Introduction

Humboldt County is located in the upper northwest region of California. It is known for its beautiful coastal views and the iconic Coast Redwood trees which grow to be over 300ft. The focus of this study is to provide detailed information on potential sites for snowboarding/skiing located in the county of Humboldt. The county doesn't, at first glance, look to be an area where good skiing might occur. The county is covered in Redwoods and Douglas-fir and a variety of other tree species, and much of the coastal zones remain near sea level. Surprisingly enough, there are areas such as Horse Mountain, which receives more than enough snowfall for snowboarding/skiing. The elevation ranges from 3,900 to 4,800 feet and the annual rainfall averages about 50 inches. This combination of elevation and precipitation results in an average snow quality of 93 percent, provided suitable conditions for skiing during 56 percent of the time from December through May. We predict the North-facing slopes which are at or above 4,500 feet will be most suitable for recreational snowboard/skiing.

Much of Humboldt County has skiing sites available on public land, some being accessible by road and only about a mile and a half trek to good sites. There are various parts of the land which are owned by the U.S. Forest Service, which are not available locations for people to ski. During the winter months between December and May, there are a solid 2 whole months where snowpack is ideal for recreational skiing/snowboarding. The maps will help show which roads to take while searching for slopes on public lands. The distance from roads to slopes plays a big role in availability to the public.

The purpose of this study is to inform the readers of various locations of ideal snowboard/skiing sites within Humboldt County. The goal is to create a clear image for the reader all of the different accessible areas for skiing/snowboarding. By meeting this goal, various mapping designs and techniques were applied to help simplify the data shown. A strict set of criteria were implemented in order to show the best skiing/snowboarding sites.
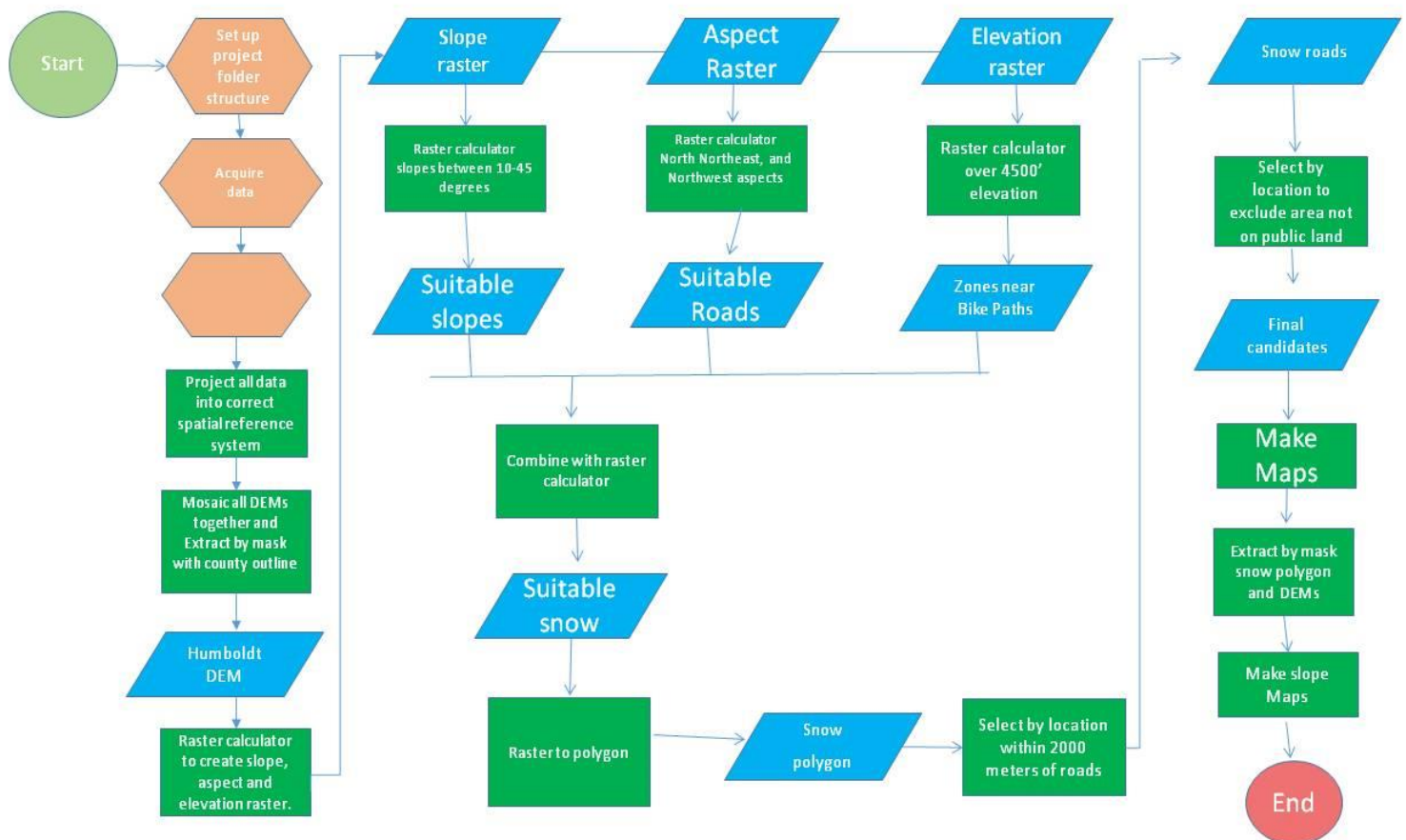

