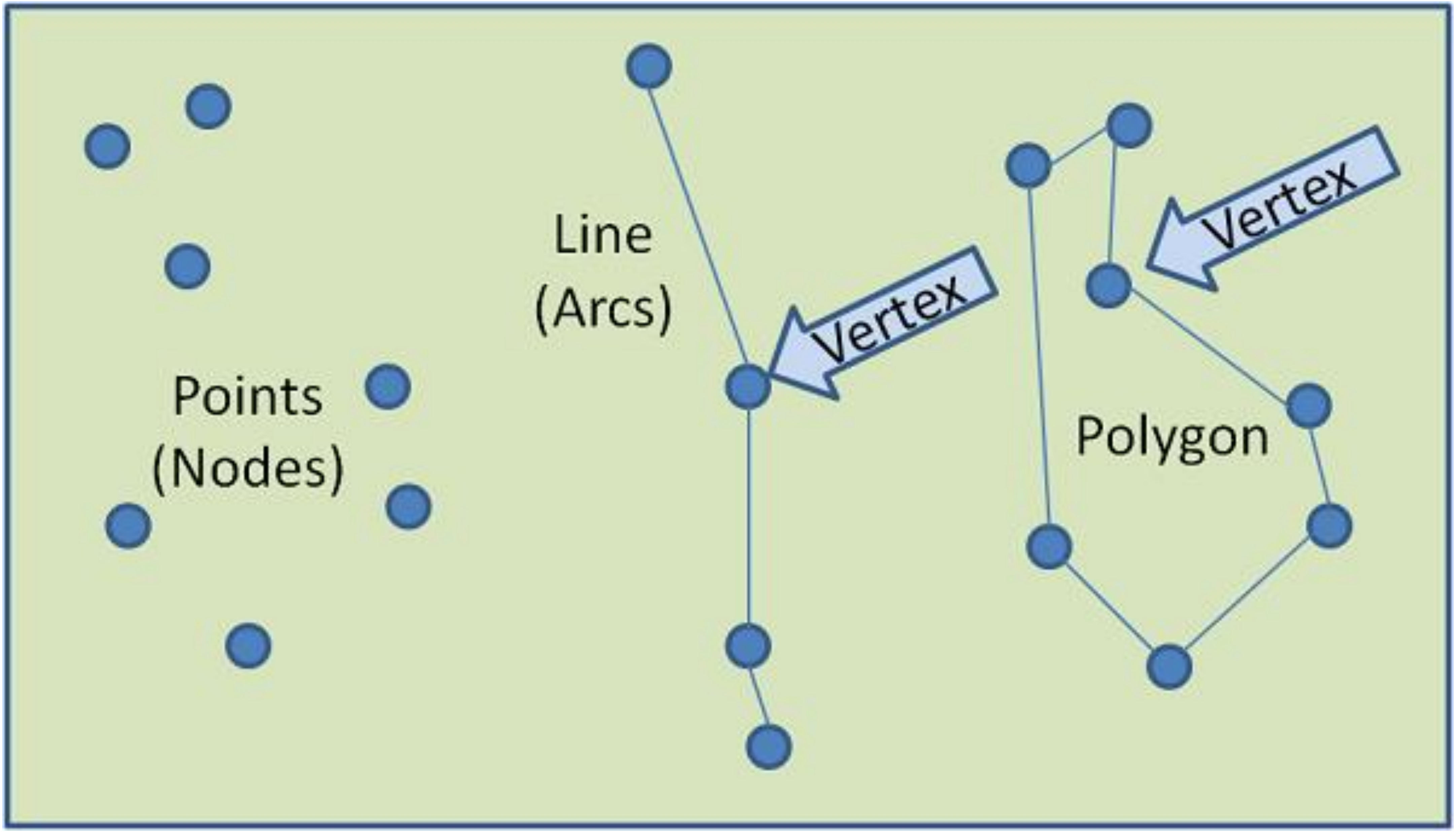
- We can represent features on the earth using a computer and a Geographic Information System (GIS). CO-WIMS is a web-based GIS.

- GIS can display raster data, where the map is made of pixels in a grid

- Or GIS can display vector data, where the map is made of GPS coordinates at each point or turn of a line/shape, with the line smoothly drawn in between



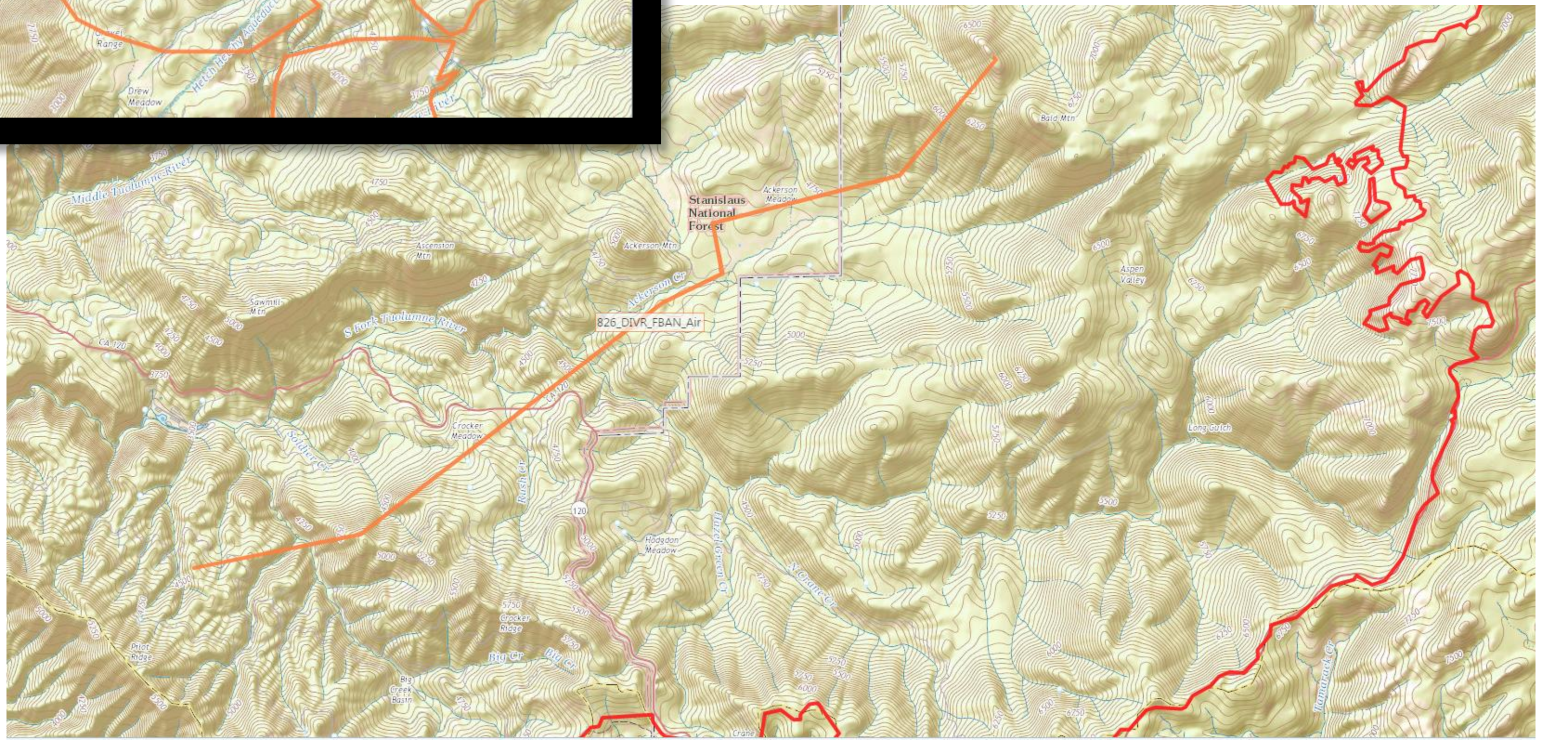
Vector Data Types



WFDSS Active Fire Input

WFDSS allows for ignitions based on imported spatial data…

…Or data drawn by hand



Indicating Active Fire

- CO-FPS uses a geoJSON object to indicate an active fire
- This object can be either a point, line, or polygon
- Options for indicating fire can include hand tracing, importing spatial data, MMA data, and VIIRS data
- Remotely sensed data can contain error, and may require manual interpretation prior to use in the model

Data Available to CO-WIMS

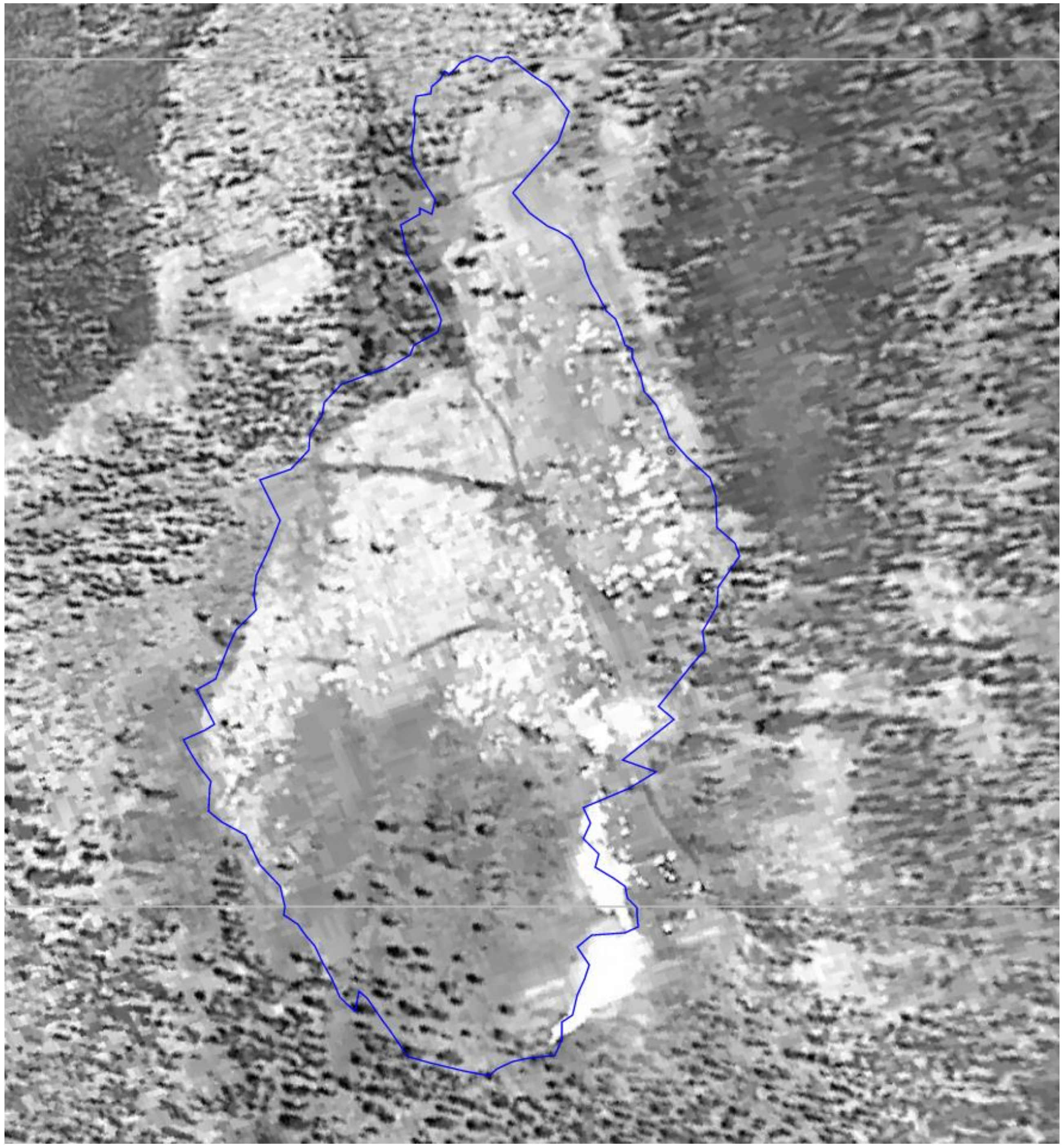
- A CO-WIMS user can turn on or turn off map layers to customize their view
- This capability will be preserved in the CO-FPS viewstate, allowing users to view MMA data, satellite data, and data pulled in from federal systems

MMA Data

- Unlike NIROPS, the MMA does not routinely separate out hot fire line from cold line when tracing a fire perimeter

- As a result igniting off the entirety of an MMA perimeter may ignite areas that will not ignite in the real world

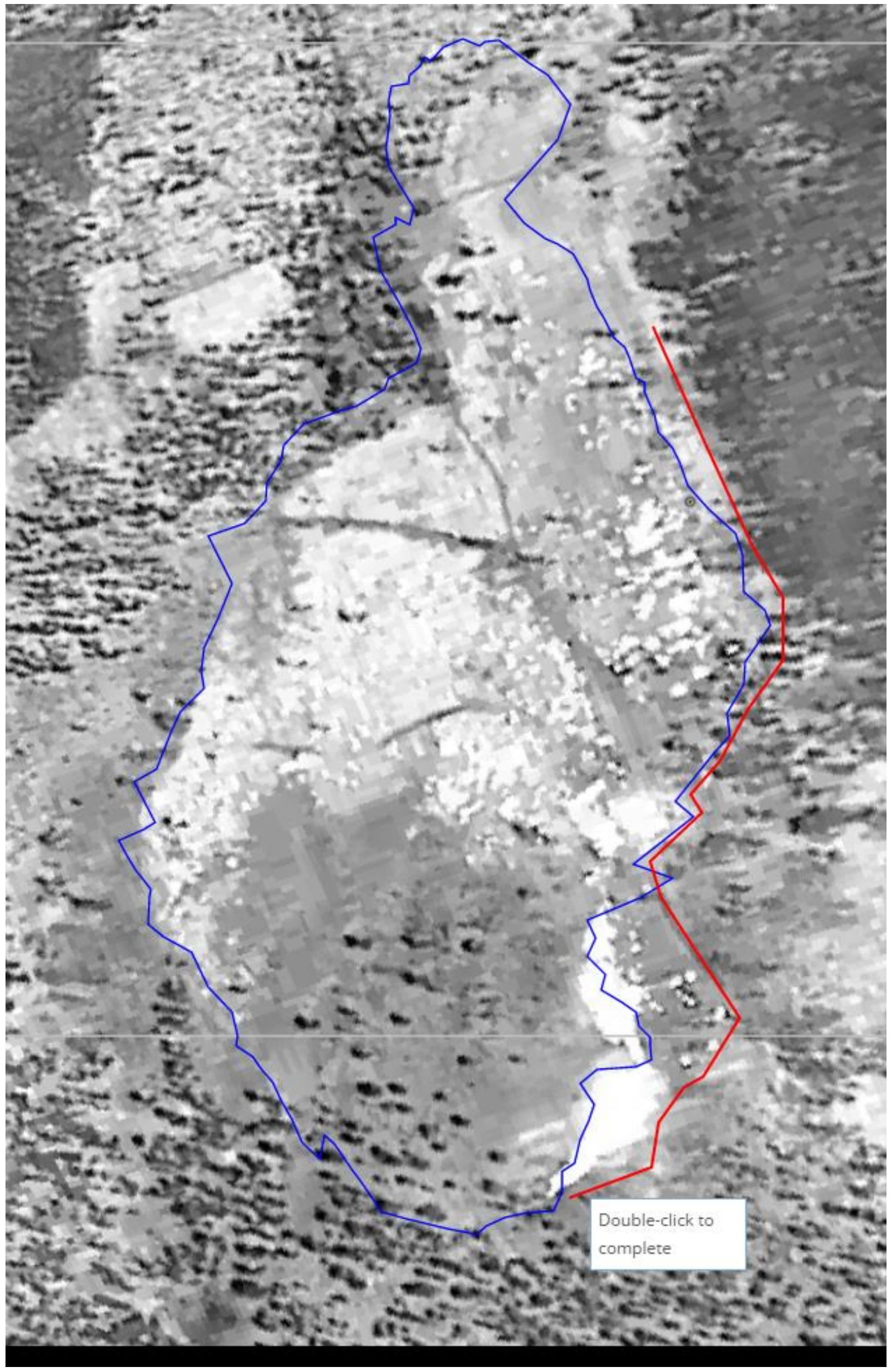
- Manual interpretation is currently required to select areas with active fire



