Final Project:
Habitat Suitability Analysis

Introduction
The goal of this project is to learn how to tackle a complex problem using GIS. This includes acquiring the data necessary for the project, identifying the steps and tools needed to accomplish the project, completing the analysis, and summarizing your results.

All of the tools and techniques required to complete this analysis you have learned over the course of the semester.

Scenario
The state of Pennsylvania has decided to develop a biological reserve system across the state to protect threatened and endangered species. The goal of the system is to protect areas that are unique in terms of species richness (number of different species) and habitat quality. The Centre County planning office has decided to hire an independent contractor (you) to perform a site selection analysis using data collected by researchers at a local university.

As a GIS Analyst, your goal is to identify lands within the county (Centre County) that meet specific criteria defined by experts in the fields of land use planning and conservation biology. The results of your analysis will be used to create maps displaying the locations of the candidate reserve areas within the county. These maps will help local government officials make informed decisions with regard to the reserve system proposal

Part 1:
Before you begin the analysis, you should create a workflow (in outline form) that identifies all of the steps that need to be undertaken to complete the analysis. Initially you do not need to identify the specific tools to be used, just what you need to accomplish (ie. crop the data to the extent of the county). Your outline should include enough detail about the sequence of operations so that any potential problems can be identified.

Keep in mind that the workflow you create is really just a proposed solution to the site selection problem, and not a set of instructions that guarantee the correct results. You will have to identify the specific tools and settings to be used in the analysis.

Selection Criteria:
Priority conservation areas should fulfill the following criteria:
- Greater than 70 bird and mammalian species combined.
- Less than 10% of each study site (studysites) occupied by buffered roads, highways and interstates.
- High habitat potential.
- Publicly owned land.
- Forested areas.
- Slopes less than 15%

Tip: Use ArcGIS Pro to explore the data first to get a sense of where the analysis is located, what data is contained within each data file, and what types of relationships there are between the different data sets. For example, identifying which layers, rasters or tables need to be joined, queried, buffered, dissolved, intersected, etc. Experiment with the geoprocessing tools so that you get an idea of which methods will be required for this analysis. You should also think about the order in which you intend to analyze the data, as this will have a big impact on the amount of time it takes to process the data. You should structure the order of operations so that in each step you reduce the amount of input data required for subsequent steps. Order is especially important when performing overlay operations (e.g., union) and joins between any two feature classes. Processing time to complete one of these operations can be reduced substantially if you sequence your operations correctly.

Part 2:

Perform the site selection analysis using your workflow. Display a series of screen captures and a brief report (see details in the "Deliverables" section, below) in a Word document.

Notes:
- In order to properly calculate the percent area transportation and also the total area of the final candidate areas all data should be projected to a coordinate system that displays area accurately. In this case you should use *NAD83 Pennsylvania State Plane North (US Feet)*
- To calculate the percent road area of each <u>study site</u>, you must approximate the road corridor by creating buffers around each of the road features. Use the road types to create buffers around the **Roads, Highways** and **Interstates** that measure **20 meters, 50 meters** and **100 meters,** respectively. Remember: in order to buffer accurately, the map units must be set in the data frame properties. Area within the buffers is not suitable land.
- Since total area is of interest for final decision, you will need to update the area calculation.
- Be sure to include the cell size you plan to use and an explanation for why you made that choice.

Deliverables:
- Final map displaying ideal candidate areas.
  - Follow best map practices.
  - Include all standard map criteria.
    - Title, legend, scale bar, etc.
  - Use Hillshade for county as backdrop for the map.
  - Do **NOT** use the default basemaps provided by ArcPro (World Topographic Map, World Hillshade, or any other).
  - Table that includes the total area of each of the final candidate areas.

- Document each of your steps with a brief description.
  - Include a screen shot of the output of each of the steps and also what you did in the step (this will help the instructor to identify if any errors occurred and where in the analysis).
- Brief explanation (<250 words) of which of the final locations you feel is best and why.