**Geography 303: Field Study in Environmental Geography**

**Lab #1: Geospatial Modeling of Mexican Wolf Habitat**

**Background**

Spatial patterns of plant and animal distributions vary with abiotic (e.g., light, temperature, and moisture) and biotic (e.g., competition) factors. All of these factors must be taken into account when explaining the observed patterns. Similarly, these factors must be considered when attempting to identify optimum sites for species conservation. The goal of this assignment is to mimic how this can be done using Geographic Information System (GIS) methods (strictly speaking, a GIS is a computer system for capturing, storing, editing, analyzing, sharing, managing, and displaying geographically referenced data). For this exercise, you will use a fine-scale spatial dataset to model site preferences for the Mexican Wolf. This wolf, native to the Sonoran and Chihuahuan Deserts of Mexico and the U.S. Southwest, is threatened due to human land use and habitat destruction.

**Tasks**

Your group has been hired by the Mexican government as a team of biogeographers. You are charged with the task of finding suitable habitat to set aside for protection of the Mexican Wolf. Because you are fully aware that the wolf has certain preferences for light, temperature, and moisture, you pick GIS data layers that enable you to model these factors.

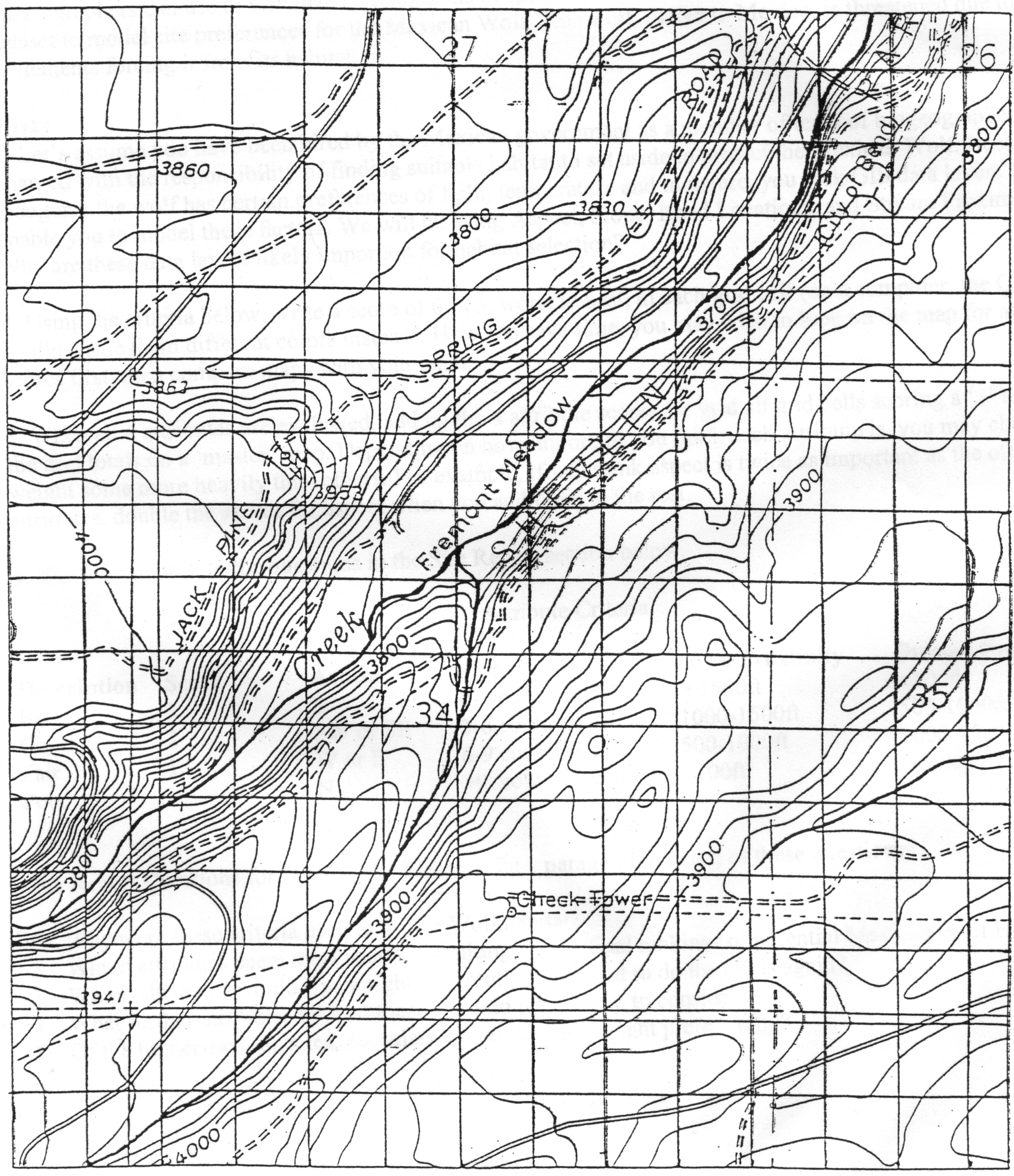
***Table 1: Attribute Criteria***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Description** | **Score** | **Stream Proximity** | **Road Proximity** | **Slope** | **Aspect** |
| Best | 3 | < 500 ft | > 1,500 ft | 0 – 3 contours/cell | Flat or S |
| Good | 2 | 500 – 1,000 ft | 1,000 – 1,500 ft | 3 – 6 contours/cell | SW or SE |
| Fair | 1 | 1,000 – 1,500 ft | 500 – 1,000 ft | 6 – 9 contours/cell | W or E |
| Poor | 0 | > 1,500 ft | < 500 ft | > 9 contours/cell | NW, N, or NE |

