

LANDTRENDR in a REMOTE SENSING STRATEGY

STATE AND PRIVATE FORESTRY
FOREST HEALTH PROTECTION

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LandTrendr

“Landsat-based Detection of Trends in Disturbance & Recovery”

- ▶ Best broad-scale change detection easily available to us
- ▶ Covers entire U.S.
- ▶ A cloud and shadow free mosaic
- ▶ 30 m resolution satellite imagery data
- ▶ 8 day intervals (2 satellites at 16 day intervals each)
- ▶ Compares annual composite images in a time series
- ▶ From 1984 to present
- ▶ Results available with ~14 day lag
- ▶ Band, index, and parameter options available in GEE tool ([track 1 tomorrow](#))
- ▶ NBR is the index used in today's example (normalized burn ratio)
- ▶ I use magnitude and direction of NBR change between two years
- ▶ LT detects some change... but not all (e.g., not light and scattered)

What kind of masks do we use with
LandTrendr?

What kind of masks do we use with LandTrendr?

Forest masks



Cloud masks



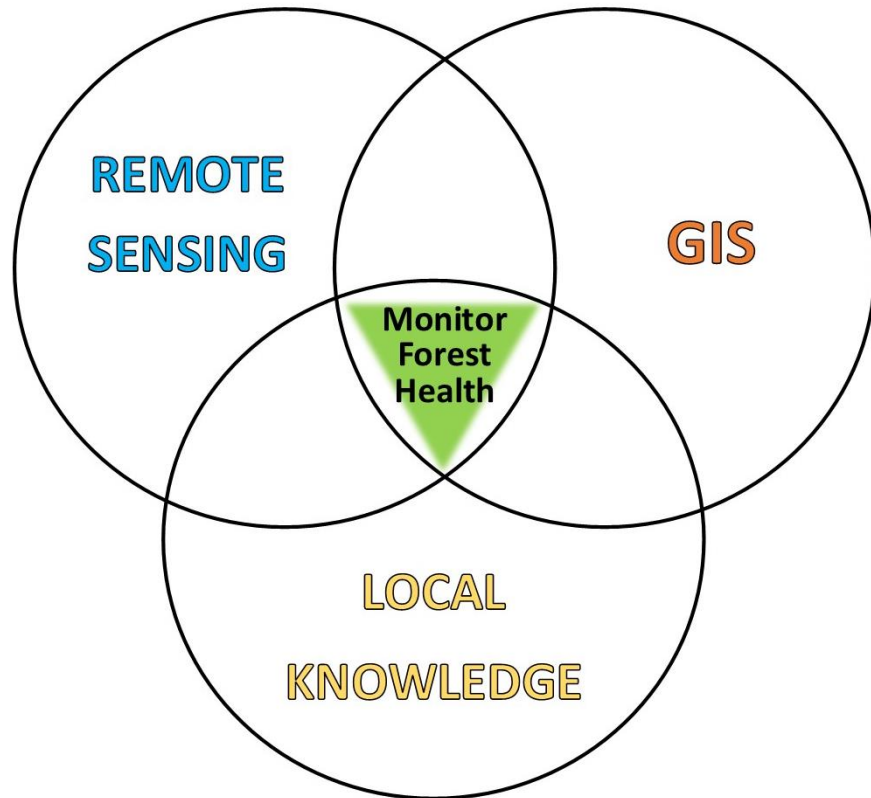
Ask Questions

- ▶ Chat window
- ▶ karen.Hutten@usda.gov



*This is a work in progress for all of us.
Suggestions are okay too.*

Identify your team and get started



- Meet 1 hour each week
- Start where you are
- Ask questions
- Pick a method
- Train up
- Jump in!

There is nobody better able to do this than you. You know the damage agents in your area and what they look like on the ground and from the air. You know the unique characteristics of your landscape. You, at the region, are the best ones to apply and interpret remote sensing.

Workflow

PRE-SURVEY

SURVEY
SEASON

POST-SURVEY

1. PREPARE

- ▶ Priority locations
- ▶ Priority agents
- ▶ Practice w **LandTrendr** etc.

2. DETECT

- ▶ Observations (professional and public)
- ▶ ForWarn
- ▶ **LandTrendr** – GEE tool, bring results into ArcGIS

3. INSPECT & IDENTIFY (CONFIRM)

- ▶ GIS layers (harvest, Rx burn, fire, tree spp, historic ADS)
- ▶ Visit: ground or special ADS
- ▶ High resolution (HR) imagery (order ahead?)

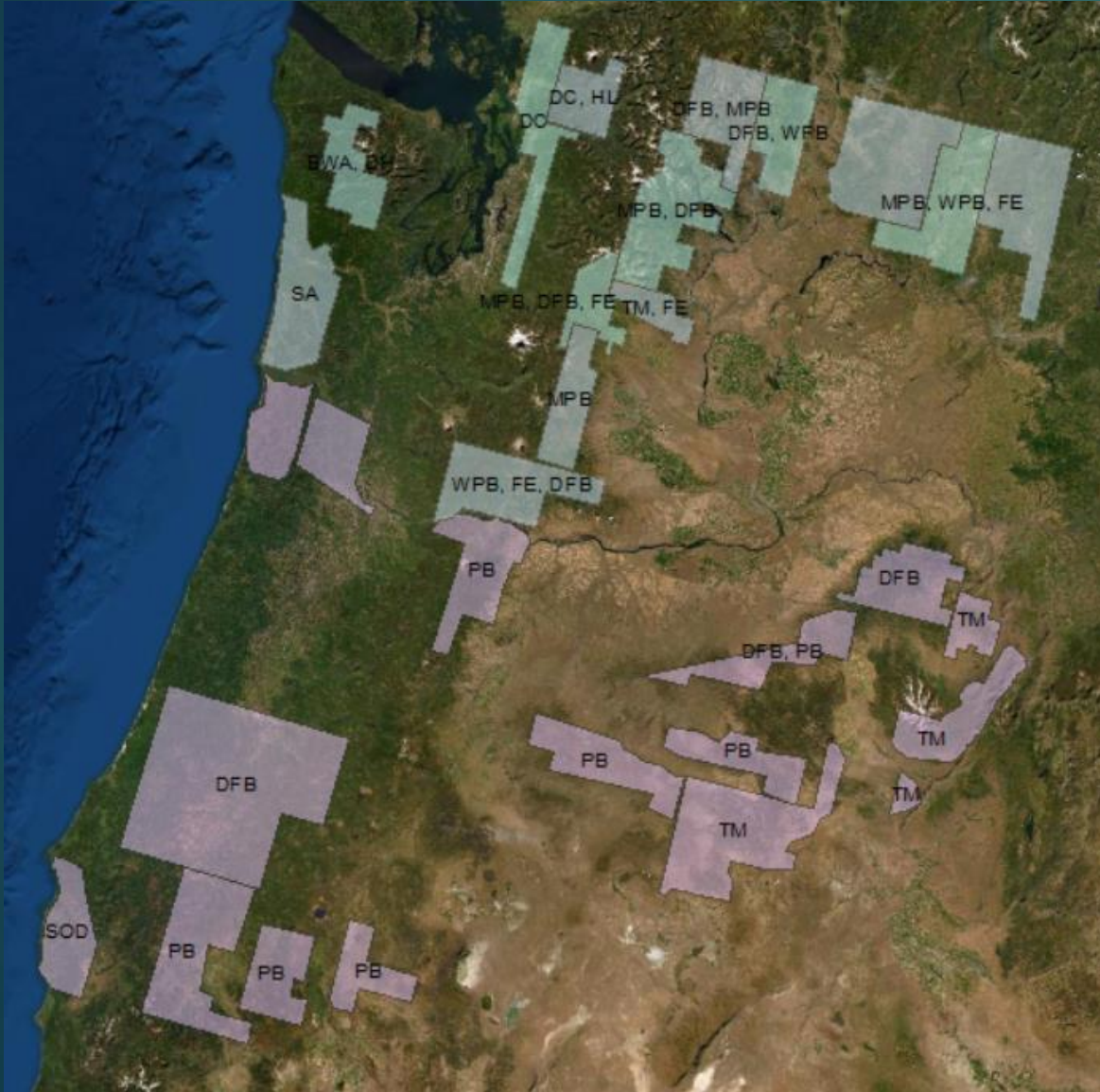
4. TRAIN **LANDTRENDR** & go back to 2.

5. MEASURE

- ▶ HR imagery – drawn polygons
- ▶ **LandTrendr** – boundaries, criteria, filters; **document**
- ▶ LCMS – refine/confirm?

Validate and report

Identify priority areas



- Historic activity (ADS/LT)
- Projected (risk map)
- Local interest
- Order HR Imagery ahead?

