

Ski Slope Suitability and Avalanche Risk: Cache County

Scope

Backcountry skiing is not as common as resort skiing due to the increased danger of skiing in uncontrolled areas. **This study aims to provide the necessary information, and present it in a way that allows new and experienced skiers to safely pick a good ski spot.** The focus area is Cache County, due to the lack of appropriate maps and relevant data for the Bear River Mountain Range. Utah is well known for its amazing snow and the skiing that can be done here, but the Bear River Mountains are often passed by in exchange for the slopes farther down south. The result is that comprehensive maps of the area are not complete. **The final product of this study will be a suitability analysis** based on slope, aspect, land coverage and distance from roads and trail-heads. This map will pinpoint a few areas that would be optimal for backcountry skiing.

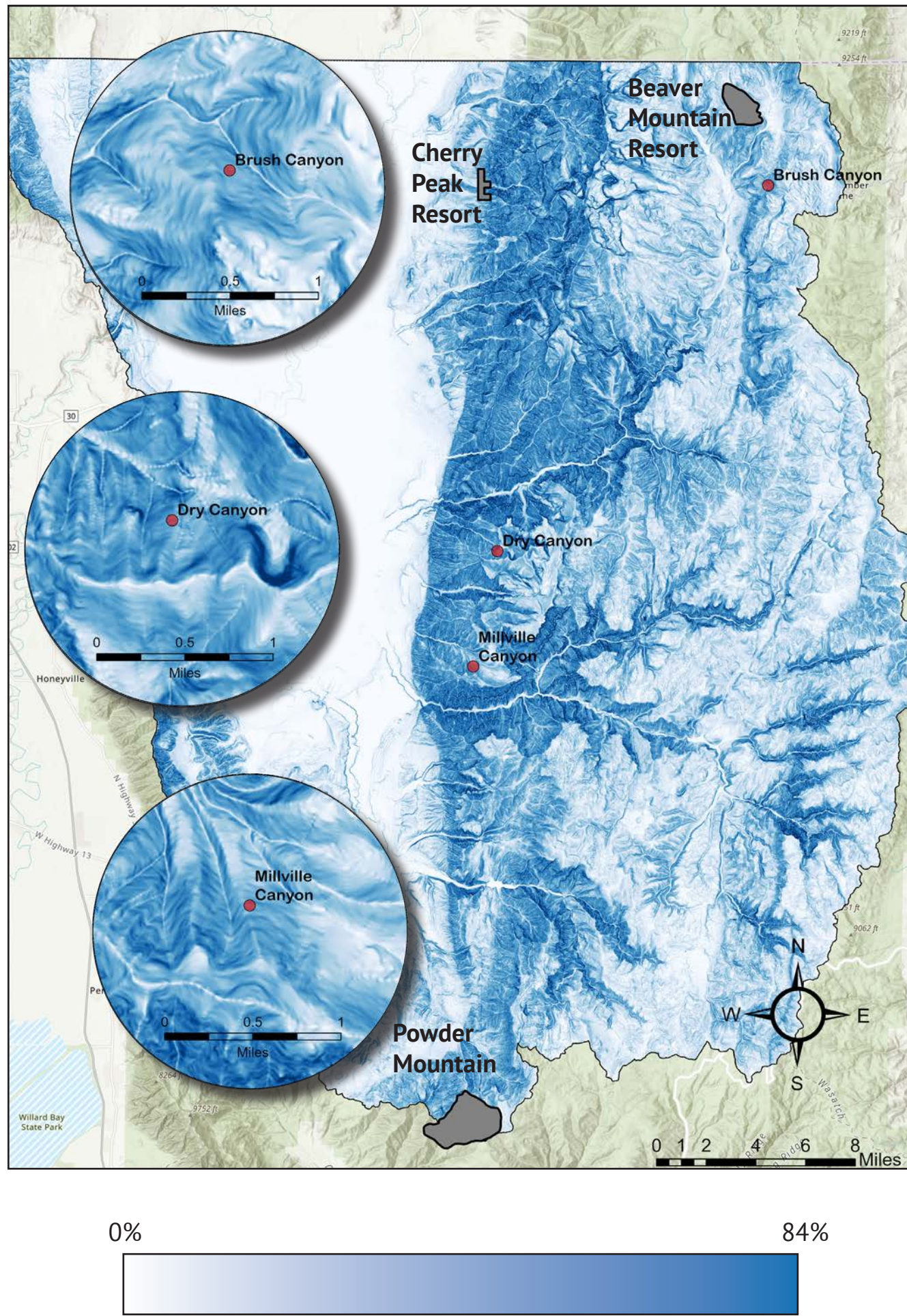
Data

The majority of the data comes from the UGRC website. Slope, land coverage, roads, counties, and trail-heads all area easily accessible. The slope names were found on the Utah Avalanche Center Website and manually entered into ArcGIS to label the map, though not shown here.