1. For each criterion listed in Table 1 above, write a score of 0 to 3 (worst to best) in each of the grid cells on the following base map (In a computer-based GIS, the software would shade each grid cell in different colors). That is, considering one criterion at a time, evaluate each grid cell in terms of its suitability (best to worst) as wolf habitat. If you think one attribute is considerably more (or less) important than others, you may choose to weigh it more or less heavily; for example, if you think proximity to streams is twice as important as slope, you may use scores of 0, 2, 4, and 6 instead of 0, 1, 2, and 3. You decide, and justify your answers.
2. After evaluating all four attribute criteria, add up the four scores for each grid cell and write these total grid scores on a “master” map.
3. After transferring the grid scores onto the master map, identify major “breaks” in the overall grid scores that will allow you to group the scores into three favorability classes. That is, classify the grid scores into the following three categories: (1) high favorability; (2) moderate favorability; (3) low favorability. Then, **shade each of the grid cells** according to its degree of favorability as wolf habitat. Use red to indicate high favorability, green to indicate moderate favorability, and blue to indicate low favorability. **Add a legend** to your master map that shows the three favorability classes and the total grid scores included in each. Finally, **add an appropriate title** to your map.
4. **Write a brief scientific-style report** that addresses the following questions (one paragraph per question).
   1. Why are the four criteria listed in Table 1 likely important for identifying suitable habitats for the Mexican Wolf?
   2. Which attributes seem most spatially limiting for the final rankings of potential Mexican Wolf habitat (i.e., which attributes make it most difficult to identify suitable habitat)?
   3. If you did not weigh attributes differently, would you do so if you had to complete the exercise again? If so, how would you weigh the attributes differently and why? --- If you did choose to weigh attributes differently, why did you select the weights that you did? Also, would you weigh the attributes differently if you had to complete the exercise again and, if so, why?
   4. In addition to the four criteria listed above, which attributes might be useful for identifying suitable Mexican Wolf habitat? Which role might remote sensing play in this context? What kinds of sampling designs would you use for field studies aimed at collecting additional attribute layers?
   5. Which of the higher-ranking sites might the Mexican Wolf prefer as habitat? Why?
   6. What field data could you collect to verify your model? What would you measure and/or observe?
5. Submit your completed assignment (all preliminary maps, the master map, and the report). For the report, follow these format instructions:
   * + Typed, not handwritten
     + Include your team at the top of each page
     + Heading: “Assignment #1: Geospatial Modeling of Mexican Wolf Habitat”
     + 1-inch margins on all sides
     + Times New Roman; 12 pt font
     + 1.5-spaced
     + Length: ~ 250 – 500 words per paragraph (total of 1,250– 2,500 words)

***Hints***

* *To facilitate the grid cell evaluation process, trace all roads with a red pen and all streams with a blue pen before adding scores to the grid cells.*
* *Your maps will be evaluated in terms of accuracy (e.g., points will be deducted if you assign high scores to sites that should be receiving low scores; in “fuzzy” cases, I trust your instincts), completeness (e.g., your name, names of contributors, legend), and “neatness” (e.g., not messy).*
* *Your report will be evaluated in terms of the format criteria listed above (e.g., I will deduct points if the page margins are incorrect), grammar and spelling, legibility, and quality of your answers to the above five questions.*



Scale: 1:12,000 \*\*\* Grid Cells: 500 ft \*\*\* Contour Interval: 20 ft