Identify priority agents & timing



Priority (1-3)	Agent	Hosts	Visible date	Full extent date	Compromised date	Date window (2 mo)	Detect w/ LT?	Confounding factors?	Attributes (mag, indices)	Multi-agent group
2	PM	PIPO PIJE PICO PILA	6/5	6/21	>8/1	6/5-8/1	We think so	WPB; MPB; needle cast; fire, harvest		
1	MPB									Pine b.
	WPB									Pine b.
	FE									
	Bear									
	SNC									
	Wind									

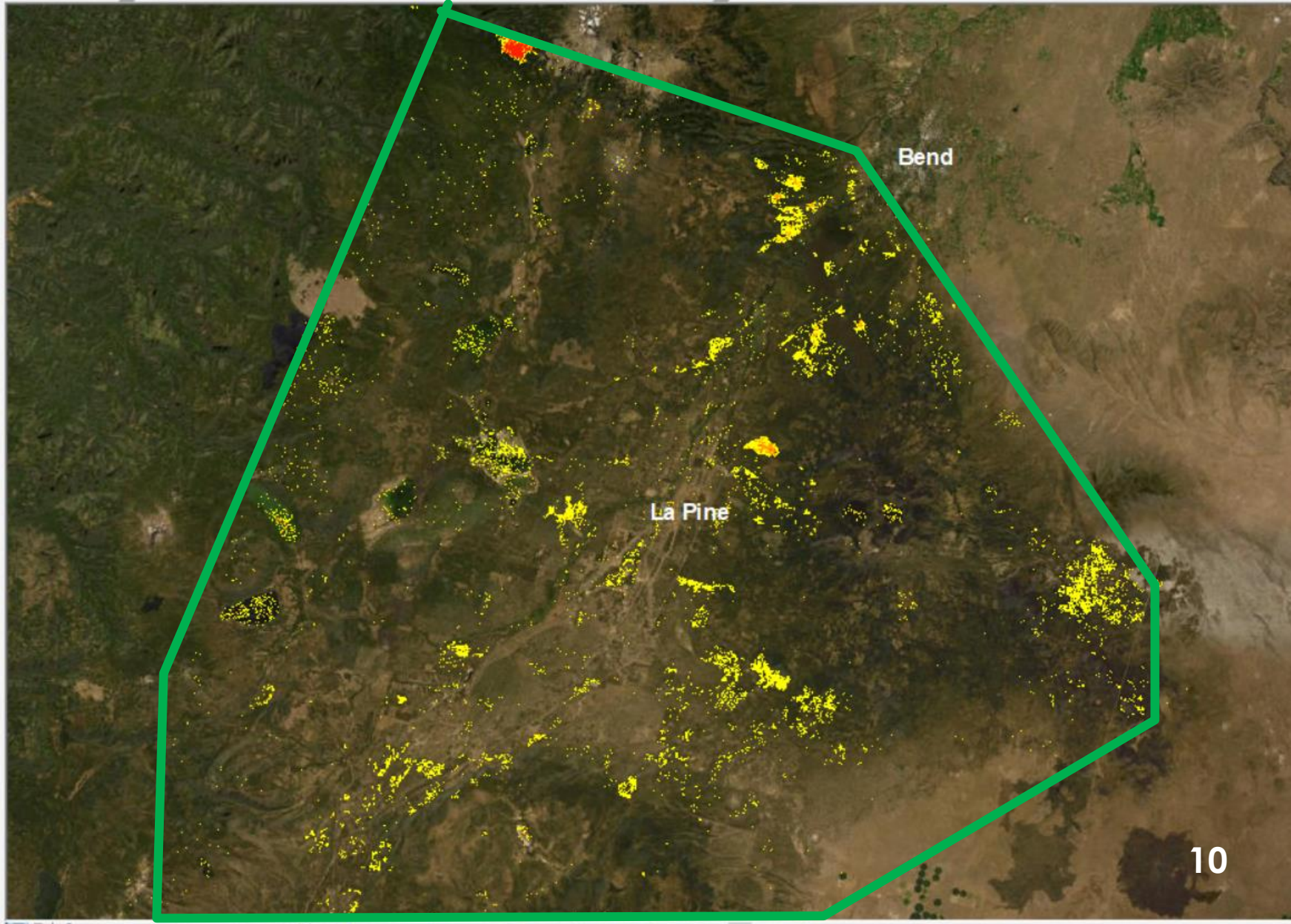
LANDTRENDR CHANGE LAYER



Table Of Contents

- Layers
 - Vegetation
 - LT Change**
 - nbr_17to18_delta.tif (this version damage is '+')
 - <VALUE>
 - 1,319 - 0
 - 0 - 50
 - 50.00000001 - 300
 - 300.00000001 - 500
 - 500.00000001 - 1,395
 - nbr_18to19_delta.tif
 - Pandora Moth 2018
 - 2018_WAFL Flight Lines
 - DMSM
 - ActivityPolygon - Harvest (ak example)
 - Fires2019_gt_100_acres
 - Priority 2020 Oregon
 - NBR values
 - forecast2020R6grid (Zack's projected damage)
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**NBR values
-50 to -1000
(0 to -50 is noisy)**

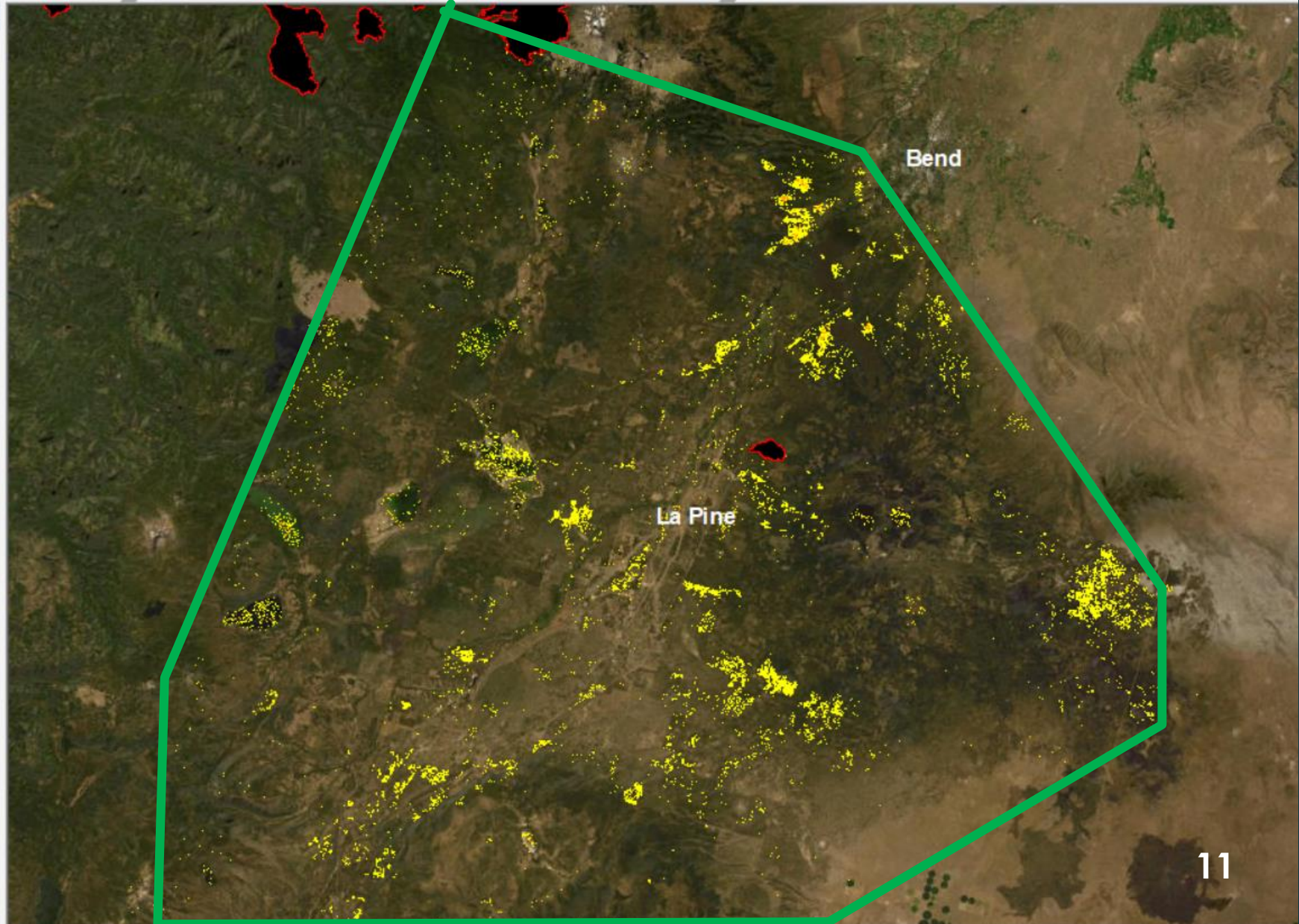


Detect damage by
Pandora moth 2018

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 - S_USA.MTBS_BURN_AREA_BOUNDARY_2017only
 - S_USA.MTBS_BURN_AREA_BOUNDARY
 - S_USA.MTBS_FIRE_OCCURRENCE_PT
 - FIRE_POLY BLM history
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HYDROLOGY

