Developing Outcome-based Objectives: First Principles and Examples for Populations

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The approach to conservation that we call Strategic Habitat Conservation or SHC is founded on setting explicit objectives that are accepted as necessary to maintain viable ecological systems that support self-sustaining populations of fish and wildlife. Knowing the current state of the system and having clear objectives are integral to developing efficient conservation strategies.

The purpose of this brief paper is to provide suggestions for what to consider when developing outcome-based objectives. Examples are provided for population objectives based on the responsibilities entrusted to a natural resource management agency. It is naturally geared to the US Fish and Wildlife Service, but it is equally applicable to other agencies that must track populations or other natural resource functions and values.

Because outcome-based population objectives may be expressed in a number of ways, the following narrative is not prescriptive. Instead, we provide first principles of outcome-based objectives – elements common to all good objectives – which, if adhered to, will yield a sound foundation for conservation strategies.

First Principles of Outcome-based Objectives

The effectiveness of conservation strategies is directly related to the clarity of objectives.

Objectives must be related to the mission of the agency, i.e., they must be directly linked to the mission of the agency.

Objectives must be expressed in terms that can be explicitly defined and therefore measured, e.g., ecosystem integrity can mean many things. An indicator of ecosystem integrity for the Service would usually be the capacity of the ecosystem to sustain populations of Federal trust species at objective levels.

Population status relative to objectives must be measurable at regular intervals.

Monitoring programs (existing or practical future surveys) are the basis for estimating population status and therefore define the units of population objectives. These units may vary among species.

Population objectives are our interpretation of (1) ecological sustainability – what is necessary to conserve populations in perpetuity (e.g., minimum viable population size) or to (2) social-viability – meet public demand. Ideally, in the latter case, setting population objectives would be an iterative process of

- setting a draft objective;
- estimating costs and public benefits of achieving the objective;

- getting partner and public feedback; and
- revising the objective if necessary.

Population objectives should inform two elements of a conservation strategy: (1) how much habitat is needed; and (2) how to configure the habitat to achieve sustainability.

Population objectives should be expressed so that they explicitly link across spatial scales from range-wide to ecoregional and local scales. Conversely, assessing progress toward population objectives will often require that we translate status estimates at local or ecoregional scales to range-wide scales.

Examples of USFWS Objectives Linked Among Spatial Scales

Range-wide population status is notoriously difficult to estimate and relate to local conservation actions. In each of the following objectives, we try to illustrate how a range-wide objectives, which is essential for the maintenance of a species, subpopulation, etc., may be linked to a **directly** measurable local objectives for a single portion of the range. Except for species with highly restricted distributions, there will usually be a number of local objectives to be attained in different parts of the range. In total, they must add up to the overall desired range-wide change. Usually, the both the range-wide and local objectives will be expressed as indices of the actual population status or trend. A relationship between the range-wide index and local index must be established to relate the two scales.

Example 1:
Distinct population segment scale (Gulf of Maine Population Segment) – Increase Atlantic salmon (*Salmo salar*) returning to streams running into the Gulf of Maine by 500%.

Penobscot River population scale – Increase the index of natural spawner returns to 500 individuals/year based on angler catch/hour and trapping data.

Example 2:
Range-wide scale – Double the current population index of king rails (*Rallus elegans*) abundance within its core breeding range and restore its pre-1950 distribution in the upper Midwest (note that this objective has two components – abundance and distribution).

Ecoregional scale (southeast Gulf Coastal Plain) – double the number of responses to broadcasts of taped calls at a random sample of marshbird survey sites (abundance index).

Ecoregional-scale (Prairie Pothole Region) – restore or enhance habitat at 40 sites with suitable habitat in Minnesota and Iowa with $\geq$1 king rails responding to broadcasts of taped calls? at an average of $\geq$20 sites annually (distributional index).

Example 3:
Regional scale – Maintain stable populations of Alaskan-Yukon moose (*Alces alces gigas*) on National Wildlife Refuges in Alaska .

Refuge scale (Arctic NWR) – Maintain a average annual cow:calf ratio of 1.56 until a population size of 400 adults is attained in the survey area between the Dalton Highway and the Canning River, and a cow-calf ratio of 1.72 thereafter to sustain the population at 400 adults.

Refuge Scale (Peninsula NWR) – Maintain stable moving 3-year mean cow:calf ratios and bull densities indices using line transect and distance sampling.

Example 4:
Range-wide scale: Maintain a continental breeding population of 8.2 million mallards (*Anas platyrhynchos*) in the traditional May Breeding Population and Habitat Survey area.

Ecoregionally-based Partnership scale (Prairie Pothole Joint Venture): Maintain an average mallard breeding population of 1.5 million with an average annual recruitment rate of 0.6.