Tracing of MMA Data

- With proper training on the interpretation of MMA infrared imagery a user will manually select areas with heat to ignite the fire

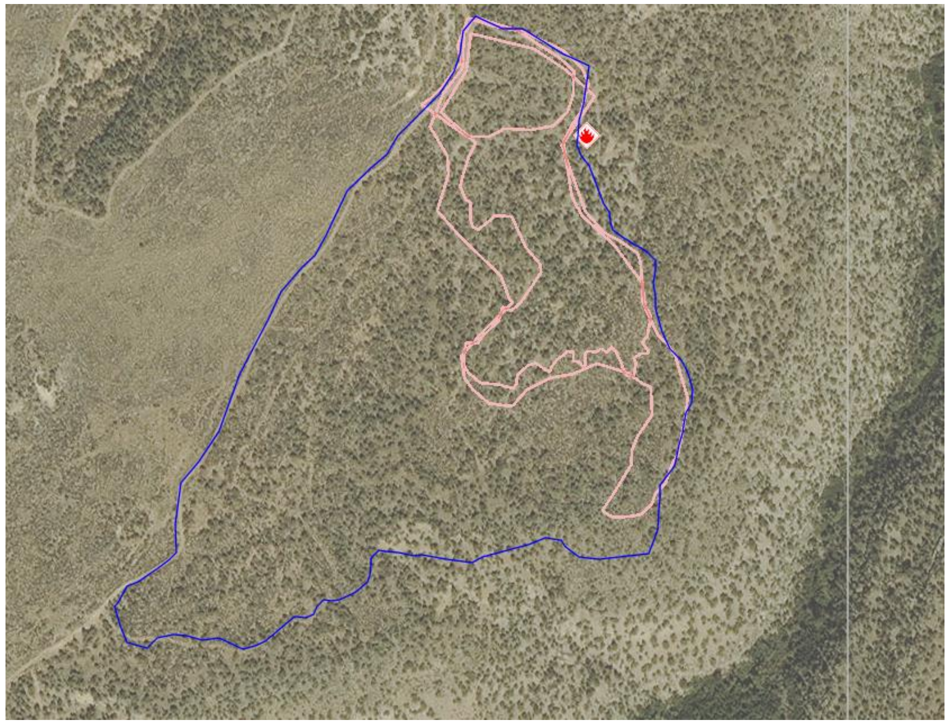
- CO-FPS will be able to ignite multiple points, lines, and polygons on a single fire

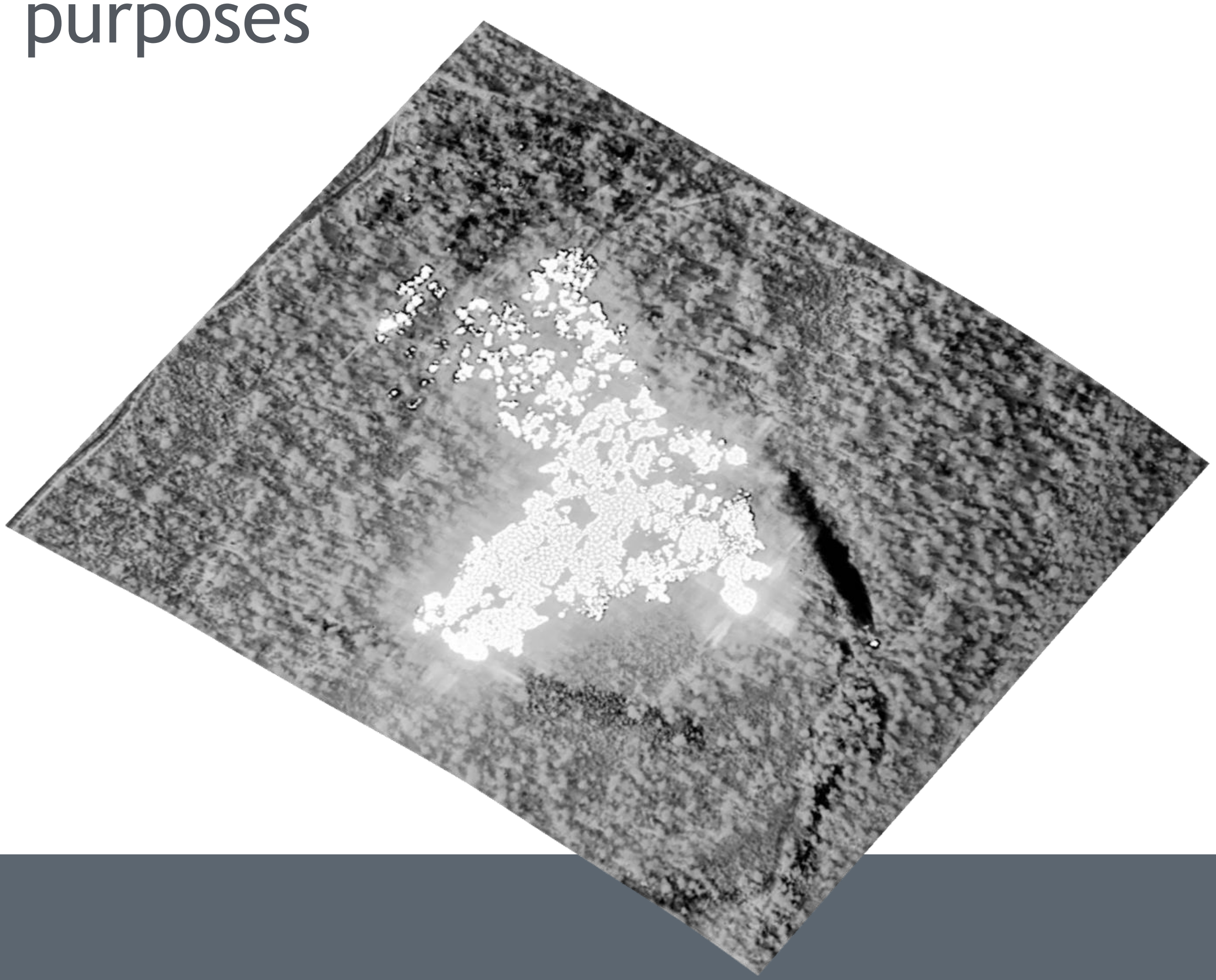


MMA Data for Verification

- The ability of the MMA to capture multiple perimeters on a single fire was demonstrated on the Old Stump Fire last week

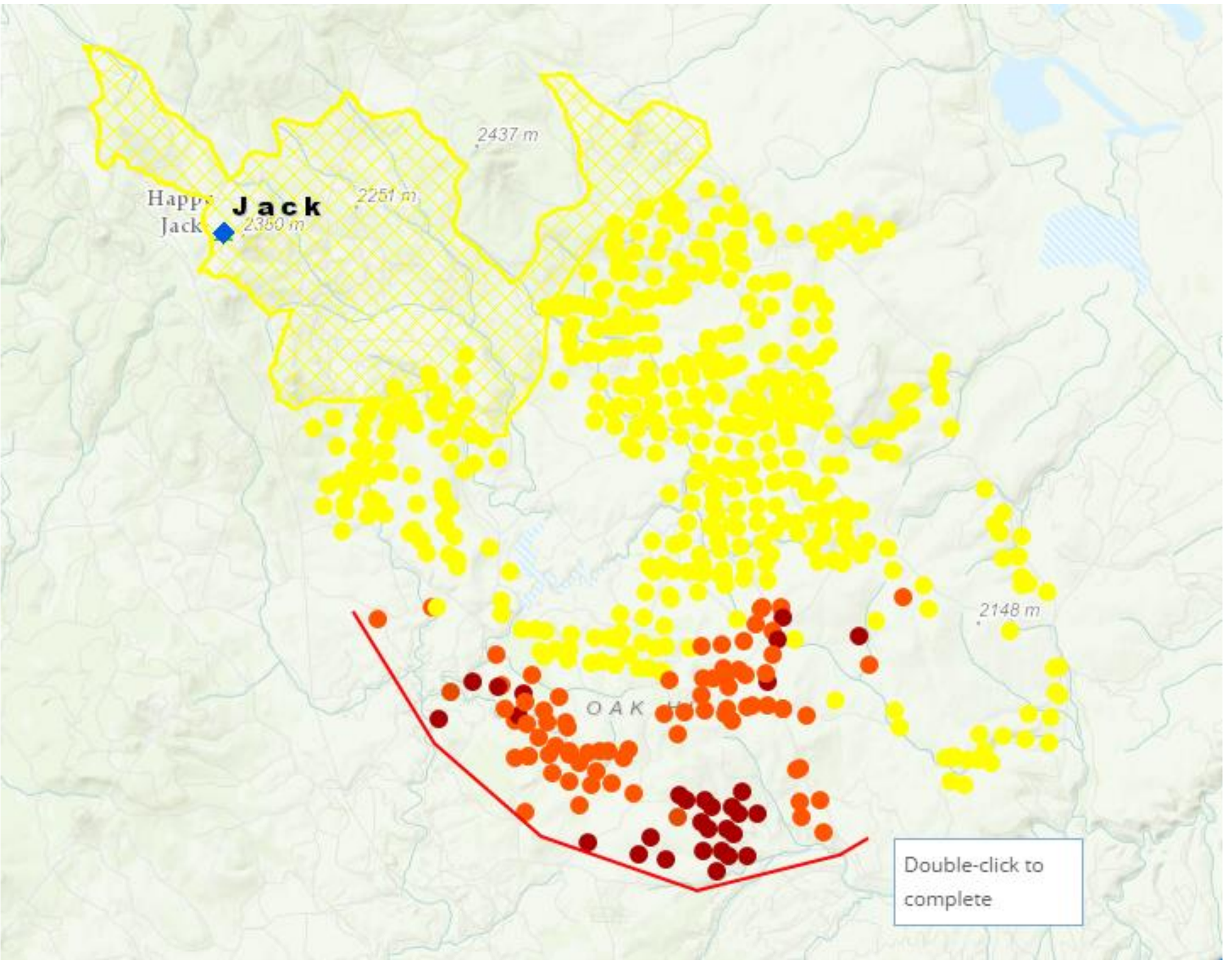
- NCAR will have the ability to ingest this type of data into CO-FPS for model verification purposes





Tracing of Satellite Data

- Satellite heat detections are time stamped, and can be classified as hot or cold fireline
- However, the presence anomalies and off-nadir errors require manual verification of detections
- Automatic usage of satellite data is anticipated for model verification purposes



Ignition Proposal

- Ignitions are either traced by hand in CO-WIMS, or formatted as a KML or shapefile and imported into CO-WIMS

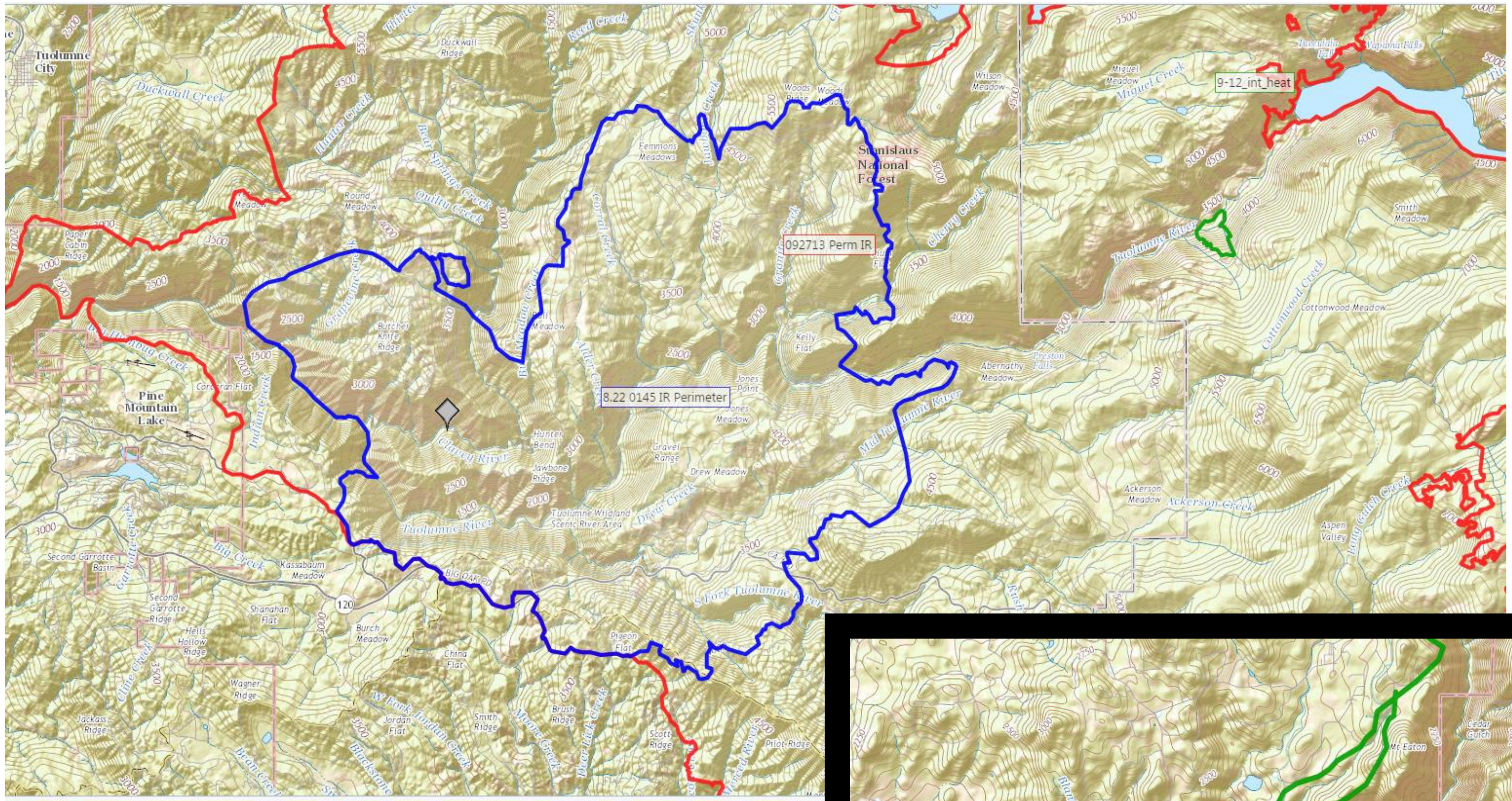
- Ignitions can be formatted as:

