

Areas at Risk of Wildfires in Deschutes County

Abstract:

The overall purpose of this project and the research behind it are to find areas that are at high risk of wild fires. For this specific project, we chose Deschutes County. This was because Bend is within Deschutes County, and Bend is a highly populated area, and a popular travel destination in Oregon. We decided to find areas at high risk of wild fires is because of the fires that took place in the western part of the United States over the past couple of years. For this project, we took into account 3 main ideas to find the areas at highest risk of wild fires in Deschutes County. These ideas were vegetation type, where past fires took place in Deschutes County, and the final idea is risk due to distance from bodies of water.

We took those ideas and combined the found areas to produce the final data set. There was a trend with our final results. There was a “vertical” trend of where there were the highest risk areas, and these areas were almost clumped together. Everything was west of Bend and west of LaPine. Based off our results and interpretations, we found a total of roughly 150,000 acres at high risk of wild fires in western Deschutes County. As for suggestions as to what the data can be used for, it is recommended that these areas have a closed look kept on them, especially given the recent events of wild fires in the past 2 years.

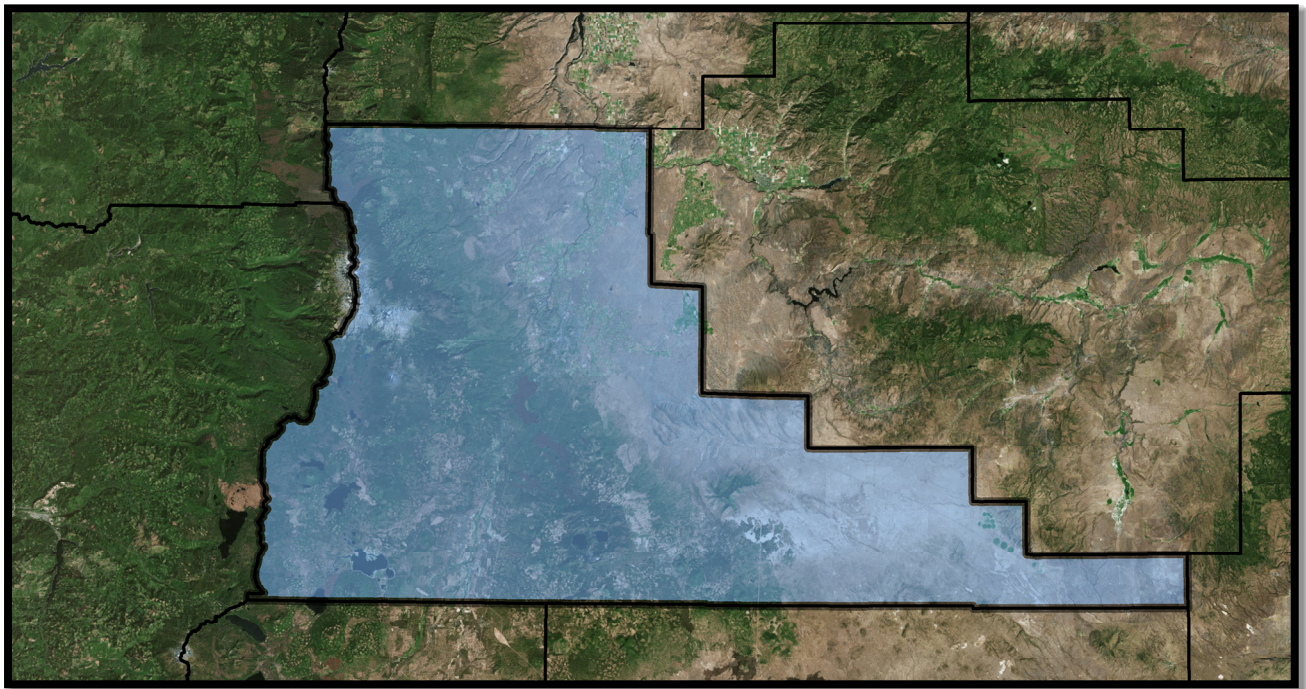


Figure 1: Deschutes County

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Background:

This project was designed to find areas within Deschutes County that are at high risks of wild fires. This topic was chosen for this specific project because of the recent events that took place in Oregon and California. What took place was a massive disaster. This disaster was major wild fires that burned for an incredible amount of time and destroyed a lot of land and properties. To be more exact, the wild fire that spread across the gorge in Oregon burned about 7,300 acres severely and 14,600 acres burned moderately (Ryan). This was a large devastation and destroyed many homes and a lot of property.

We wanted to prevent anything like that from happening again, especially since there are a lot of tourist travel destinations within Deschutes County. We would hope that the results we found and what we concluded would be used in the future to better prevent any other wild fires and how to better contain them if one did occur. Especially since it is believed that Oregon's fire seasons are only getting worse "Across the Western United States, longer summers and a shrinking snowpack mean particularly severe fire seasons can last up to 8 weeks longer than they did 50 years ago, according to the Forest Service's Pacific Northwest Research Station" (Hamway). Even last summer was considered a bad fire season as 1 million acres of Oregon burned with 6,000 of that total coming just from the Twin Bull fires which are west of Bend (Hammers). The challenges with this specific project are finding the correct data sets, where to apply them, and the strategies that were used to find our results. The principal objective of this project was to find the areas within Deschutes County that are at the highest risk of wild fires.

Site Description

Analyzing all of the state of Oregon would require too much processing power for the scope of this project so we decided to limit our area of interest to Deschutes County. It contains a large amount of the vegetation we were interested in, lots of previous fires, and many water bodies. The map we were using to determine risk of fire also showed several areas at high risk of fire near all three of these.

