Assembling the Conservation Puzzle: Conservation Science and Decision-Making

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Bites of Science
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New York and onwards...
And then, grad school!
Cold seeps and corals in the Gulf of Mexico
Integrated instruction in conservation studies in a different kind of classroom...
Biodiversity loss and mass extinction

“If current rates of human destruction of the biosphere continue, one-half of all species of life on earth will be extinct in 100 years. The rate of species extinctions at present is estimated at 100 to 1000 times "background" or average extinction rates in the evolutionary time scale of planet Earth.”
What is extinction?

The loss of a species from...

... a portion of its range (local extinction)

... wild, free-living existence (extinct in the wild)

... the world (global extinction)
How does extinction happen?

Meet the Sneebles…
Characteristics: What favors extinction?

- Small population size
- Small geographic range
- Scattered population
- Harvested by people
What is conservation?
Goals of Conservation

• **Document** biodiversity (species)
• **Investigate** human impacts
• **Mitigate** negative effects
Conservation is interdisciplinary

- Genetics
- Zoology
- Economics
- Luck
- Botany
- Veterinary Medicine
- Reproductive Physiology
- Behavior
- Population Biology
- Sociology & Conflict Resolution
- Policy Makers
- Wildlife/Habitat Management
- Luck
Conservation is a normative, crisis-driven discipline

• What’s normative?
  – Pertaining to a norm; a standard; value-driven

• Why crisis driven?
  – Mass extinction and a changing climate alter environmental conditions faster than many species can adapt

To address conservation problems we must…

1) Determine our goals, and determine how to measure progress towards them
2) Determine how to most effectively take action
3) Determine how we can improve our conservation actions
So how do we decide what to do? What counts as success?
Evolution of Project Management

Method

Plan

Do

Monitor & Evaluate
Adaptive management is based on project cycle management.
Using adaptive management to set measurable objectives

1. Conceptualize
   - Define initial team
   - Define scope, vision, targets
   - Identify critical threats
   - Complete situation analysis

2. Plan Actions and Monitoring
   - Develop goals, strategies, assumptions, and objectives
   - Develop monitoring plan
   - Develop operational plan

3. Implement Actions and Monitoring
   - Develop work plan and timeline
   - Develop and refine budget
   - Implement plans

4. Analyze, Use, Adapt
   - Prepare data for analysis
   - Analyze results
   - Adapt strategic plan

5. Capture and Share Learning
   - Document learning
   - Share learning
   - Create learning environment

Conservation Measures Partnership Open Standards
Measurable objectives are aimed at specific targets

- Targets = what specifically do you hope to conserve?
- What are the direct threats to those targets?
- What are the indirect threats that influence the direct threats?

*Threats are always anthropogenic.*

*Are they always science-based?*
Conceptualize:
Define Scope, Vision, & Targets
Step 1

Conceptualize: Define Scope, Vision, & Targets

Direct Threat

Vision

Conservation Target

Goal

Conservation Target

Direct Threat

Direct Threat

Direct Threat

Project Scope

Goal
Step 1

Conceptualize: Define Scope, Vision, & Targets
Following an understanding of the topic, students...

- Define **strategies** to reduce direct threats and conserve the target

Each step focuses on the achievement of results and is composed of assumptions that can be tested

Implicit Assumptions:

- **Strategy** → ? → **Conservation target improved**
For example...

- Strategy: Brazil nut mgmt plan
- Objective 1: Mgmt plans implemented
  - Result: Higher quality brazil nut
  - Objective 2: Higher income
  - Result: Objective 3
  - Objective 4
  - Goal: Brazil nut forest conserved

Impact on Target:

1. Greater recognition of forest's economic value
2. Less conversion of forest to ag
3. Higher quality of life
4. Local people committed to forest mgmt
The Scientific Method as an Ongoing Process

- **Make Observations**
  What do I see in nature? This can be from one's own experiences, thoughts, or reading.

- **Think of Interesting Questions**
  Why does that pattern occur?

- **Refine, Alter, Expand, or Reject Hypotheses**

- **Formulate Hypotheses**
  What are the general causes of the phenomenon I am wondering about?

- **Gather Data to Test Predictions**
  Relevant data can come from the literature, new observations, or formal experiments. Thorough testing requires replication to verify results.

- **Develop Testable Predictions**
  If my hypothesis is correct, then I expect a, b, c,...

- **Develop General Theories**
  General theories must be consistent with most or all available data and with other current theories.
A Black-footed Ferret Story
Black-footed ferret historic range
Decline of black-footed ferrets

- Closely connected to prairie dogs for burrows and food
- Prairie dog decline
  - Exterminated by farmers, ranchers, and government officials
  - Bubonic plague also affected prairie dogs
- Today, 98% of their habitat is urban development, farms or ranches
Declared extinct! But...

• In 1981, a dog found a black-footed ferret!

• Remnant population of a few dozen ferrets found

• 1985-87: Ferrets captured for captive breeding
Today’s status?

- 1991- reintroductions began
- Ensuring survival
  - Vaccines!
  - Pre-conditioning
- 27 reintroduction sites
  - Some self-sustaining
  - Thousands of ferrets in population!
- Land and habitat needed
Your turn! Building an adaptive management model for ferrets

• What’s the target?
• What’s the geographical scope?
• What’s the direct threat?
• What are the indirect threats?
• Which stakeholders need to be involved?
• What are the strategies to address this problem, and what are the results we expect from our strategies?
Your turn! Building an adaptive management model for ferrets

Step 1:

Step 2:
Remember: Adaptive management is based on project cycle management
Major takeaways

• Science content matters
• To do effective conservation, interdisciplinarity matters more
• Even MORE important are.... (Blickley et al 2012)
  – Effective communication
  – Teamwork
  – Project planning matters!
Thanks for your attention!
Any questions?