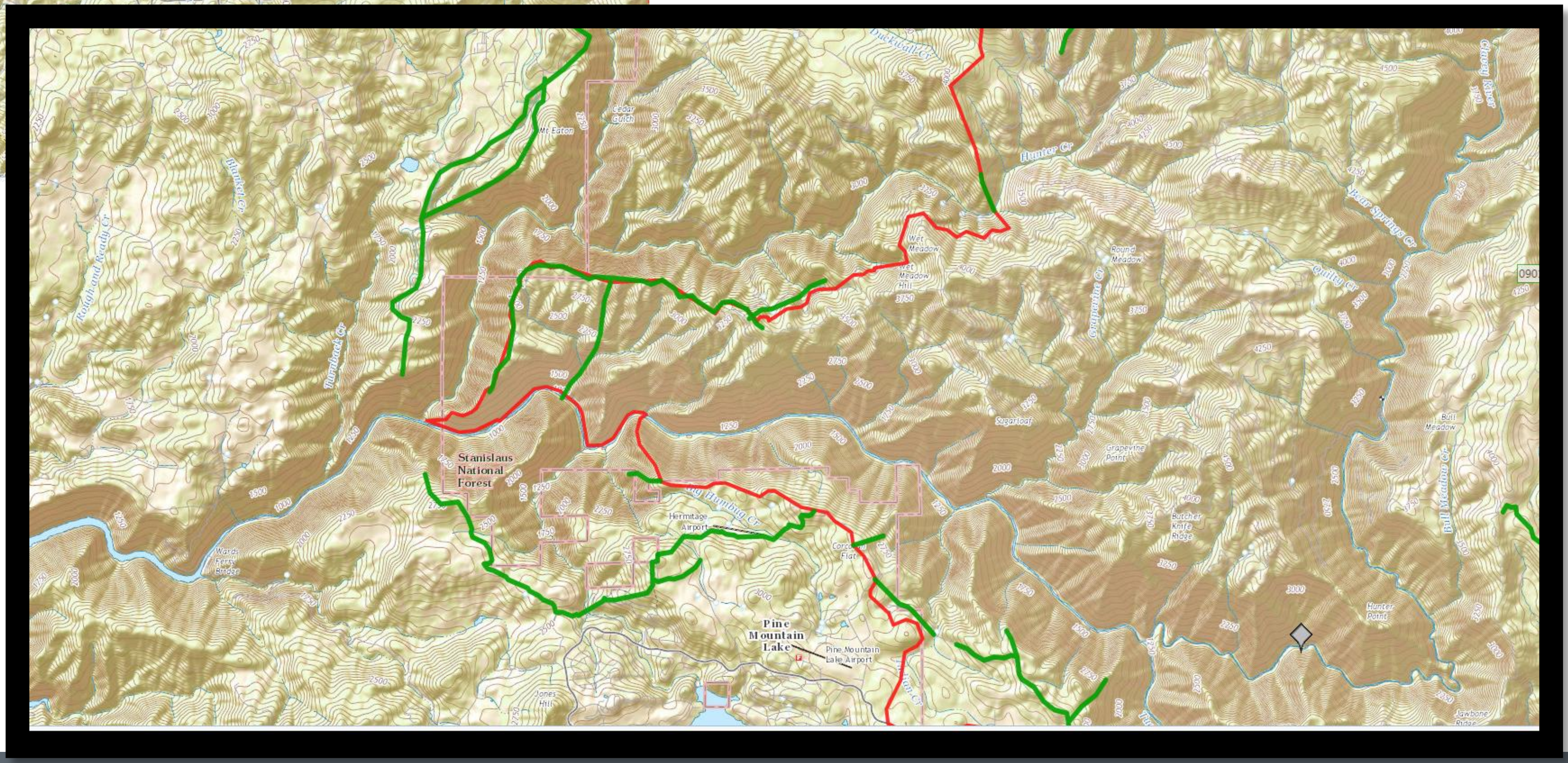
- a point

- a line (where the fire ignites along the line and can spread in either direction)

- a polygon (where the fire ignites along the perimeter of the polygon and can only spread outward, as the interior of the polygon becomes a landscape mask)

WFDSS Burned Areas & Barriers





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Indicating Burned Areas & Barriers

- CO-FPS uses a “burned area geometries” geoJSON object to indicate areas devoid of fuels

- This can be used to create a landscape mask, which covered the area burned to date by the fire

- This can also be used to create a barrier such as a fireline to constrain fire spread

Burned Areas Proposal

- Barriers are traced by hand, imported as a KML/shapefile, or “fire lines” captured by the MMA

- Landscape masks (burned areas) are traced by hand, imported as a KML/shapefile, or a polygon fire perimeter from the MMA

- Satellite data also can indicate burned areas, but may need to be traced to account for errors

Other Model Inputs

- The name of the user will automatically be captured
- The user must select what time the fire will start at
- The domain size must be selected
- What other inputs are desired?

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Options for the Look and Feel of CO-FPS Products

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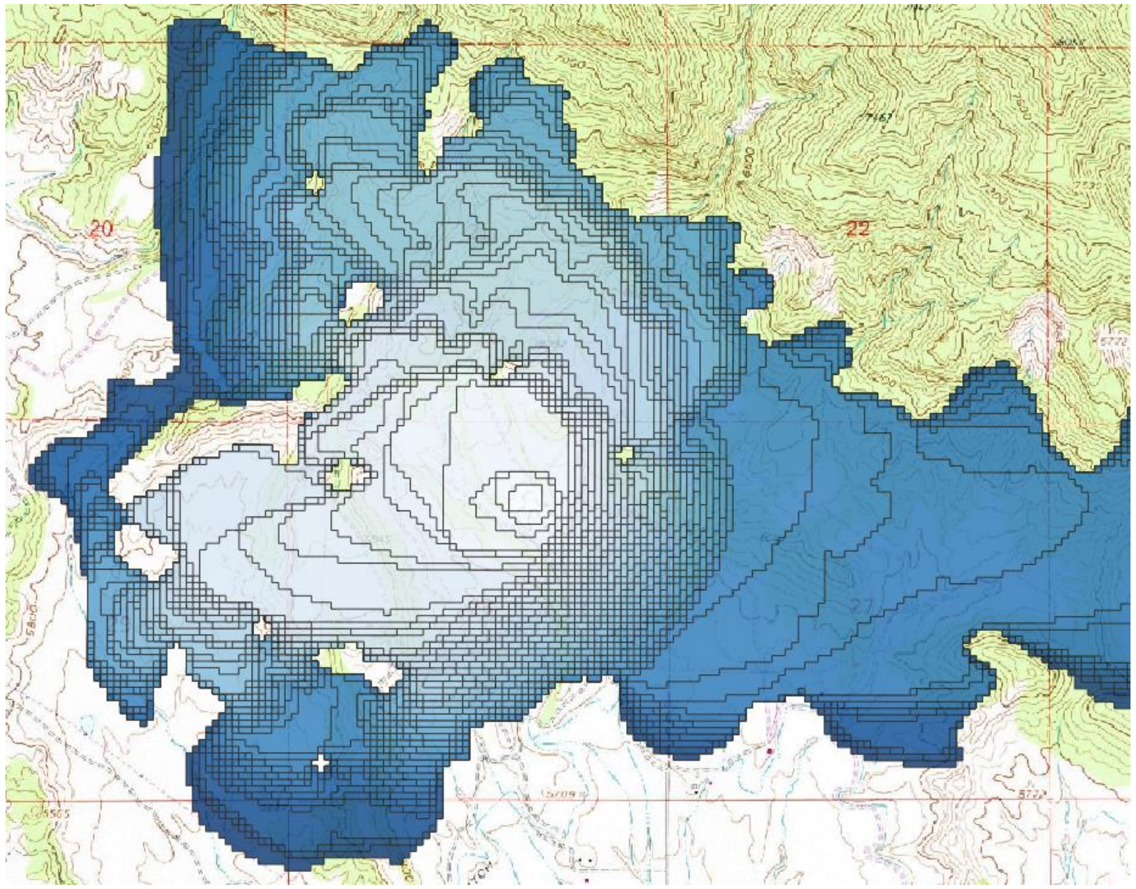
Output CO-FPS Produces

- The computational server within CO-FPS initially produces a netCDF file, which is a specialized type of raster data

- These output files flow into the CO-FPS GIS server, where they are translated into easily interpreted GIS files that are then sent to CO-WIMS for viewing

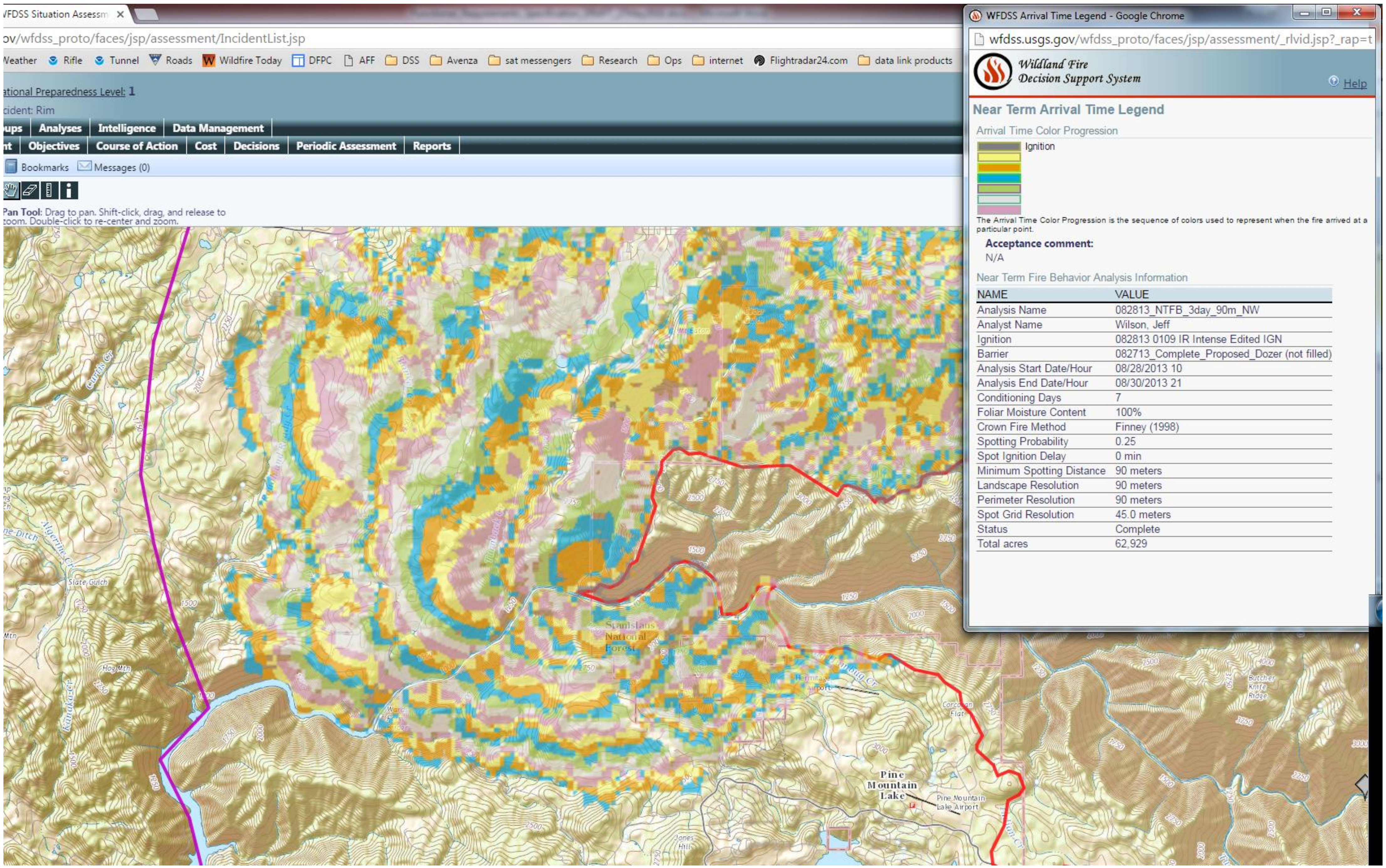
- While we can create and display vector files with CO-FPS output, they are based on raster data



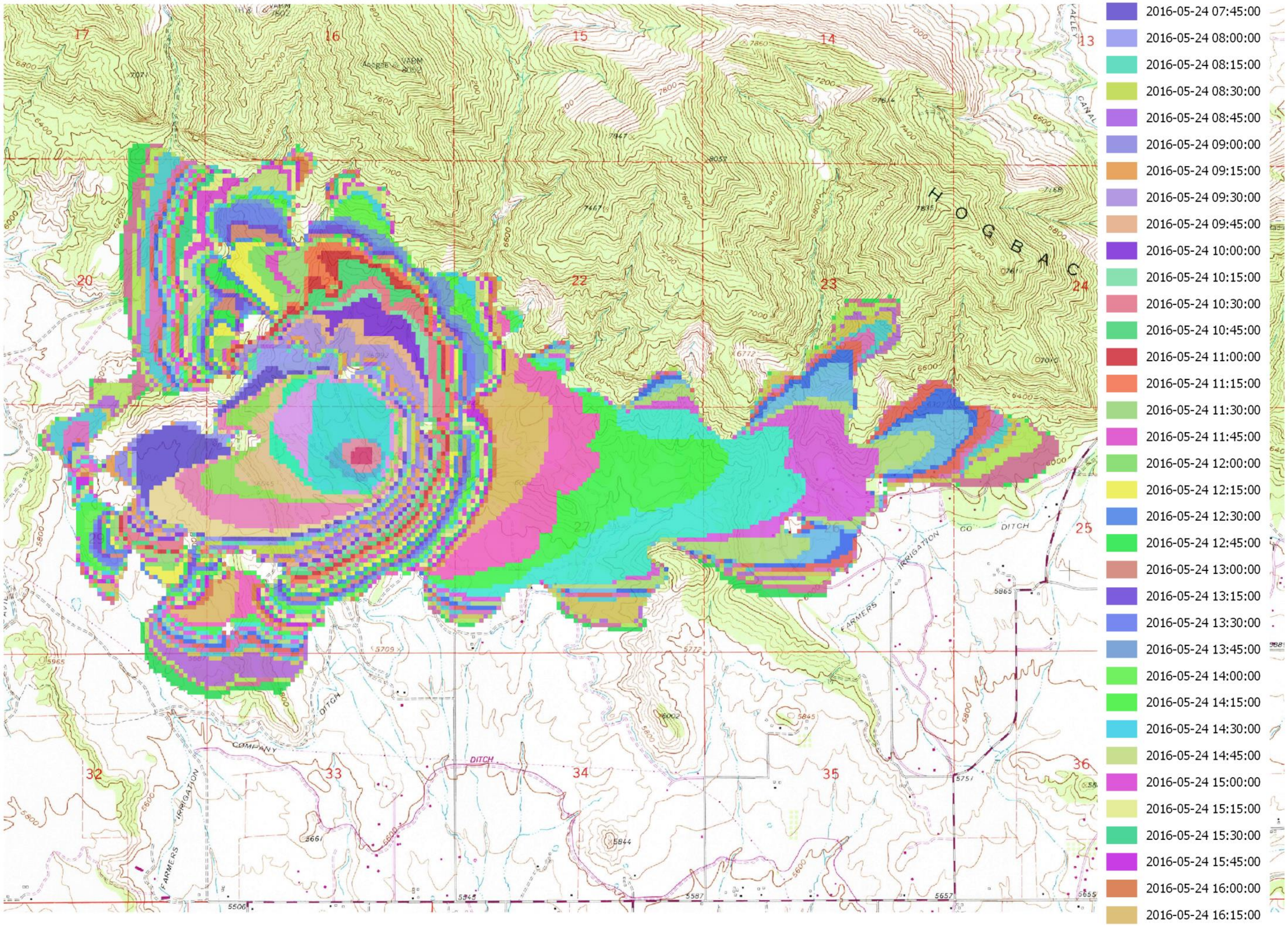
Feedback Needed!