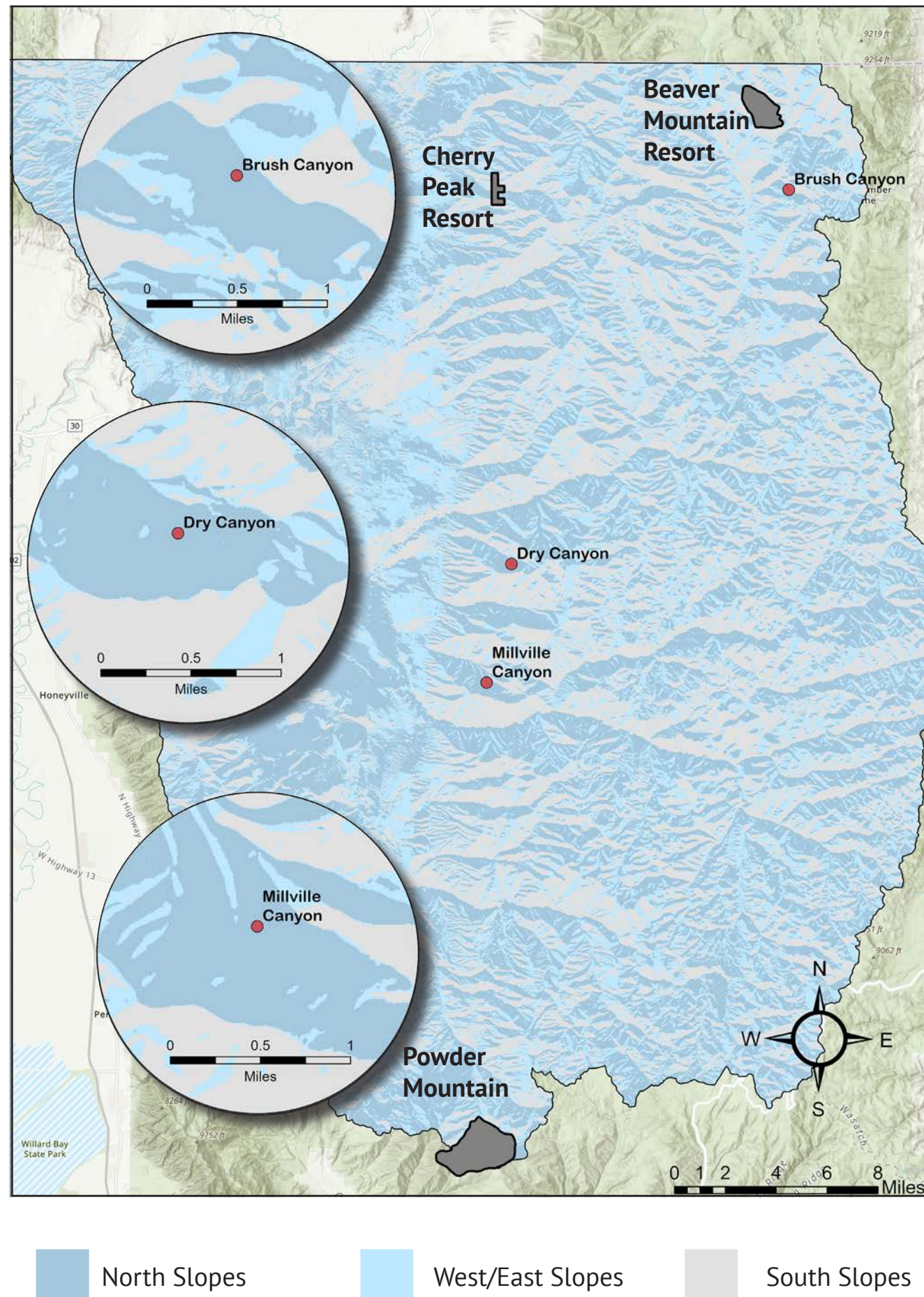
Process

Raster data is stored in cells with a defined width and length. In this project I used a cell size of ten meters by ten meters. This allowed me to calculate specific values for each cell, with each layer of data. By classifying layers of data into specific groups I assigned values to each cell to calculate which areas are best suited for backcountry skiing. Figure 1 shows slope unclassified, I then classified this into three groups: **0-20% = 0, 20-30% = 6, 30-50% = 1 and +50% = 10.** The reasoning behind these scores is that slopes **below 20% are not steep enough to ski, 20-30% are good for skiing but put you right below possible avalanche areas, 30-50% are high risk for avalanches, and anything above 50 is too steep for avalanches,** and there is no danger of setting off an avalanche above you. Similar logic was followed for aspect, based on how much the sun would affect avalanches and quantity of snow on each slope. For land coverage, brush and open terrain ranked higher than densely forested areas for ease of skiing.