Figure 1: Locator map of Humboldt County within the state of California.

Methods

The methods for this project had to be very detailed to get the desired results. The first step was finding suitable DEM's for Humboldt County. Using the same website that provided the DEM's for a previous lab, we were able to get enough tiles at 10m resolution to cover the county. We then used the mosaic function to put them all together and get one continuous DEM. Using the extract by mask function and an outline of Humboldt County, we were able to limit the DEM's to just the outline of the county to better understand the extent of our possible locations. After having access to useful DEM's, we were able to isolate the slope of the land in the county to areas between 10 and 45 degrees using the raster calculator tool to create a slope raster. We also used the raster calculator tool to limit the aspect of

each area to north, northeast, and northwest areas to create an aspect raster. We also were able to isolate areas over 4,500' in elevation, which is the most likely area to find snow within the county. Once we had each item isolated, we combined them using raster calculator once again. These gave us locations from the raster data with these three parameters. We needed to convert the rasters to a polygon using the "raster to polygon tool" in order to use these areas in the rest of our project that required vector calculations. After the conversion, we added the roads and public lands layers from the Humboldt County GIS data download page. We clipped these two layers to the extent of the county for a more concise map. Using the "Select by Location" tool, we were able to limit the areas we had previously calculated to be within 2000 meters of a public road for the sake of accessibility. The same was done for public lands to ensure that all of the areas that we had previously deemed suitable were not privately owned and could be used by the public to find suitable locations for winter recreation. This provided us with a very useful map and allowed us to complete the task we set out to do.

Results

After we compiled all of the layers and calculations, we came up with the selected areas in Humboldt County that would be suitable to find snow to go snowboarding. These layers combined the attributes that we wanted and selected

from the previous layers. The area was to be North facing (Northeast and Northwest included), with a slope between 10 and 45 degrees, within 2000 meters of a road and located on public lands within Humboldt County. Below are the locations.
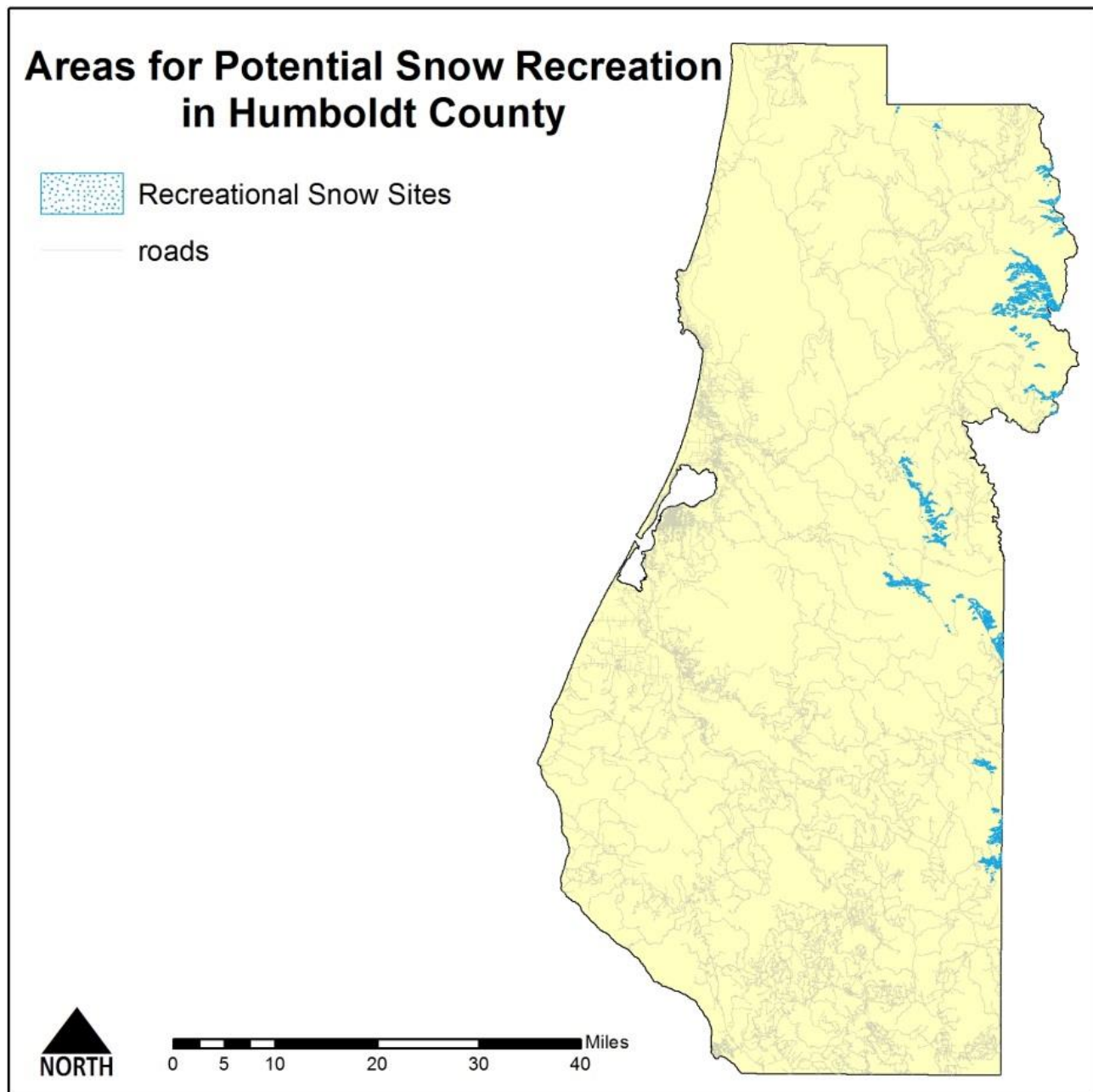