- When is an animation of products appropriate?
- When will a static map provide the necessary information?
- What products can be combined to provide as much information as possible on a single map?
- What information do you need to extract from a map?

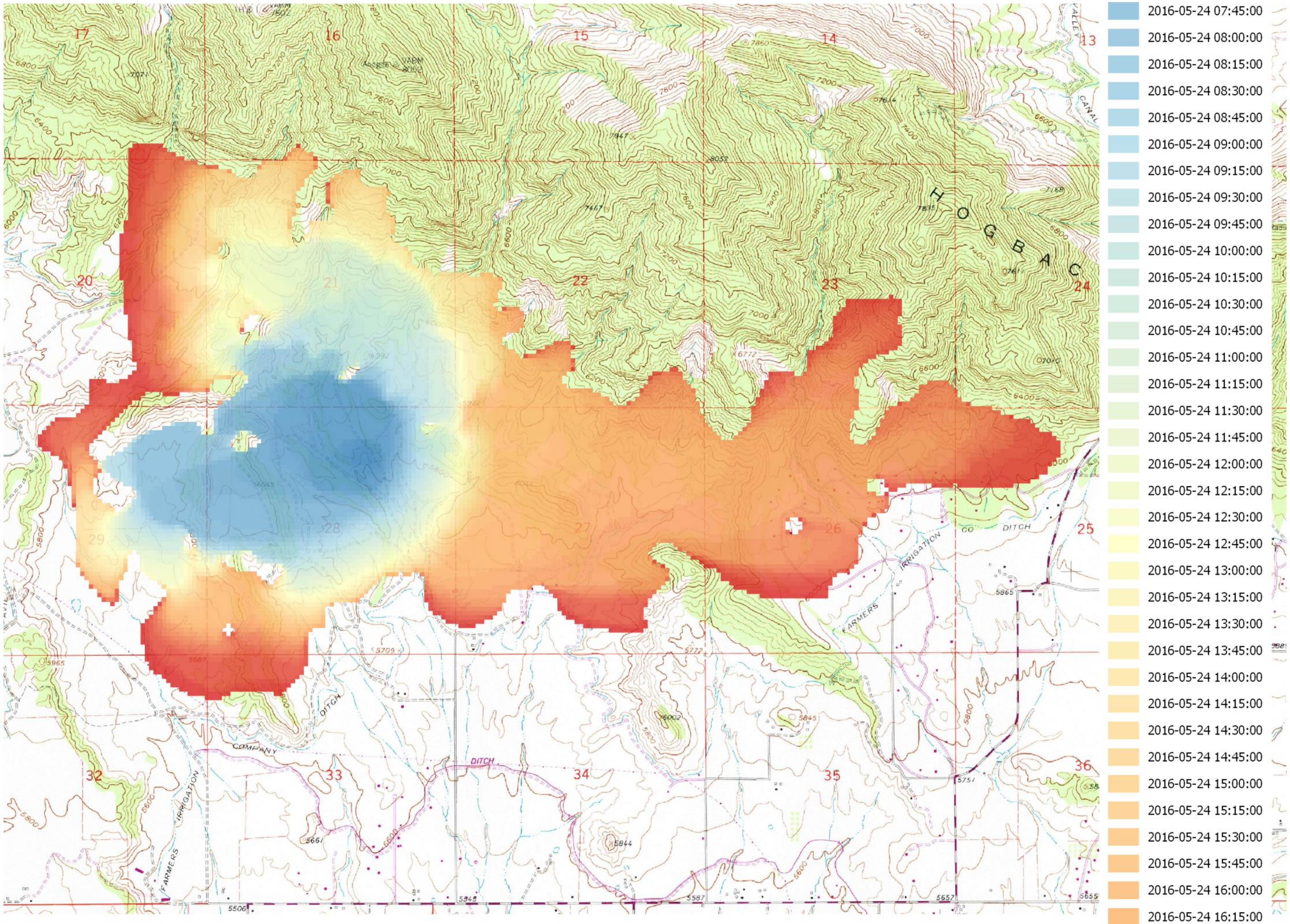
WFDSS NTB Time of Arrival



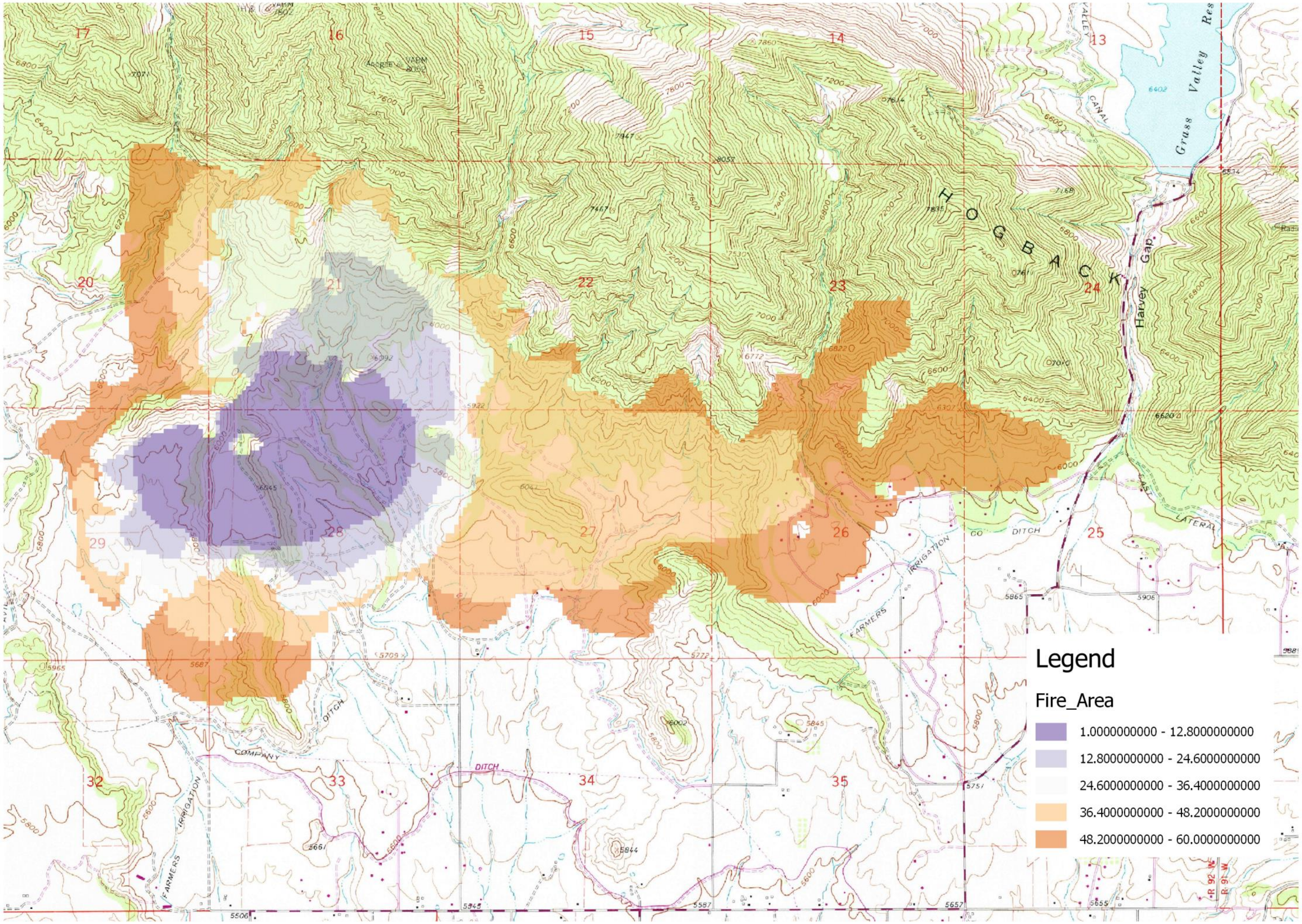
Random Colors Time of Arrival



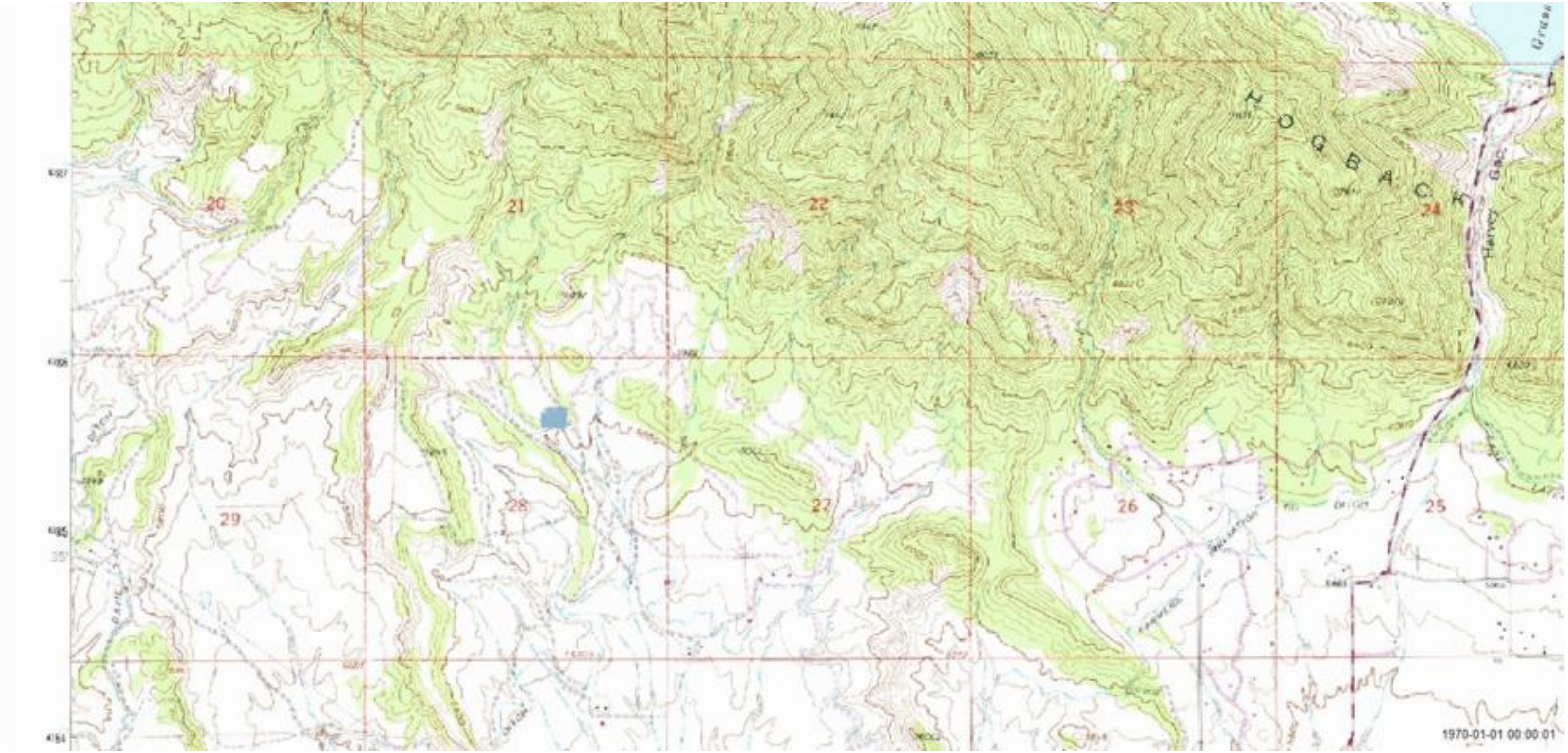
Color Ramp of Time of Arrival



Classified Color Ramp TOA



Animated Time of Arrival



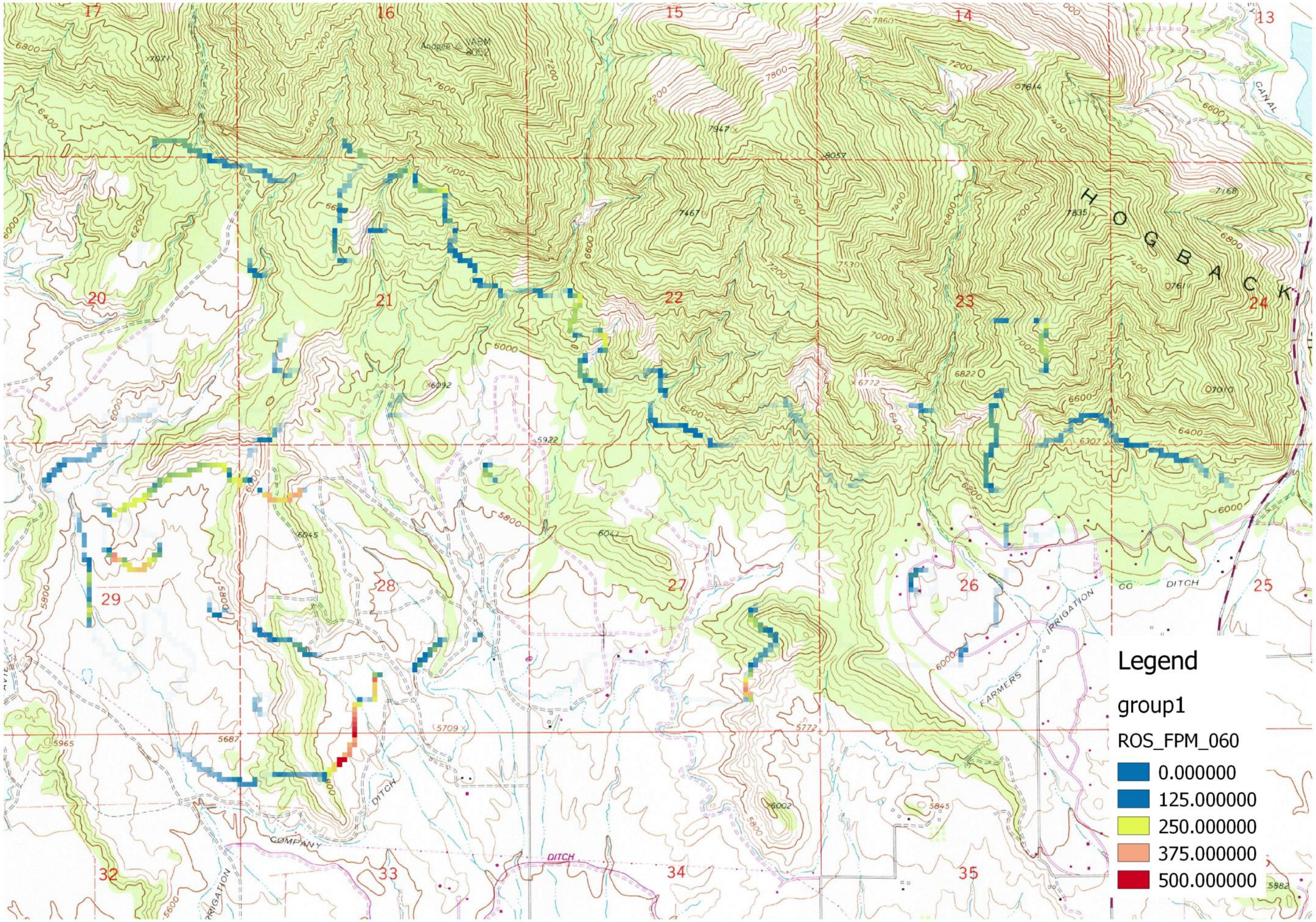
Non-Spatial TOA Data

Timestep	Date & Time	Acres
1	5/24/2016 5:15	3.622681
2	5/24/2016 5:30	10.86804
3	5/24/2016 5:45	19.06674
4	5/24/2016 6:00	80.08032
5	5/24/2016 6:15	110.7778
6	5/24/2016 6:30	126.2218
7	5/24/2016 6:45	164.9273
8	5/24/2016 7:00	199.8195
9	5/24/2016 7:15	256.4477
10	5/24/2016 7:30	295.3439
11	5/24/2016 7:45	353.3068
12	5/24/2016 8:00	387.6269
13	5/24/2016 8:15	400.5923
14	5/24/2016 8:30	420.803
15	5/24/2016 8:45	434.5311
16	5/24/2016 9:00	451.3098
17	5/24/2016 9:15	467.7072
18	5/24/2016 9:30	507.1754
19	5/24/2016 9:45	532.5341
20	5/24/2016 10:00	568.761

