The ConsNet Portal 1.0

Systematic Conservation Planning Primer

CONSNET.ORG BIODIVERSITY AND BIOCULTURAL CONSERVATION LABORATORY SCP BLOG

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M13: Periodic Network Reassessment

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Learning Objectives: This module discusses the importance of periodic network reassessment in systematic conservation planning. Learners will be introduced to the dynamic aspects of this process and the complexity involved in reassessing a conservation plan after its implementation.

- Systematic conservation planning is not a one-shot process in which a plan is formulated, implemented, and nothing must be done again in the future.
  - Setting up a conservation area network (even if it is successfully implemented) is not sufficient for the persistence of biodiversity surrogates such as threatened species.
  - Conservation planning and implementation is a dynamic process –see **Example 12.4**.
    - The framework that should be used is that of **adaptive management**.
  - Networks must be monitored and reassessed because a variety of features can change.
    - The landscape context can change, for instance, through settlement, industrial or agricultural development, or road construction in nearby areas.
    - Global change, especially climate change, may affect what happens within a given conservation area.
    - Present plans may not be effectively implemented.
    - Conservation areas may recover under a plan, leading to better prognoses for biota and prompt changes in the designation of individual areas that should be included within a conservation area network.
  - The appropriateness of plans may also change as new data flows in.
  - Conservation plans, including the management of conservation areas, must also

be monitored and periodically reassessed.

- Monitoring should include both biodiversity and sociopolitical features.
  - Biodiversity conservation never occurs in a sociopolitical vacuum. Not embracing this feature in a planning process is a recipe for disaster.

- Periodically monitoring performance of a plan is also prudentially important.
  - Donors and others who invest in biodiversity conservation will typically want evidence of progress and success to continue investing.
    - Local stakeholders who may be prompted to compromise their own interests for more global biodiversity goals will similarly want tangible evidence of progress.
  - Monitoring is a practical way to get knowledge on what works—and what does not work—in a given context.
    - Success demonstrated through monitoring will show that a conservation plan can be and is being successfully implemented.

- The basis of adaptive management consists of monitoring, evaluating, and reacting to results.
  - The motivation for the adaptive management framework is that the uncertainty under which conservation plans must be formulated makes it likely that many initial plans will not work during the first iteration.
    - Frequent monitoring will prevent errors, issues, and threats from being amplified.
    - In particular, ecological models are notorious for not being able to make long-term predictions successfully (Sarkar 1996).
  - Uncertainty is compounded because effective conservation plans must address a complex network of influences in which both scientific and sociopolitical factors playing a role.
  - Uncertainty is always present in any complex ecological system.
  - Always note that conservation plans must often be formulated and enacted under such time pressure that all the data that could potentially help remove uncertainties cannot be gathered.
  - Adaptive management requires the rejection of plans that don’t work and the formulation of new ones to be tested.
    - Adaptive management gets its name from the analogy of random

variation and natural selection which leads to adaptation during biological evolution.

    - Variation may occur biologically or sociopolitically. Thus, the formulation of plans should be consciously guided by past experience on what works and what does not.

- For monitoring, explicit operational goals must be set to measure success or failure.
  - Benchmarks must be established for representation and persistence of all biodiversity surrogates.
    - True rather than estimator surrogates (see **M5: Surrogacy Identification and Analysis**) must be used for this purpose.
  - Benchmarks must be established for all other biodiversity conservation goals and sociopolitical goals.
  - Assessment must include testing the assumptions that were used during the formulation of the plan.
    - Models used to assess and predict viability of biota and vulnerability of areas must be tested with data –see **M9: Vulnerability and Persistence Analysis**.
    - Surrogacy analysis should be periodically repeated to verify that estimator surrogates continue to represent true surrogates adequately –see **M5: Surrogacy Identification and Analysis**.
  - All management actions should be accompanied by the recording of outcomes in as much detail as practical.
    - However, it is possible to waste resources by collecting irrelevant data.
  - When predictions fail, the factors responsible for the failure should be individuated and identified.
    - On many occasions controlled experiments must be used for this purpose—whether or not these can be performed will depend on context.
  - Both success and failure should be tracked in order to best inform future decisions.
  - These steps are best carried out by having an explicitly clear model of the system even if it involves many simplifications.
    - The model would give guidance on what data must be collected.

- This knowledge would similarly allow computation of the cost of monitoring.
- However, model specification is a time-consuming process.