Figure 1: Outline of Humboldt County, showing the roads of the entire county along with the sites representing potential snow activity. Roads information was downloaded from the Humboldt County GIS website.
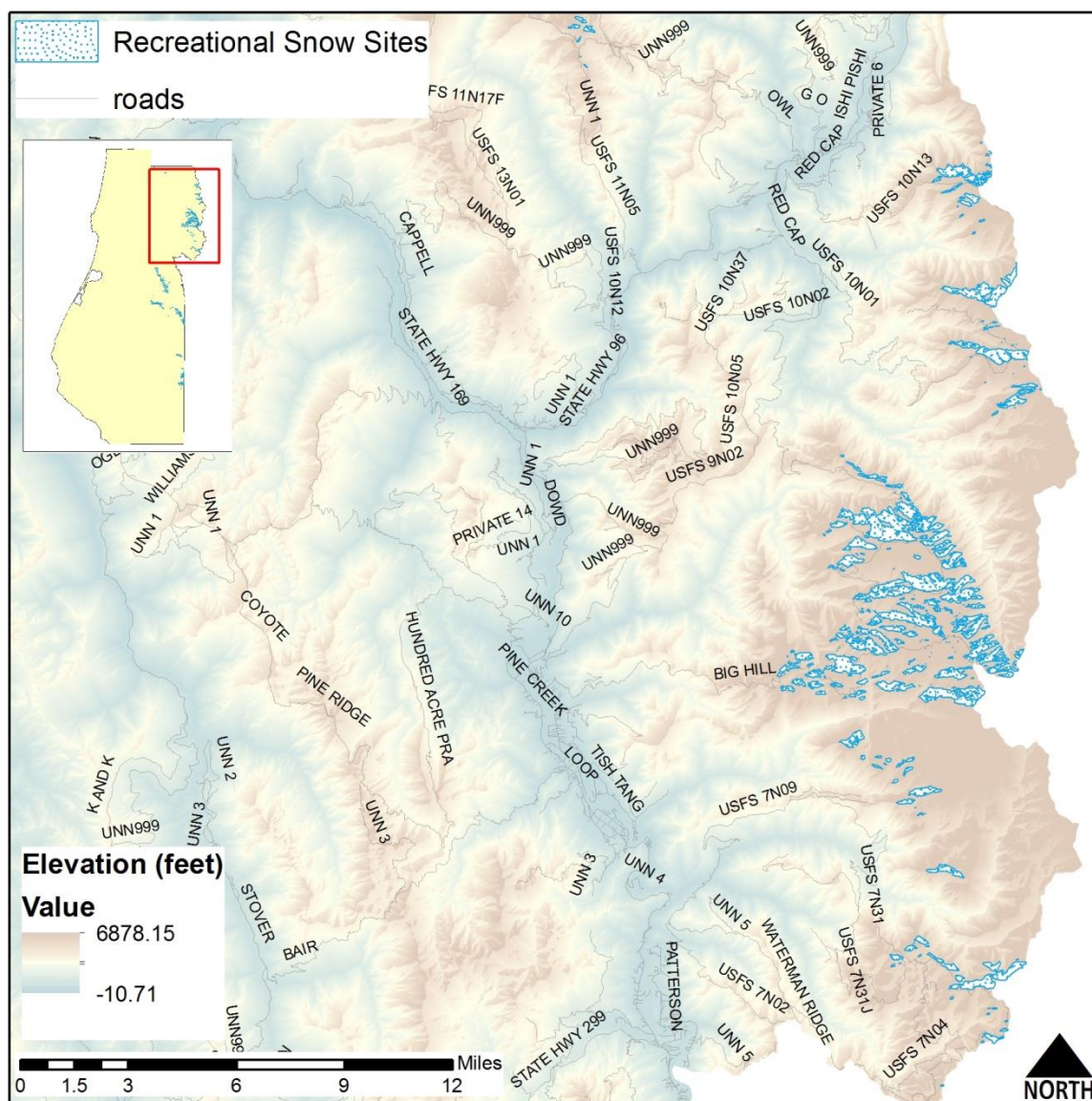
Figure 2: Representing the North-eastern extent of Humboldt County. Glaciated regions of the