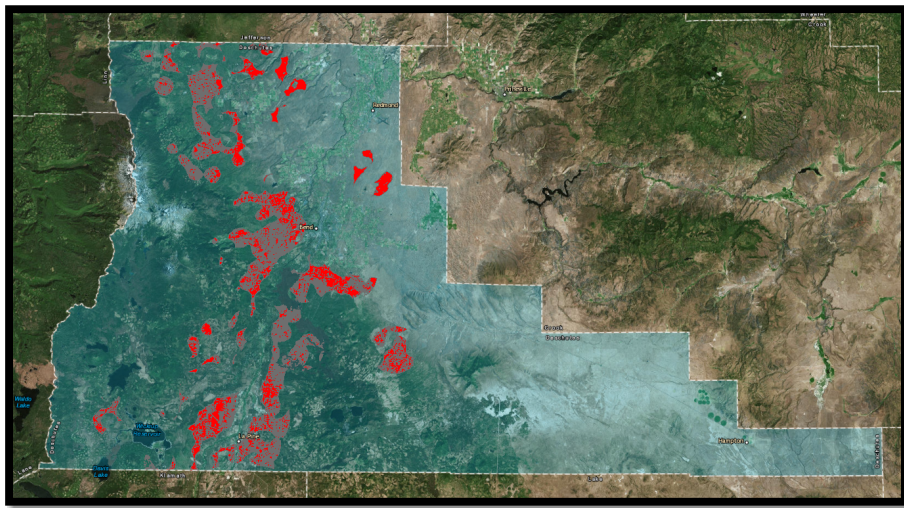


Figure 2: Areas of Interest in Deschutes County

Data

Name	fires_odf (Fire Occurrence (State) - 1986-2003)	wb_oregon (Oregon Water Bodies - 2005)
Description	Point locations for ODOT statistical fires from 1986-2003, updated annually	Layer consists of bays, lakes, ponds, rivers, streams and other hydrographic features
Vector/Raster	Vector, Points	Vector, Lines
Map Projection	Lambert_Conformal_Conic NAD_1983_Oregon_Statewide_Lam bert_Feet_Intl	Lambert_Conformal_Conic NAD_1983_Oregon_Statewide_Lam bert_Feet_Intl
Datum	D_North_American_1983	D_North_American_1984
Units	Feet	Feet
Data Author (web address)	Oregon Department of Forestry	Oregon Water Resources Dept.
Scale/Resolution	Map scale - 1:500,000	Map scale - 1:500,000
Attributes	SHAPE DISTRICT CAUSED_BY TOPGRAPHY	SHAPE SHAPE_LENGTH SHAPE_AREA

Data Continued:

Name	ORE_counties_Intersect (Oregon Counties - 2015)	risk_r	fuel_f
Description	Shows line and polygon representation of jurisdiction and cartographic perimeters	Likelihood of a fire occurring from fire records and land use	Use of the Fire Fuel Model Behavior to indicate which type of vegetation is present
Vector/Raster	Vector, Polygons	Raster, 100x100	Raster, 100x100
Map Projection	Lambert_Conformal_Conic OGICdefaultAG82	NAD_1983_Lambert_Conformal_Conic	Unknown
Datum	D_North_American_1983	D_North_American_1984	Unknown
Units	Feet	Feet	Unknown
Data Author (web address)	Bureau of Land Management	Oregon Department of Forestry	Oregon Department of Forestry GIS
Scale/Resolution	Map scale - 1:500,000	Raster resolution: 250m	Raster resolution: 250m
Attributes	SHAPE INSTNAME	FIRES_PER_1_000_COUNT	COUNT DESC:_FUEL_MODEL

GIS Methods:

Audrey's Section:

For the vegetation section, I was searching for the areas at risk due to the vegetation surrounding them. Figure 2 shows the four main types of vegetation currently in Deschutes County. The blue stands for open water; tan for semi-desert, shrub land, or grassland; green for forest or woodland; and red is development or other human use. Also included are the previous fires for 17 years (1986-2003).

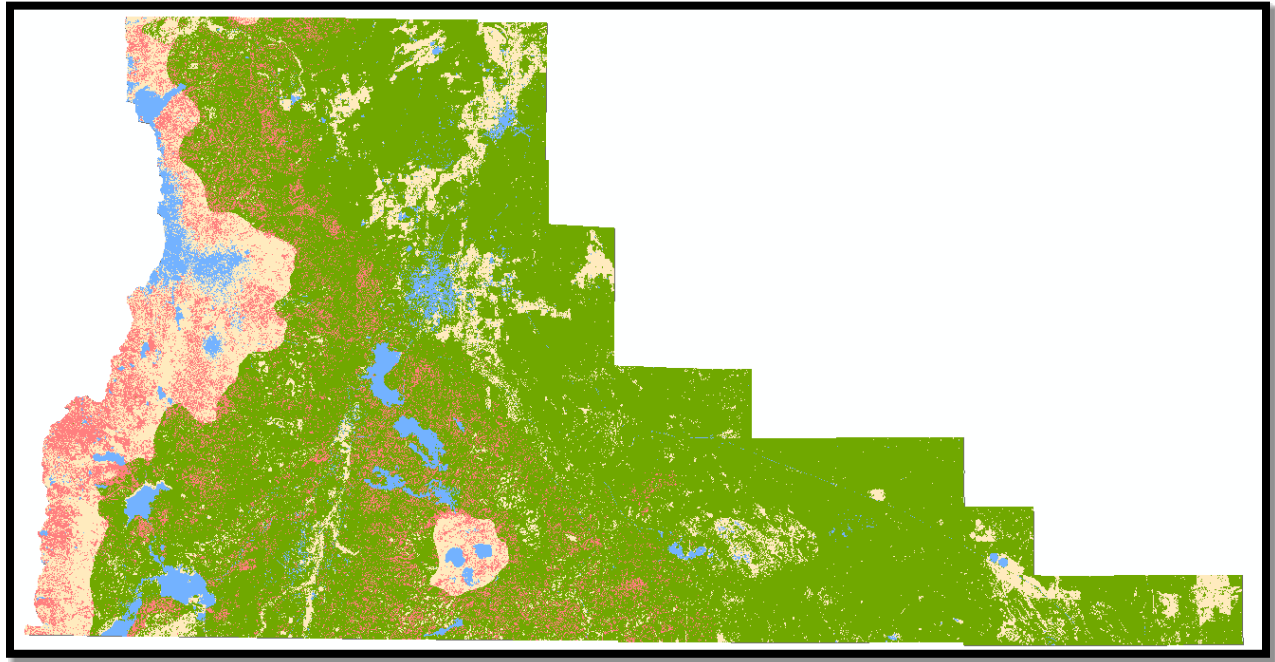


Figure 3: Land Use for Deschutes County

This begins by clipping the raster data to just Deschutes County using the raster clipping tool located in the toolbox. This tool is used for this process exactly, defining a big raster set into something smaller. The next step is to convert the raster dataset to polygon (vector) so that a new layer can be formed. Third, I intersected the fires with each different category of vegetation to count the number of fires in each type. From this, it becomes obvious that the forest or woodland vegetation have the most fires in its territory, which makes sense. I made a new layer of just the forest and woodland area for later use. On a separate process, I clipped the risk dataset to Deschutes County and turned it into a vector set as well. From that, I created a new layer of just the high risk areas. I intersected the high risk area and the forest layer to find the areas that are high risk in the forest.