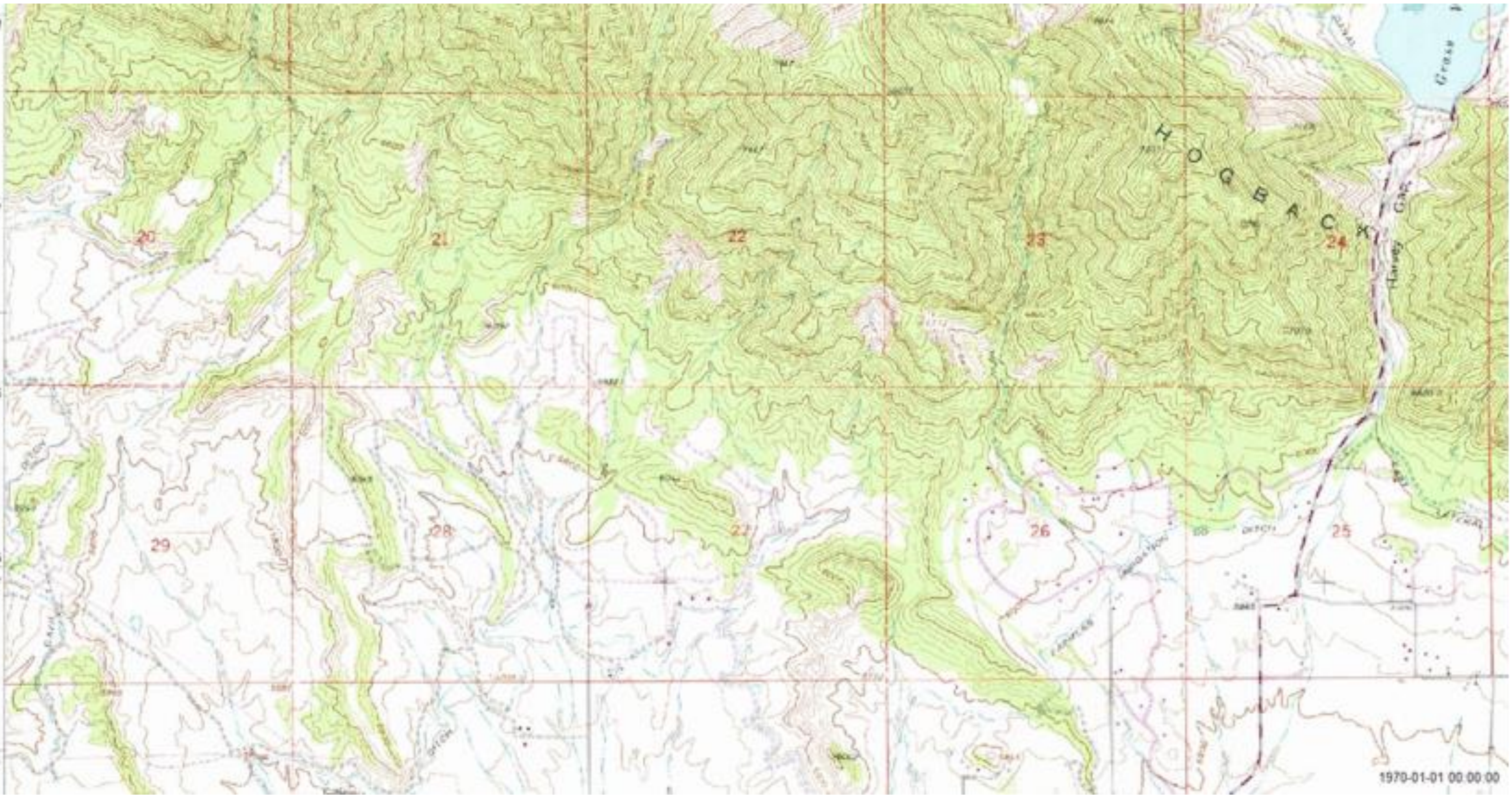
Time of Arrival Recap

- Random colors, useful for detecting small changes?
- Color ramps, useful for the broad overview?
- Classification, helpful when looking for trends?
- Animation, the ultimate change detection?
- Non-spatial, the best for non-visual learners?

