Prehistoric Site Prediction Model for the Lake Tahoe Basin Management Unit

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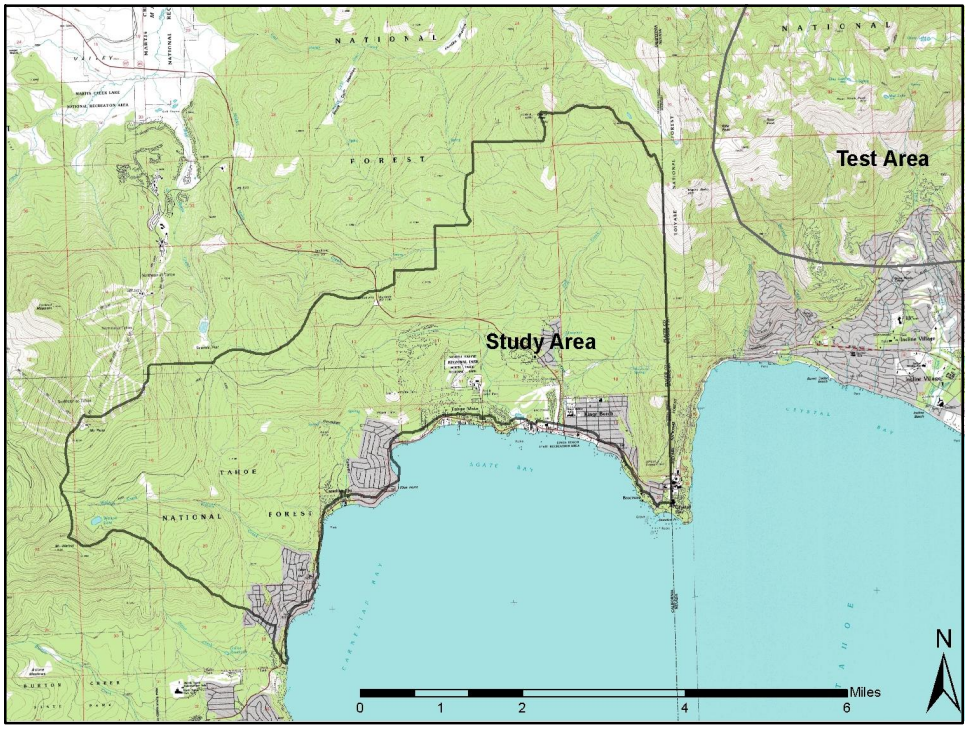
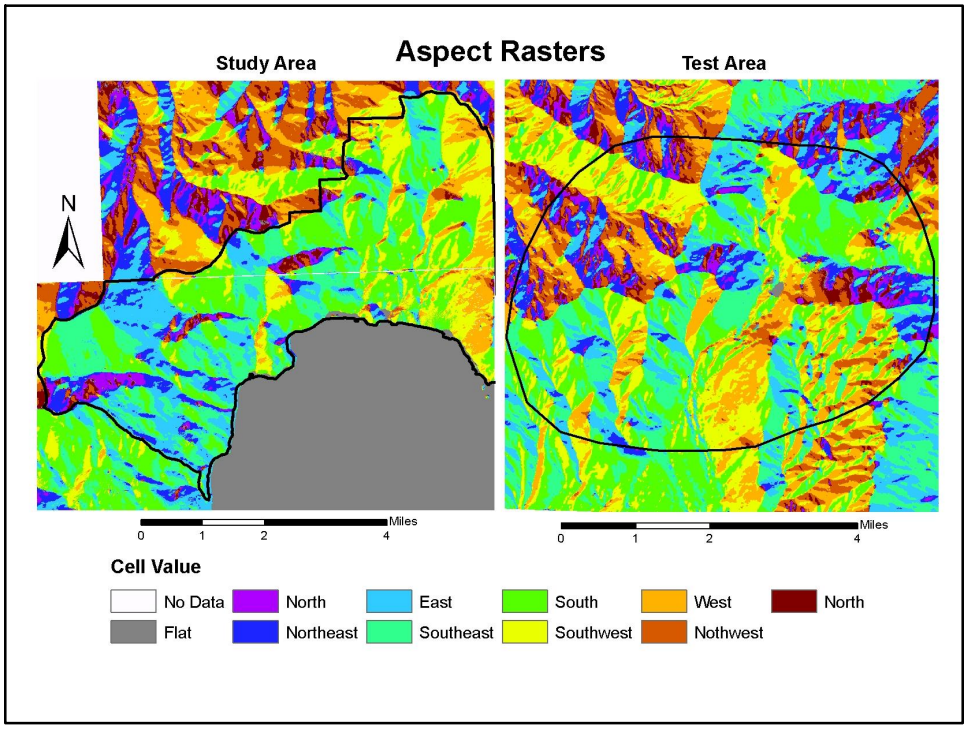
Research Questions