mountains at or above 4,500ft in elevation. Elevation scale represented by legend in lower left-hand corner of map. Blue color equaling low elevation and brown equaling high elevation.
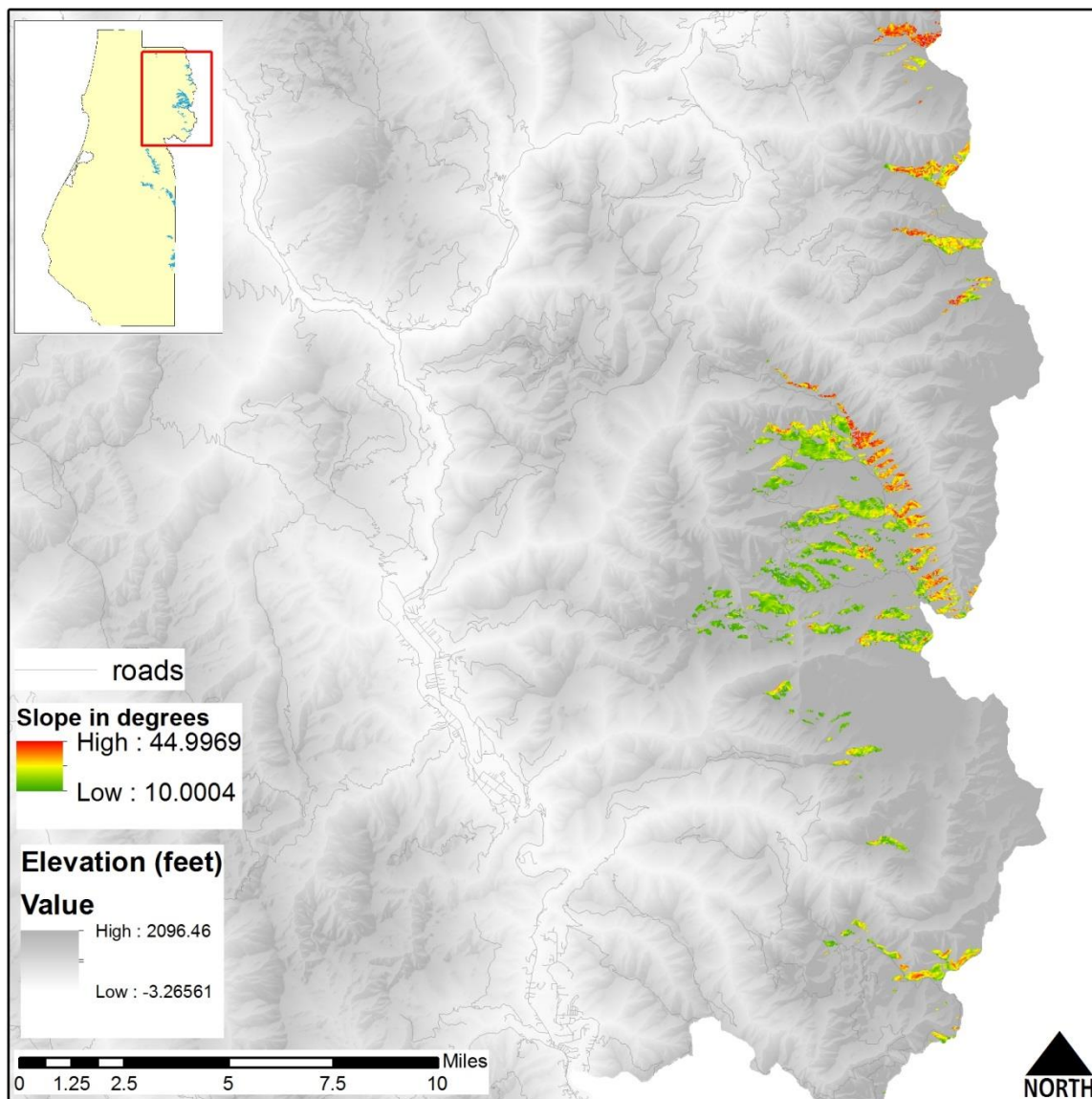
Figure 3: North-eastern extent of Humboldt County, detailing the North, NW, and NE facing slopes. North-facing slopes receive