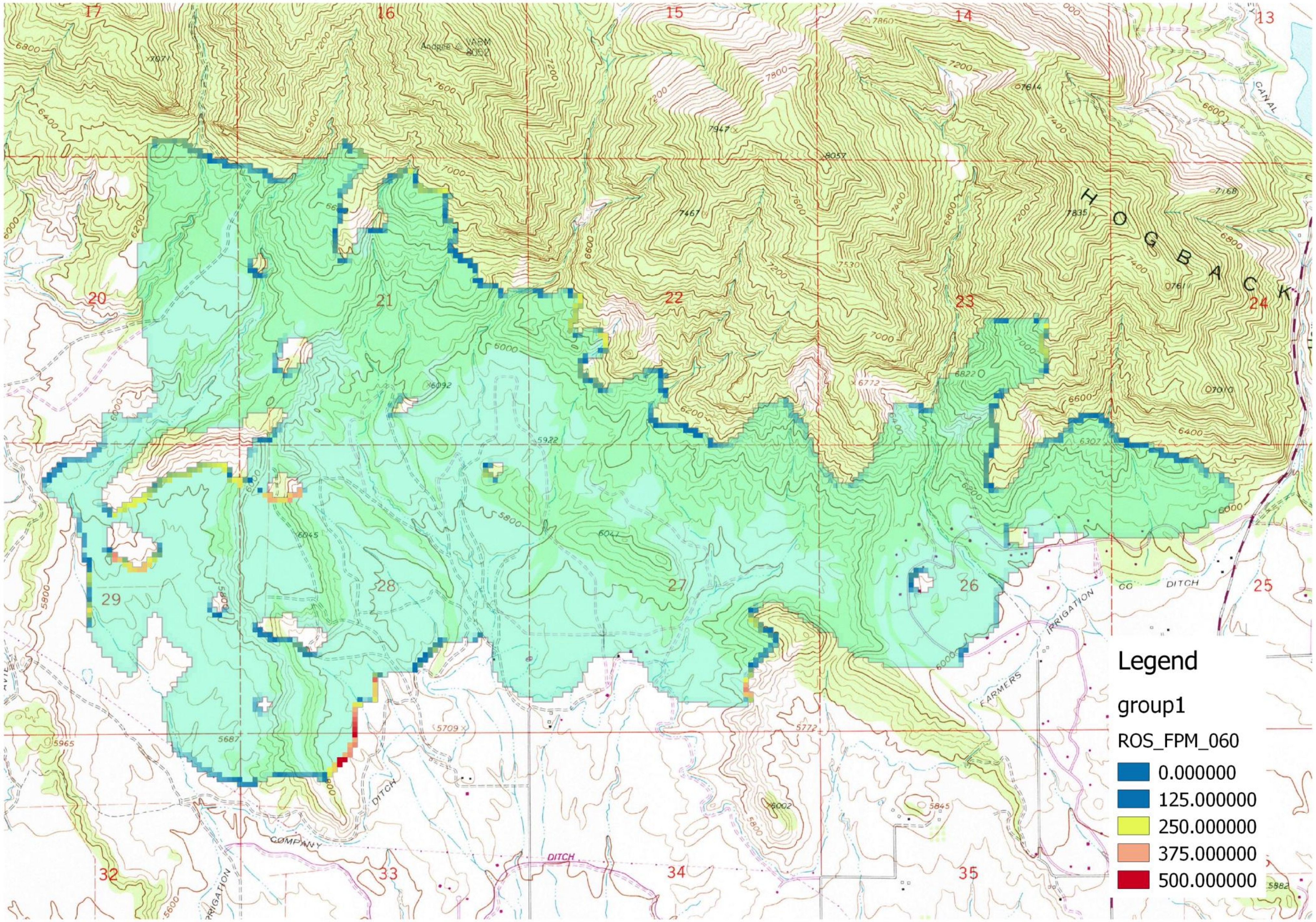
Rate of Spread



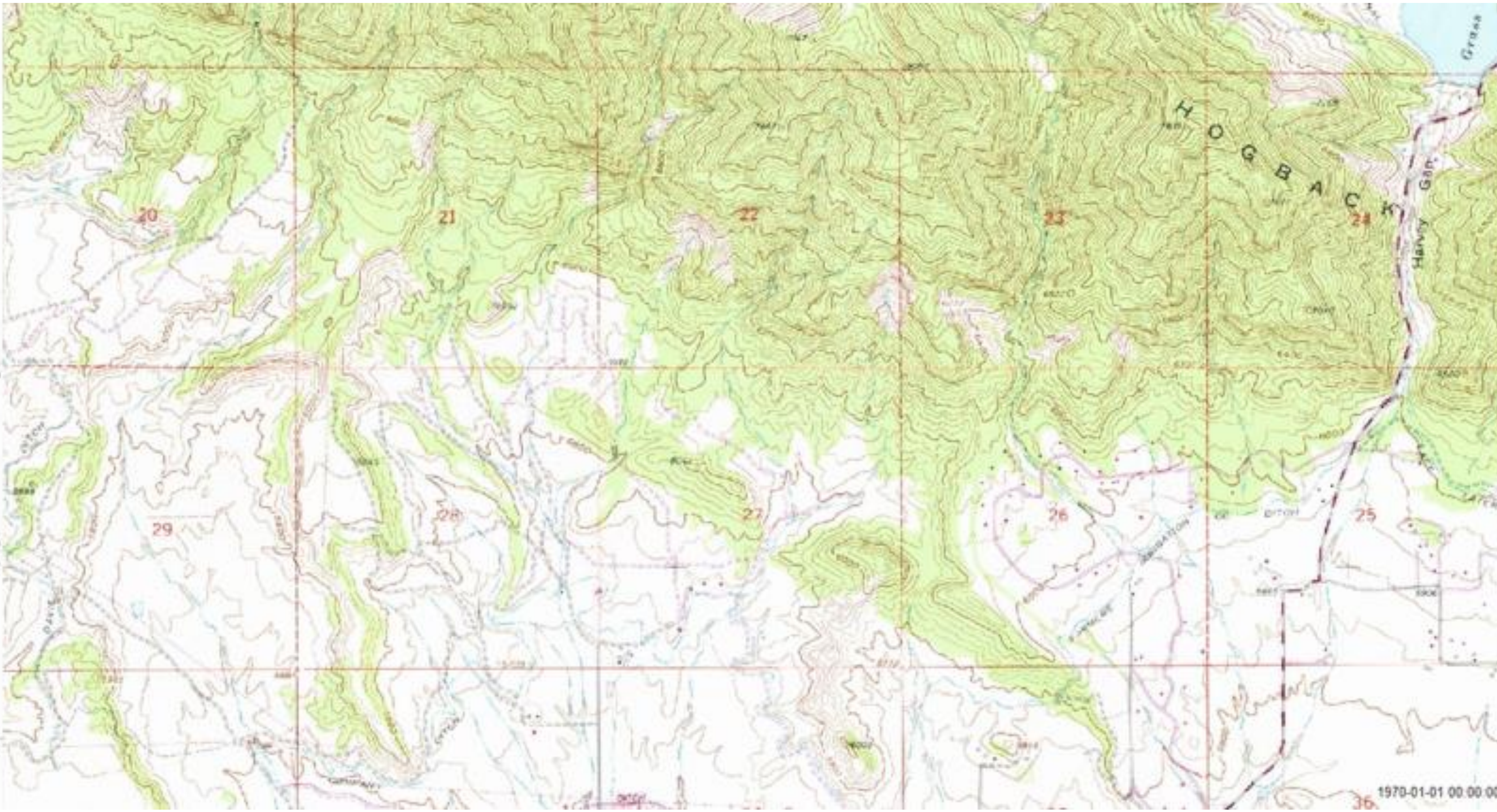
Animated Rate of Spread



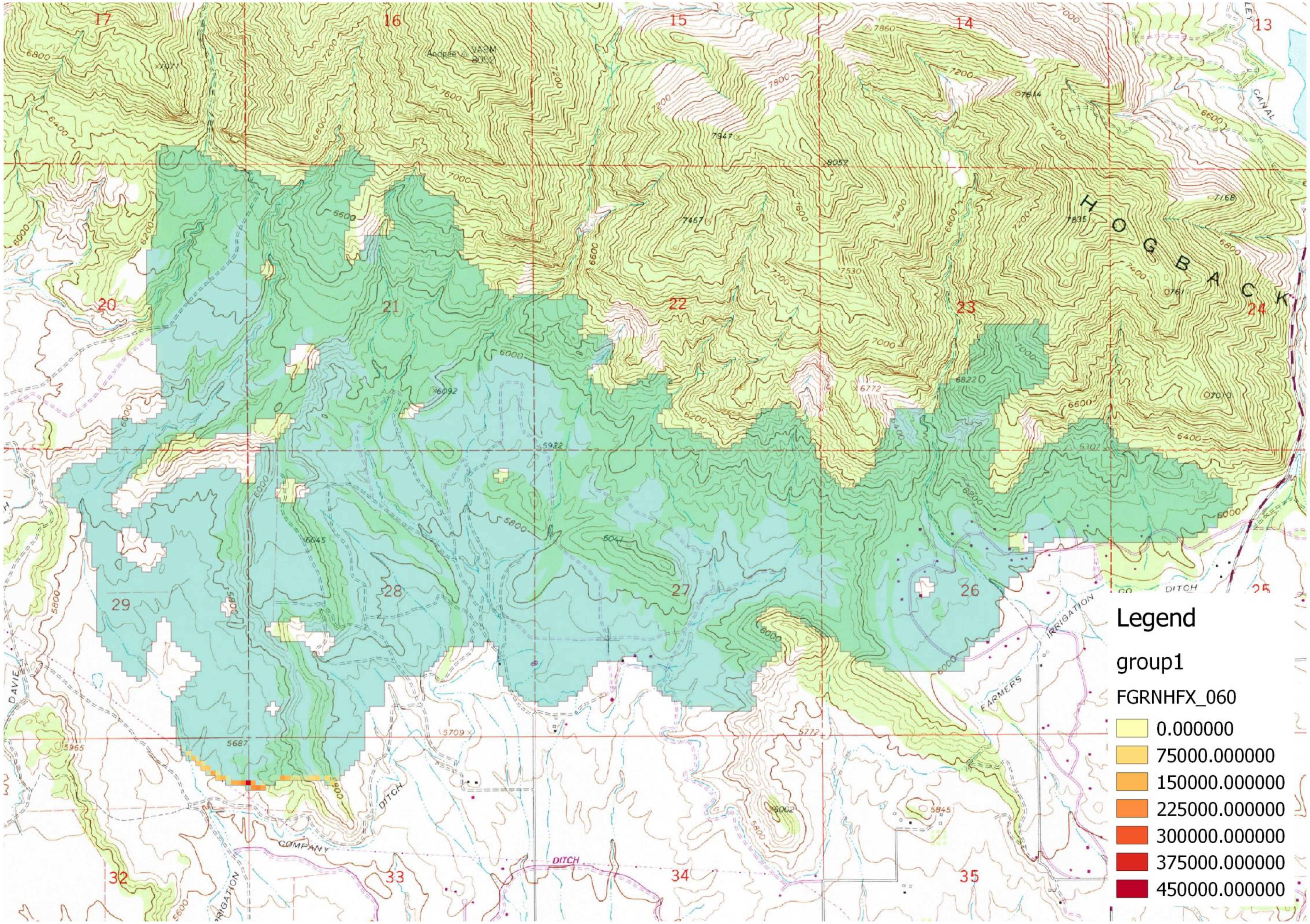
Rate of Spread and Fire Size



Animated ROS and Fire Size

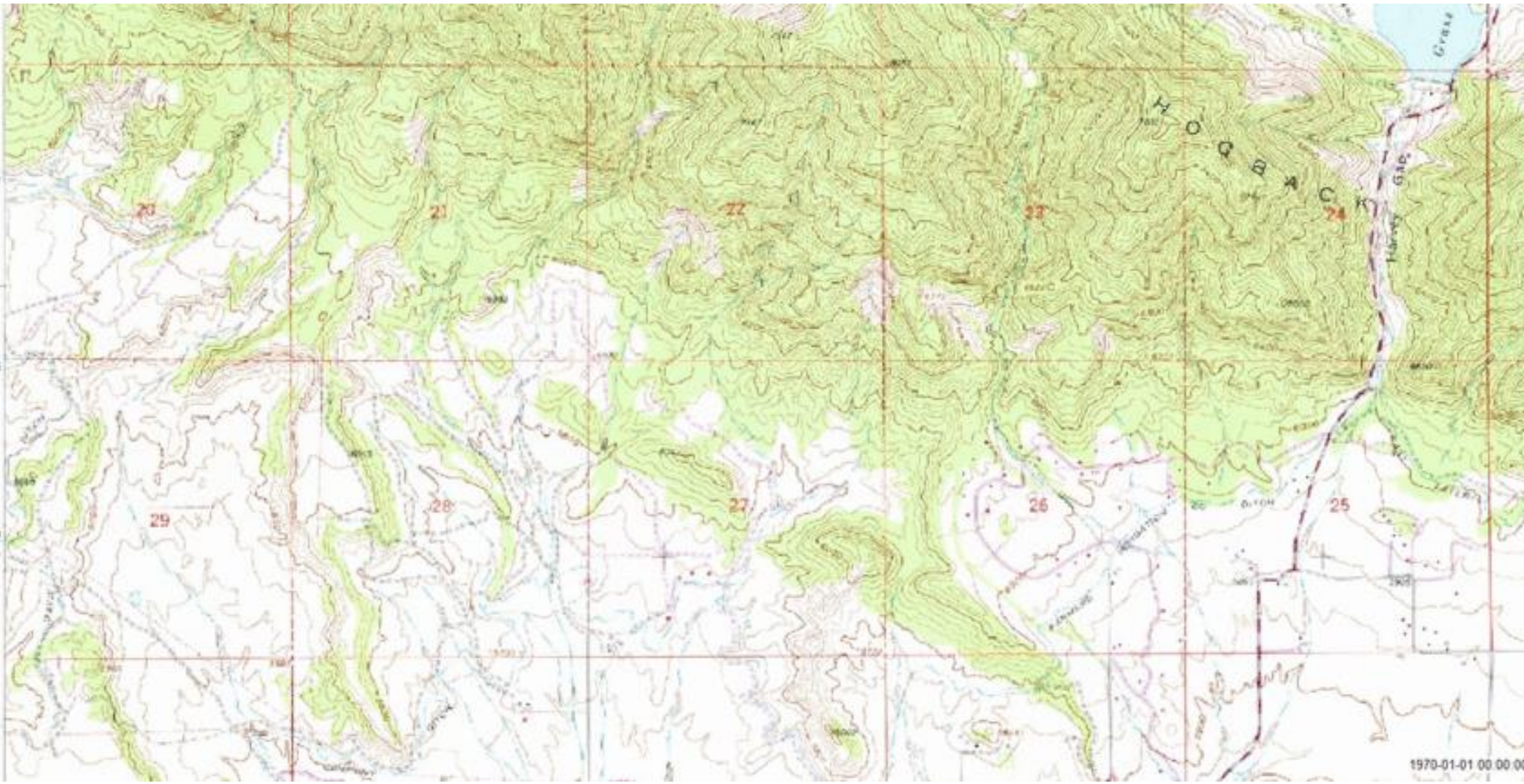


Heat Flux



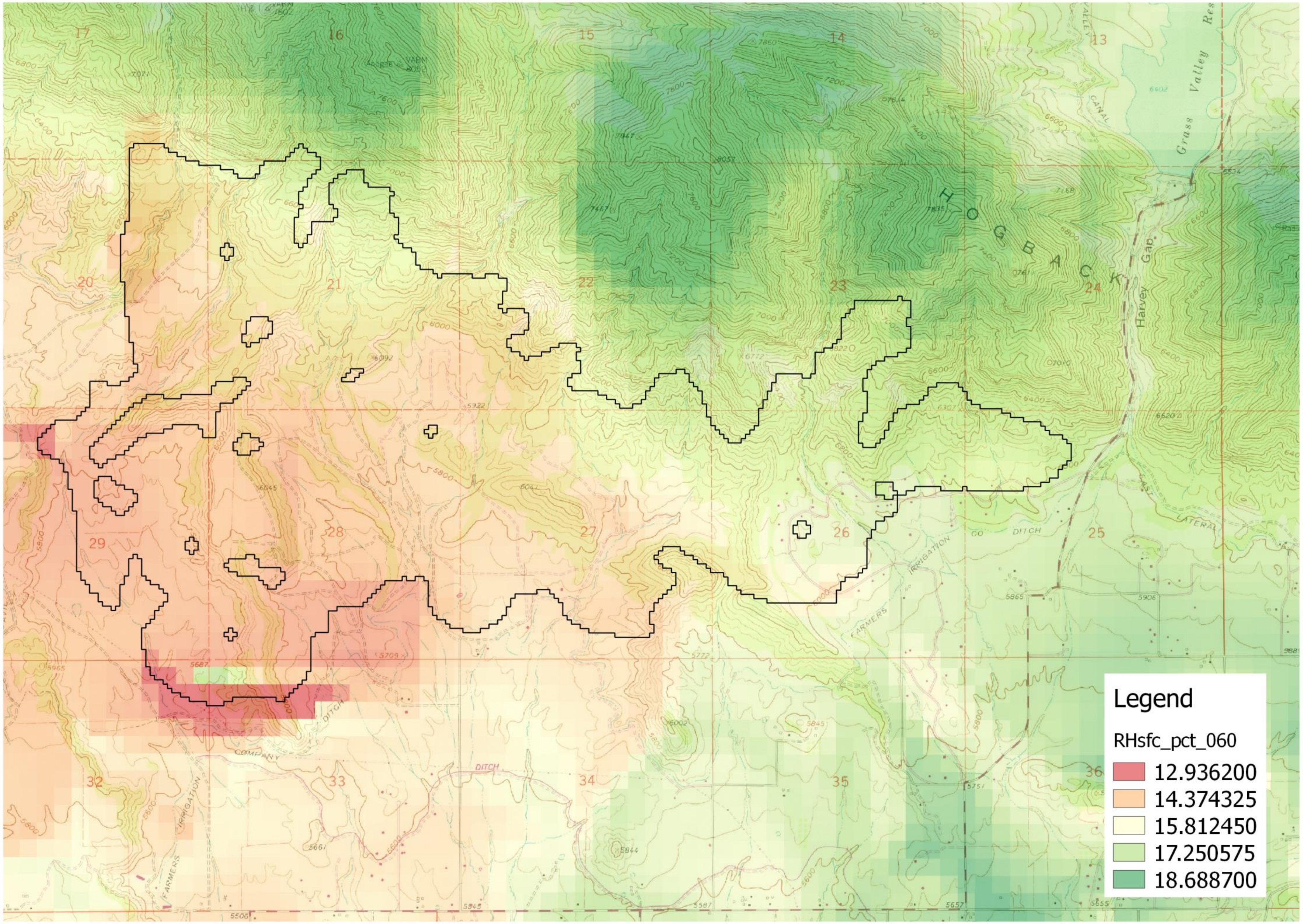
Legend
group1
FGRNHFX_060
0.000000
75000.000000
150000.000000
225000.000000
300000.000000
375000.000000
450000.000000
HOGBACK