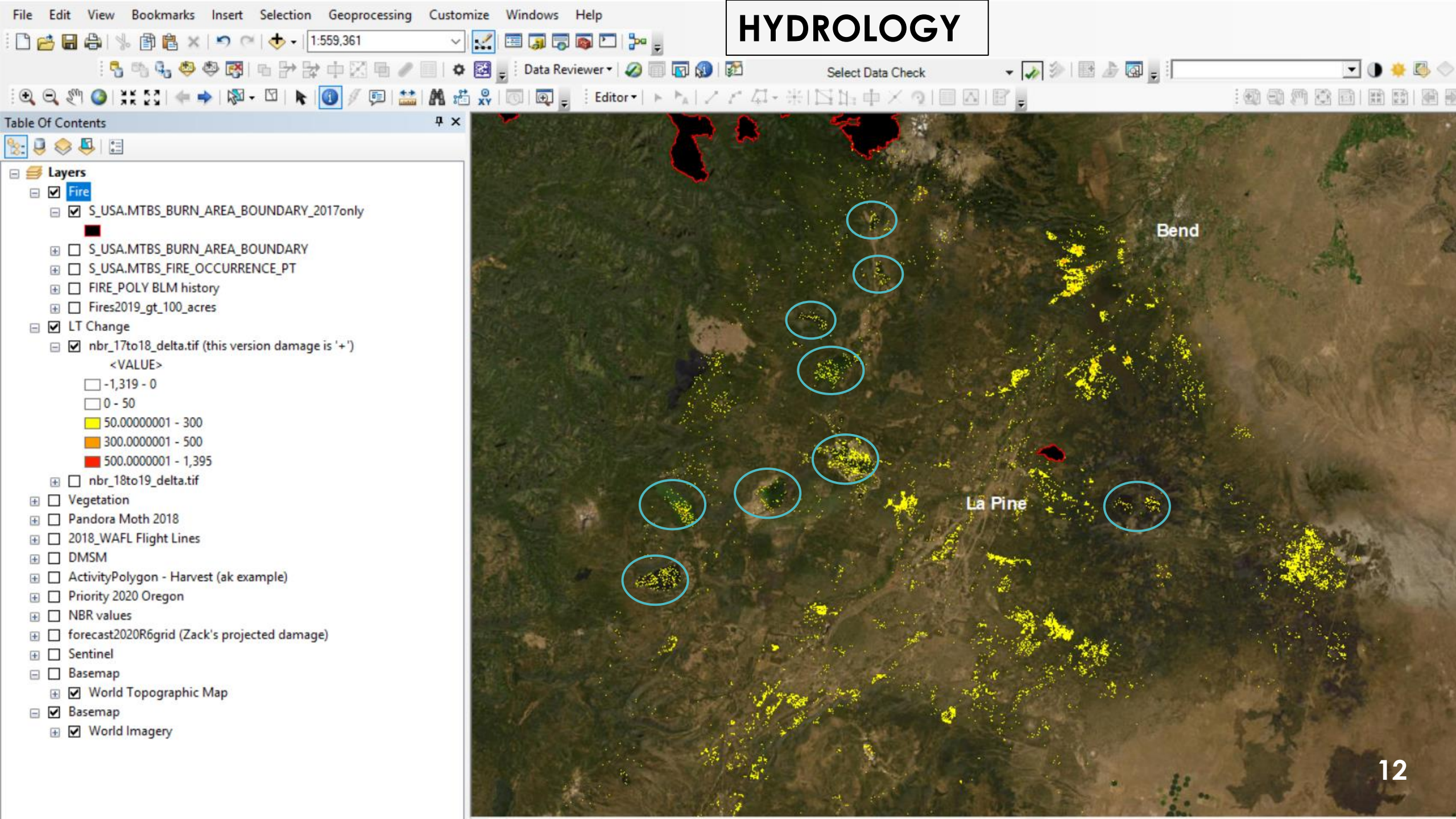
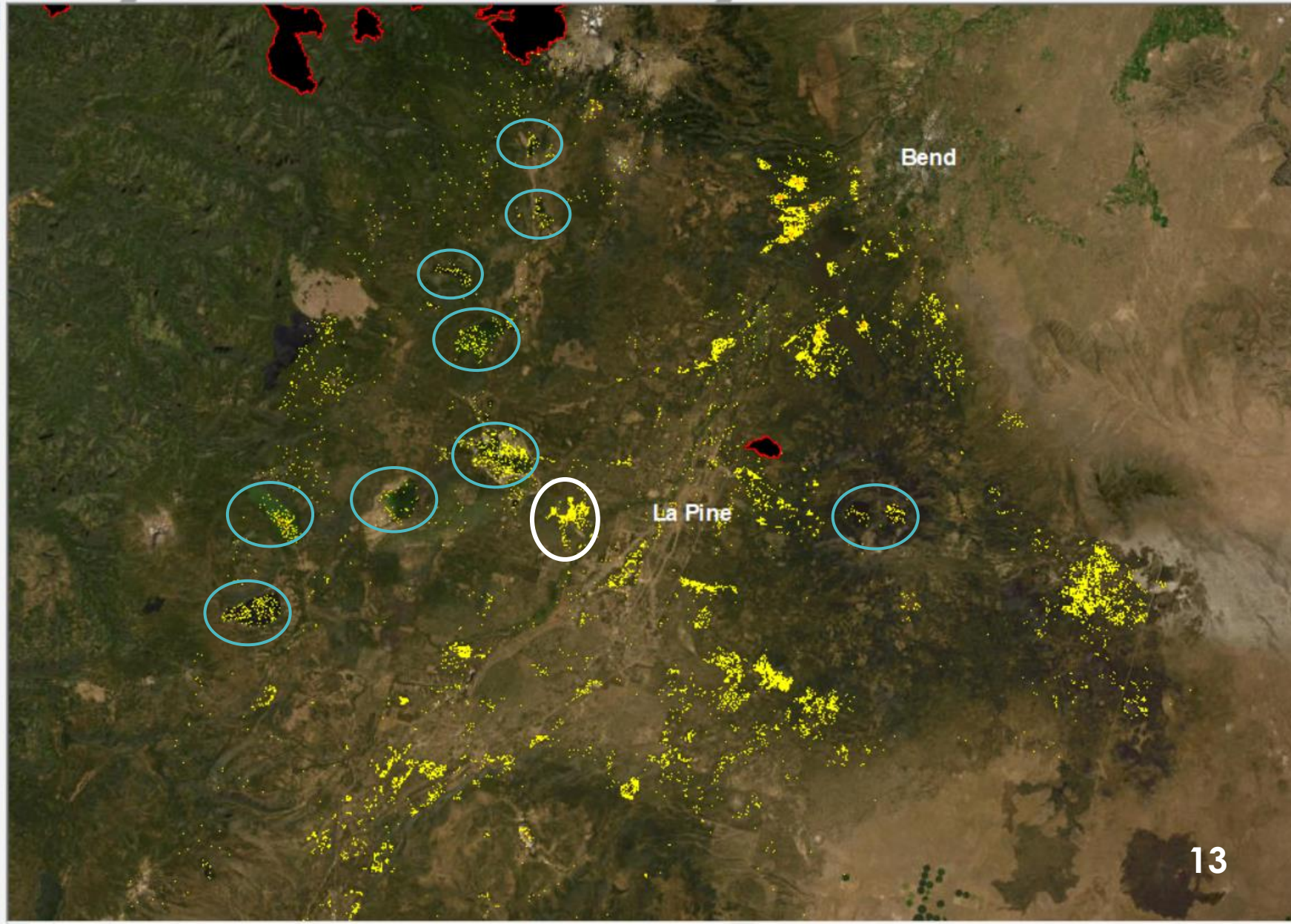
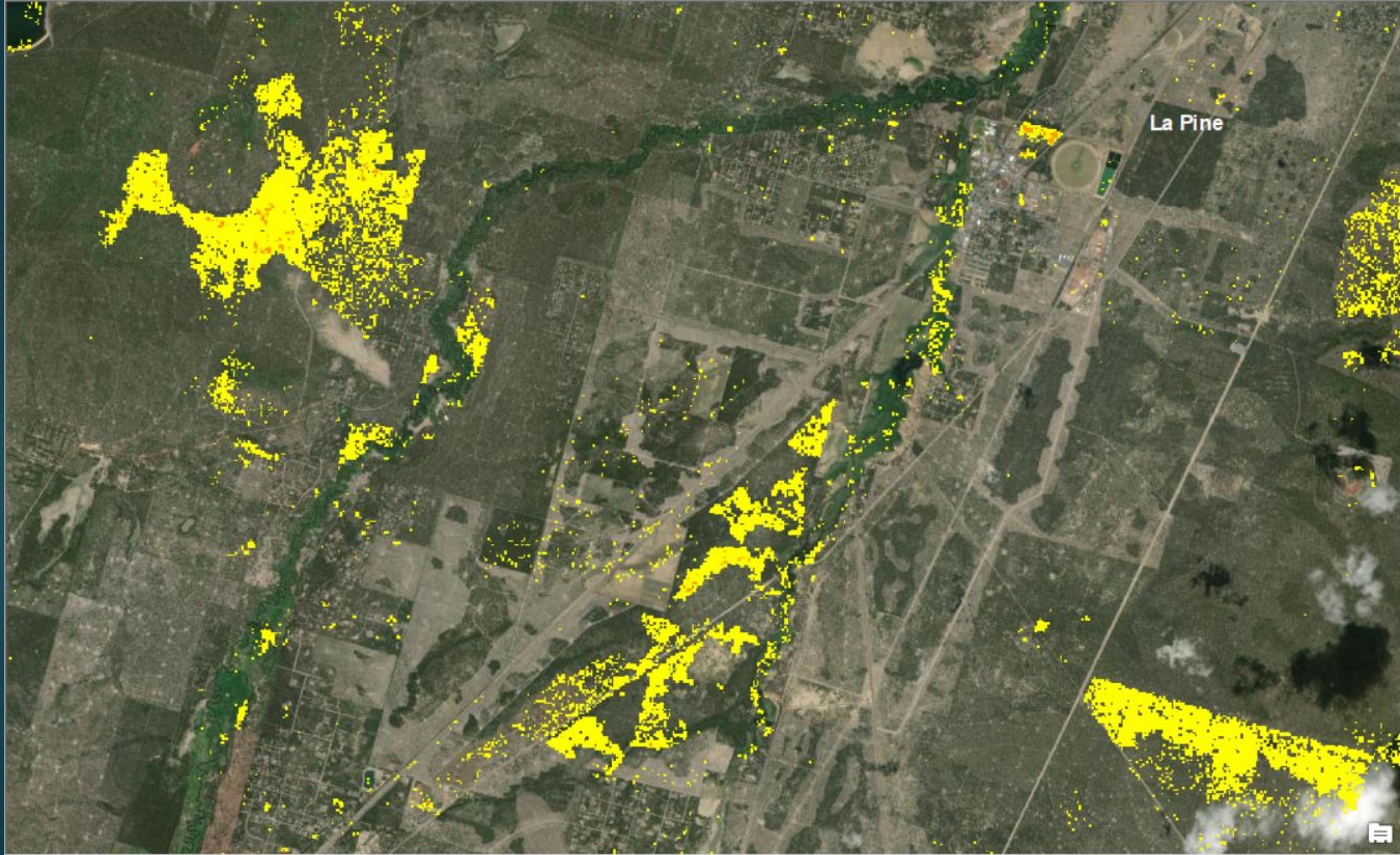


