Designing a Monitoring Program

Ecological Monitoring and Analysis (REM 357)

Outline
1. General model for monitoring (Elzinga)
2. Herrick’s six steps to a monitoring program
3. Objectives

General model for monitoring (Elzinga)

Monitoring Overview

FIGURE 2.1. These seven major steps are broken into sub-steps and illustrated in figures 2.2 - 2.5.

Background Tasks

A. COMPLETE BACKGROUND TASKS
1. compile and review existing information
2. review upper-level planning documents
3. identify priority species and/or populations
4. assess resources available for monitoring
5. determine scale
6. determine intensity of monitoring (quantitative, qualitative, demographic)
7. review

FIGURE 2.2. Flow diagram of the monitoring process, continued. Steps associated with completing background tasks are illustrated in detail.

Develop Objectives

B. DEVELOP OBJECTIVES
1. develop an ecological model
2. develop general management goals
3. select indicator
4. identify and define attributes
5. specify direction and quantity of change
6. specify time frame
7. develop management objective
8. specify management response
9. review management objective

FIGURE 2.3. Flow diagram of the monitoring process. continued. Tasks associated with developing objectives are illustrated in detail.

Elzinga et al. 1998
Herrick’s Six Steps to a Monitoring Program
Key Attributes in Monitoring

Three Key Attributes in Monitoring

1. Soil and site stability
   - the capacity of the site to limit redistribution and loss of soil resources (including nutrients and organic matter) by wind and water

2. Hydrologic function
   - the capacity of the site to capture, store and safely release water from rainfall, run-on and snowmelt

3. Biotic integrity
   - the capacity of a site to support characteristic functional and structural communities in the context of normal variability; to resist loss of this function and structure due to a disturbance; and to recover following disturbance(s)

Monitoring in Six Easy Steps

Three attributes

Soil and site stability
Hydrologic function
Biotic integrity

Step 1: Define Objectives
Types of Objectives

1. Management Objectives
   - Sets goal for attaining ecological condition

2. Sampling/monitoring Objectives
   - Sets goal for measuring that value

Types of Management Objectives

- **Target/threshold Objectives**
  - aim for a particular condition
  - **Examples**:
    - increase the population size of Species A to 5000 individuals
    - maintain Site B free of noxious weeds X and Y

- **Change/trend Objectives**
  - aim for a change relative to existing condition
  - **Examples**:
    - increase mean density by 20%
    - decrease the frequency of noxious weed Z by 30%

Elzinga et al. 1998

Components of an Objective

- **Species or Habitat Indicator**: what is monitored
- **Location**: geographical area
- **Attribute**: aspect of the species or indicator (e.g., size, density, cover)
- **Action**: the verb of your objective (e.g., increase, decrease, maintain)
- **Quantity/Status**: measurable state or degree of change for the attribute
- **Time frame**: time needed for management to prove itself effective

Elzinga et al. 1998
SMART Objectives

- **Specific** – defines focus in ecosystem
  - Goal: restoring native biodiversity
  - Vague objective: increase abundance of rare species
  - Specific objective: double the number of suitable home ranges for the American marten

- **Measurable** – quantitative
  - Goal: increasing water quality
  - Immeasurable objective: reduce pollution in watershed
  - Measurable objective: reduce phosphorus loading in the Dismal River by 50%

- **Accountable** (achievable) – group accepts responsibility for addressing objective
  - Goal: decrease invasive species
  - Unaccountable objective: assure weeds are controlled
  - Accountable objective: members of the NPS Inventory & Monitoring program will monitor effects of herbicide use to control leafy spurge

- **Realistic** – reasonable possibility of happening
  - Technical capabilities, accepting sociopolitical climate, resources available, within group’s realm of responsibility
  - Goal: decrease invasive species
  - Unrealistic objective: restore native prairies to 50% of Illinois land
  - Realistic objective: restore native prairie ecosystems along 50% of abandoned railways in Illinois

- **Time-bound** – state beginning point, milestones, and deadlines (use dates when possible)
  - Goal: increase number of conservation easements
  - Slightly time-bound objective: quadruple the number of conservation easements in four years
  - Time-bound objective: double the number of conservation easements in two years, and double it again in the next two years.