Animated Heat Flux



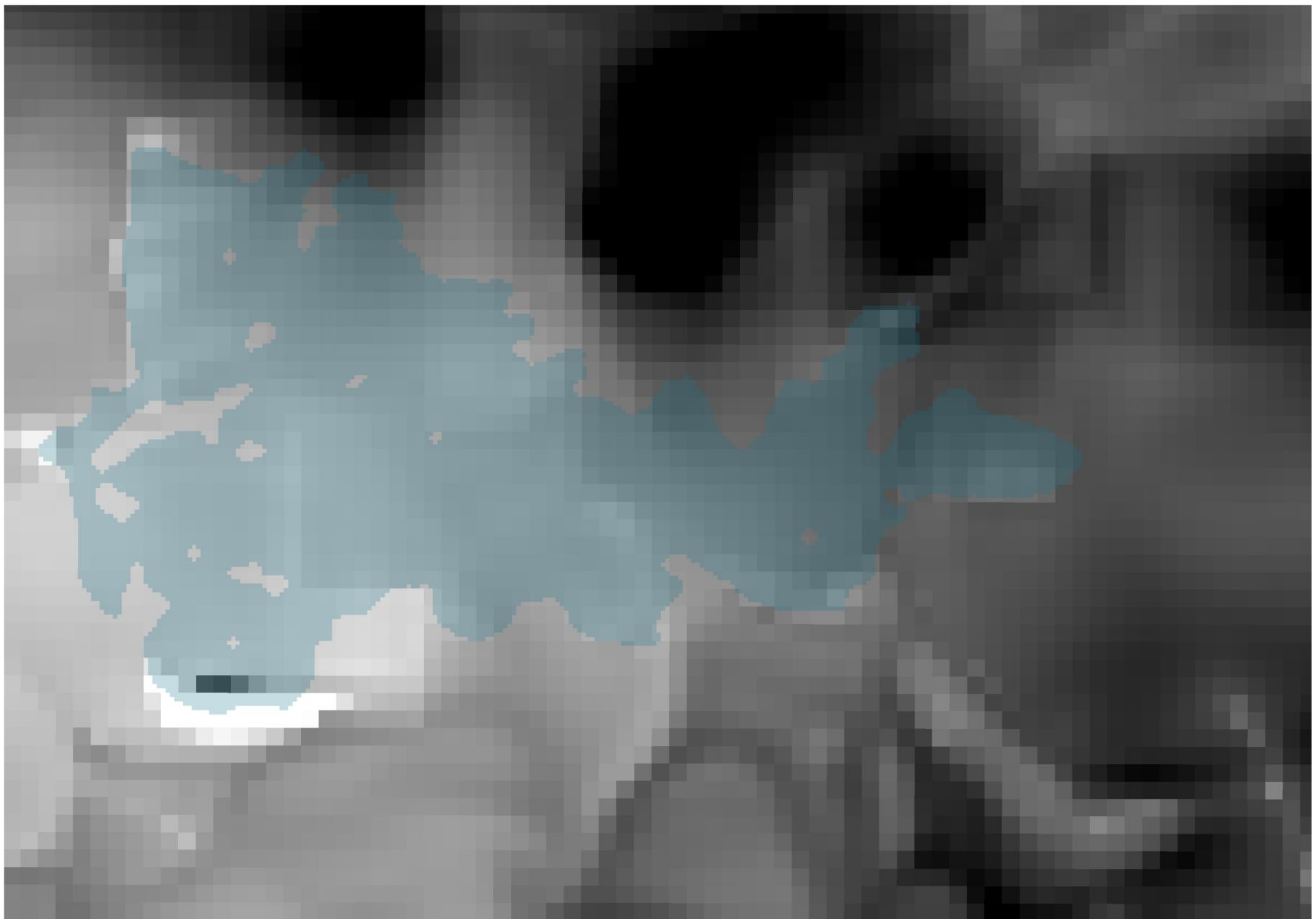
Humidity

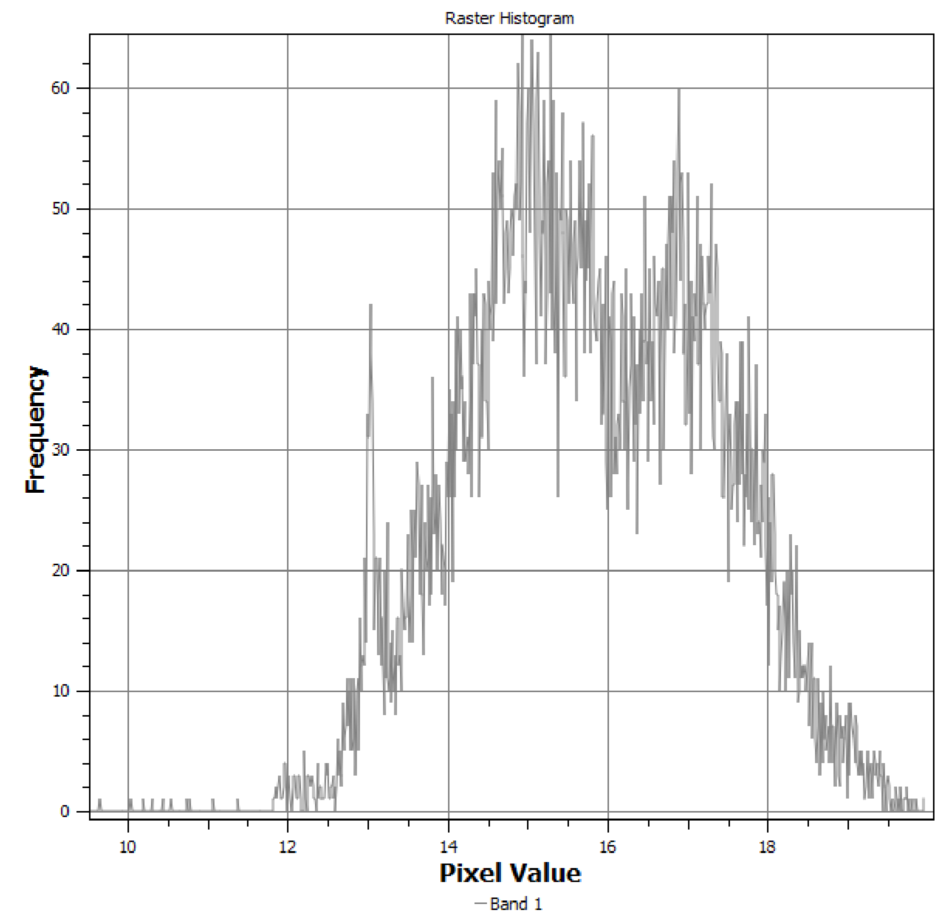
Color Ramp Humidity



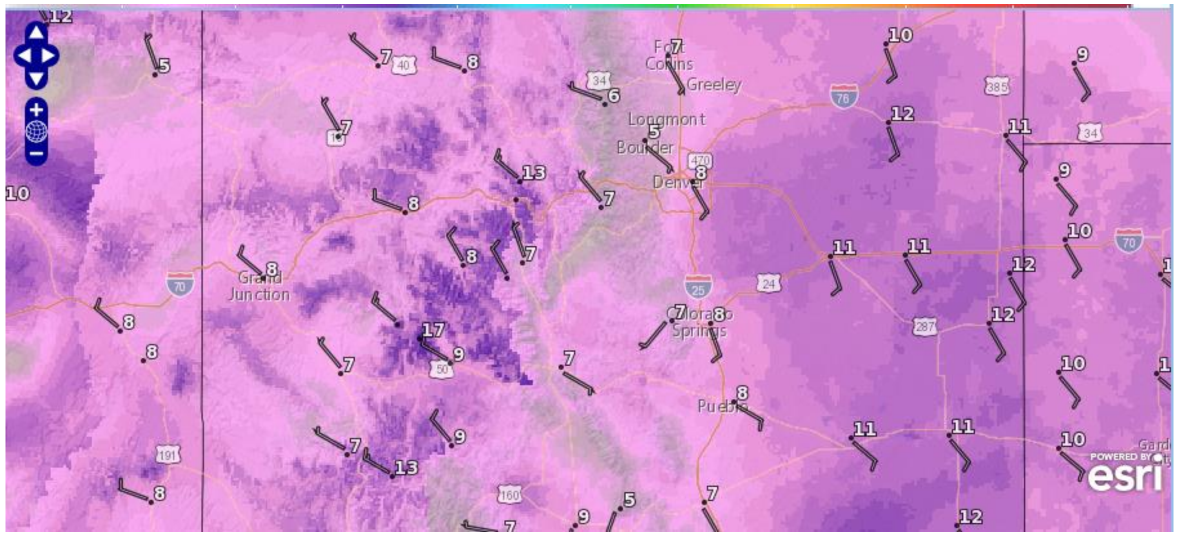
Humidity Map and Statistics

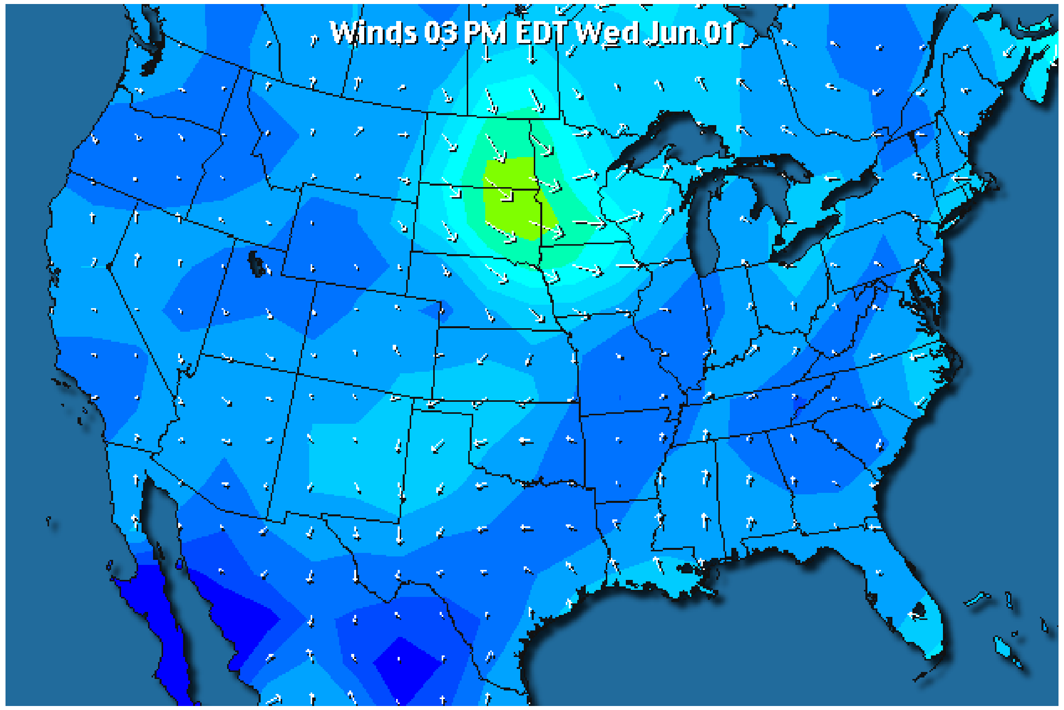
Mean RH	Median RH	Std Deviation	Min RH	Max RH
15.76 %	15.68%	1.51	7.39%	19.95%