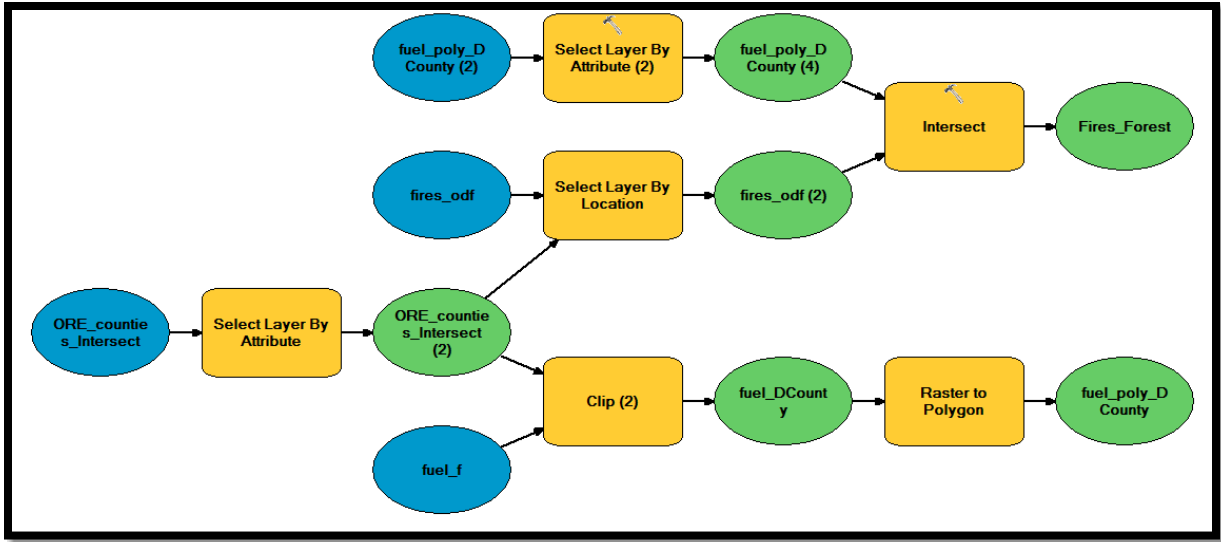


Figure 4: Model Builder for Vegetation Layer

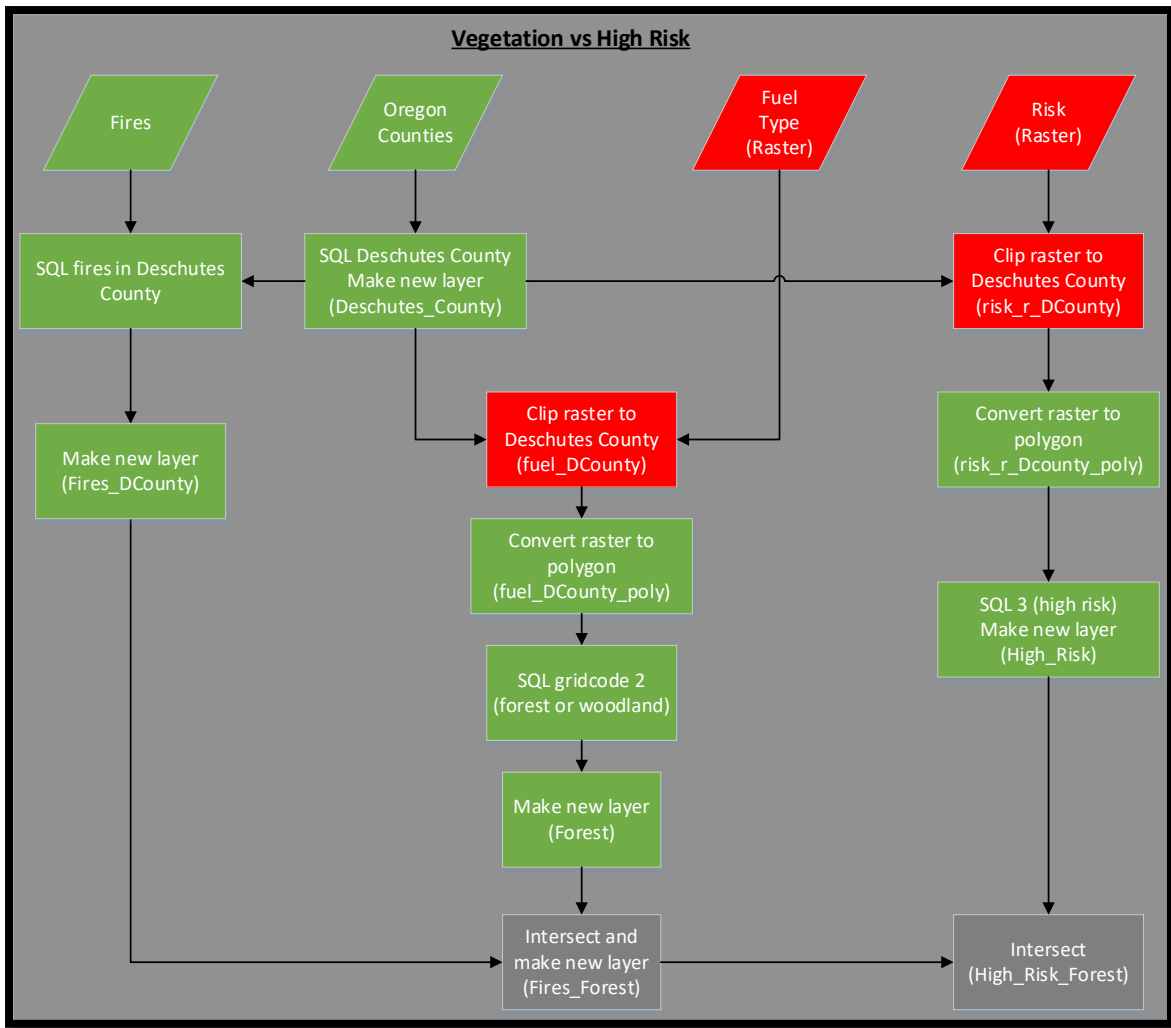


Figure 5: Flowchart for Vegetation Layer

Zachary's Section:

This flowchart (Figure 6) begins with converting the risk_r (Raster) to a polygon (vector) and then completing a search by attribute for all areas of high-risk fire in the State of Oregon, and finally creating a new layer for the selected polygons. Next, a search by attribute for the ORE_counties_Intersect dataset was completed to find Deschutes County, as well as creating a new layer for this. After, Deschutes County was intersected with the high-risk polygons so that the only high-risk areas we looked at were within Deschutes County. After this, the fires_odf dataset was sorted into just the fires within Deschutes County by a search by location, and then exported to a new layer to work with less data. With the new fires layer, a 3-mile buffer was computed due to the fact that fires spread and areas around previous fires need to be considered. To get the final Layer, an intersect between the high risk areas in Deschutes County and the fires buffer was completed. With all these steps, I was able to find what areas in Deschutes County were at high risk due to previous fires.

