Research Question:

How has the large-scale wildfire distributed and overlaps natural heritage communities in the Washington States in recent 50 years?

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Introduction:

Wildfires can have a large impact on property, resources, and crops. Large-scale wildfires typically burn over 100 acres and cause surrounding environmental hazards, such as causing the habitat destruction of plants and animals. Especially for rare plants and organisms, the impact of a wildfire that destroys their habitat or alters the ecology is incalculable. While once we know where natural heritage areas and large-scale wildfire-prone areas overlap, we can focus on protecting and preventing wildfires in these areas to reduce the natural impacts. This paper defines large-scale wildfires as fires that last more than one day or burnt over 100 acres. The research question aims to figure out the large-scale fire distribution in WA and its intersection with natural heritage communities in recent 50 years.

Methodology

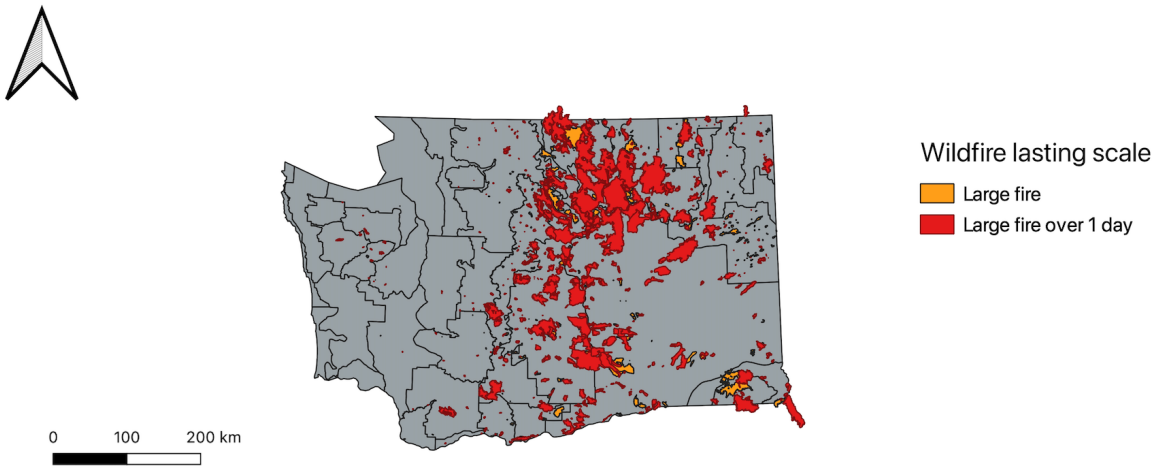
1. Data collection:

The data is collected from the Washington State Department of Natural Resource GIS Open Data. The CRS used in this project was NAD83(HARN) / Washington South (EPSG: 2927) to better perform the WA geographical information.

2. Distribution of WA large-scale wildfire:

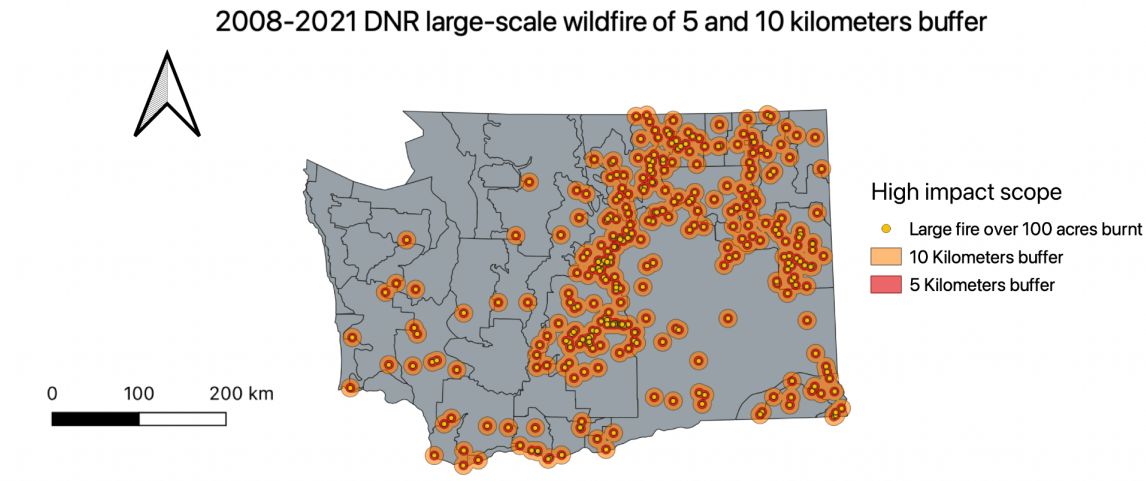
Initially, I used the shapefile from Fire Shutdown Zones (2021) as the background layer and used the query to select the features in Washington Large Fires 1973-2020 (2021) shapefile. Since wildfires longer than one day usually have a greater impact on the environment, I used the expression of "STARTDATE != PERIMDATE" to count cases that lasted over one day, and figured out there are 551/812 cases. Then I export the selected features and save as a layer on QGIS. Finally, I created map 1, including map elements and map of the original layer and the new layer to distinguish between the distribution of large-scale fires and more serious ones.