less direct sunlight, which allows for more snowpack for longer amounts of time.
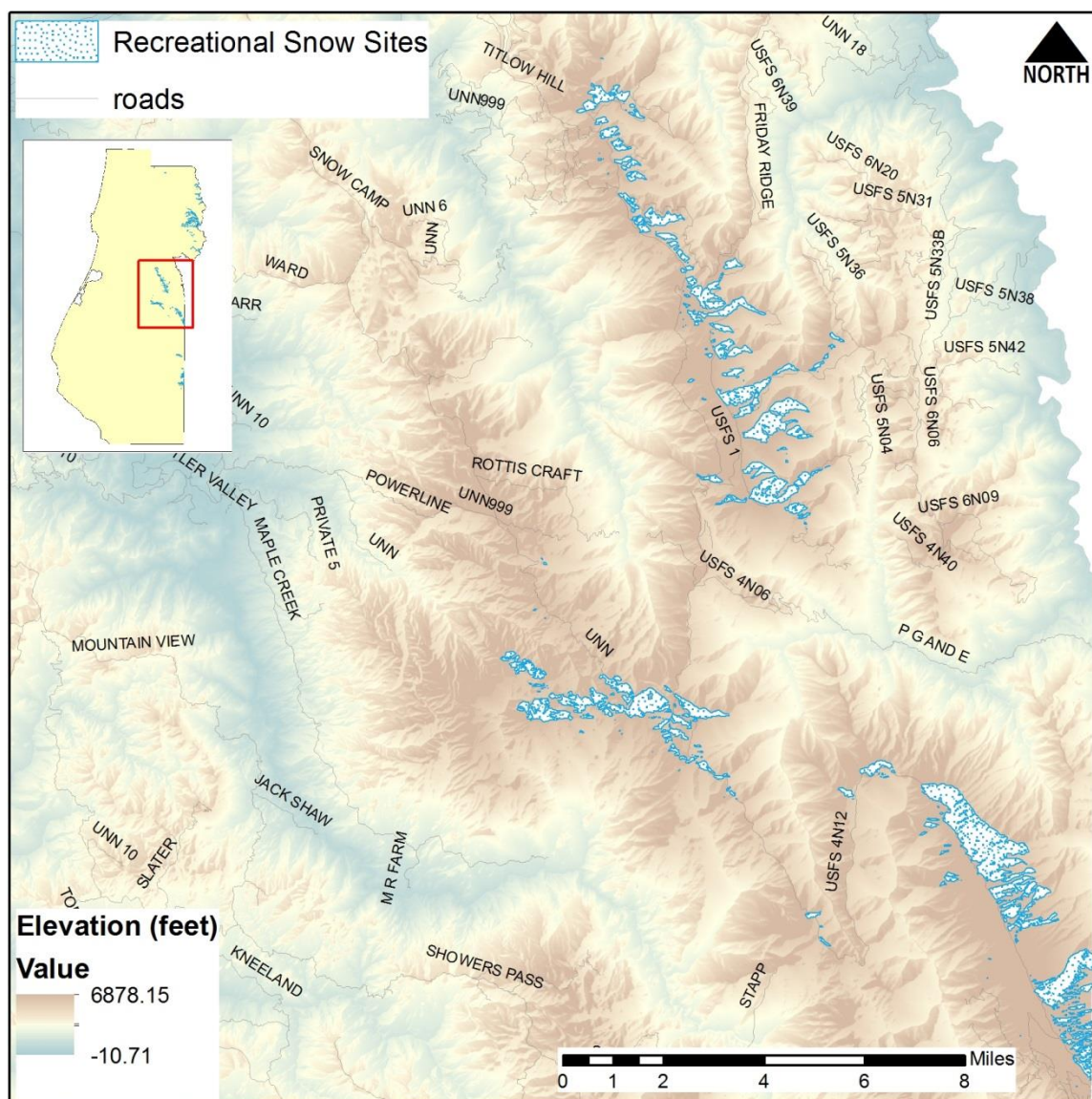
Figure 4: Central Humboldt County showing the elevation of mountainous regions. Glaciated areas indicated by outlined blue/white graphic. Roads and their names represented in map.
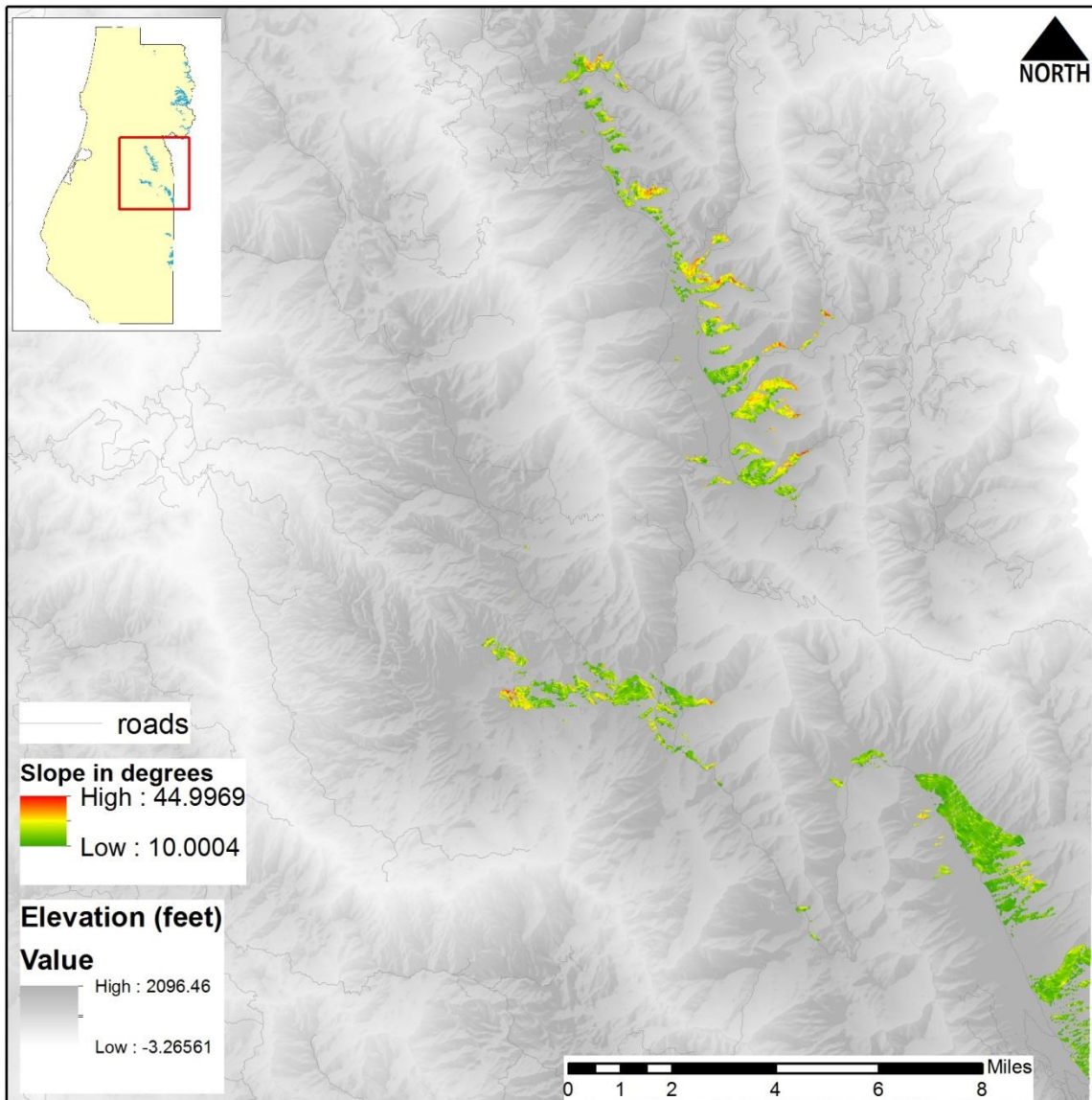