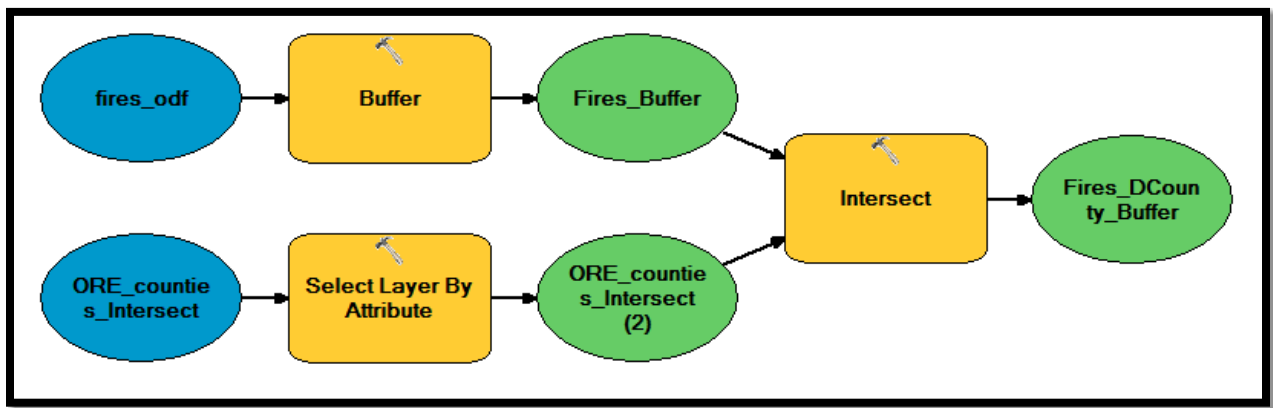


Figure 6: Model Builder for Previous Fires Layer

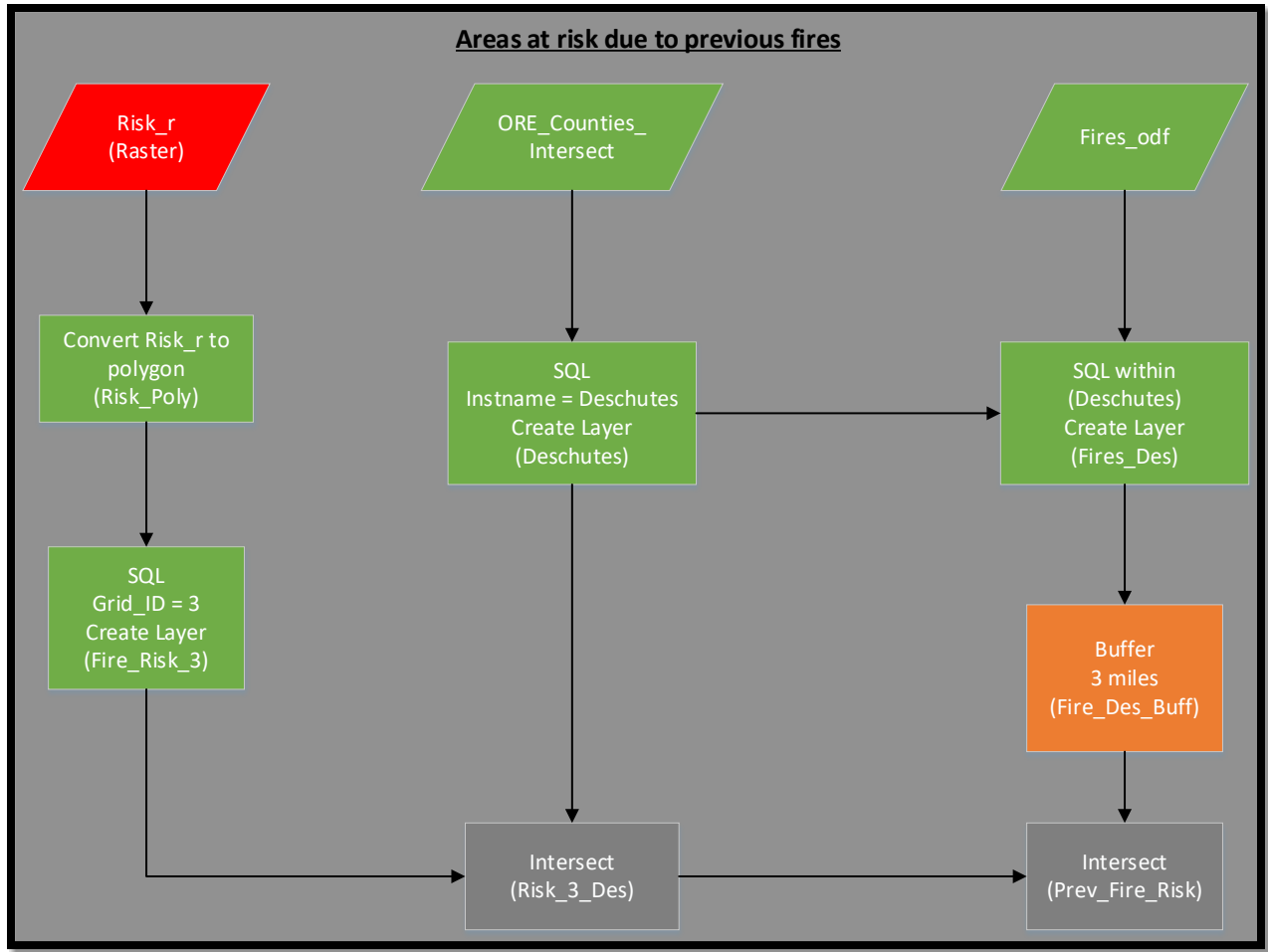


Figure 7: Flowchart for Previous Fires

Bret’s Section:

What we were interested in for this section were the areas at high risk of fire that were in close proximity to a major water body in Deschutes County. We began by selecting the polygon labeled “Deschutes” from the Oregon Counties layer and creating a new layer containing only this county. After that, we intersected the water bodies layer with this new layer to show all of the major water bodies within Deschutes County. Next, we added a 1-mile buffer around all of these water bodies since they would have to be relatively close to the fire to be of any help. We then converted the Fire Risk raster data to polygons and used the “select by attribute” function to select all polygons with a grid value of “3” (High Risk of Fire) and create a new layer. To generate our final map for this section we intersected this layer with the buffered water bodies layer. This process in its entirety is shown in Figure 8 on the next page.

