



# Winter Hiking Safety: New Hampshire White Mountains

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## INTRODUCTION

The New Hampshire White Mountains are a popular hiking destination for more than two million visitors every year and contain 48 mountains reaching an elevation of 4,000 feet. Many people pursue these mountains however they also pose risks to unprepared hikers. In the last year alone, 200 rescue missions have taken place (MacQuarrie, The Boston Globe 2017).

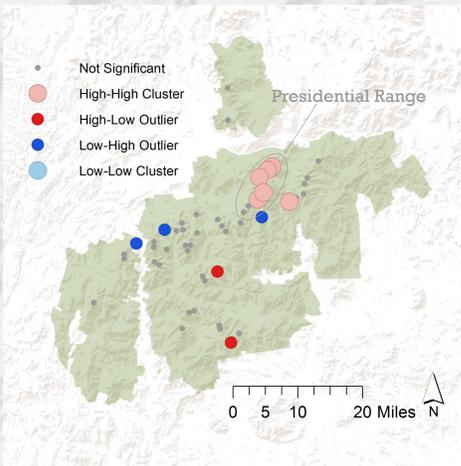
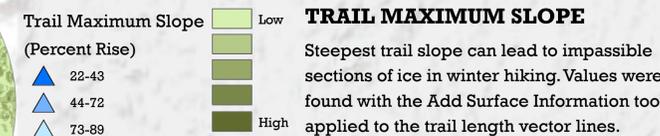
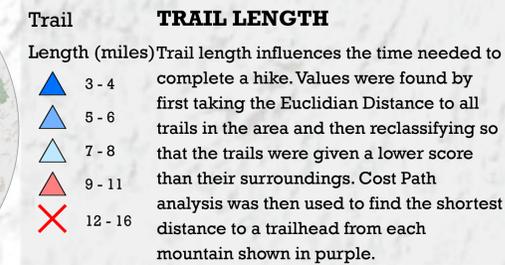
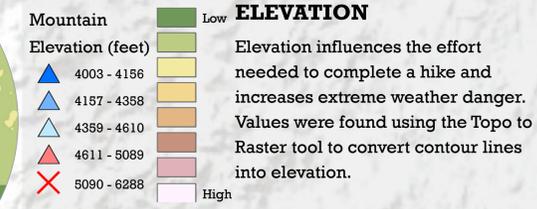
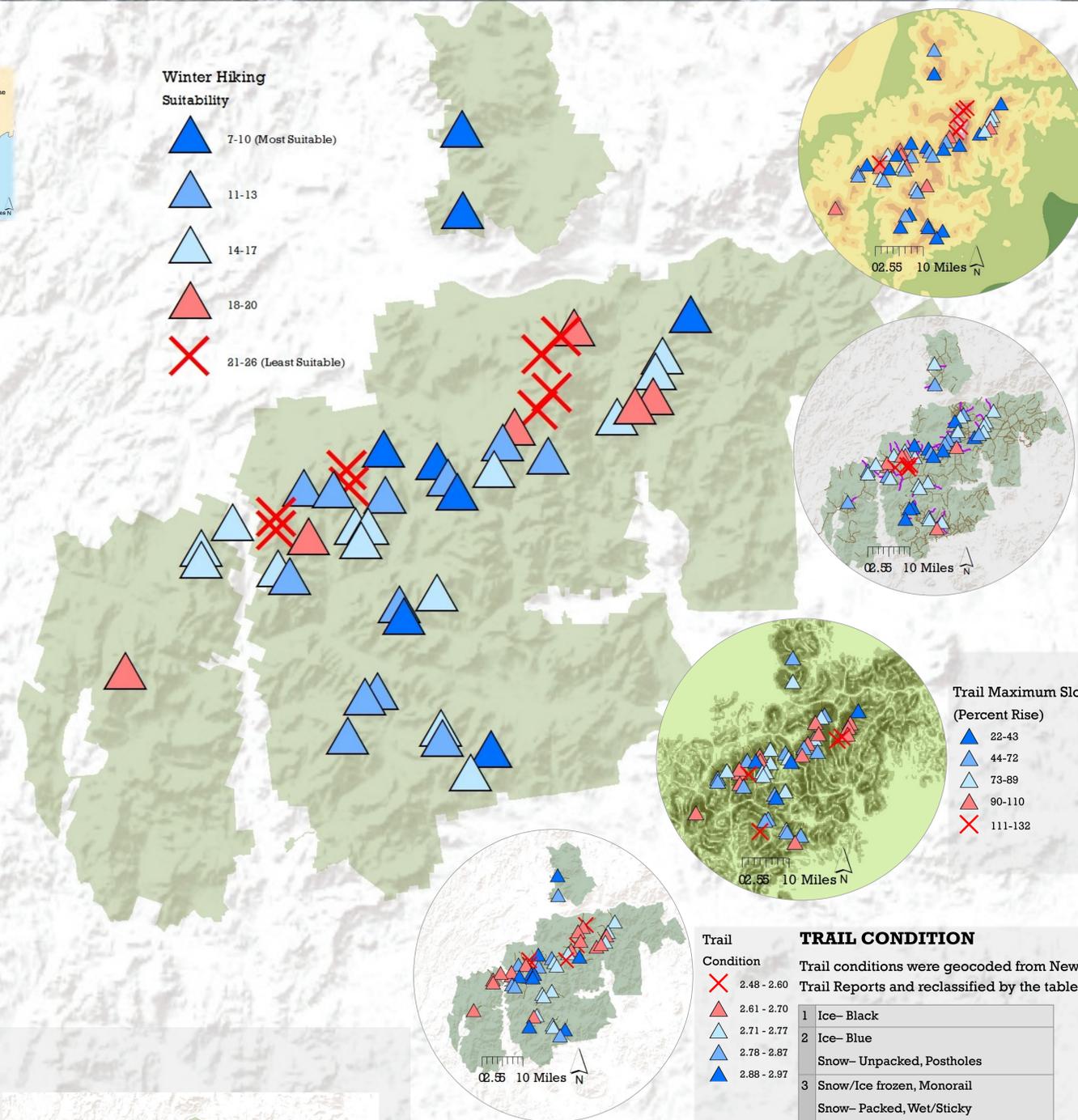
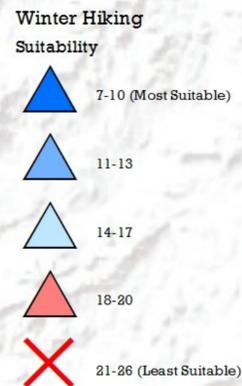
When planning winter hikes, there are many factors to take into account and online sources provide abundant data on relative difficulties of the peaks. However, a lot of this information is difficult to take into account in combination and little of the information is presented spatially. This project combines the features of mountain elevation, trail length, maximum trail slope, and trail surface conditions to identify areas that are most suitable for winter hiking.