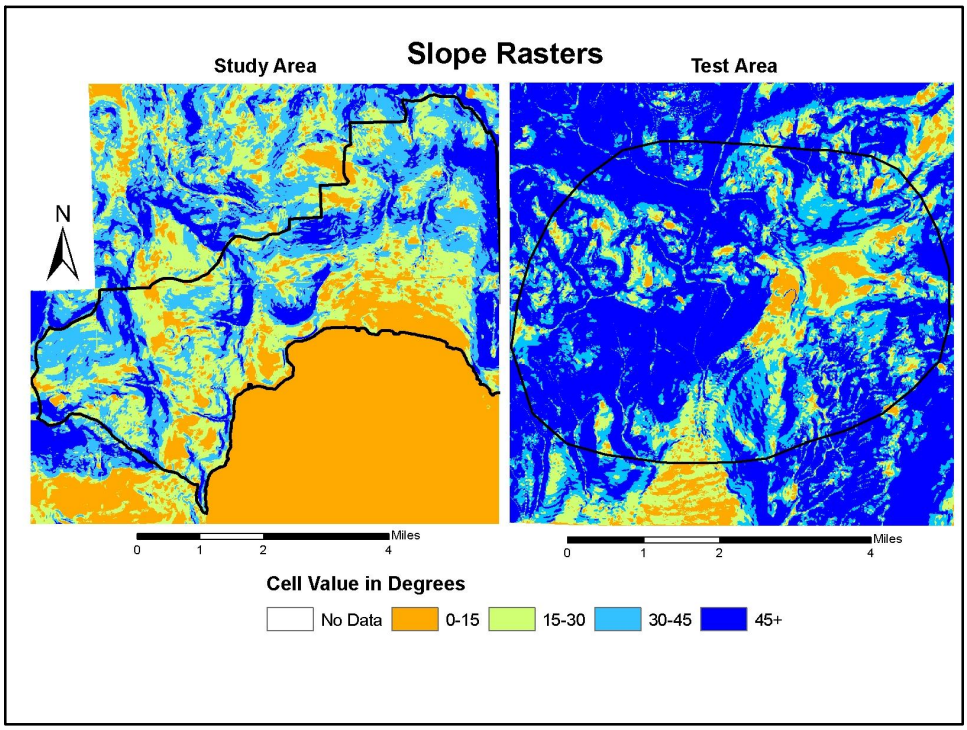
- Can we design a prehistoric site prediction model for the Lake Tahoe Basin?
- What factors play a role in site locations?