1973-2020 Large wildfires in Washington State over 100 acres and last over one day



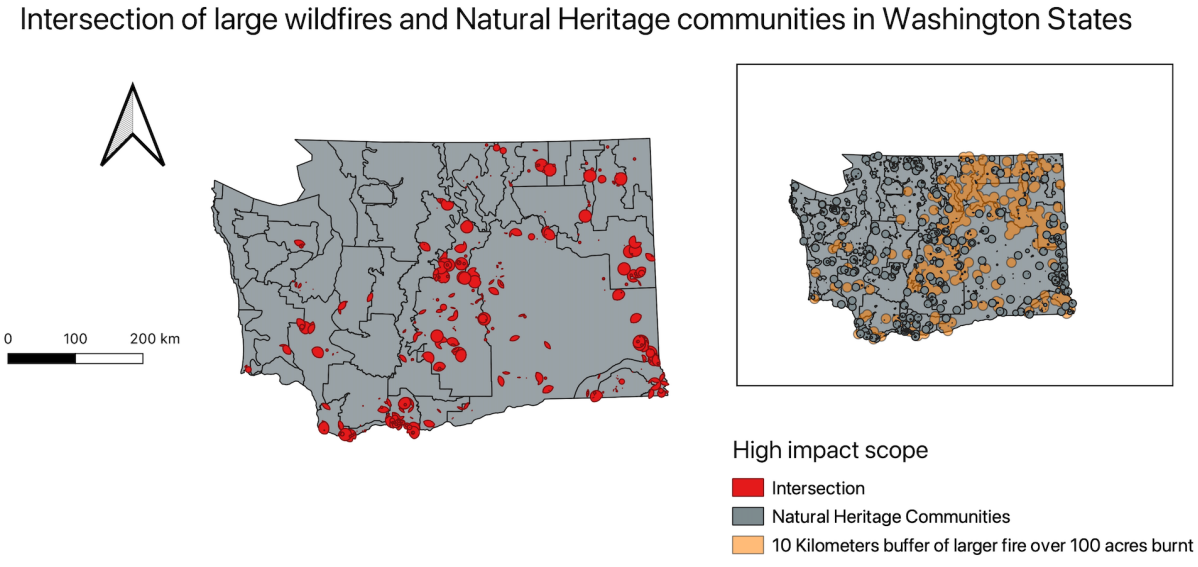
3. High risks scope

Focusing on the large-scale fires of the last decade, I firstly used the query expression "ACRES_BURN > 100" to select the data of large-scale fires from the DNR Fire Statistics 2008-Present (2021) shapefile, and I found there are 322/13539 selected features of large-scale fires. Generally, 5-10 km around the center of the fire will be greatly affected ecologically, and these ecological impacts will be fatal for rare animals and plants. Therefore, after saving the selected features as a new layer, I used the geometry tool - buffer to create 5 kilometers and 10 kilometers buffer around the large-scale fires. Adding the shutdown zones in Fire Shutdown Zones (2021) and mapping elements, map 2 was created.



4. Intersection with natural heritage communities:

After researching the distribution of the large-scale wildfires and their related high-risk buffer, I added the shapefile from the Washington Natural Heritage Program (2021) to figure out the historical occurrences of rare plant and nonvascular species communities. Moving on, I used the geometry tool – intersection to make an intersection consisting of 10 kilometers of large-scale wildfire buffer and the historical occurrences of natural heritage communities. Finally, I created map 3 of the intersection, which represents the areas in particular need of protection. This map also used Fire Shutdown Zones (2021) as a background.



Result and Interpretation

From map 1, the result shows that the distribution of large-scale fires is concentrated in central Washington, and the query illustrates that about 70% of these large-scale fires last longer than one day. Map2 shows the 10-km area most affected by large-scale fires, and the dense dots in this map still show a high frequency of occurrence in central and eastern Washington. The result of using query shows that in both maps, most of the large-scale fires occur at the edges of fire zones 41, 43, and 50. This implies that the authorities have shutdown zones in place to combat wildfires, but the large number of cases make the effectiveness of the fire zones questionable. In the third map, intersections are evenly found throughout Washington State, while the intersection appeared intensively in central areas, especially focusing on the central portion of shutdown zone 50 as well. As the scarcity of rare plants and animals and the great impact of high-risk scope on the ecosystems in which they live, it is essential to set up or improve more shutdown areas in the intersection on the map.

Conclusion

Although wildfires can renew resources and present opportunities for many organisms, large-scale wildfires lasting longer than a day and burnt over 100 acres are a disaster for the surrounding 5-10 km ecosystem. Concentrated primarily in central Washington, such large-scale wildfires also show intersection with natural heritage occurrence areas. To further protect these natural habitats, the department should focus on setting and improving central and eastern fire shutdown districts such as District 50 to address and prevent future large-scale wildfires.