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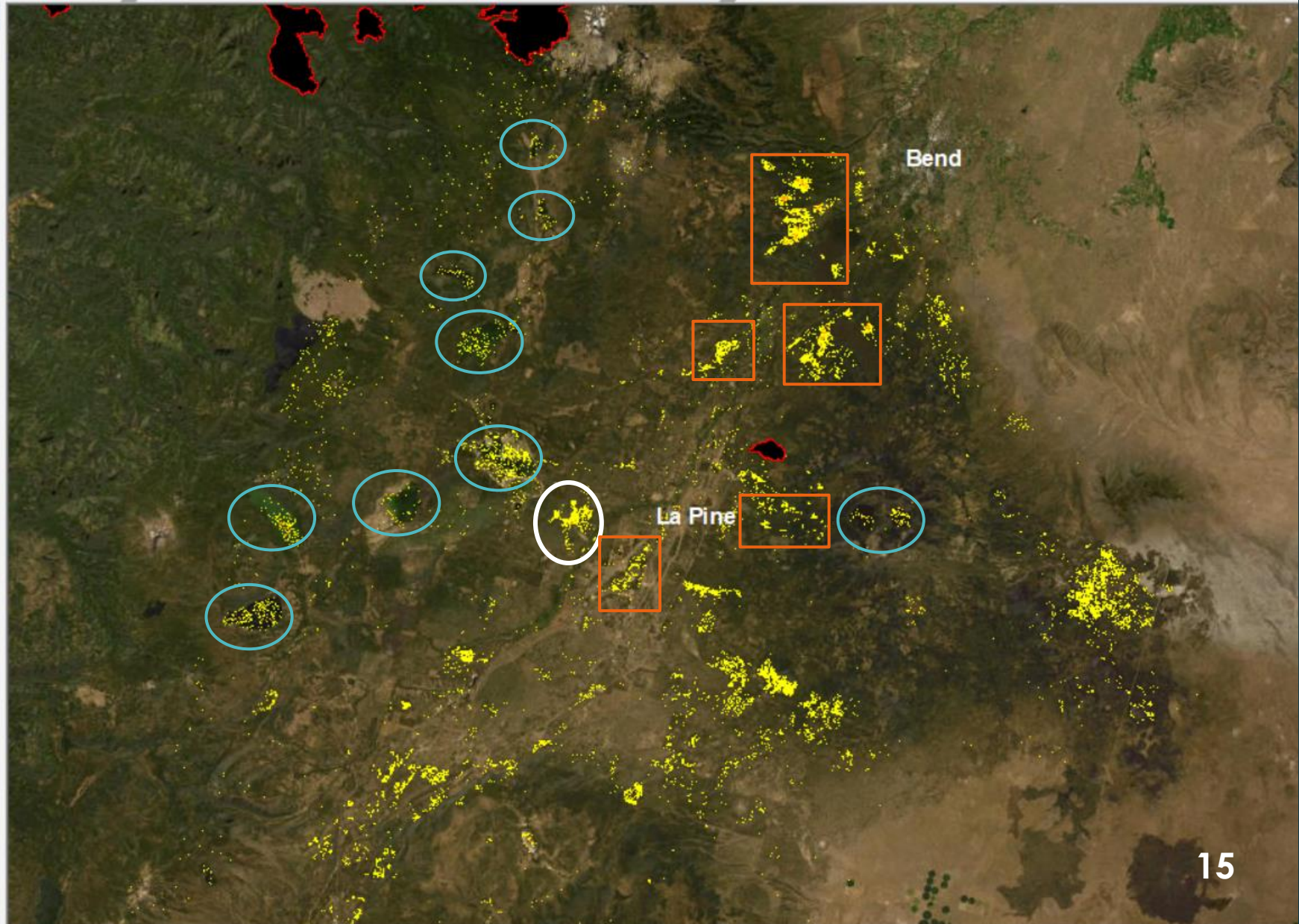