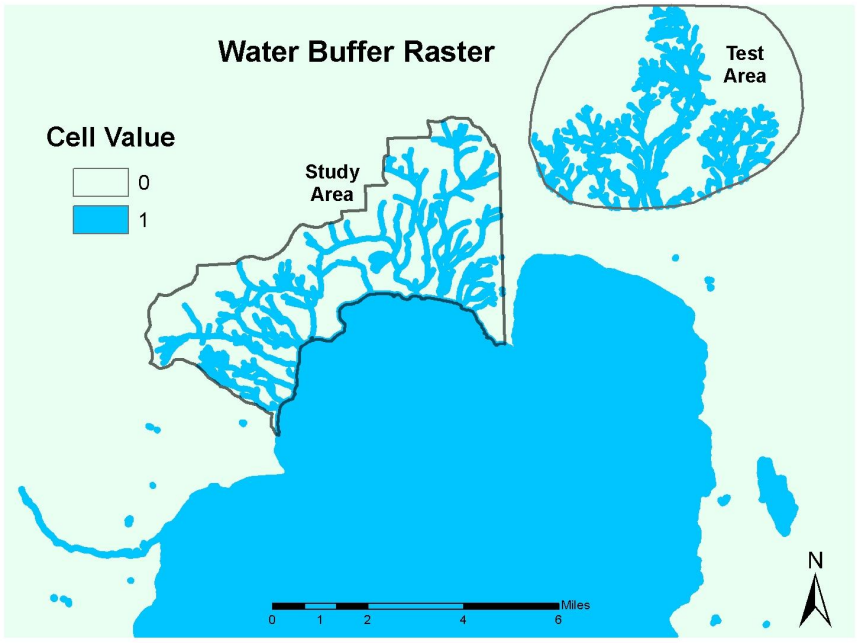


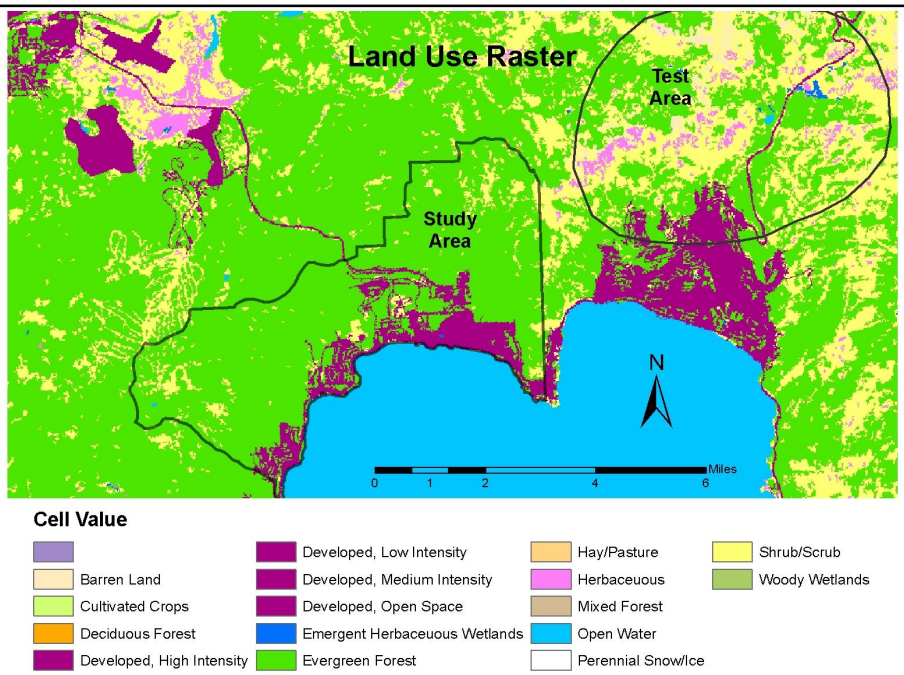
Layers Used

- 10 meter DEMs from the US Forest Service
  - Used to generate:
    - Aspect
    - Slope
- Water
  - 100 meter buffer around lakes and streams
- Land Cover
- Heritage Site layer from the LTBMU


Aspect Rasters
Study Area
Test Area
N
0 1 2 4 Miles
0 1 2 4 Miles
Cell Value
No Data
North
East
South
West
North
Flat
Northeast
Southeast
Southwest
Nothwest


Slope Rasters
Study Area
Test Area
N
0 1 2 4 Miles
0 1 2 4 Miles
Cell Value in Degrees
No Data
0-15
15-30
30-45
45+


Water Buffer Raster
Test Area
Cell Value
0
1
Study Area
N
0 1 2 4 6
Miles


Land Use Raster
Test Area
Study Area
N
0 1 2 4 6
Miles
Cell Value
Barren Land
Cultivated Crops
Deciduous Forest
Developed, High Intensity
Developed, Low Intensity
Developed, Medium Intensity
Developed, Open Space
Emergent Herbaceuous Wetlands
Evergreen Forest
Hay/Pasture
Herbaceuous
Mixed Forest
Open Water
Perennial Snow/Ice
Shrub/Scrub
Woody Wetlands

Factor Weighting

- Used equal weighting and AHP to determine weights for 2 different models
- In the study area:
  - Water:
    - 17 of 25 sites
      - Reclassified to have values of:
        - 1 for cells within the water buffer
        - 2 for cells outside the water buffer
  - Slope:
    - 9 of 25 sites fell into the 0-15˚ slope (cell value of 1)
    - 11 of 25 sites fell into the 15-30˚ slope (cell value of 1)
    - 5 of 25 sites fell into the 30-45˚ slope (cell value of 2)
    - 0 of 25 sites fell into the 45˚+ (cell value of 3)

