The ConsNet Portal 1.0

Systematic Conservation Planning Primer

Coastal Wet Forest, Western Ecuador. These forests are along the coastal cordillera of Ecuador west of the Andes. This habitat type is currently poorly protected—see Example 10.2. © 2006 Rodrigo Sierra.

Mangrove Swamps, **Eastern Ecuador.** These swamps are on the ocean and threatened by shrimp farming. This is a priority area identified by Sarkar *et al.* (2004)—see Example 10.2. © 2006 Rodrigo Sierra.

M10: Network Refinement Protocol

Learning Objectives: This module develops a protocol for refining conservation area networks selecte (see M8: Place Prioritization). Learners will draw from what was learned in previous stages and be asl how to utilize these methods in the process of refining a conservation network plan.

- Identifying a candidate (nominal) conservation area network that satisfies biodiversity surrogate r targets (see **M8: Place Prioritization**) is only the beginning of the process of selecting a network implementation in the field.
  - Recall that representation of biodiversity surrogates in a conservation area network is use prognosis for their survival is not good —see **M9: Vulnerability and Persistence Analy**
  - This module will consider how persistence considerations can be taken into account to re prospective conservation area network.
    - Results from the vulnerability assessment (see **M9: Vulnerability and Persister** be crucial.
    - Careful attention must be given to the representation targets that were used and planning because these targets often do not have very good biological justificatic
    - The next stage (see **M11: Multi-Criteria Analysis**) will take up the incorporation criteria.
    - The network refinement protocol can also be implemented at other stages, for ins prioritization (see below).
  - Experts with local knowledge and experience are crucial to the refinement process (see b
- The basic idea is to drop selected areas that either have high vulnerability of the surrogates in the reasons, cannot be put under a conservation plan, and then run place prioritization again without **M8: Place Prioritization**) to ensure adequate representation of the surrogates.
  - If an area itself has high vulnerability, then it should be removed from the conservation ar
    - This means that the prognosis is not good for all surrogates in that area.
  - If only some surrogates at an area have low viability then what must be determined is wh

necessary for the adequate representation of those surrogates (reaching the target level surrogate).

- If these surrogates are adequately represented and are viable in the other areas network, then the area need not be dropped from the network becuase of these problems.
- Throughout the network refinement protocol, "adequate representation" means tl represented at least up to its target level.
- Viability assessments of taxa are difficult to carry out because of the reasons dis **Vulnerability and Persistence Analysis**, such as requirements for large amour demographic data.
- This viability assessment strategy--simultaneous population viability analysis of a species--has apparently so far not been used in any application because of such

- Quite often a stage of site assessment which is equivalent to network refinement is carried out ev place prioritization.
  - Areas with high vulnerability can be dropped even before areas are prioritized to create a conservation area network—see **Example 10.1**.
    - The most obvious situation when this should be done is when some areas are ve anthropogenically transformed (e.g., through urbanization, industrialization, etc.)
    - This process is known as "masking" a site--essentially coding it for non-selection
    - Most software tools for area prioritization (for instance, ResNet) allow such mask
  - However, if the prognosis of individual surrogates must be taken into account, this is a cu option.
    - The viability of surrogates must be estimated for all areas in the planning region, the selected areas.
    - Given how difficult it is to estimate such viabilities (see **M9: Vulnerability and Pe Analysis**) this is extremely cumbersome to achieve in practice.
    - When hundreds of species are used as surrogates, they must all have their viabi practice this is impossible.
    - Additionally, "masking" an area when using individual surrogates is not acceptab surrogates have viable populations within the site. Whether or not the area could the representation of these other surrogates can only be judged from the results prioritization.