- Systematic conservation planning is so young of a discipline that there has been little implementation—see **M12: Implementation of Conservation Plan**. Consequently, there are no well-established case studies demonstrating what succeeds and what fails in monitoring regimes.
  - However, insight can be gained from experience in scenarios that are related to general biodiversity conservation.
  - Wildlife monitoring has a long history and there have been recent innovations—see **Example 13.1**.
    - Game animals, including fish, have been managed through wildlife monitoring for centuries.
  - There have been many cases in which single species have been monitored—see **Example 13.2**.
    - In the United States this is required by federal law for endangered and threatened species.

Example 13.1

Community-Based Game Management in Zambia (Salafsky et al. 2001)

Zambia, in south-central Africa, is rich in wildlife and has several national parks. The increasing human population has led to increased hunting pressure and encroachment into conservation areas. The central government, noting its own failure to control these problems effectively, has adopted a decentralized approach, turning over many natural resource management responsibilities, including the control of wildlife consumption, to local communities. In 1983 the Zambian National Parks and Wildlife Service initiated the Administration Management Design (ADAME) program which works in 36 Game Management Areas around the country. Community Resource Boards, elected by community members, are authorized to make game management and other natural resource use decisions. They typically work with both the government and private sector investors such as tour and safari operators. A major source of revenue for many ADAME programs is commercial safari hunting.

ADAME monitors wildlife throughout each project area primarily through paid village scouts. These scouts accompany safaris to gather hunting data and ensure that rules are not violated. The data are used to levy fees and to adjust hunting quotas for different species in each region. The scouts also collect data on illegal hunting, fishing, and encroachment. ADAME uses extensive data analysis to refine planning goals for the region. The most systematic data are for species diversity and abundances of key species.

Adaptive management involves testing planning choices (from a more traditional philosophical perspective, these are also termed hypotheses). ADAME tested several planning choices (hypotheses):

- Clan chiefs would be good leaders and role models for the community—this turned out to be false.
- Expansion of the safari industry would improve the local economic resource base.
- Economic incentives from safari hunting will end the incentive for poaching.
- Income achieved from safari hunting will be sufficient incentive for local communities to manage wildlife.

Example 13.2

Barton Springs Salamander Recovery Plan (USFWS 2004)

The Barton Springs Salamander (*Eurycea sosorum*) has been listed as a federally endangered species since 1997. It is only known to occur at four spring outlets in Zilker Park in Austin, Texas. Habitat degradation due to urban expansion over the watershed is believed to be the primary cause of its endangerment. Because it is federally listed, the United States Fish and Wildlife Service is required by law to devise a recovery plan. Though a comprehensive recovery plan has yet to be devised, state and local authorities have begun monitoring and assisting habitat recovery, primarily through water quality protection ordinances.

The City conducts monthly surveys at the four outlets of Barton Springs. Captive breeding programs have been initiated but have so far achieved very limited success because knowledge of the breeding requirements of the species remains rudimentary. Biologists working for the City have developed a technique to identify salamander individuals by photographing the unique patterns of pigments on the head and body. Non-intrusive identification of individuals is necessary to develop an effective capture-recapture protocol in the field which would allow more accurate monitoring of populations.

The City and the US Geological Survey also monitor water quality in Barton Springs. There is continuous monitoring for pH, specific conductance, temperature, turbidity, total dissolved gas, and dissolved oxygen. The water is tested for bacteria and analyzed for nutrients, total suspended solids, and chlorophyll A twice weekly. All these features as well as major ions and heavy metals are measured four times a year. A more comprehensive list of metals and organic compounds are monitored twice a year, and still others on a yearly basis. Over ten years the program is estimated to cost over $ 5.5

million.

- There have been some cases in which several species have been simultaneously monitored after the creation of a conservation area—see **Example 13.3.**
    - For many plant species, monitoring a large class of species may not require substantially more effort or change of protocol from monitoring a single plant species.
        - Most (though not all) plant surveys are multi-species.
    - Game animal monitoring is also often multi-species, as well.
    - While biologists routinely carry out multi-species taxonomic surveys, these are usually not done in the context of monitoring the performance of conservation plans.
    - If such surveys are not done on a carefully designed schedule they may not give reliable information about population sizes and other demographic trends. This is due to uncertainties associated with population monitoring, such as uncertainty about abundance.