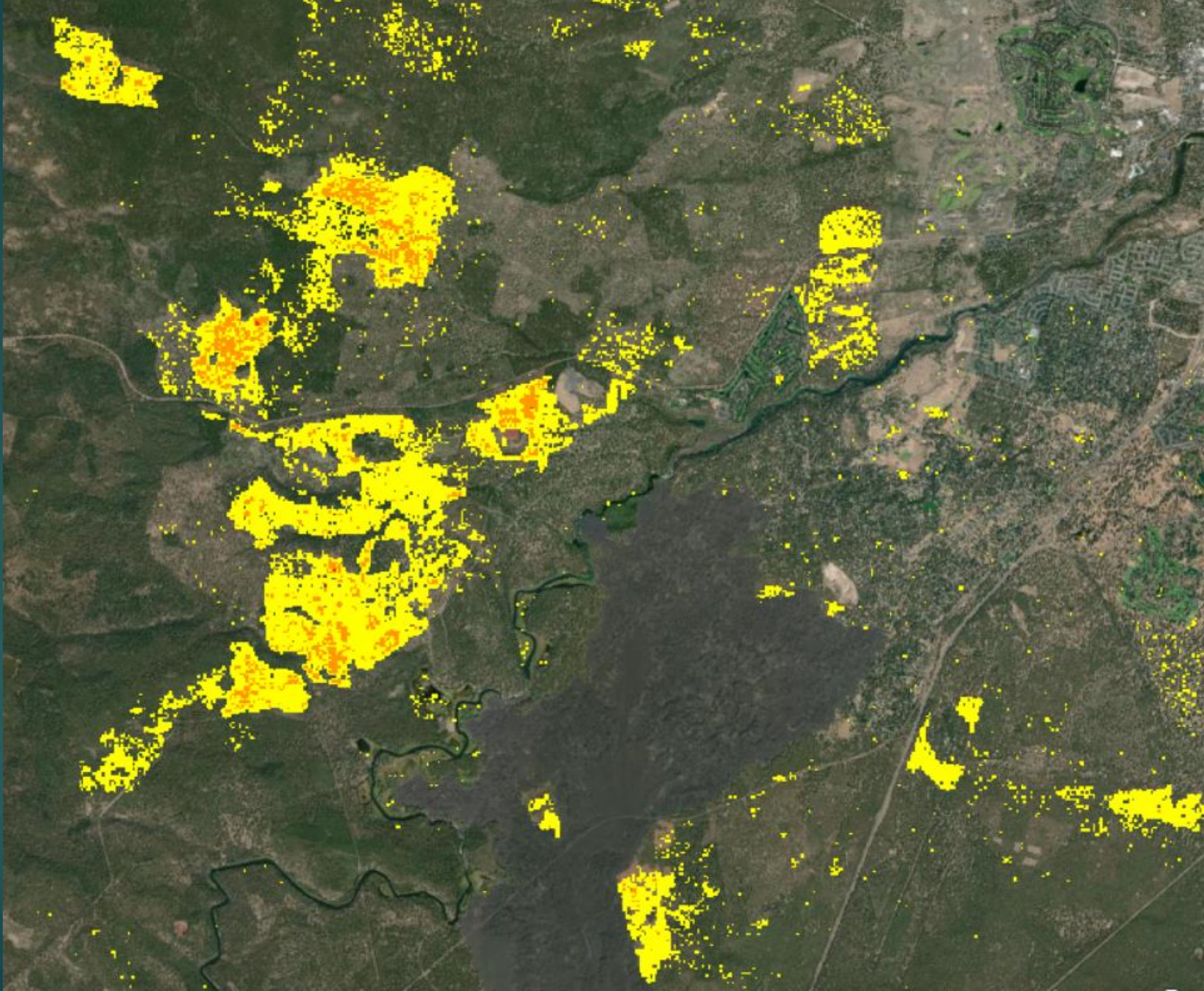
La Pine

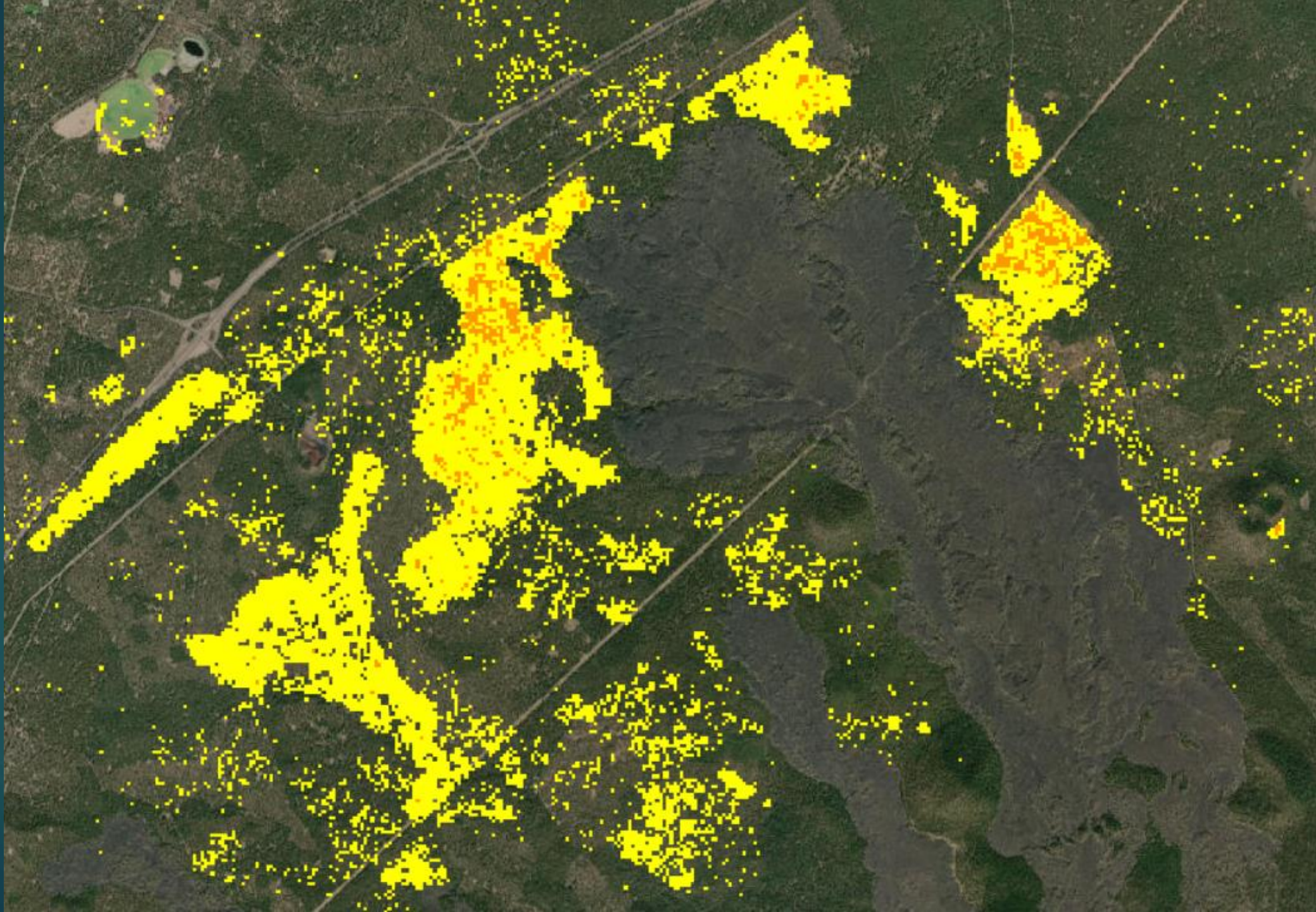


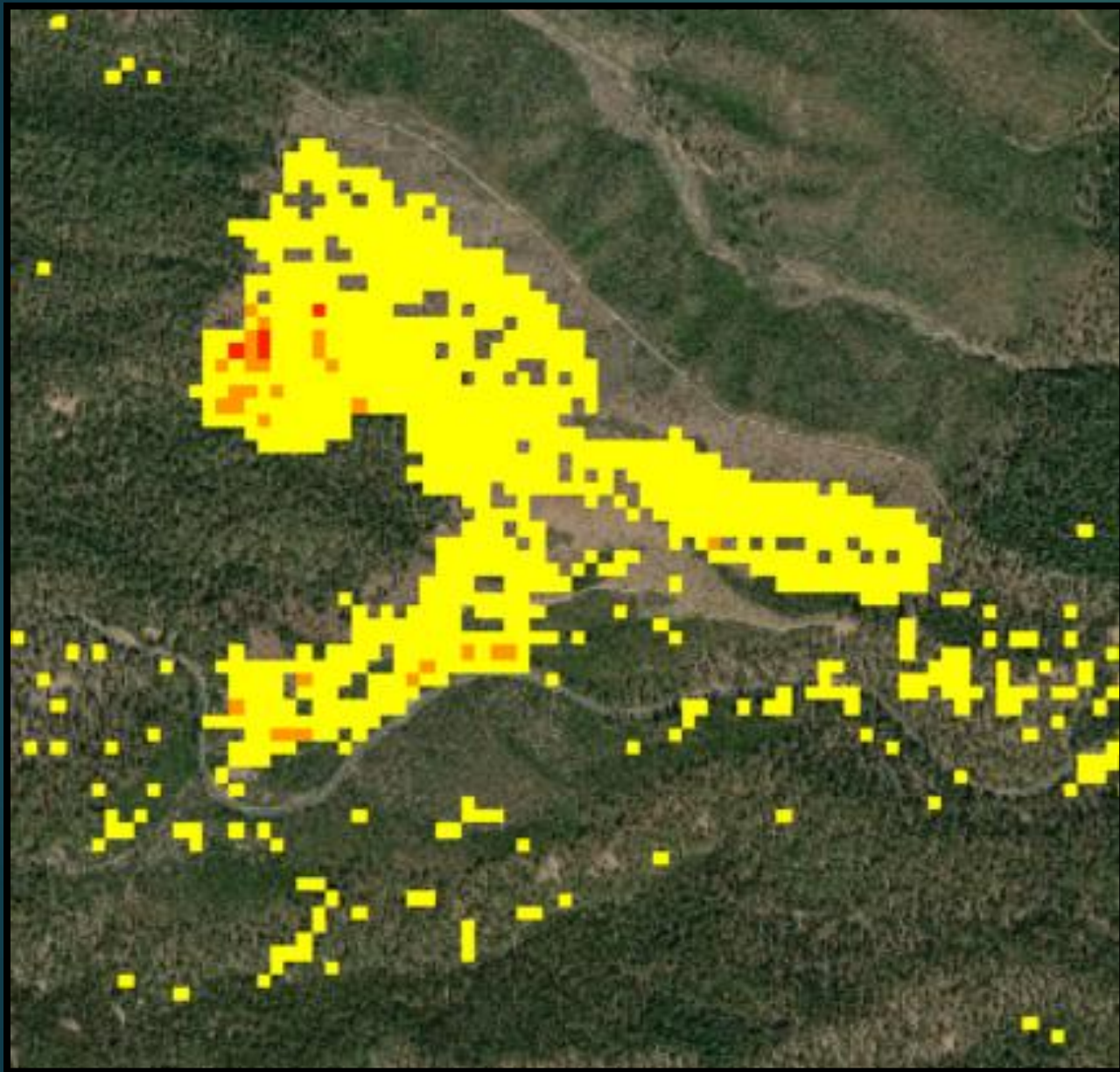
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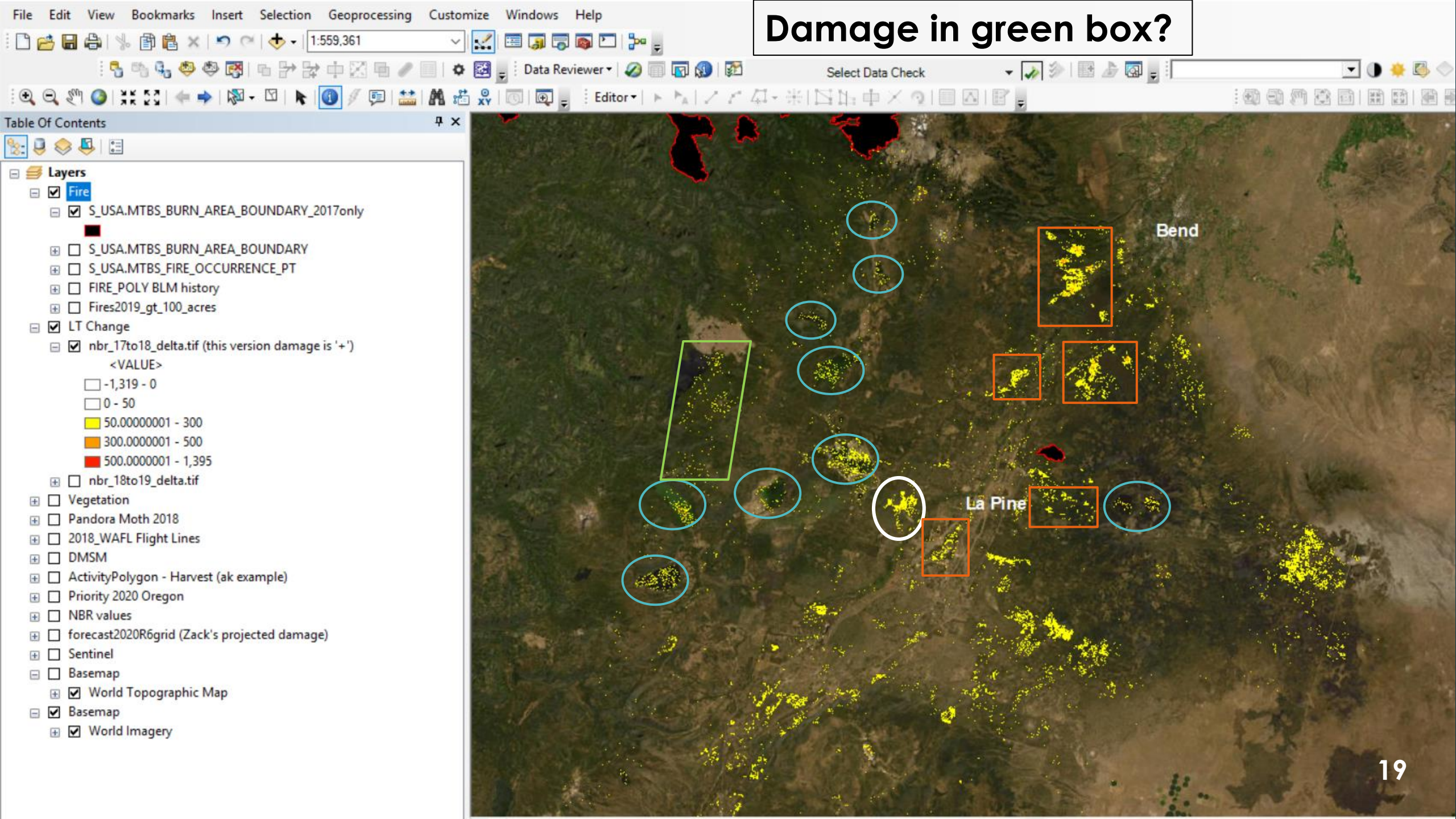