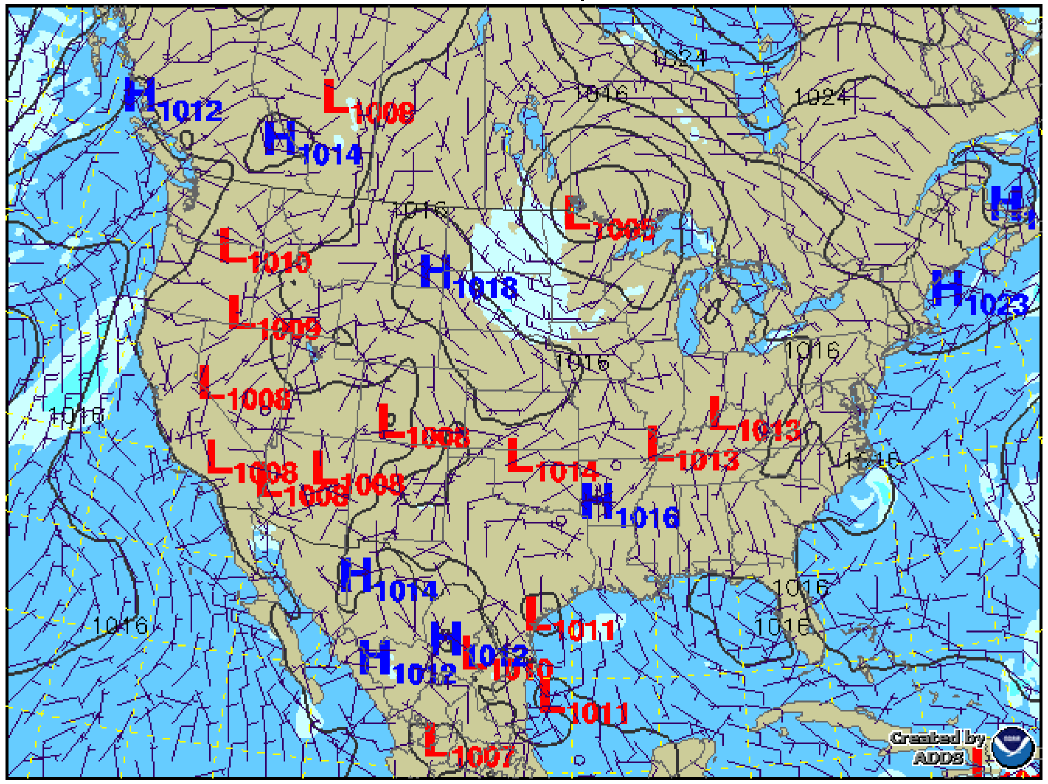


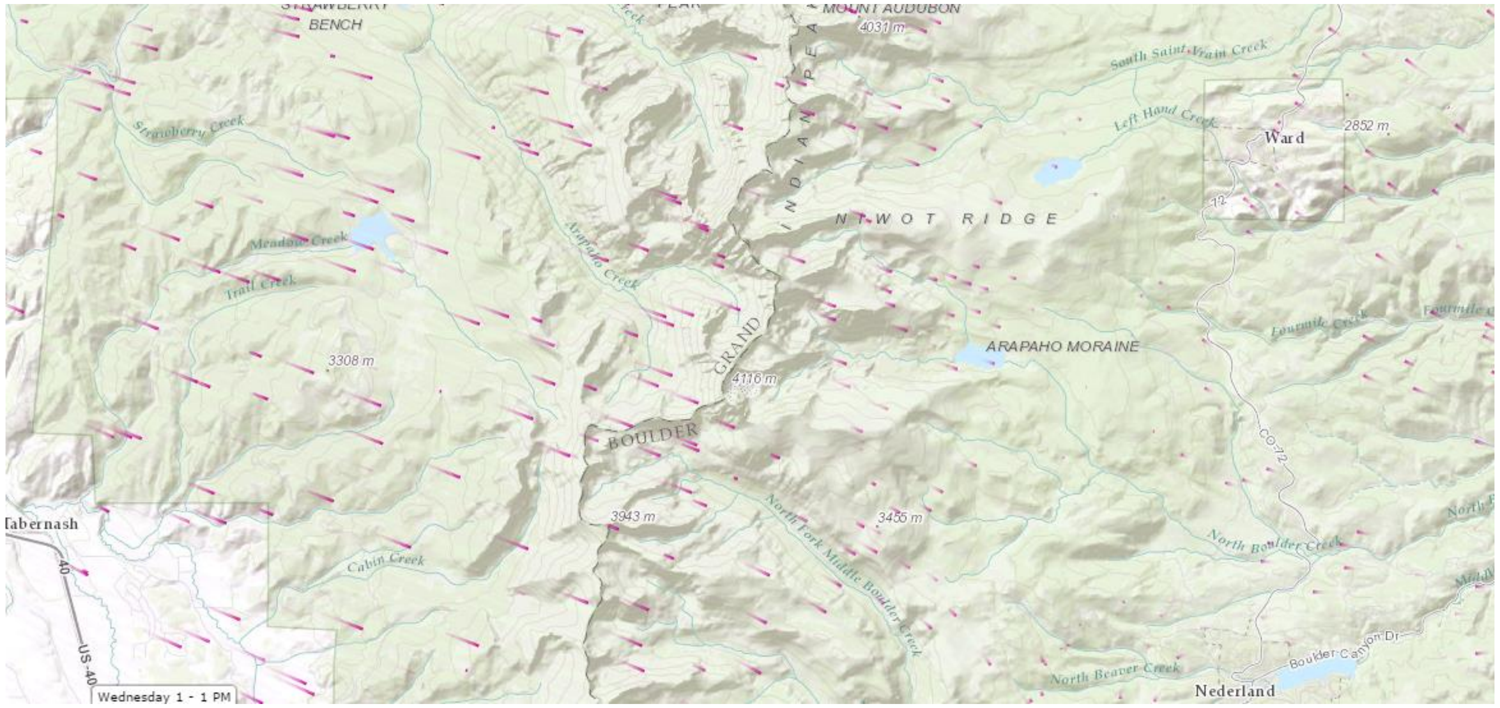


Wind Speed and Direction

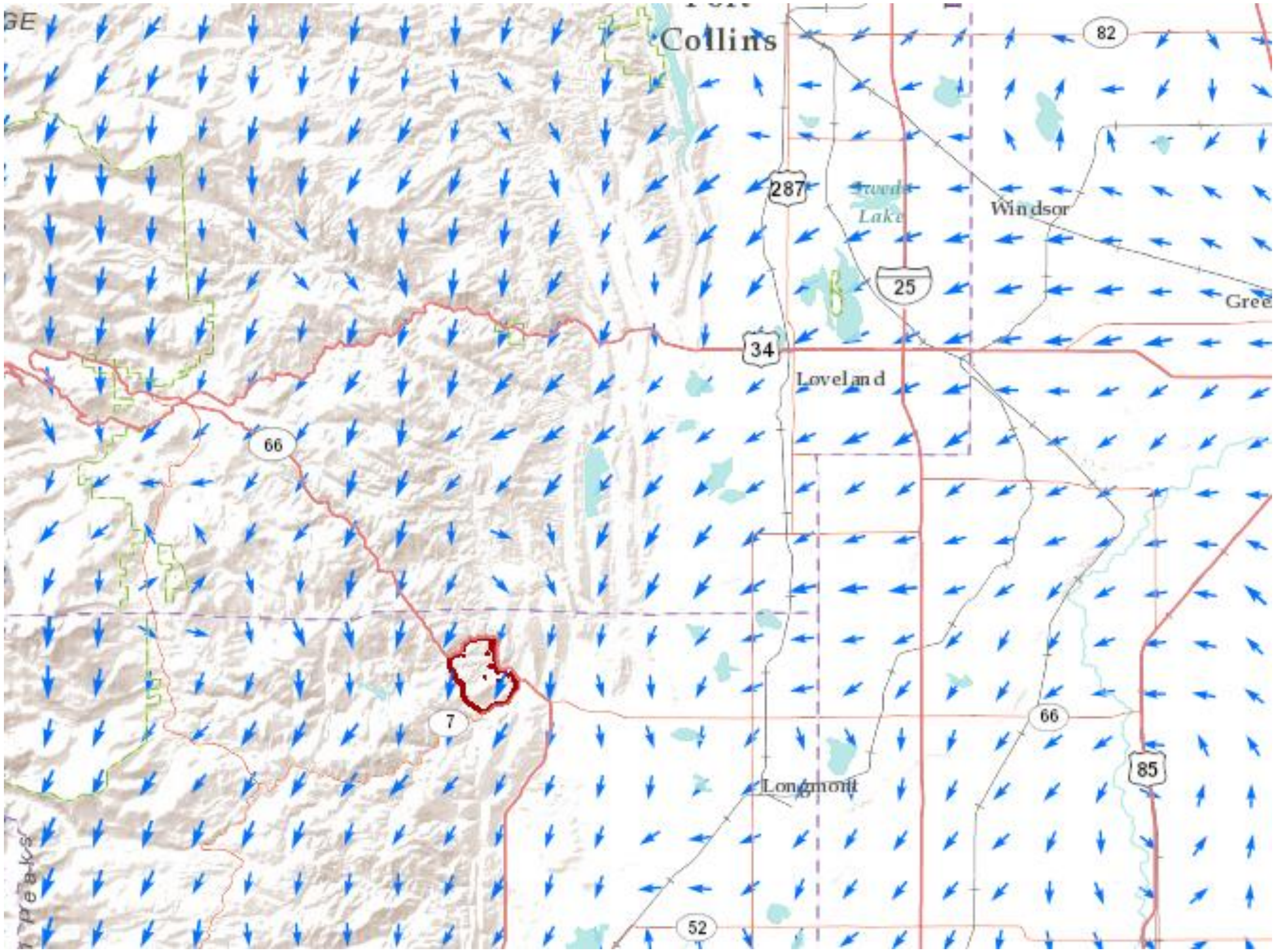




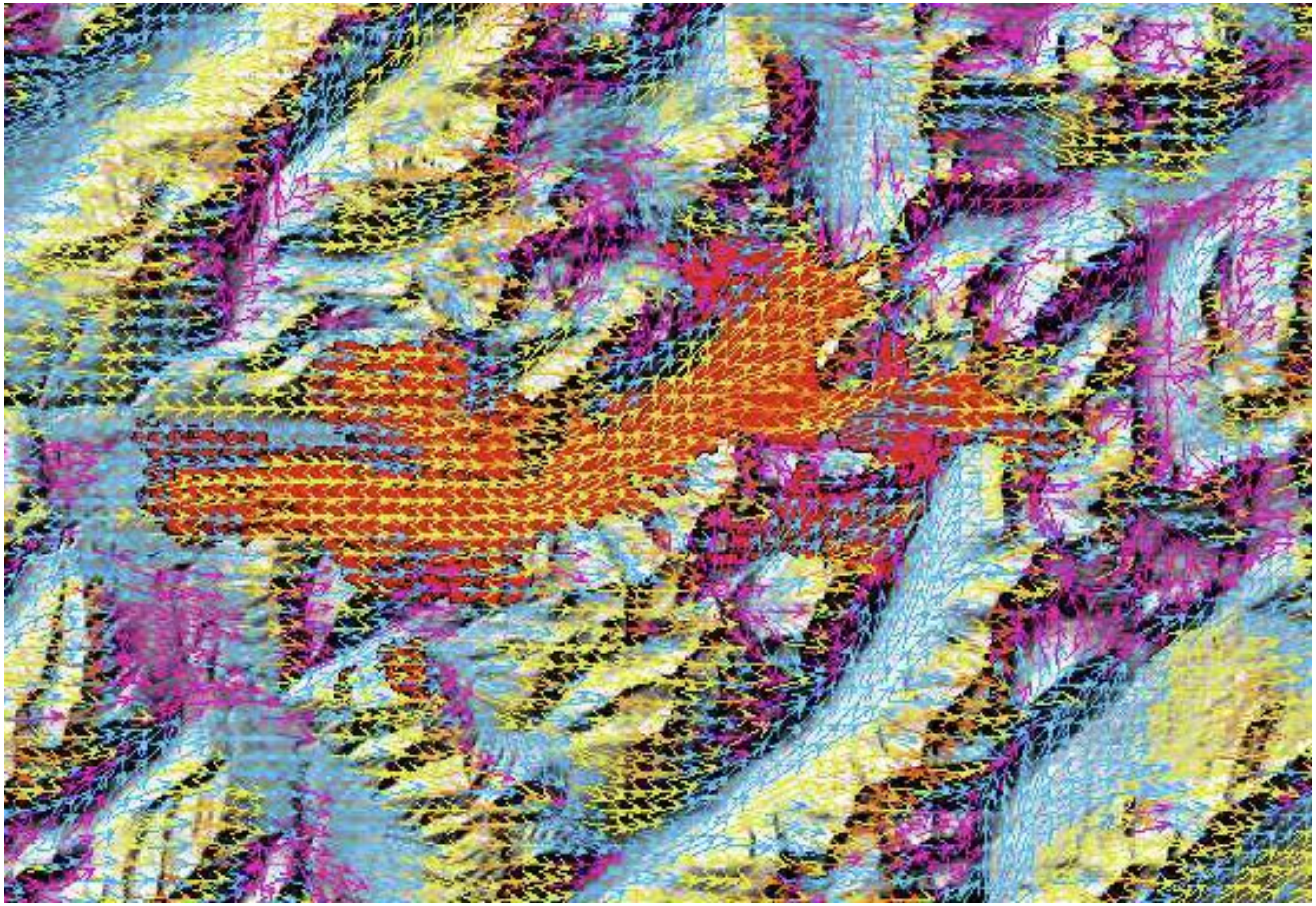




Example with HRRR Data



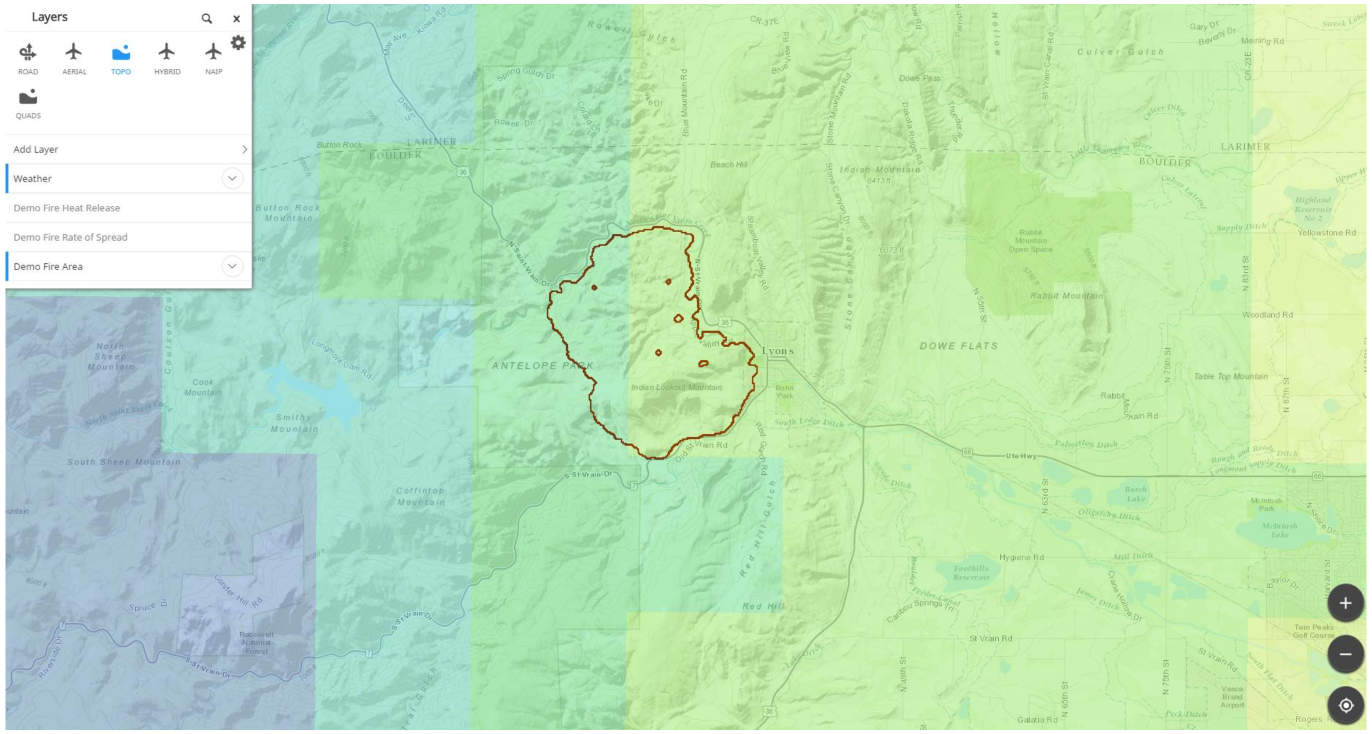
Example With Modelled Winds



Combinations of Data

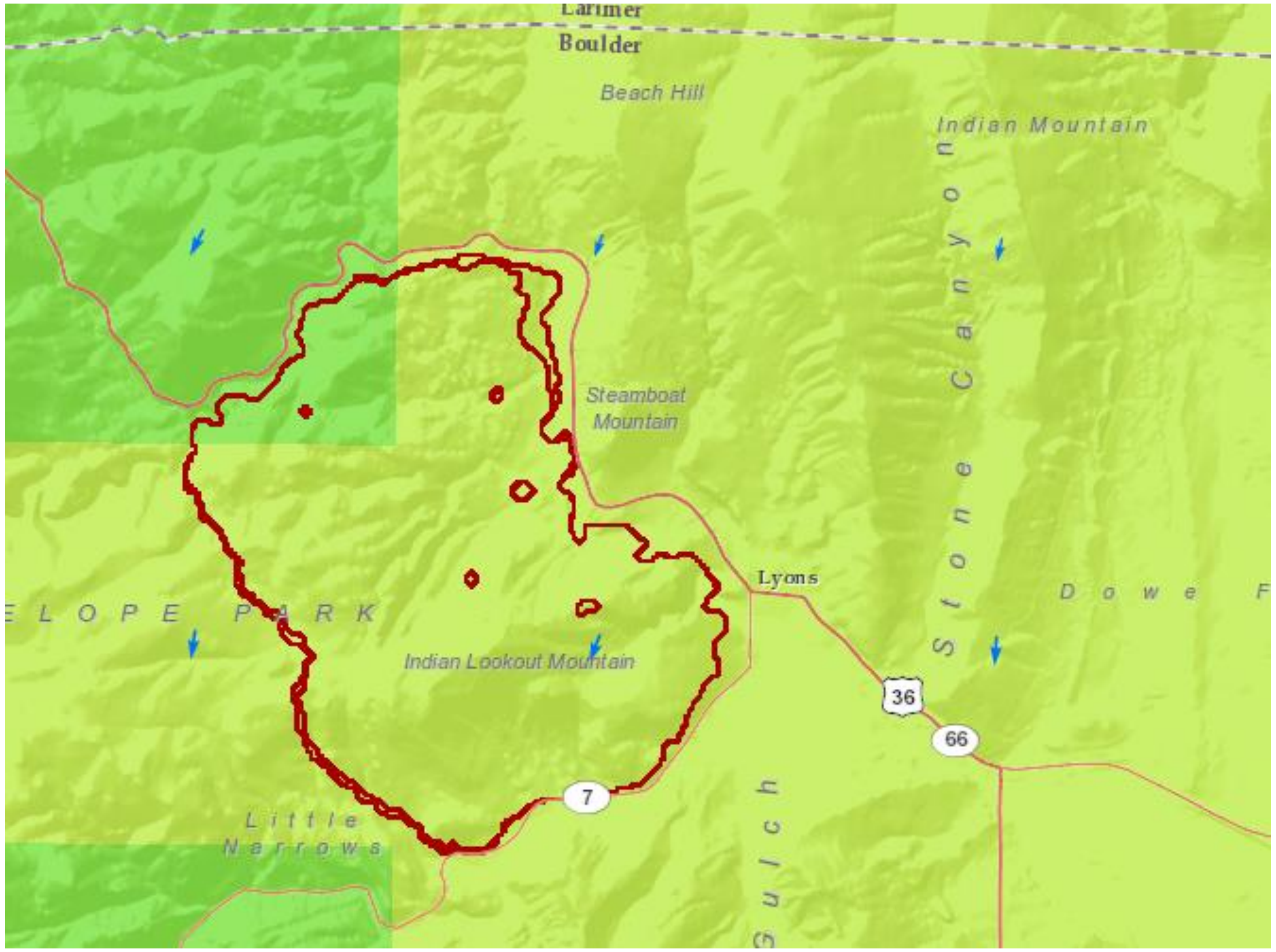
- CO-WIMS allows multiple layers to be displayed at the same time, though multiple raster grids cannot easily be shown at the same time

- Feedback from the previous meeting indicated that a combination of outputs in a single animation can quickly provide a large amount of information to decision makers



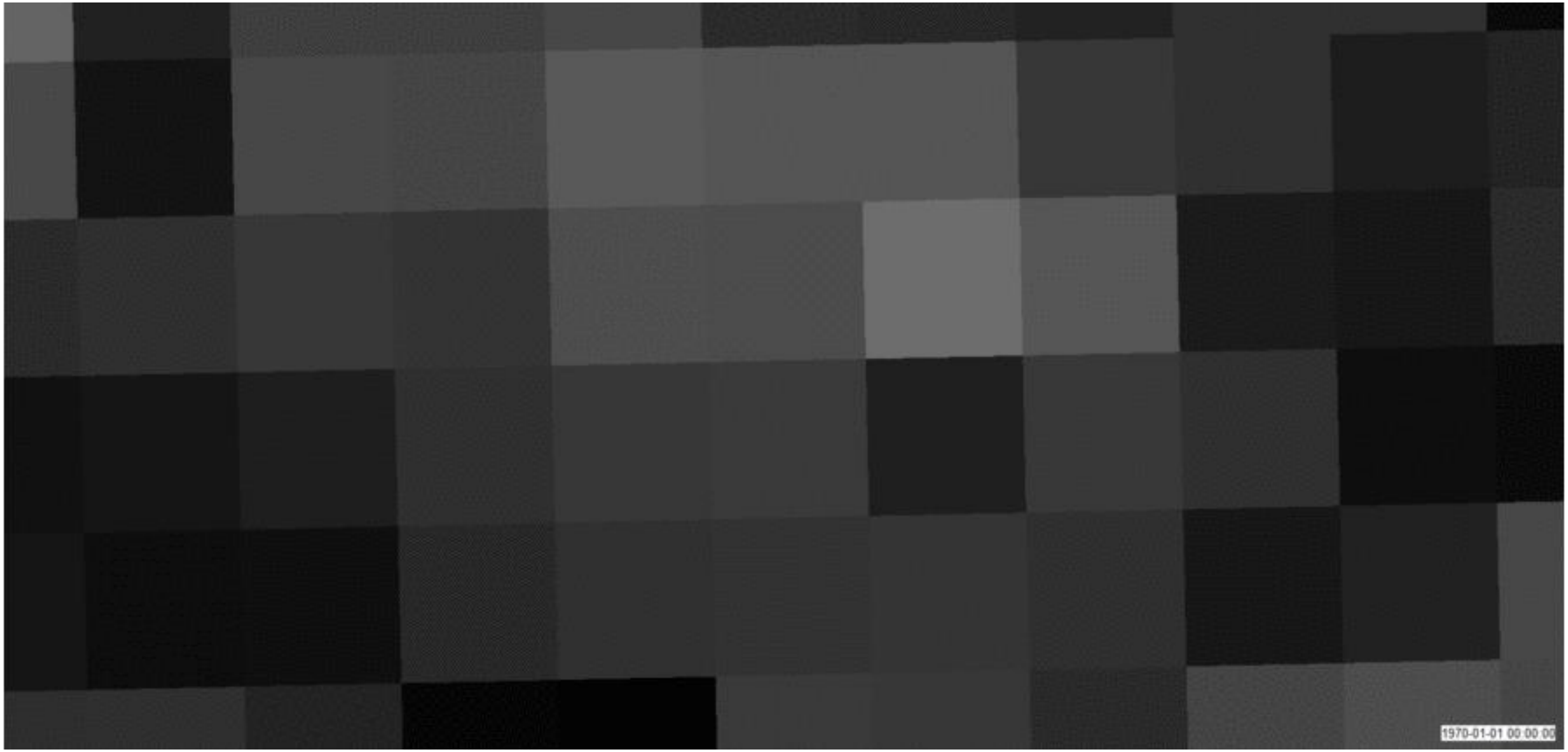
Still Combination Map

- Temperature is a raster grid with color ramp
- Fire size is a vector polygon
- Wind speed and direction are vector arrows



Time of Arrival and Temp

HRRR Wind Gusts and TOA



Combination TOA, Temp, Winds

What Combinations Make Sense?

- Flame Length
- Air Temperature
- Smoke Concentration
- Time of Arrival
- Rate of Spread
- Fuels
- Risk Indices
- Terrain
- Wind Speed/ Direction
- Humidity
- Wind Gusts
- Aerial Imagery