Factor Weighting Continued…

- In the study area:
  - Aspect:
    - Flat: 0 of 25 sites (cell value 2)
    - North: 2 of 25 sites (cell value 2)
    - Northeast: 2 of 25 sites (cell value 2)
    - East: 6 of 25 sites (cell value 1)
    - Southeast: 9 of 25 sites (cell value 1)
    - South: 3 of 25 sites (cell value 1)
    - Southwest: 2 of 25 sites (cell value 2)
    - West: 0 of 25 sites (cell value 2)
    - Northwest: 1 of 25 sites (cell value 2)

Factor Weighting Continued…

- In Study Area:
  - Land Cover:
    - Evergreen Forest: 17 of 25 sites (cell value 1)
    - Shrub/Scrub: 5 of 25 sites (cell value 2)
    - Developed: 3 of 25 (cell value 3)

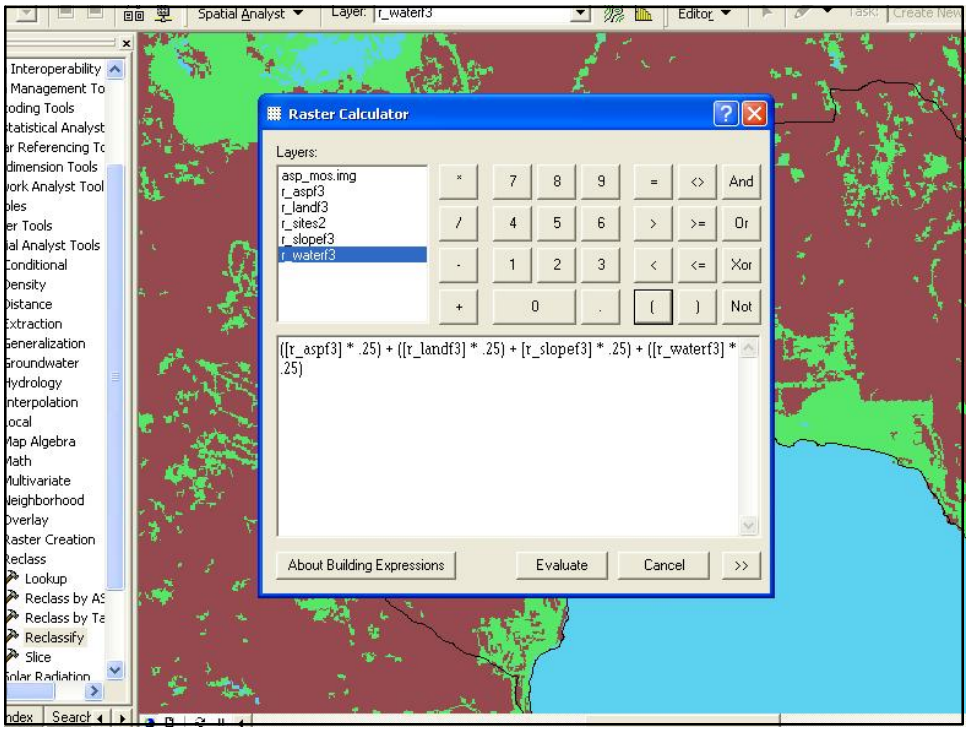
Determining Weights

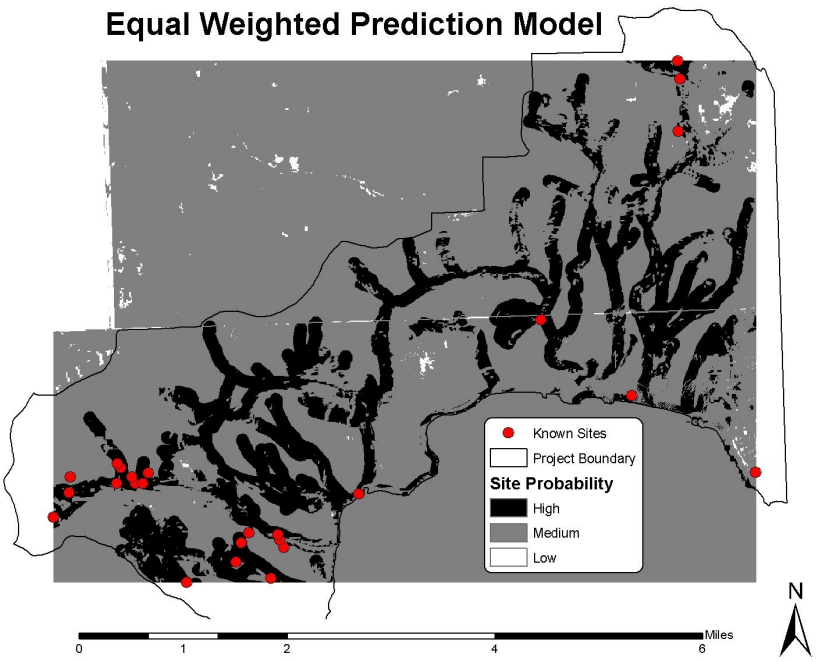
- Equal weights were given for the first model
  - .25 for all 4 variables
- Analytical Hierarchy Process was used to determine the weights for the second model
  - 0.12 for Proximity to Water and Slope layers
  - 0.38 for Land Cover and Aspect layers