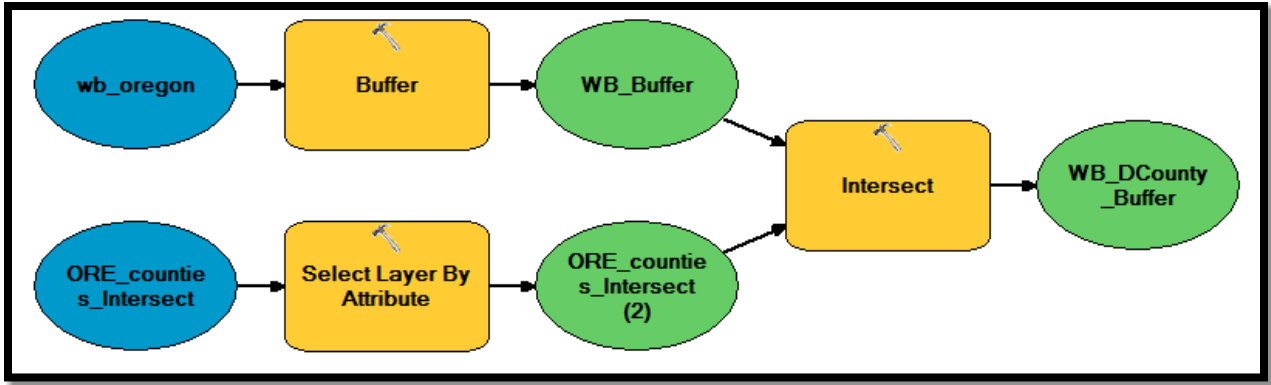


Figure 8: Model Builder for Water Bodies Layer

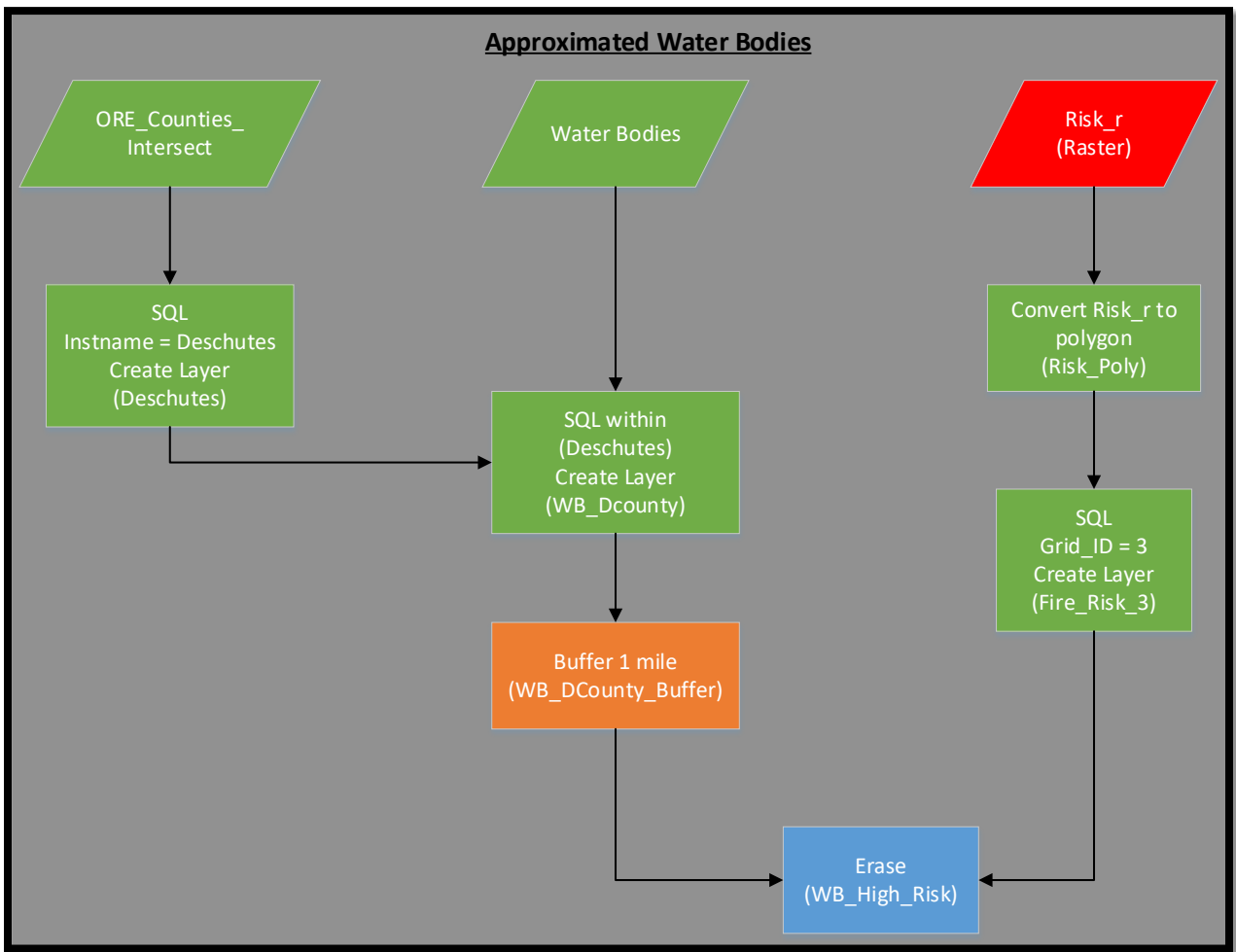


Figure 9: Flowchart for Water Bodies Layer

Results/Conclusions:

We wanted to look at areas that were already known to be at high risk of fire and find locations within these areas that we thought required extra attention based on several factors. Fires in areas covered in forests and woodlands can spread very large distances very quickly, locations of previous fires can give insight as to where more may occur in the future, and larger bodies of water can be used to help combat fires in the area.

Once we completed each analysis comparing vegetation type, proximity to previous fires, and proximity to water features to the recorded fire risk we intersected all three resulting maps.

The results are shown below.

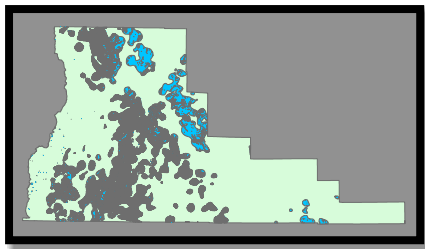


Figure 10: Vegetation Map

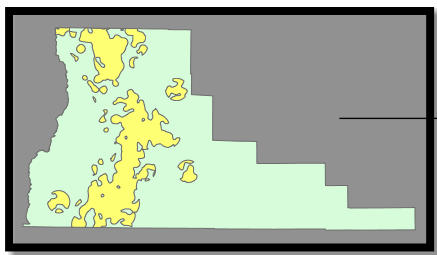


Figure 11: Previous Fires Map

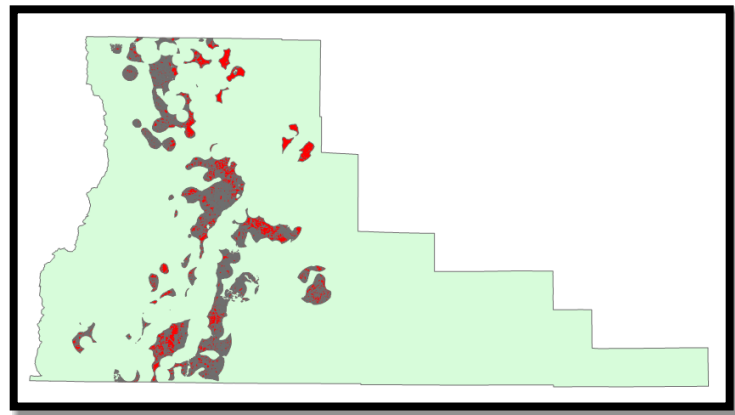


Figure 12: Overall Areas of Interest Map

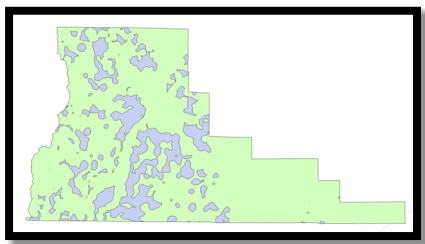


Figure 13: Water Bodies Map

Using these three maps we were able to find a several large areas that are known be at high risk of wildfire that would prove problematic should a fire start. We think extra precaution should be made concerning these areas, especially those near major cities such as Bend and LaPine. Two of

the largest areas on our final map are near these two towns, which could prove very dangerous and expensive for their populations.

Some things to take into consideration regarding our three preliminary maps:

- 1) The locations of the previous fires are given as points and don't show the spread of each fire. We created a buffer to help account for this but this causes smaller previous fires to have a bigger impact on our data and the bigger fires to have a smaller impact.
- 2) There was no way to filter out the water bodies that are too shallow to be used to help fight fires. We assumed that most of the water bodies included in the data set are deep enough to help but there may be a few instances that aren't actually helpful. Taking this into account could add more areas of interest but the number would be small relative to the total area we found.