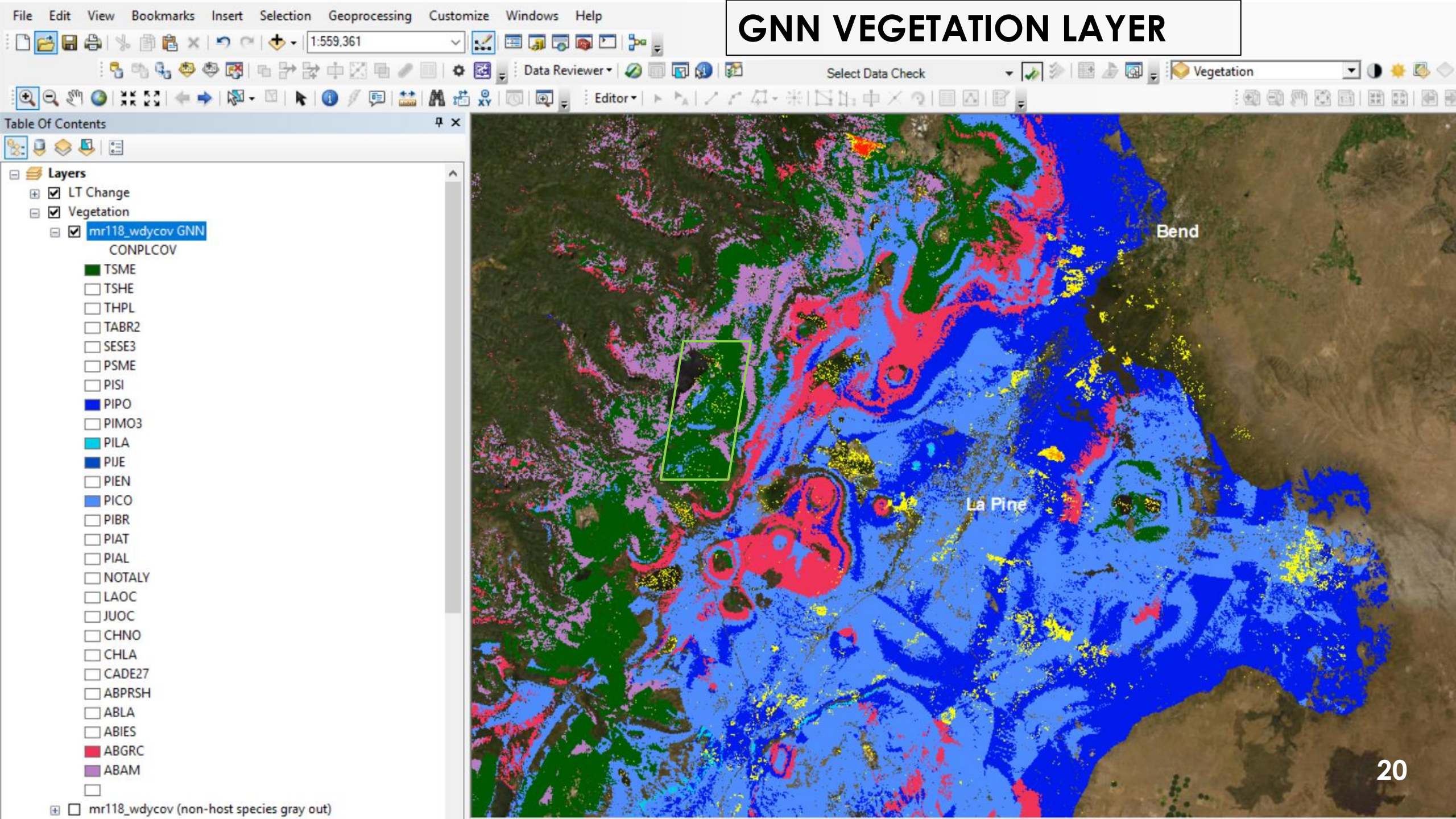




Damage in green box?