AHP Table

	Proximity to water	Landcover	Slope	Aspect
Proximity to Water	1	0.33	1	0.33
Land Cover	3	1	3	1
Slope	1	0.33	1	0.33
Aspect	3	1	3	1

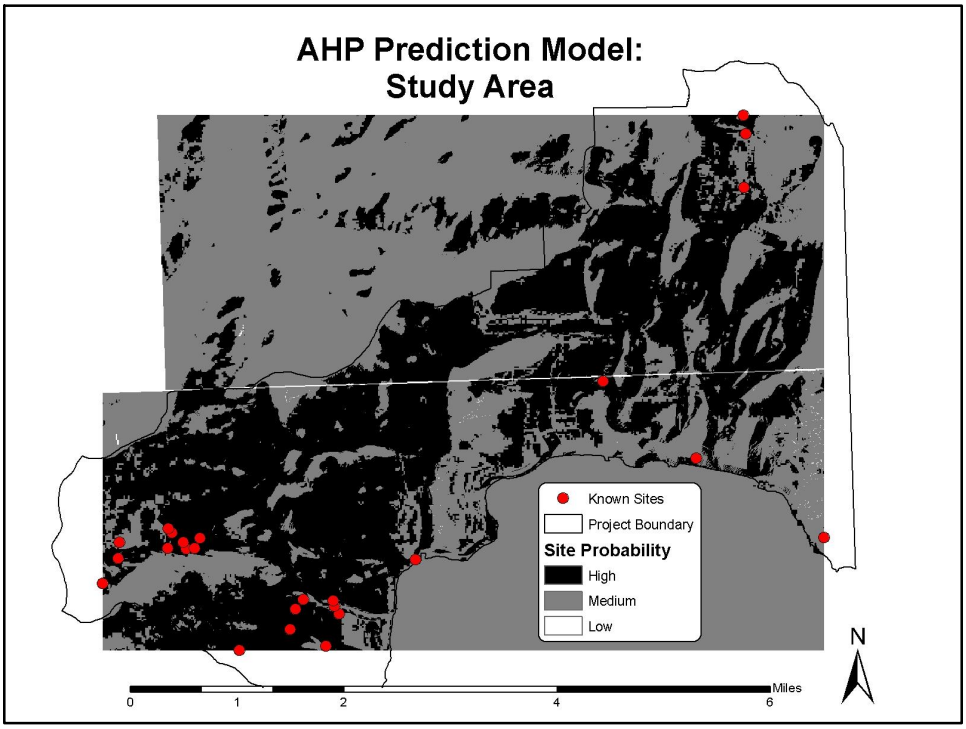
Criteria	Geometric Mean	Weight
Water	0.574	0.12
Land	1.73	0.38
Slope	0.574	0.12
Aspect	1.73	0.38
Sum	4.608	1





