

Scientific Writing and Presentations

Objectives, Questions, Study Areas,
Methods,
Results, Discussion, Outline

NRC 601

Research Concepts in Natural Resources

Department of Natural Resources Conservation
University of Massachusetts Amherst

Fall 2009

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Research Questions, Objectives, and Hypotheses

~ one possible approach ~

Project Title:

Species Composition and Distribution of a Forest
Insect Community on Martha's Vineyard,
Massachusetts.

Examination of an insect community in an isolated woodlot in the center of the island, that has been protected from development, fire, and other disturbances for several decades.

(1) Think about the questions you would like to ask.

-- what is the composition and distribution of insect species in this isolated woodlot?

-- is the composition of species here different from other areas of the island; the mainland?

-- what factors may have influenced the current distribution of insects?

*isolation, vegetation composition and structure,
lack of fire, lack of predators?*

(2) State these as objectives; use active voice and verbs:

My objectives are to (1) describe the composition and distribution of insect species . . . , (2) compare species composition to other areas . . . , and (3) review environmental and ecological factors, such as . . . , that may have influenced the current composition and distribution of species in this woodlot.

(3) *Prepare a brief discussion on research hypotheses that could be addressed, including alternate hypotheses*

Remember that a research hypothesis is a candidate explanation for an observed pattern or phenomenon.

Then you might ask yourself, "How might I address these research hypotheses in a series of experiments?"

Consult your advisor and graduate committee!

STUDY AREA

- often a separate section, but sometimes a subsection under METHODS.
- a brief description of your study site, just enough relevant information to give the reader an understanding or picture of where you did the research.
- usually includes topography, precipitation, vegetation, but tailor the description to the content of the paper.
- often (not always) includes a reference map . . . which should have
 1. N arrow
 2. scale in km
 3. inset locator map
 4. clear lettering and not too much detail
 5. this will often be Figure 1.

STUDY AREA . . .

- this is the only section where present tense is usually allowed, reserved for description on a geologic scale.
- most study area descriptions should be presented in past tense, e.g., "average annual precipitation was 46 cm", "vegetation was primarily grass-shrubland".
- exceptions include geological formations that have been present for centuries.

METHODS

- sometimes called MATERIALS AND METHODS, more of a laboratory orientation.
- the main purpose is to
 - describe (and defend if necessary) your design
 - provide enough detail so a competent worker can repeat
 - key word is *repeatability*
- many readers will skip this section;
 - nevertheless, Methods is a cornerstone of your paper
 - to have scientific merit your results must be reproducible
- this section will be the most heavily critiqued by your peers

MATERIALS . . .

- when you cite the use of equipment and materials, avoid trade names
- if you do use trade names, cite the source parenthetically

e.g., We used a 10x power night-vision scope to observe crane behavior on their nocturnal roost sites (Night Owl Equipment Corp., Seattle, Washington, USA).

- in this case, you may need to provide a disclaimer

. . . (Night Owl Equipment Corp., Seattle, Washington, USA; use of trade names does not imply endorsement by the federal government).

- avoid use of jargon whenever possible; if you do use an uncommon piece of equipment, provide a citation if possible

e.g., We used an ocular tube, commonly called a moosehorn, to quantify forest canopy cover (Smith and Stevens 1984).

METHODS . . .

- describe the procedure in the order that makes most sense
- what was the most important thing you had to do, or the first thing that needed to be done before other procedures could be accomplished
 - e.g.,
 - set up study plots
 - capture and mark animals
 - set up telemetry system and collect locations
 - conduct habitat sampling
- use subsections with subheadings if that will be useful, but don't over-do this either.

METHODS . . . USING TABLES AND FIGURES

-- use of tables and figures is permissible in METHODS

e.g., habitat study with a long list of variables -
name and describe in a table

e.g., a critical piece of uncommon equipment -
show a diagram or photo as a figure

cite as Table 1:

We measured 22 habitat variables (Table 1).

Not Descriptions of habitat variables are in Table 1.