Bibliography:

Hammers, S. (2017). "How Big are Oregon's fires." *The Bulletin*.

<<http://www.bendbulletin.com/localstate/5578135-151/how-big-are-oregons-wildfires>>.

(Mar. 16, 2018).

Hamway, S. (2018). "Presentations on megafires coming to Central Oregon." *The Bulletin*.

<<http://www.bendbulletin.com/localstate/fireupdates/6034059-151/presentations-on-megafires-coming-to-central-oregon>>. (Mar. 16, 2018).

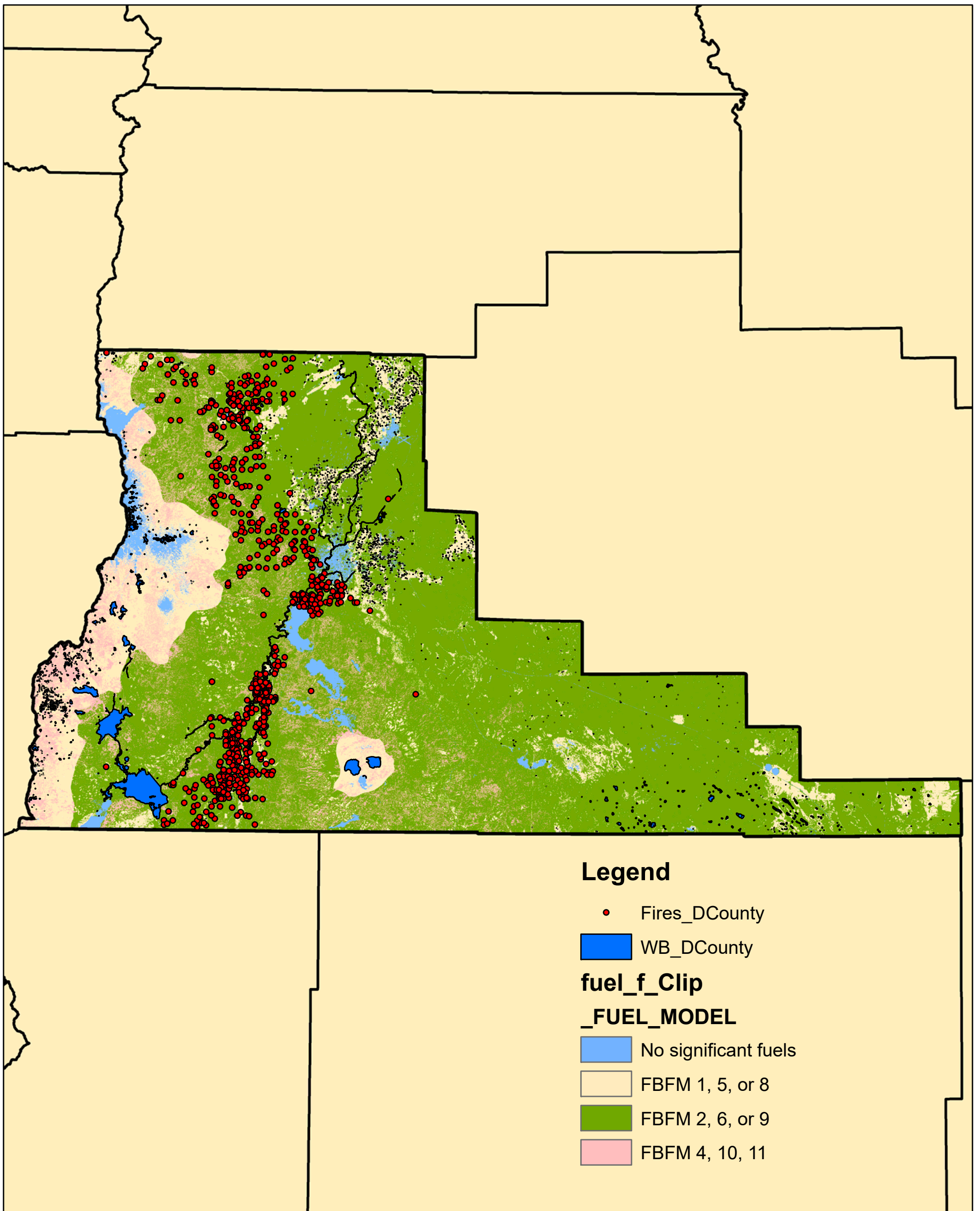
Ryan, J. (2017). "New Map of Columbia Gorge Fire shows How Areas Fared." *OregonLive.com*,

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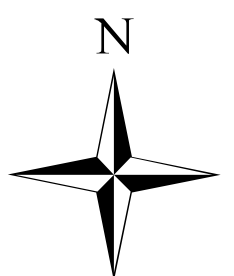
(Mar. 16, 2018).