Figure 5: Central Humboldt showing the regions such as Horse Mountain. The map includes the slope in degrees, red indicating the steepest areas and green indicating the flatter areas which correlate to the boundaries of slope severity between 10-45 degrees.
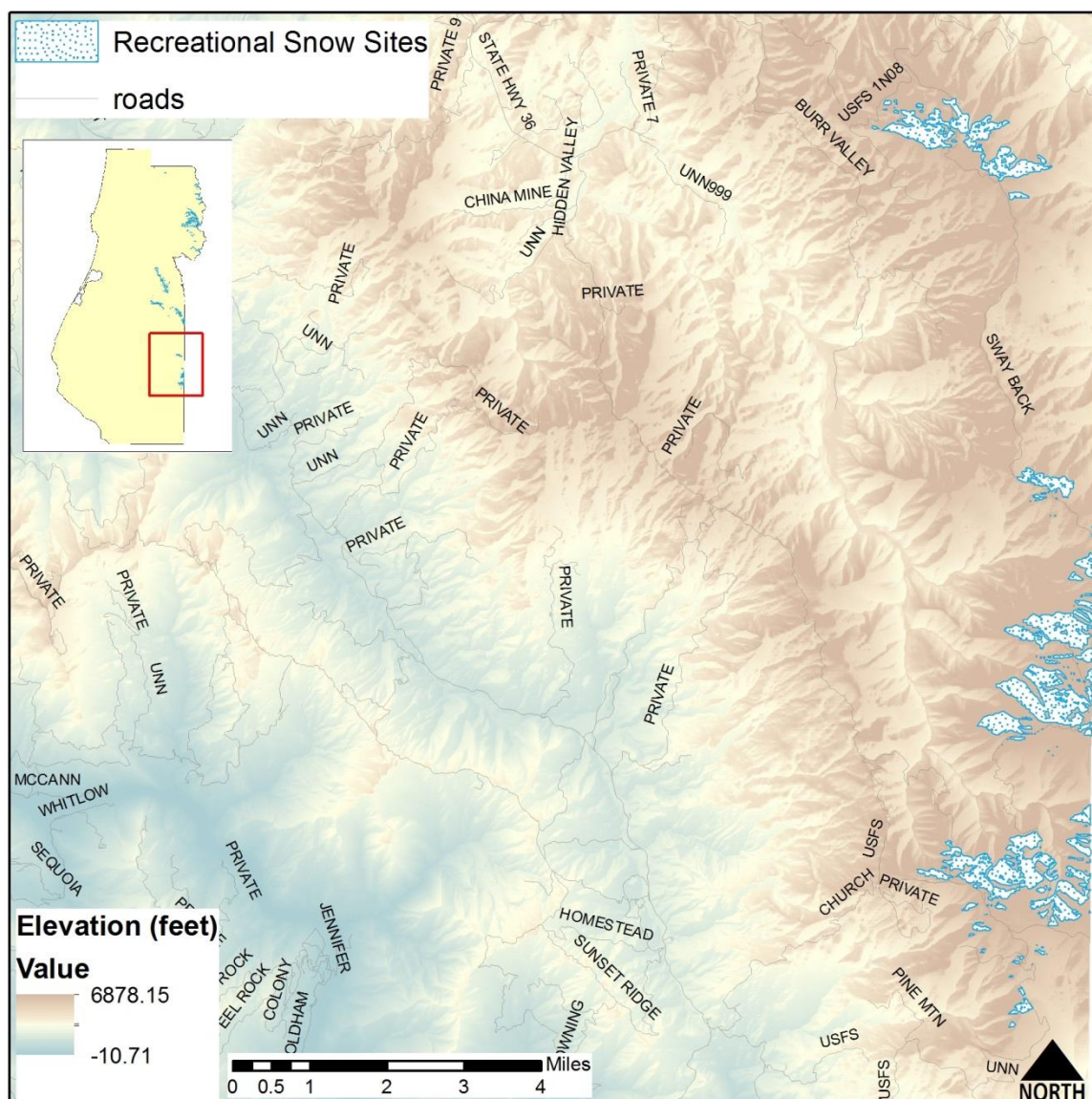