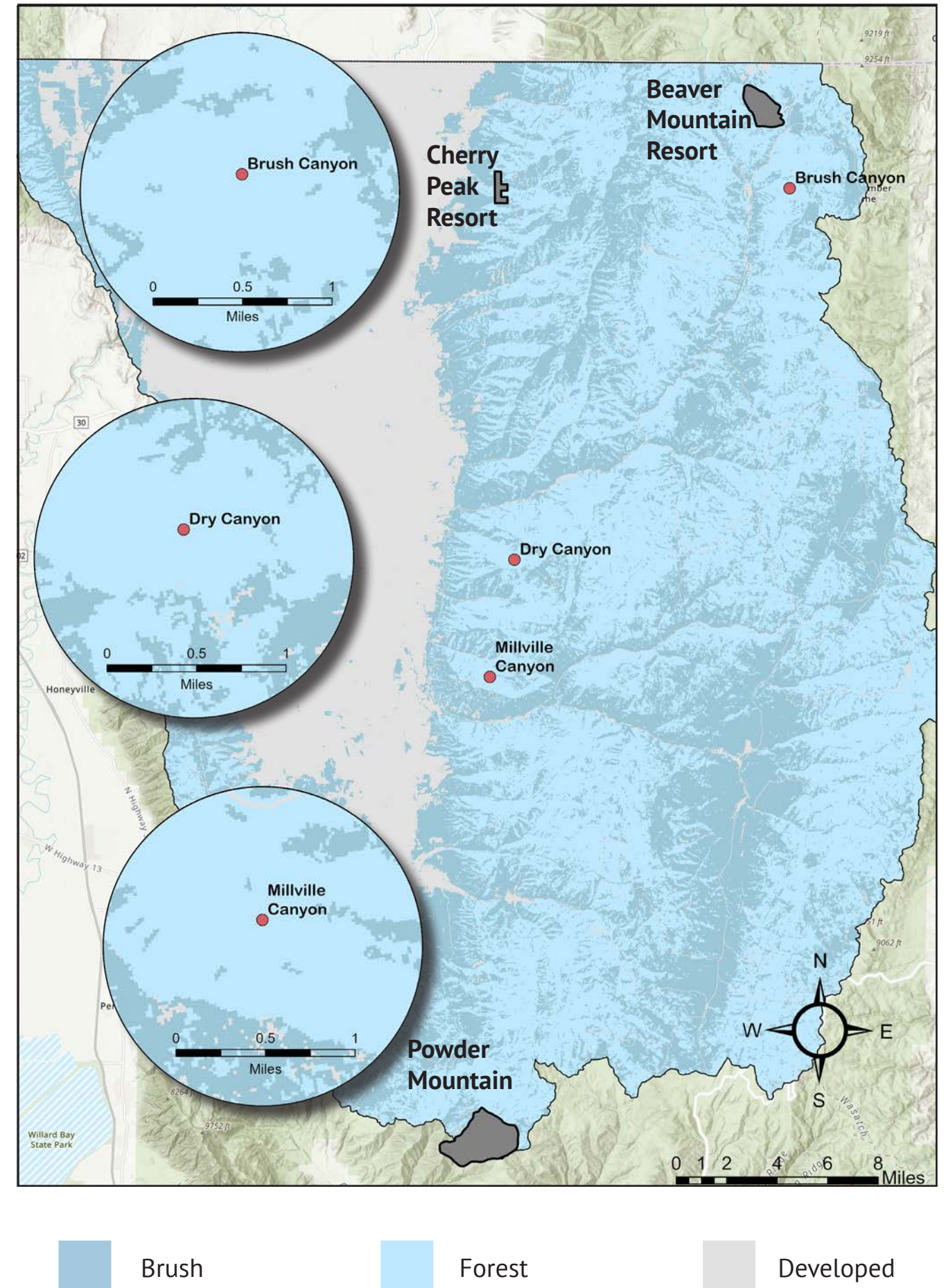
1. Slope



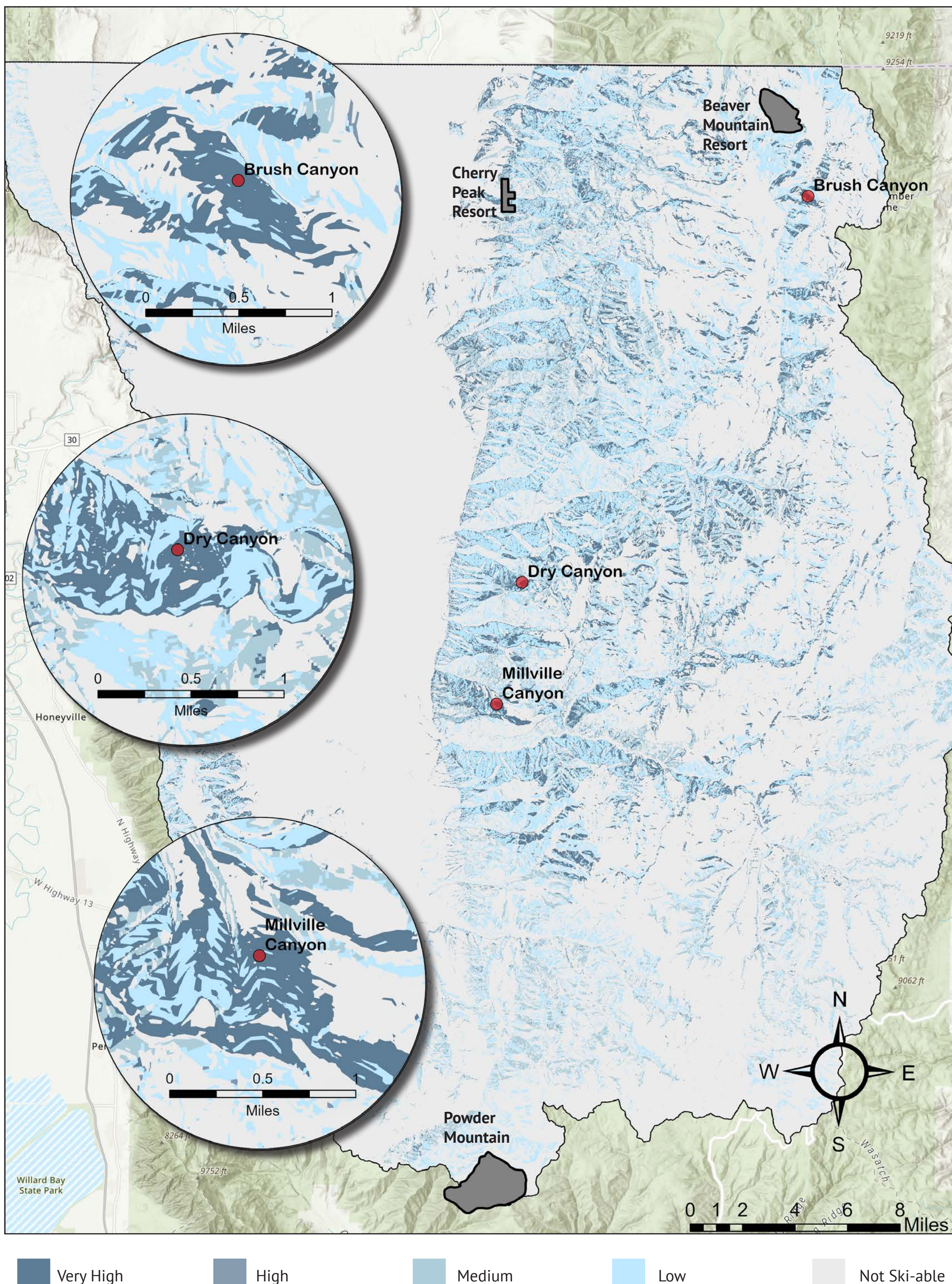
2. Aspect



3. Land Cover

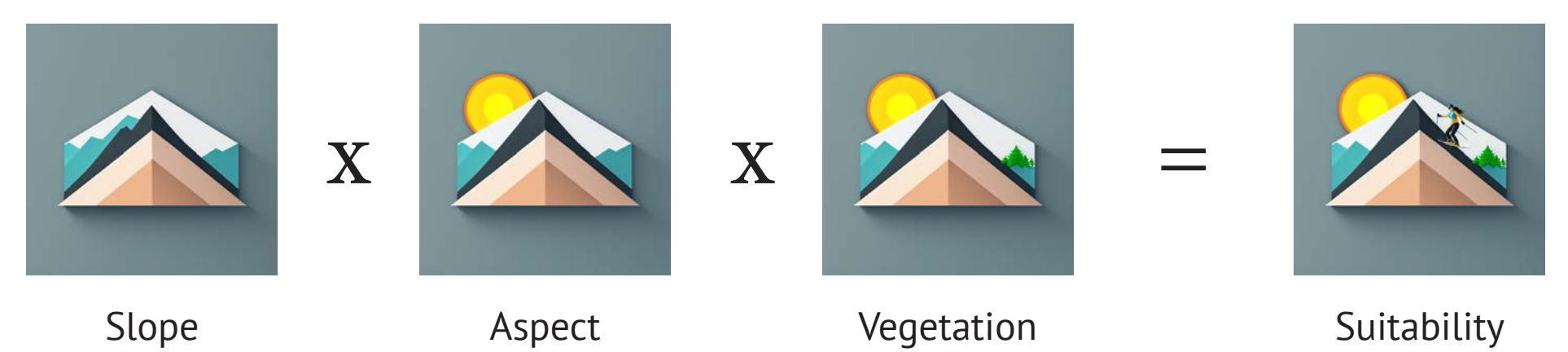


4. Suitability Analysis



Results

Figure 4 is the suitability map. The map shows the areas by rank. This is the product overlaying the different rasters, and multiplying each pixels values together. Two other rasters were used on top of the maps in figures one through three. The distance from roads, and the distance from trail-heads were considered, because backcountry skiing requires participants to hike in to the location. Therefore accessibility is very important in this calculation as well.



The three locations highlighted in the maps are three of the highest scoring areas.

Limitations

The most **obvious limitation of this analysis is the subjectivity of what makes a good ski slope.** People prefer different areas, different difficulties, and have varying levels of comfortability with avalanche risk. **The map I created focuses on safety and ease of the slope for inexperienced backcountry skiers.** Using this map is a good place to start in order to pick a general area to ski in, but with more experience this map could be rendered inutil.

Takeaways

- Slope is a huge factor in ski safety and enjoyability
- Aspect affects avalanche risk mainly when the sun has caused an abrupt change in temperature
- There are many places to ski outside of ski resorts that are safe and accessible

Citations

U.S Forest Service. (n.d.-b). Home - utah avalanche center. Home - Utah Avalanche Center. <https://utahavalanchecenter.org/>