Example 10.1

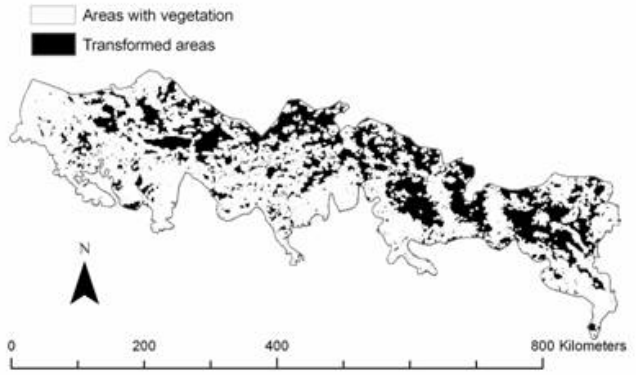
Excluding Anthropogenically Transformed Areas from a Conservation Area Network f the Transvolcanic Belt of Mexico (Fuller et al. 2006)

This example was also discussed in **M9: Vulnerability and Persistence Analysis** —s **Example 9.2**. Fuller et al.'s (2006) identification of priority areas for the Transvolcanic Belt Mexico excluded (or "masked") all anthropogenically transformed sites as candidates either conservation or restoration action—see Figure 10.1.

The region was divided into three types of landscape: those that had primary vegetation relatively intact, those that had secondary vegetation, and those that had neither. The first type was used to identify conservation areas, the second type to identify areas that could potentially be restored. The third type was excluded from the analysis because the prognosis for the persistence of any biota in them was deemed unlikely.

Figure 10.1

Anthropogenically Transformed Areas in the Transvolcar Belt of Central Mexico



These are the areas that were excluded from the analysis "masked" of Fuller et al. (2006) before site prioritizati algorithms were applied. 36 % of the total area was excluded this way.

- Yet another method of dealing with vulnerability is to use features related to vulnerability as criter analysis (MCA) (see **M11: Multi-Criteria Analysis**)—see **Example 10.2**.
  - These features include the human population of an area, its distance from an anthropoge transformed area, the distance to an existing conservation area, etc.

Example 10.2

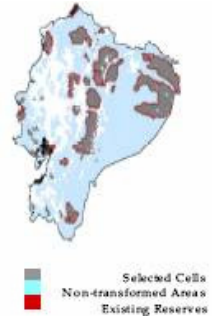
Priority Areas for Ecuador (Sarkar et al. 2004b)

Sarkar et al. (2004b) used 46 vegetation types as biodiversity surrogates to augment t National Reserve System (NRS) of Ecuador to include 10 % of the habitat of each vegetati type. Continental Ecuador (248 750 sq km) was divided into 2 × 2 sq km cells in a grid for t

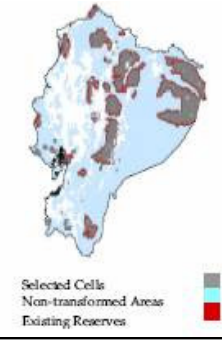
analysis. From 100 different solutions, the best two (Figures 10.2a, b) were selected usi multi-criteria analysis (see **M11: Multi-Criteria Analysis**) using six criteria (1) the aggrega number of conservation areas, which should be minimized to achieve spatial cohesiveness the network; (2) the average area of each conservation area, which should be maximized encourage larger conservation areas; (3) the variance of the areas, which should minimized to discourage further the selection of very small areas; (4) the aggregate distance the selected cells to existing units of the NRS, which should be minimized, again to increa cohesiveness; (5) the aggregate distance to anthropologically transformed areas, whi should be maximized to decrease the threat of habitat destruction; (6) the total area of t selection cells, which should be minimized to decrease the cost of acquisition of the add cells.

Figure 10.2

(a)



(b)



- In addition to refining the network before the place prioritization process, refinement of initially se conservation area networks can be used to mitigate the effect of the targets that were imposed o
  - Recall that these targets often do not have a very firm or strong biological basis—see **M6 Targets and Goals**.
  - Therefore it makes sense to modify conservation area networks in such a way that there robustness with respect to the use of targets.
  - If targets are set as percentages of the total land, or percentages of the habitats of surro targets may change because of land use patterns by humans.
  - This problem can be avoided by carefully refining the initially selected conservation area **Example 10.3**.