Descriptive Map

Data Included: Fires (1986-2003), Water Bodies and Types of Vegetation

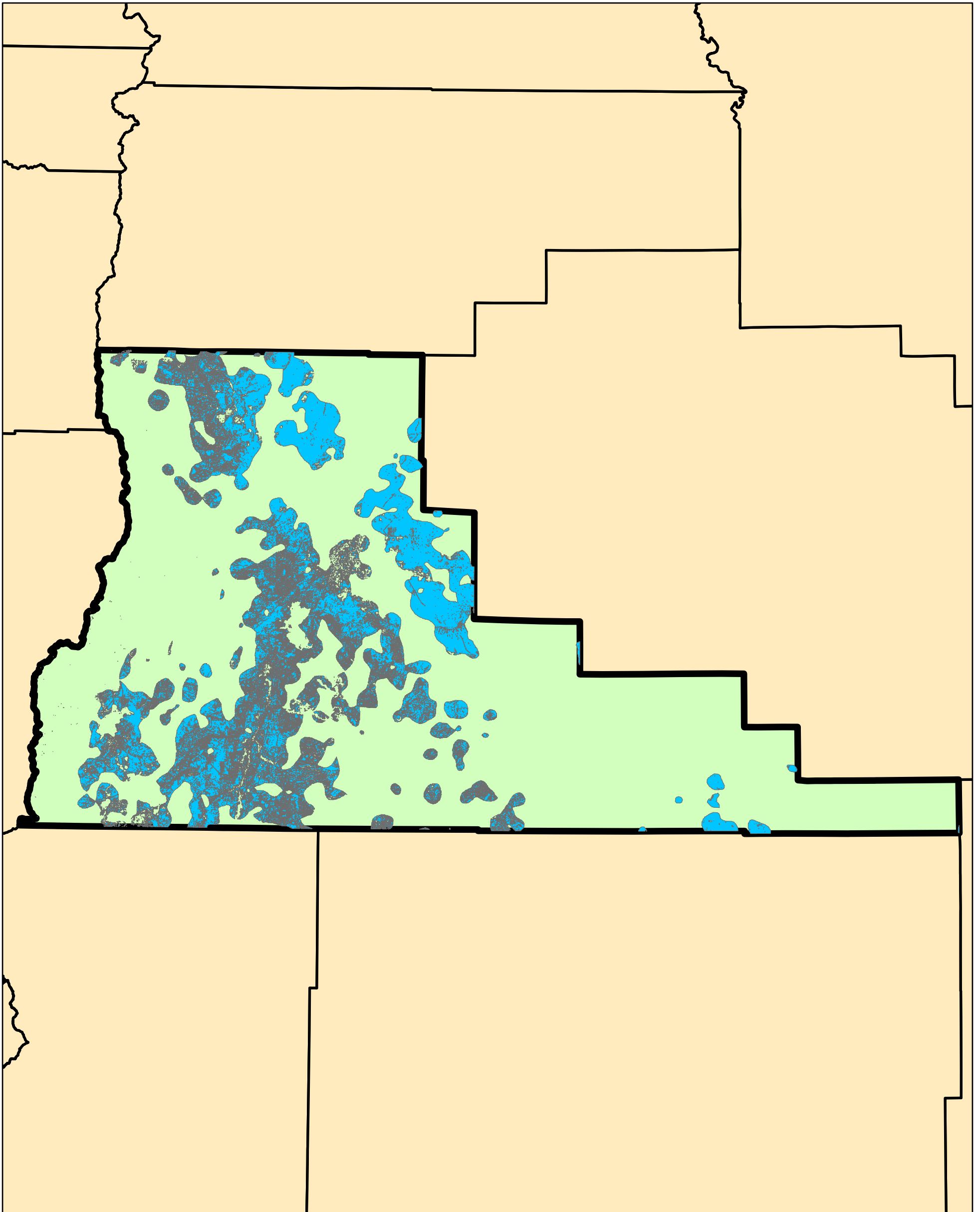


0 10 20 40 Miles

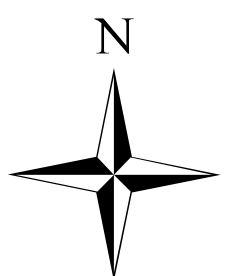


Vegetation Map

Forest Vegetation Intersected with High Risk

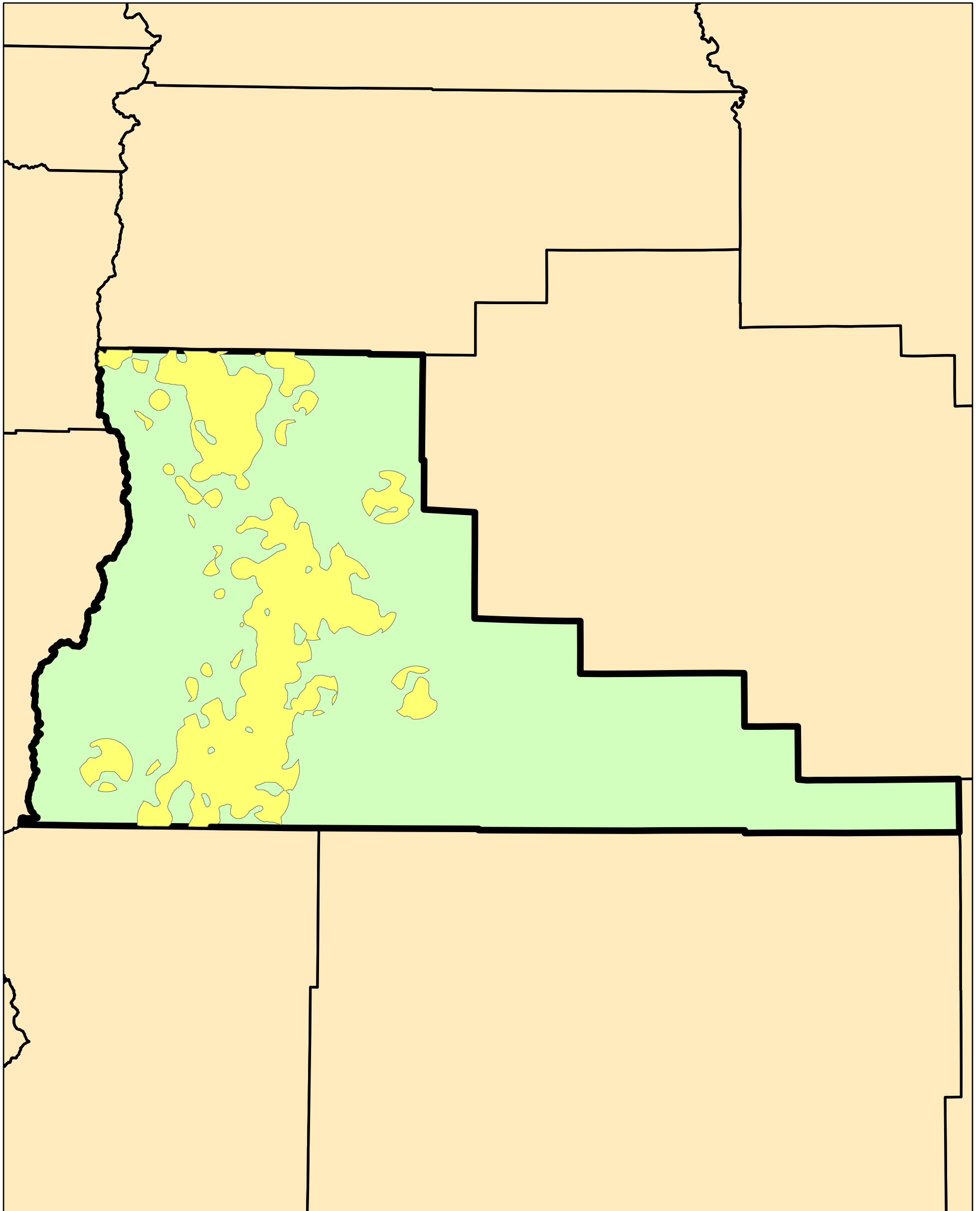


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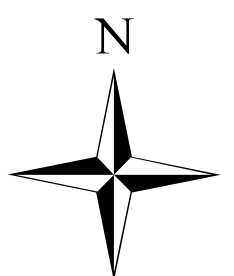