## METHODS

Suitability of the 48 4,000' mountains in New Hampshire for hiking in winter was calculated by mapping risk factors for each mountain. The resulting values were then joined to the mountains and reclassified to range from easiest (1) to most difficult (10) hiking conditions. These values were then summarized to advise on safest areas for hiking in the winter.

## Spatial Clustering

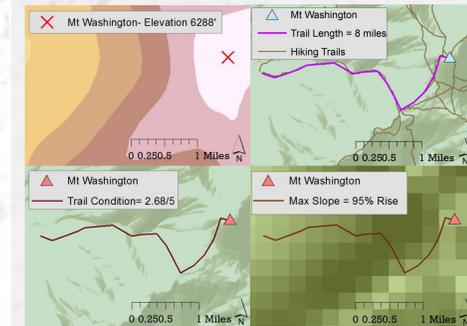
The suitability of the mountains is spatially clustered (Global Moran's I  $p < 0.01$   $z = 3.49$ ) with a group of points that are not suitable for winter hiking surrounding the Presidential range. These mountains are the tallest and are well known for their treacherous winter weather. The two peaks shown in red in the southern region of the White Mountains, Mt. Whiteface and Mt. Carrigain, had higher danger than surrounding mountains. The three dark blue Low-High mountains, Mt. Isolation, Mt. Garfield, and Mt. Cannon had better suitability for winter hiking than surrounding mountains.



## CASE STUDY:

### MOUNT WASHINGTON

The deleterious hazards of Mt. Washington, the highest of the peaks at 6,288 feet are often underestimated by visitors that have summited western mountains more than double its height. The peak however has the second highest global recorded wind speed of 231mph (World Meteorological Organization 2010). Since first recorded in 1849, 149 deaths have been recorded on this single mountain (Siler, Outside 2016). Mt. Washington was ranked to have the highest danger with a score of 26/40 in the analysis of this project. In addition to its long, steep trails and high elevation, the mountain has extreme weather. Before departing on a hike on Mt. Washington, the Mount Washington Weather Observatory should be consulted for the best accuracy in weather information.



## RESULTS AND LIMITATIONS

This suitability map is a great starting point for identifying best areas for winter hiking in the White Mountains. The map successfully ranks mountains on their suitability based on spatial information. The analysis also found clustering of the most dangerous areas for winter hiking at the Presidential Range. Even the most suitable mountains however require careful preparation and planning. Hikers need to compare weather reports and ensure that they have all necessary equipment before departing.

## THE 10 HIKING ESSENTIALS

- Navigation
- Hydration
- Nutrition
- Fire
- Illumination
- First Aid
- Repair Kit
- Insulation
- Sun Protection
- Emergency Shelter

PROJECTION- NH State Plane (feet) Transverse Mercator  
 COORDINATE SYSTEM- NAD 1983  
 DATA SOURCES- New England Trail Conditions 2018, USDA Forest Service 2013, Appalachian Mountain Club  
 IMAGE SOURCE- [https://commons.wikimedia.org/wiki/File:Caution\\_sign\\_used\\_on\\_road\\_pn.svg](https://commons.wikimedia.org/wiki/File:Caution_sign_used_on_road_pn.svg)