-- Tables and Figures are numbered separately and must be numbered sequentially *in the order they appear in the paper.*

-- each Table and Figure should be presented on its own page and *should stand alone*

-- Tables are placed after Literature Cited, Figures after Tables

METHODS . . . IN GENERAL

- strive to strike a balance between
 1. providing enough information to be repeatable, vs.,
 2. being brief, concise, and clear
- write in the present or future tense for a proposal
write in the past tense for a thesis, dissertation, or manuscript
- use the metric system *no matter what!*
- be sensible regarding the rounding of numbers
 - convert 40 mi² to 103.62 or even 103.6 km² ???
 - why not 104 km², or even 100 km²?
- have a friend read it and see if they can follow the procedures;
put it away, read it later, and see if *you* can understand it.
- report IACUC and Human Subjects approval number and date here

CITING LITERATURE

-- in general, use the form

(Smith 1999, Jones 2003) in text

(Fuller and DeGraff 2001)

(McDougal et al. 1998)

(Smith 1999, 2005; Jones 2003)

Hornocker et al. (1974) reported that . . .

-- in text, arrange multiple citations chronologically

-- in L.C. section, arrange citations alphabetically 1st, chronologically 2nd

-- in L.C., use the following format:

Matter, W. J., and R. W. Mannan. 1989. More on gaining reliable

knowledge: a comment. *Journal of Wildlife Management*

53:1172-1176.

RESULTS

- present the results of your experiment or study
 - descriptive statistics
 - data summaries
 - test results
- can be presented in several different ways
 - narrative form
 - tabular form
 - in a figure
 - usually no overlap among these forms
- writing style
 - brief, straight-forward, no embellishments
 - do not let Methods spill over into Results
 - do not let Discussion or Conclusions intrude
 - often the most "boring" section in the paper
 - can be very, very brief (e.g., one paragraph)

RESULTS ...

-- Tables

- stand alone
- numbered sequentially as they appear
- caption placed on top of table
- can be large (full page); usually short
- designed for a single column, or to span two columns
- use horizontal rules or lines; no vertical lines

-- Figures

- stand alone
- can be line graphs, bar graphs, diagrams, photographs
- pie charts used infrequently
- sharp lines, black and white
- clear and simple
- make sure lettering is large enough when reduced
- for manuscript: provide figure captions on separate pages
- for presentation: provide a figure heading

DISCUSSION

- the place in the paper to answer the question "so what?"
 - highlight your major findings
 - summarize your thoughts
 - draw your conclusions
 - what does it mean to ecological knowledge?
 - what does it mean to management and conservation?
- not everything presented in RESULTS needs to be mentioned in the DISCUSSION
 - cover only the most important points
 - use "reverse triangle" approach of newspaper articles
 - cite a pertinent table or figure again if it helps
- writing style
 - be clear and concise; use simple language
 - avoid or limit the use of abbreviations
 - cite literature

FOR A PROPOSAL . . .

The "RESULTS" section in a manuscript could become "ANTICIPATED RESULTS" in a proposal, and,

The "DISCUSSION" section in a manuscript could become "POTENTIAL IMPLICATIONS" or "IMPLICATIONS OF THE RESEARCH" in a proposal.