Previous Fires Map

Within 3 Miles of a Previous Fire Intersected with High Risk

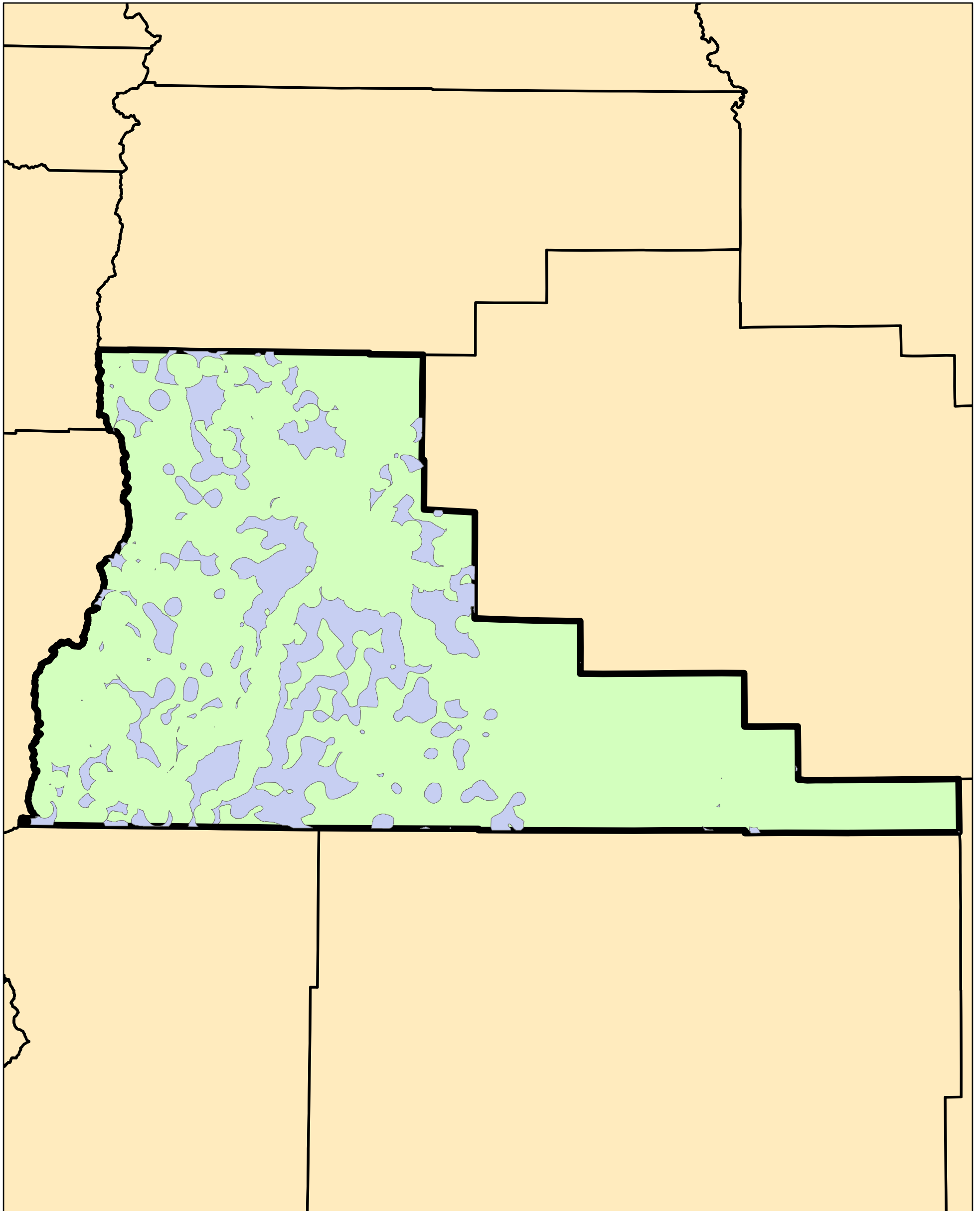


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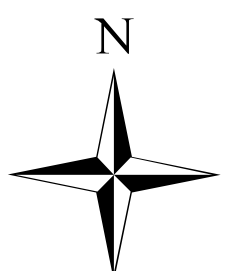



Water Bodies Map

Not Within 1 Mile of a Water Body Intersected with High Risk

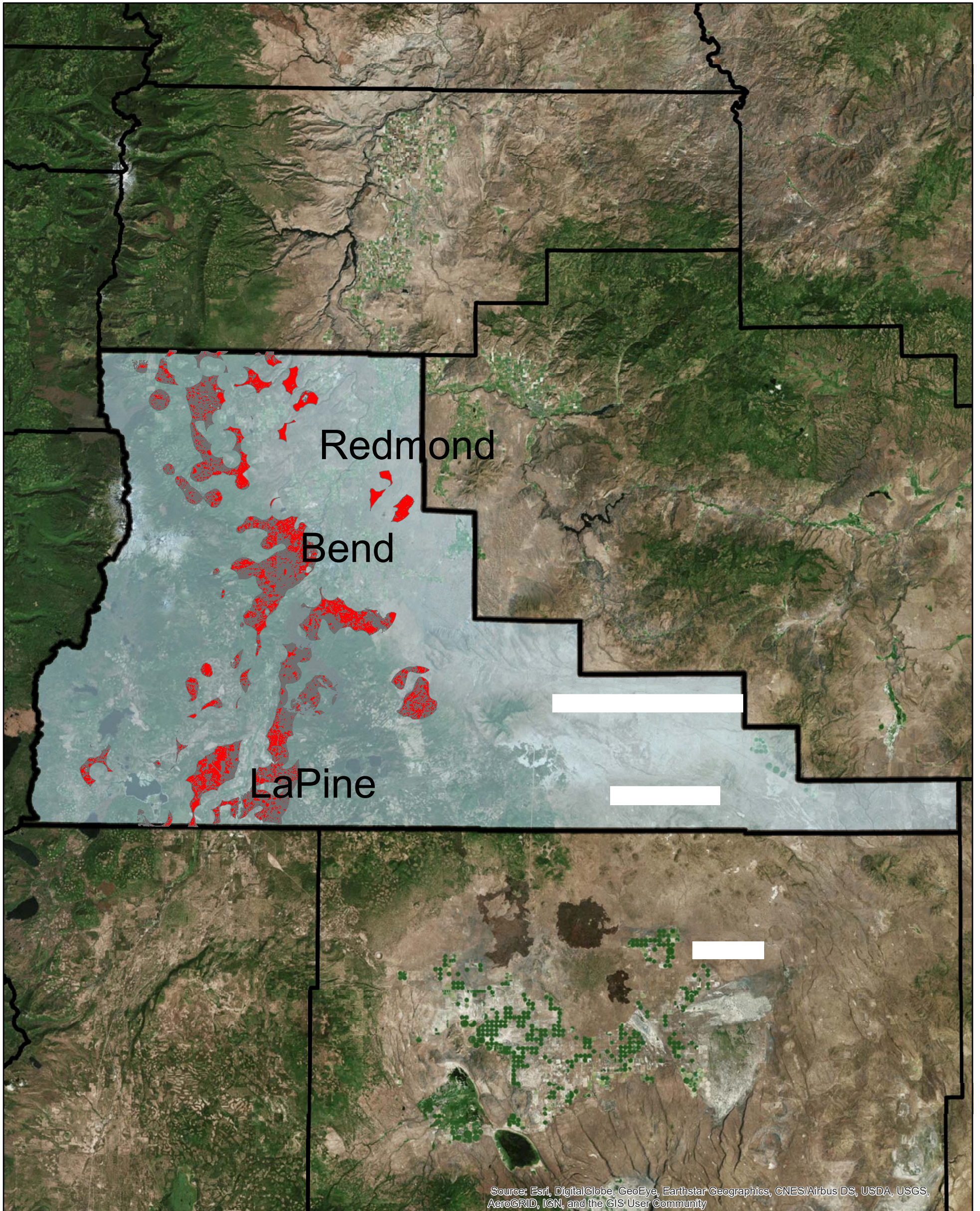


0 10 20 40 Miles



Final Map

Intersection of Forest vegetation, not within 1 mile of water body and within 3 miles of previous fires



0 10 20 40 Miles