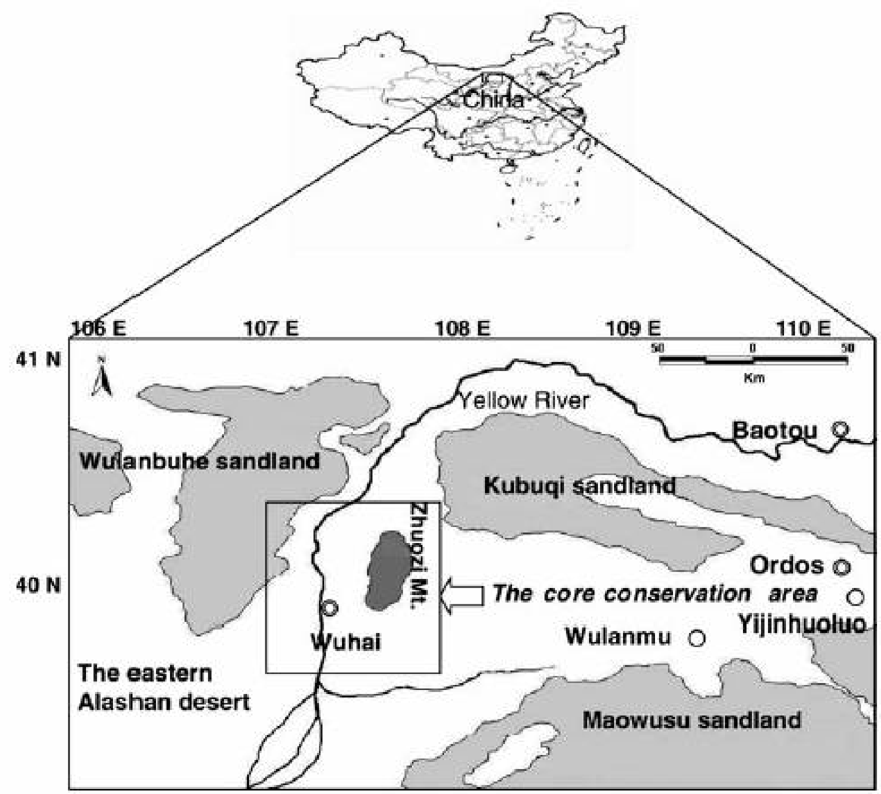
Example 13.3

Western Ordos National Natural Reserve of China (Wang 2005)

The western Ordos plateau is in the semi-arid zone of northern China and has a rich shrub diversity and a large number of relict (isolated, barely persisting) and endemic plant species, some of which may be under threat of extinction (see Figure 13.1). The plateau is also rich in mineral resources and mining activities have been detrimental to local biodiversity. The Western Ordos National Natural Reserve (WONR) was established in 1998 with a core conservation area around the city of Wuhan where most of the relict shrub species occur. However, biologists continued to monitor these species after the designation of the reserve. Two field surveys of relict and threatened shrub species were conducted between 2003 and 2005. Monitoring has revealed that though the creation of the reserve has reduced grazing by cattle and firewood collection, mining activities in the region continue to impact threatened species negatively. These surveys have led to the recommendations of: (1) expanding the reserve to include all habitats of the endemic and threatened shrub species; (2) removing coking (coal) and cement facilities from within the reserve; (3) implementing integrated conservation and economic development plans; (4) enforcing ecological restoration after mining; and (5) introducing more comprehensive population monitoring programs.

Figure 13.3

Location of the Western Ordos Plateau in Central-North China
(Including the Core Conservation Area in the Western Ordos National Natural Reserve and the Five Mining Cities).



- Informal monitoring may also indicate biological and ecological trends.
  - These may provide the first evidence that some biota are at risk of extinction.
    - For instance, informal monitoring gave the first sign that amphibian populations were declining in many disparate regions of the world in the 1980s (Sarkar 1996). Detailed surveys followed later.
    - For some taxa, amateur observers (for birds, butterflies, etc.) and other enthusiasts may be the first to notice trends.
  - However, insight from informal monitoring is likely to be limited to charismatic taxa (e.g., birds, butterflies, etc.) or conspicuous taxa (e.g., large mammals).

  - Informal monitoring may also give an indication of sociopolitical trends.
  - Local knowledge is a form of informal monitoring.
  - Ultimately, informal monitoring cannot be a substitute for scientific monitoring. However, it provides insights that may be used to generate testable hypotheses and more systematic work.