Example 10.3

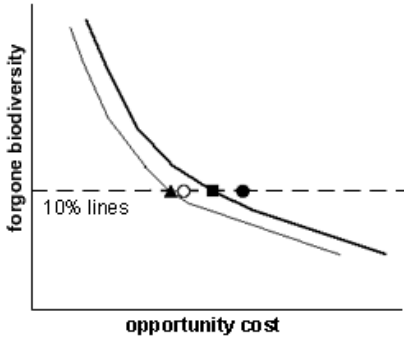
A Conservation Plan for Papua New Guinea (Faith et al. 2001

Faith et al. (2001) used network refinement for the Papua New Guinea region in a nc in that they refined the conservation area network of Papua New Guinea throug representation, rather than the viability of the species. In conventional cases, an a p as 10 % of the habitat (see **M6: Conservation Targets and Goals**), is usually cho biodiversity surrogates.(This example was also used in **M4: Data Compilation, As Treatment** see **Example 4.1**.) In the Papua New Guinea case, Faith et al. (2001) conventional approach to target representation in conservation planning does not main goals of biodiversity representation and persistence. They contended t biodiversity representation and persistence fully, percentage targets should first b assessed with no constraints on biodiversity representation from other criteria. This targets of representation used in the presence of constraints (usually used in the in region) can only emerge after an initial analysis of a region.

For example, if one were to use a target of 10 % of representation in conservatic network, Faith et al. argue that representation should be manifested in a target (or 10% of a total area and/or habitat types without incorporating humans, opportunity history, etc. (things that normally get factored into the standard method of setting t 10.3a, this is indicated by the white circle.This is called the baseline analysis.The ne this initial baseline target (ie. amount/type of surrogates within the initial 10%) in th incorporating humans, opportunity costs, land use history, and existing protected 10.3a, the triangle represents the trade-off curve with only the constraint of cost tak The square represents the trade-off curve with additional constraints including exist areas.Essentially, conservation planning includes the minimizing of opportunity minimization of biodiversity vulnerability.Thus, initializing planning with a baseline constraints) will help to develop a more representative plan for persistence of biodive

Figure 10.3a

Trade-off curves
(Faith et al. 2001)



Each area for the conservation network was depicted in a Resource Mapping Unit (F a grid cell. Using a comparison of the opportunity cost to the complementarity value c complementarity value of a site exceeded the opportunity cost (i.e. timber value/volur then the site could potentially be added to the network.Other such data criteria that

account were: opportunity costs (timber value and agricultural potential); comm
conservation areas Figure 10.3c); masks (land use intensity--high to moderate--a
depicting small site areas which are undesirable); preferences (i.e. low human po
and priority conservation areas (those sites satisfying the criteria of low land
population density, etc. Figure 10.3d). The final map of the conservation network (RM
data criteria taken into account is demonstrated in Figure 10.3e.

Figure 10.3b

Timber Volume Classes

Yellow = highest volume class
Red = second highest class

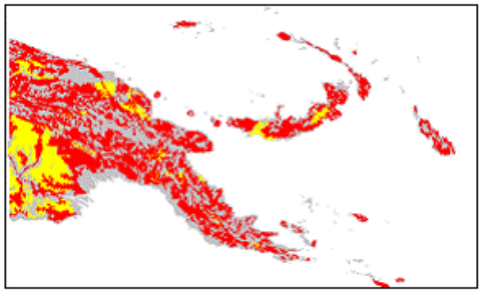


Figure 10.3c

Existing Protected

The areas were modified to fit
changing their shapes in t

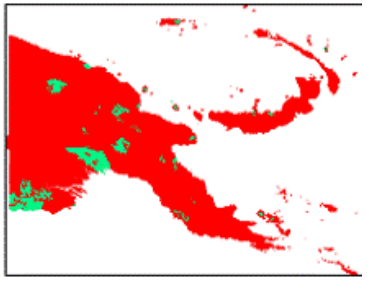


Figure 10.3d

High Priority Areas

The areas were modified to fit the RMU shapes changing their shapes in the process.

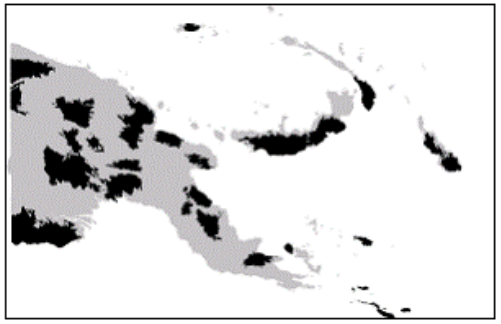
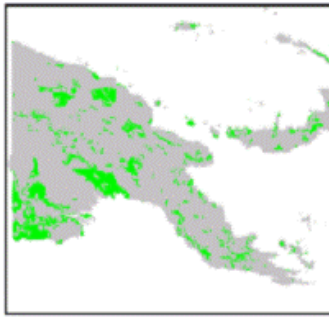


Figure 10.3e

Areas with High Conserv

The areas were modified to fit
changing their shapes in t



- Refinement is also used in some cases to include areas that were not selected in the original con network but are known to be obviously of conservation interest.
  - For instance, there may be biological features that are known to be important but not exp surrogates.