Equal Weighted Prediction Model in the Study Area

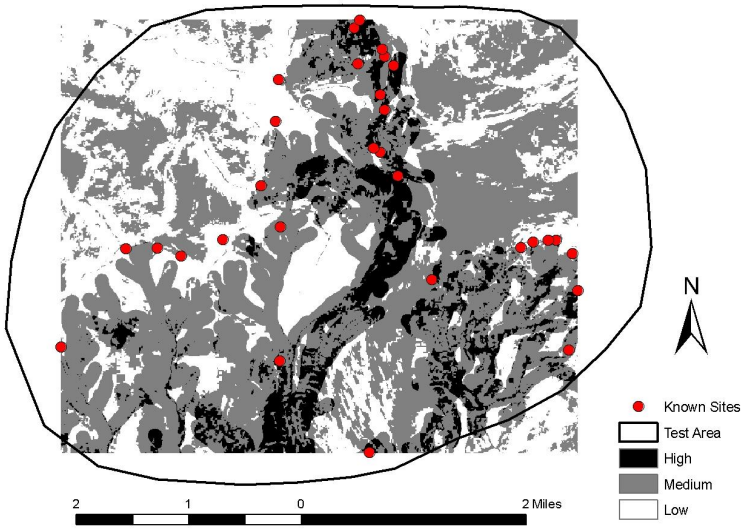
- 14 of 25 sites captured in the High Probability Area
- 11 of 25 sites captured in the Medium Probability Area



AHP Prediction Model in the Study Area

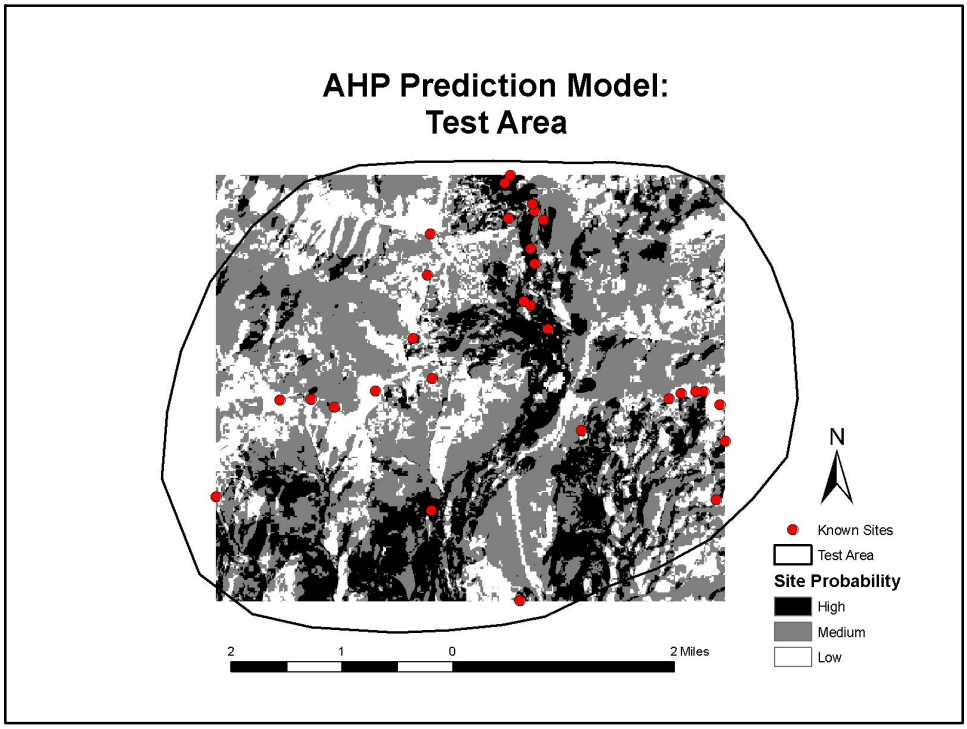
- 18 of 25 sites were captured in the High Probability Area
- 7 of 25 sites were captured in the Medium Probability Area

Equal Weighted Prediction Model: Test Area



Equal Weighted Prediction Model in the Test Area

- 9 of 30 sites were captured in the High Probability Area
- 12 of 30 sites were captured in the Medium Probability Area
- 9 of 30 sites were captured in the Low Probability Area



AHP Prediction Model in the Test Area

- 12 of 30 sites were captured in the High Probability Area
- 7 of 30 sites were captured in the Medium Probability Area
- 11 of 30 sites were captured in the Low Probability Area

Conclusions

- Problems
  - Landcover different in test area
  - Slopes were steeper in the test area
  - We did not have DEMs for the entire Lake Tahoe Basin area
  - If we had the DEMs we could have done a frequency ratio model and logistical regression model to help weight variables
  - AHP is subjective

Sources

- http://fsweb.clearinghouse.fs.fed.us/regions/regions.html
- ftp://ftp.dv.r5.fs.fed.us/pub/open/teams/