Research Project Proposal Format

1 Name(s).

2 Title. (5 points)
   (list species or groups of species to be studied, if not identified in title)

3 Question. (5 points)
   State explicitly what question(s) your research will address.

4 Hypotheses. (10 points)
   State your hypotheses about the question. You must state at least two. I strongly recommend
   that you frame your hypothesis using the following format: "If (premise), then (prediction),
   because (mechanism)."
   Example 1:
   Hypothesis 1. "**If** most birds in Whatcom County specialize on a relatively small number of
   food types, **then** Bellingham's central business district will support fewer birds species than
   any comparable sized area in the county, **because** fewer kinds of avian foods are available in
   the central business district than anywhere else in the county."

   Hypothesis 2. "**If** avian species diversity in Whatcom County is limited primarily by the
   variety of predators, **then** Bellingham's central business district will contain more bird
   species than any comparable area in the county, **because** predator control measures, habitat
   isolation and fragmentation, and low availability of predator den and nest sites reduces
   predator variety in the central business district relative to other areas.

   Example 2:

   Hypothesis 1. "**If** the distribution of American marten (*Martes americana*) is determined
   primarily by the availability of suitable habitat structures (large snags, logs, trees with broken
   tops, etc.) at the local habitat scale, **then** marten will be ubiquitous in old growth forest
   fragments of all sizes, **because** fragments of all sizes contain those habitat structures.

   Hypothesis 2. "**If** American marten (*Martes americana*) persists in old growth forests in the
   North Cascades via metapopulation processes, **then** marten populations will occupy old
   growth valleys in the Glacier Peak Wilderness and they will be absent from the Finney block,
   because old growth valleys in the Glacier Peak Wilderness are connected by habitat suitable
   for marten dispersal but the Finney block is isolated from source populations by dispersal
   barriers that are impassable to marten.

5 Study Design and Methods. (30 points)
   5.1 Where will you conduct your work? Be specific!

   5.2 What kinds of data will you collect?

   5.3 Why will these data be needed to answer your question?
        Will these data be sufficient to answer your question?

   5.4 How and when will you collect your data?

   5.5 What form will your data take on paper?

   5.6 How will your activities affect the animals you will study?

6 Data Analysis.   (30 points)

6.1 How will you analyze your data? Identify statistical methods you will use.

6.2 Does your study design provide adequate power to detect the patterns or effects that you will study? Do an analysis of the statistical power of your proposed sampling regime. This will require you to estimate the likely variability in your data. A preliminary survey of your study system may help; see Project Guidelines. For some methods of data analysis (e.g., multimodel inference), you should evaluate your study design using alternatives to power analysis. If your project involves alternatives to testing statistical null hypotheses, please consult your instructor for advice.

6.3 If you need information, references, or software for analysis of statistical power, you may find your statistics text and the following sources helpful.

General information and practical advice:
> http://davidmlane.com/hyperstat/power.html   (and links therein)
> http://www.psycho.uni-duesseldorf.de/aap/projects/gpower/how_to_use_gpower.html

Links to free power analysis packages:
> http://statpages.org/#Power
> http://www.psycho.uni-duesseldorf.de/aap/projects/gpower/
> http://www.mbr-pwrc.usgs.gov/software/monitor.html
> http://www.dartmouth.edu/~eugened/power-samplesize.php

7 Interpretation of Results.   (20 points)

How will your data support or refute your hypotheses?
Anticipate how you would interpret both positive and negative results.
Your hypotheses should make predictions about the results you will obtain. Describe potential outcomes of your data analysis and the resulting conclusions you would make about your predictions and hypotheses. How would you answer your question(s) (stated in 3), given each potential outcome of your data analysis.