- For migratory birds and flying insects, patches of habitat added to an existing network at (wherever necessary using knowledge of the dispersal patterns and rates of the species) valuable connectivity —see **Example 10.4**.
  - In such cases, anthropogenic transformation of these intervening lands may not deleterious.

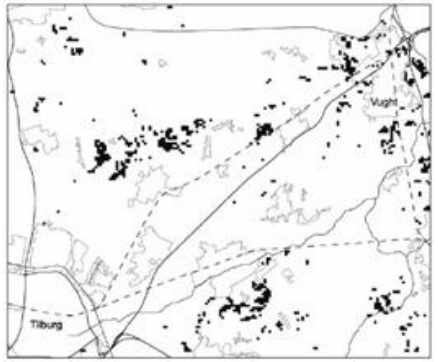
Example 10.4

Stepping Stones and Enlargement of Conservation Areas in the Netherlands (van Langevelde et al. 2002)

In an analysis of an area in the southern Netherlands van Langevelde et al. (2002) used the nuthatch (*Sitta europaea*) as a surrogate for other birds. The choice was made because the nuthatch is an umbrella species for other birds. (Note that this is a controversial choice because umbrella species are often poor surrogates for other species - see **M5: Surrogate Identification and Analysis**). The area included both deciduous woods and farmland. Initial conservation areas were selected on the basis of their suitability for nuthatch habitat and unsuitability for agriculture. These are the areas in black in Figure 10.4a. Stepping stones (or intervening lands) were then added to ensure connectivity between populations in the conservation areas— these are shown in Figure 10.4b. Finally, the areas were all expanded to promote higher viability of all the populations—see Figure 10.4c

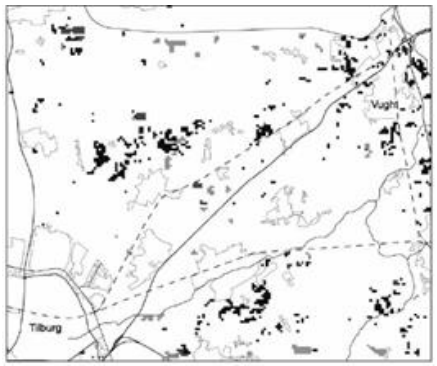
Figure 10.4

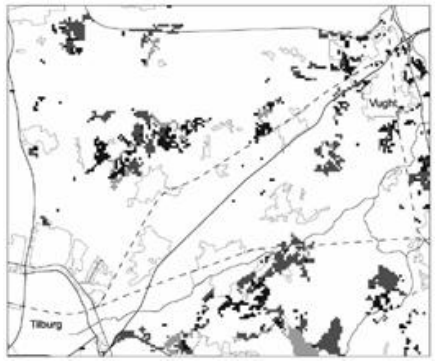
(a)



(b)

(c)





- Refining initial plans often requires the participation of experts with specific knowledge of the plar
  - Computer algorithms may miss important local idiosyncrasies.
  - Refinement is a highly context-dependent process, and knowing the appropriate context with local issues, both biological and sociopolitical issues.
  - The emphasis should always be on the fact that planning protocols are to be used by exp replace experts.

Assess Your Knowledge

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M2: Systematic Conservation Planning Overview
M3: Stakeholder Identification and Involvement
M4: Data Compilation, Assessment, and Treatment
M5: Surrogacy Identification and Analysis
M6: Conservation Targets and Goals
M7: Review Existing Conservation Areas
M8: Place Prioritization
M9: Vulnerability and Persistence Analysis
M10: Network Refinement Protocol
M11: Multiple Criteria Analysis
M12: Implementation of Conservation Plan
M13: Periodic Network Reassessment
M14: Conclusion and Review - Future Directions

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M12: Implementation of Conservation Plan
M13: Periodic Network Reassessment
M14: Conclusion and Review - Future Directions
Module Glossary

Welcome Page