Figure 6: Southern extent of Humboldt County. Map detailing the roads and glaciated areas which are suitable for snow recreational activity. Elevation indicated by legend in lower left-hand portion of the map.
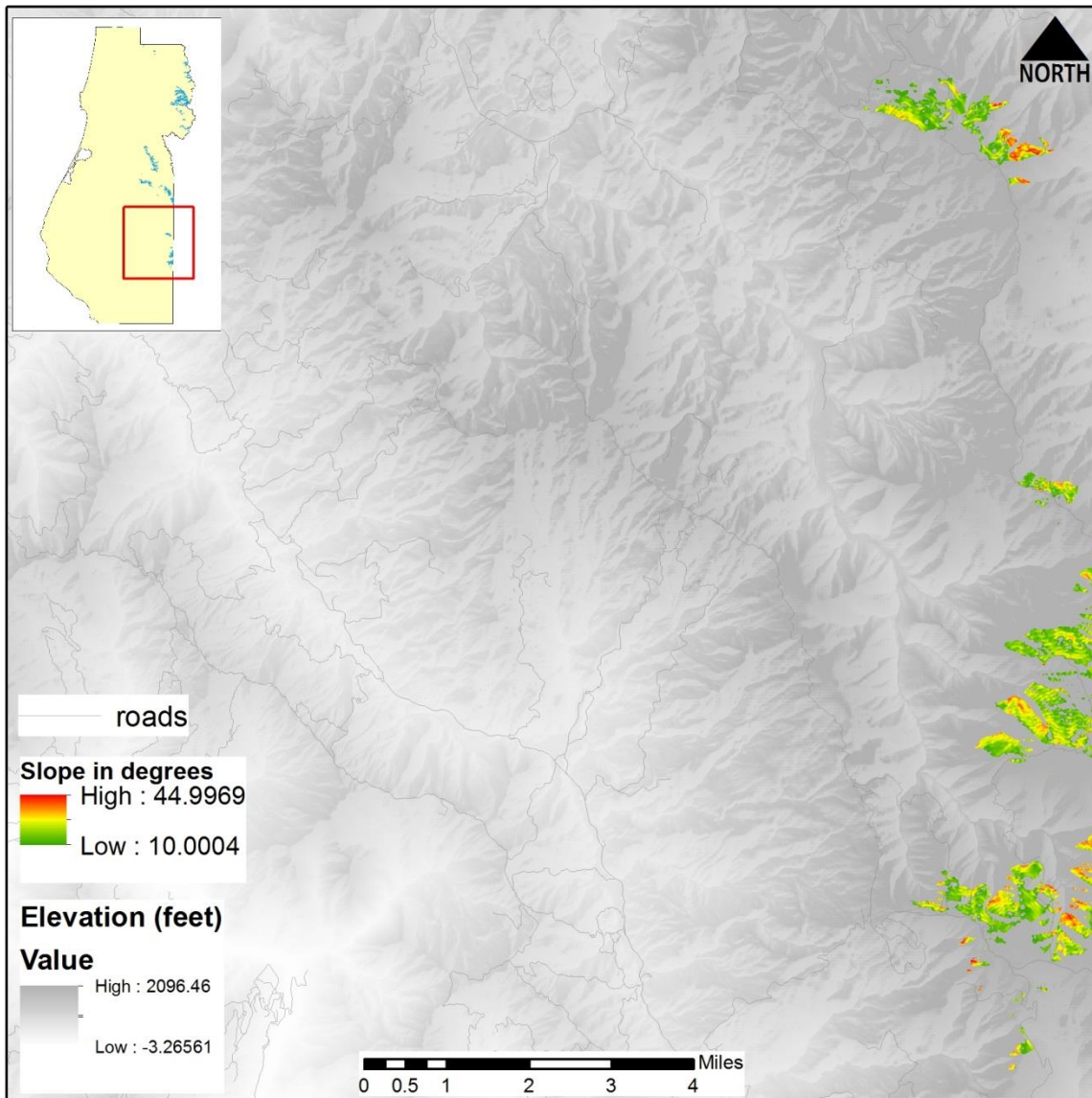
Figure 7: Map of Humboldt County, CA. Southern extent of the slopes above 4,500ft in elevation. 50% transparency of the Humboldt County DEM.