- Indicators of ecosystem health may be of use in many contexts.
  - Trends in these indicators are often monitored by state agencies, particularly in Northern countries, because they are presumed to affect human health and well-being.
    - These may include quality of water (presence of organic and inorganic contaminants).
    - Quality of air can also be used in this way.
    - Regeneration of native vegetation can sometimes be used to infer that animal species have improved viabilities.
    - As in the case of surrogates for biodiversity, single taxonomic groups may sometimes be indicative of general trends—such claims remain largely untested.
  - The use of indicators remains scientifically controversial. However, their use is often unavoidable.
  - Empirical data should always be collected to test the adequacy of indicators. The situation is similar to the use of surrogates for the representation of biodiversity –see **M5: Surrogate Identification and Analysis**.

- Besides ecological features, the state of the sociopolitical climate should also be monitored.
  - Population and consumption trends may indicate whether the level of threat to a conservation area is increasing or decreasing.
    - A variety of economic and medical indicators are available for this purpose (e.g., per capita income, childhood mortality, average lifespan).
    - Technological change should be assessed with respect to how it affects biodiversity.
  - The economic health of the funding sources for conservation action must be monitored.

        - Ideally there should be robust fallback plans to secure funding from other sources if there is uncertainty about the future reliability of a source.
        - Global downturns in economy may negatively affect funds available for environmental protection at all scales.
    - Local and regional attitudes towards biodiversity conservation should also be monitored.
        - Without adequate political and public support no conservation plan will succeed.
        - Indicators for sociopolitical parameters are better understood than biological indicators because the sociopolitical parameters are regularly evaluated in most regions.

- Monitoring is expensive (see **Example 13.2**): this is the main reason why monitoring is not done as much as desirable or possible, particularly at the intensity required for success.
    - Monitoring in the field, just like survey work, requires trained personnel.
    - Ultimately, monitoring should indicate long-term trends. This is almost impossible to achieve in short-term planning periods, necessitating the long-term timeline for effective monitoring.
        - For species, population trends can only be reliably determined from decades of demographic data.
    - However, the increasing availability of remote-sensed data is making some aspects of monitoring both less expensive and requiring less time.
        - Vegetation change, encroachment, etc., can all be assessed from remote-sensed data.
    - There is a trade-off between spending resources in monitoring and spending them to put additional land under conservation plans.
        - If areas important for the representation of biodiversity are highly vulnerable, it makes sense to concentrate resources on acquiring such land rather than monitoring existing conservation areas.
        - However, adequate monitoring and reassessment should always remain an important goal.

- The results of monitoring, done adequately, can be put back into Stage 1 of the systematic conservation planning protocol (see **M2: Systematic Conservation**

Planning Overview) and the entire process reiterated.

- Such an analysis should be global.
- In sharp contrast, almost all monitoring today takes place for individual conservation areas rather than networks.
- Complementarity can be used for monitoring: judging performance of an individual area by what it contributes in addition to the contributions of other areas.
    - Areas become important depending on their contribution to the regional goal, not because of their ability to hold most biodiversity features by themselves.

- Monitoring may demonstrate that a conservation area does not contribute sufficiently to the representation and persistence of biodiversity given the cost (including forgone opportunity cost) of maintaining it.
    - There is a clear case for delisting such areas, that is, removing them from a conservation area network.
    - However, conservation planners must ensure that delisting is accompanied by a tangible legally binding commitment to use the freed up resources to acquire other areas that are valuable for biodiversity representation and persistence.
        - In most contexts political bodies are more willing to delist existing conservation areas than to designate new ones—the former process typically frees up economic resources to be then used for some other purpose.
    - Areas in a conservation area network may be important for criteria other than biodiversity representation and persistence.
        - Sociopolitical criteria (natural beauty, wilderness value, etc.) may dictate that an area be left protected even if its contribution to biodiversity representation and persistence does not warrant it.

- By and large effective protocols for periodic monitoring and reassessment of conservation area networks remain to be formulated in sufficient detail to guide practice in the field.
    - The main reason is that there has not been enough time to assess long-term successes and failures of systematic conservation plans.
    - The most important goal for monitoring protocols is to develop methods that are inexpensive, rapid, and transparent.

- With respect to available human personnel and expertise, what may and may not be achieved in different contexts must be studied more systematically.
- Adequate surrogates for monitoring will have to be found.
  - Ecological indicators (see above) may prove to be good surrogates in many contexts.
  - Such surrogates may even be easier to monitor (that is, less expensive and more rapidly assessed) than surrogates used for biodiversity representation during conservation planning.
  - As always, the adequacy of surrogate sets must be established through empirical tests before they are adopted.
- A large number of detailed case studies must be built up to guide formulation of better monitoring protocols in the future.

Assess Your Knowledge

Systematic Conservation Planning Modules