GNN VEGETATION LAYER

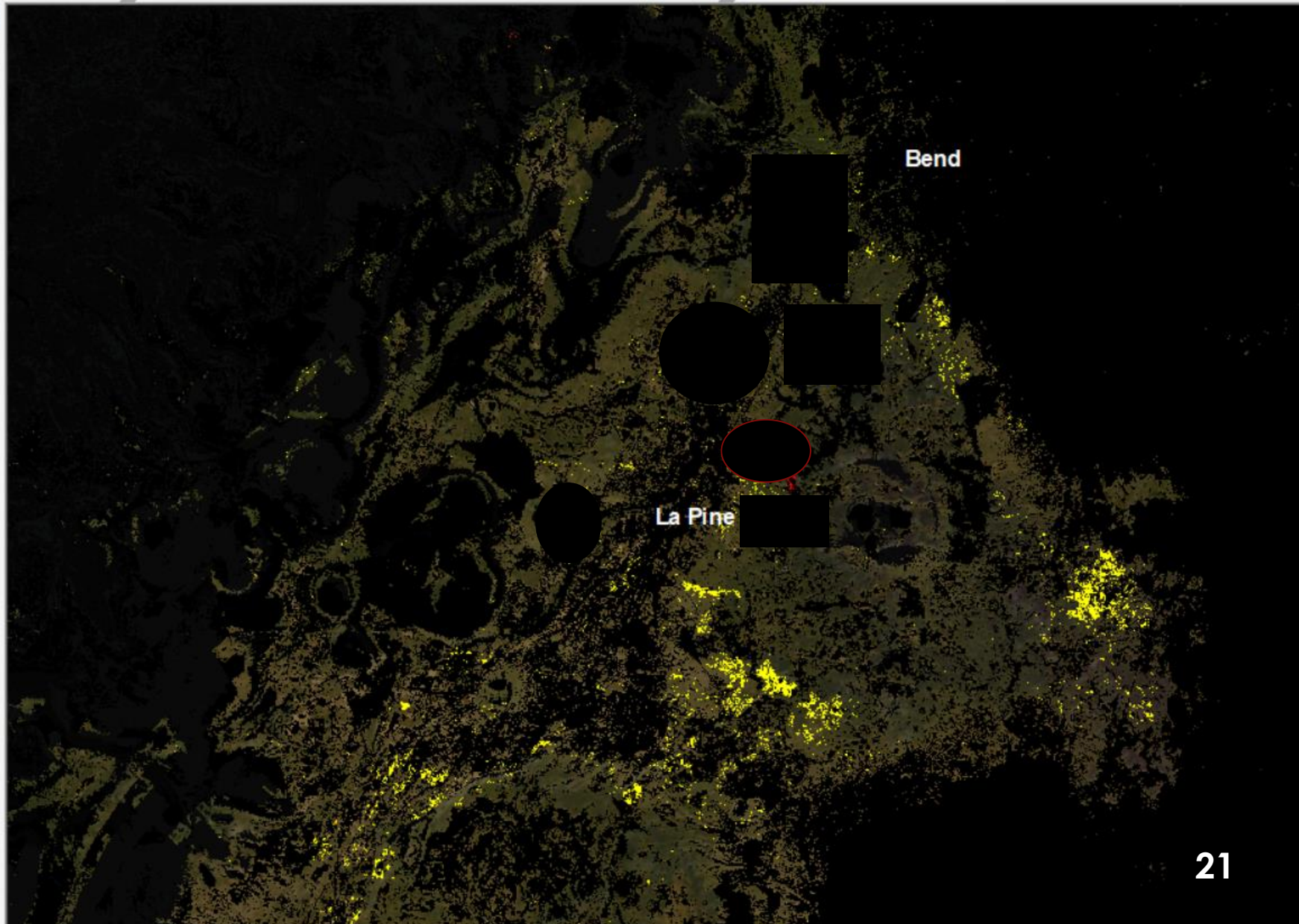


BLACKED OUT NON-HOST



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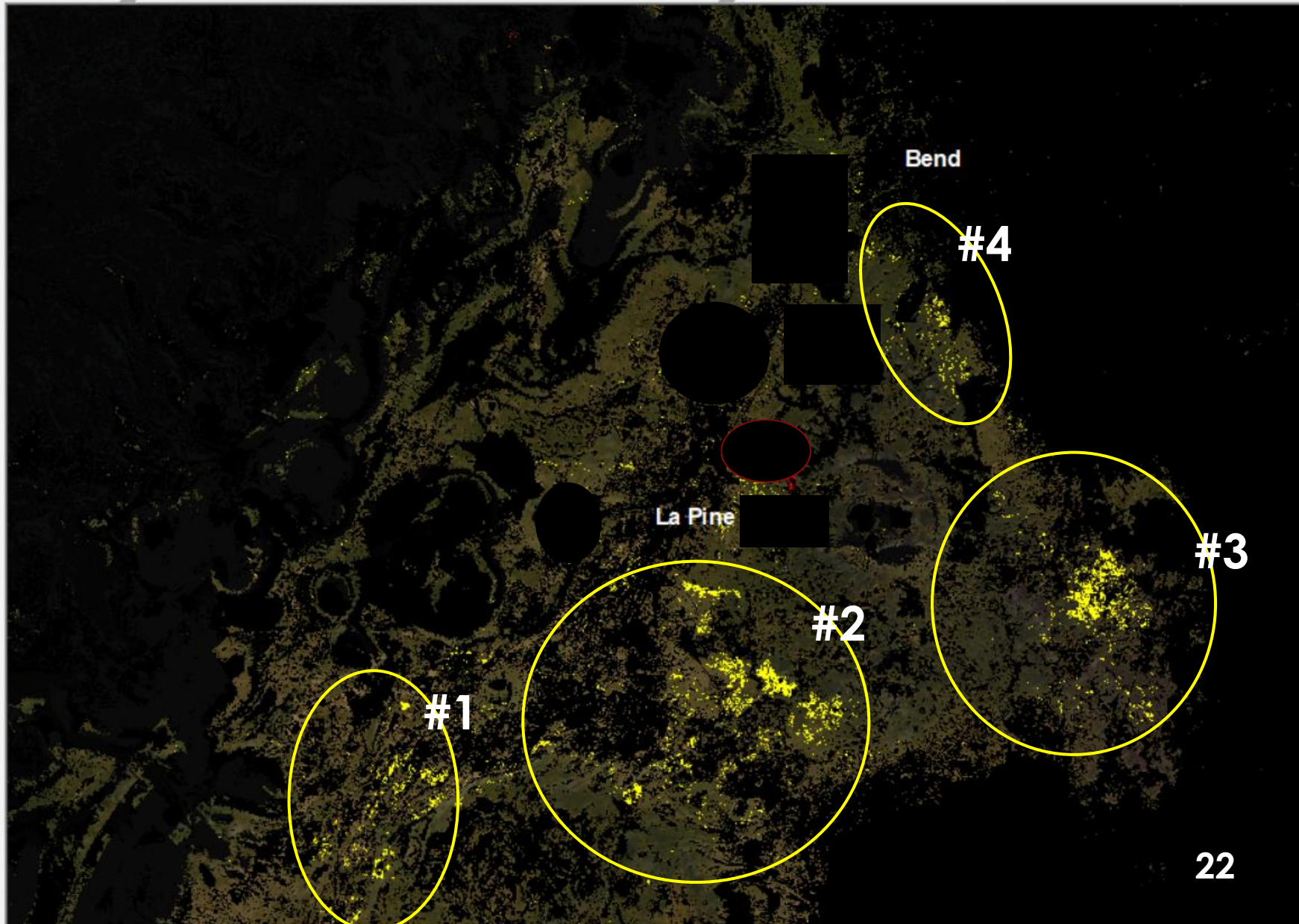