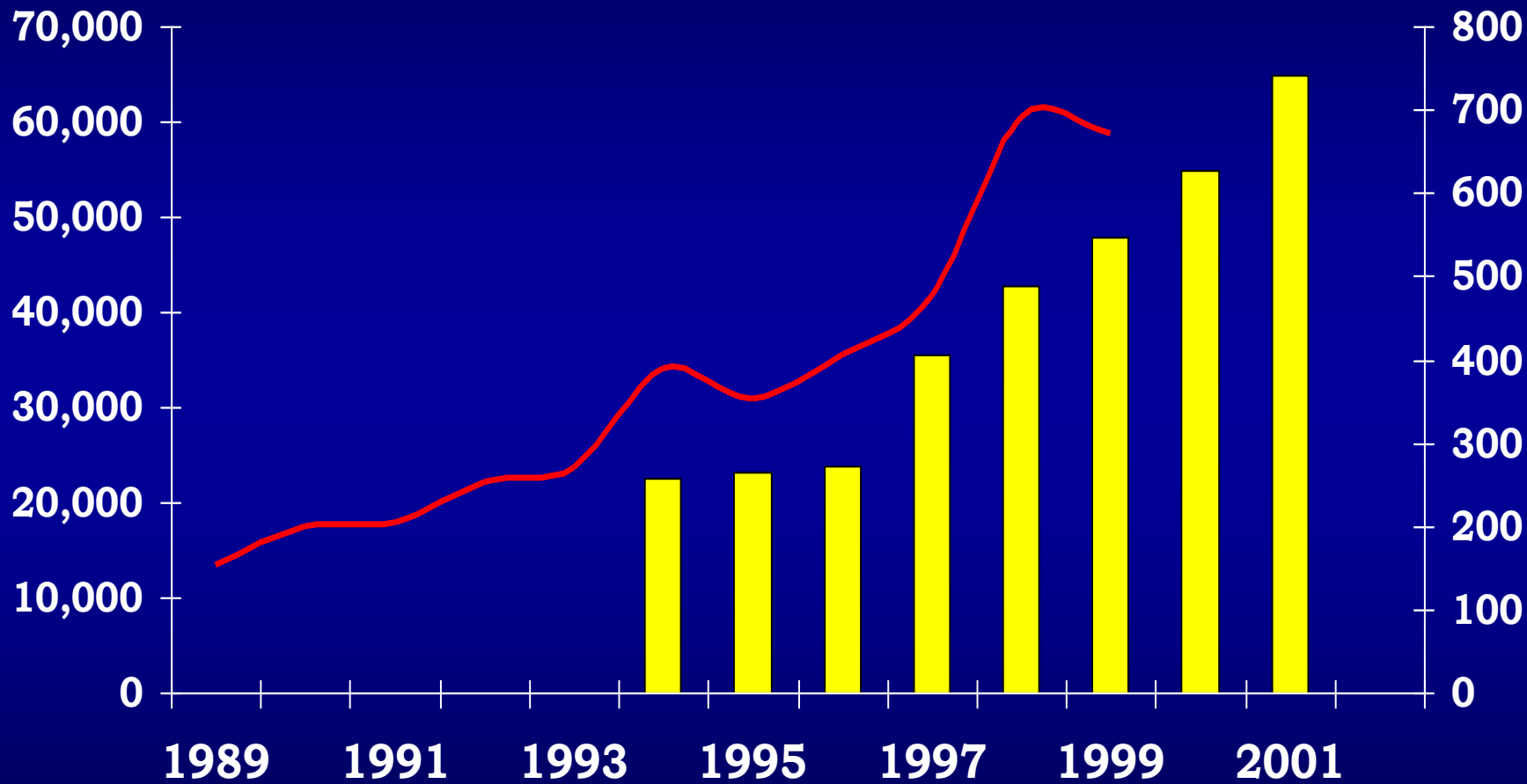
Table 1. Comparison between individual treatments for spring vs. fall aspen sucker densities (number/m²), Cedar Mountain, Utah, USA, 2003.¹

Treatment	Season				<i>t</i>	<i>P</i>
	Spring		Fall			
	Mean	SE	Mean	SE		
Control	0.36	0.12	0.67	0.28	1.17	0.15
Unfenced, baited	0.37	0.07	0.97	0.41	1.68	0.08
Fenced	0.38	0.03	1.02	0.38	1.86	0.06
Fenced and baited	0.35	0.06	1.21	0.48	1.93	0.06

¹From Coggins and Conover (2005)

Population

Complaints



DISTRIBUTION AND MOVEMENTS OF A COLONIZING MOOSE POPULATION IN MASSACHUSETTS

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Abstract:

Introduction

Background and Justification

Literature Review

Conceptual Model

Objectives

Study Areas

Methods

Capture and Marking

Global Positioning and Conventional Telemetry Systems

Monitoring Movements

Habitat Assessment

Anticipated Results

Potential Management Implications

Literature Cited

Tables

Figures

Schedule

Budget