Conclusion

We realized that snow is not a common occurrence in Humboldt County. If we were to isolate the locations with the greatest possibility of snow for winter recreation, we would need to consider several different aspects. One of the most limiting factors is obviously elevation. We get quite a bit of winter precipitation on the north coast but generally, temperatures are much too mild for snow. This means we must seek a higher elevation in order to find temperatures suitable for snow. We then checked with historical snow data from the U.S. Weather Service which matched our

findings almost directly. The selected area would also not be of much use if it was located on private land, so we were sure to include areas only within public recreation areas. The distance from a trailhead to the snow area is also a limiting factor, as a long hike with snow gear is not an easy task. For this reason, we limited the hike to the area to 2000 meters. Snow generally tends to last longest and be of the best quality on the northern side of a mountain, because there is less direct sun exposure and temperatures generally remain colder. This is the opposite to finding say, a suitable location for a farm because agriculture generally makes use of the southern exposure for the best sunlight.

After considering all of these variables, we are positive that we have created a useful and beneficial map for the winter sports community to find the elusive snow in Humboldt County. We figured that since there are no local snow resorts or operating chairlifts, these maps can be a useful tool for anyone living in Humboldt County to be able to find quality snow not too far from home. Even though our results showed that the suitable snow areas were all in the eastern portion of Humboldt County all of these locations are still within a much closer distance than Mount Shasta which is the closest operating ski resort. Many people would not realize that Humboldt County was capable of creating locations suitable of Snow recreation but with the help of these maps we hope it can help people easily access areas to snowboard near their homes. Furthermore we added the additional maps that show the slope of the snow areas for the benefit of skiers/ snowboards to help users find areas to recreate within their abilities. Beginners can stay in the moderately sloped areas of 10-20 degrees while advanced riders can find areas that challenge their abilities in the steep 35-45 degree slopes.

Acknowledgements

Thank you to Dr. Gwenzi for helping us with the most difficult part, the data collection!

Bibliography

https://upload.wikimedia.org/wikipedia/commons/thumb/3/31/Map_of_California_highlighting_Humboldt_County.svg/800px-Map_of_California_highlighting_Humboldt_County.svg.png (Locator Map)

\https://viewer.nationalmap.gov/basic/ (DEM Data for Humboldt County)

http://www.humboldtgov.org/276/GIS-Data-Download (Roadways, Public lands, County outline data)