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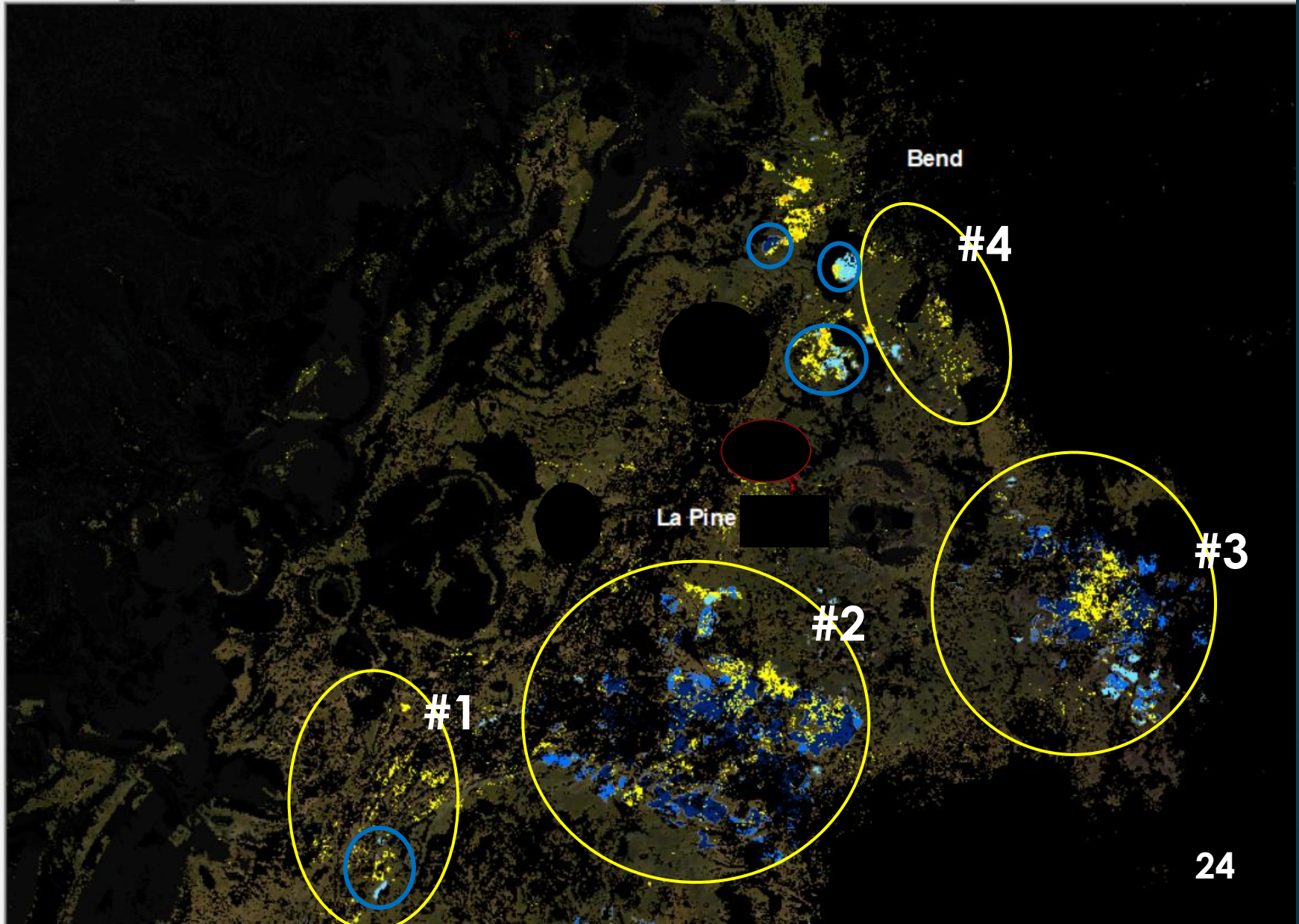
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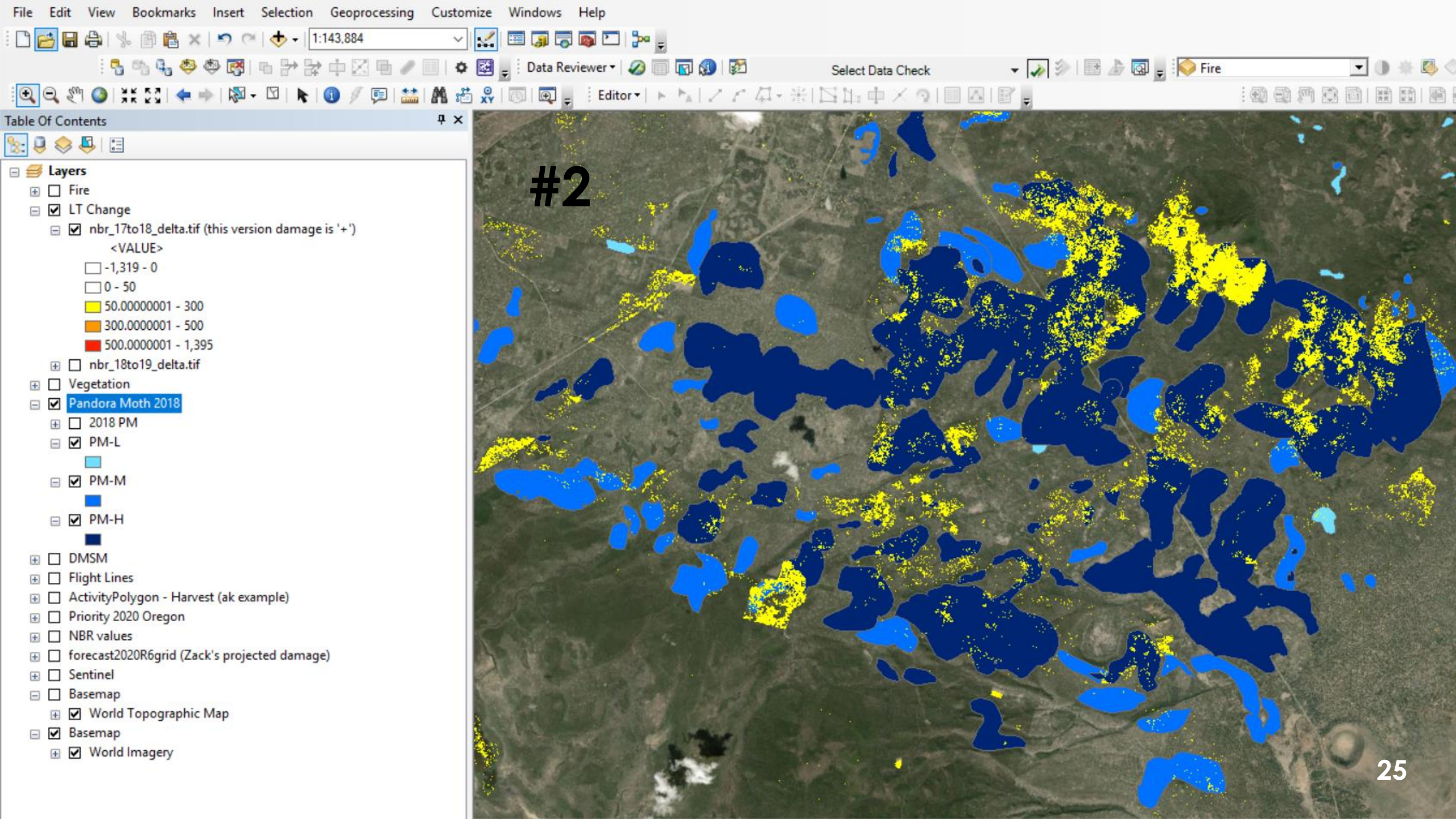


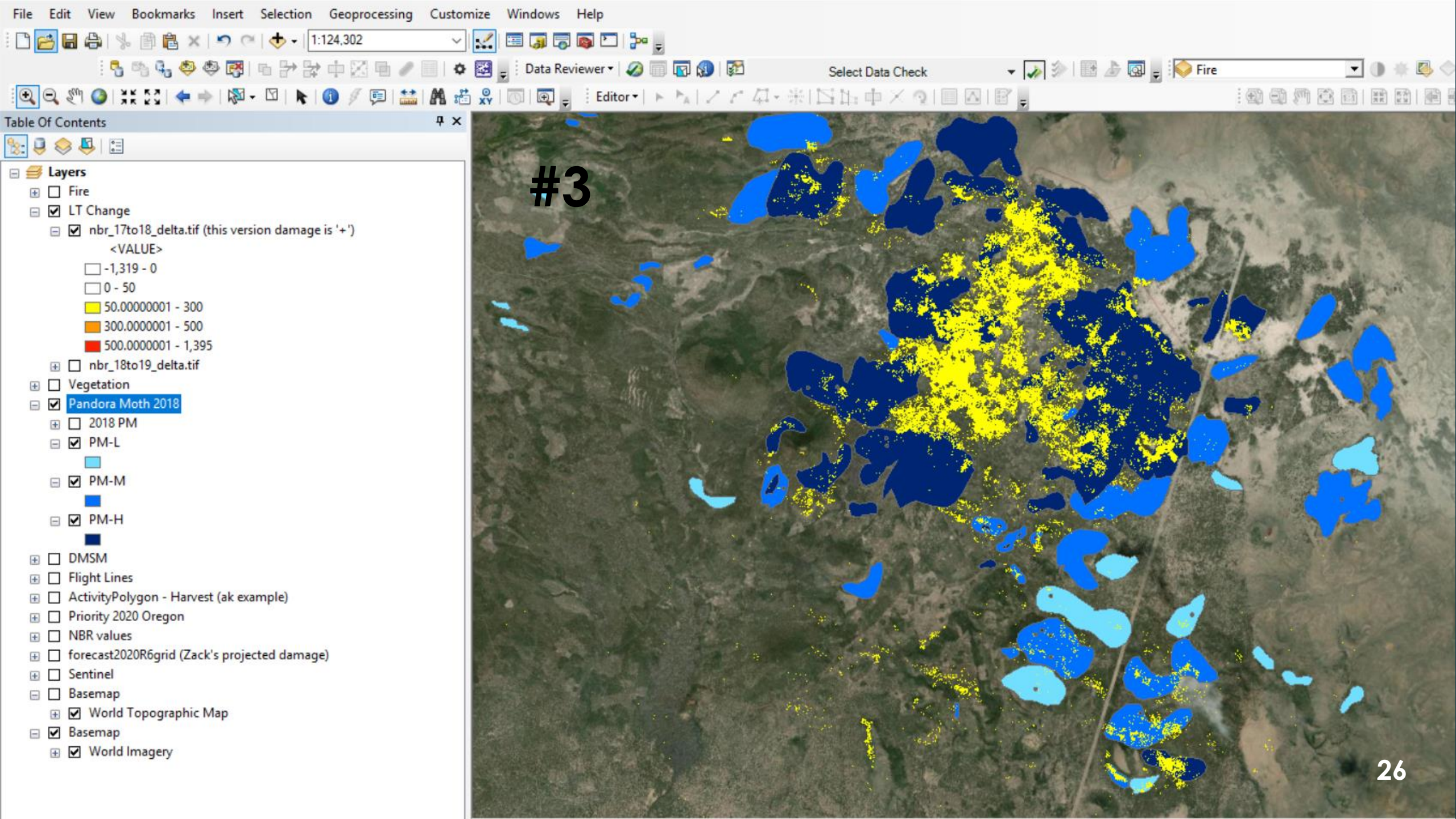
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Now what?

- ▶ Gather more local info about activities associated with PM forest (was 2018 ADS conducted before other damage occurred?)
- ▶ Use RGB and Time series tool to try different indices and parameters*
- ▶ Adjust magnitude range in ArcGIS
- ▶ Train LandTrendr by using pixels with verified PM change, possibly using more than one index.
- ▶ Conclude that PM is not a good candidate for LT
- ▶ Plan to use HR imagery for measuring PM instead

* See the training document section 2.3 for parameter ideas

(http://emapr.ceoas.oregonstate.edu/pages/education/how_to/roberts_workshop.html)

- ▶ maxSegments: default is 6; rule of thumb is 1/3 the number of observation years
- ▶ spikeThreshold: removes noise, but also subtle signals; default is 0.9; set to 1.0 to turn off and check for increase in sensitivity vs. noise.
- ▶ recoveryThreshold: the default 0.25 smooths over rapid recovery; 0.75 may improve detection; 1.0 turns off and may increase noise.