ECORREGIONAL ASSESSMENT EASTERN CORDILLERA REAL ORIENTAL PARAMOS AND MONTANE FORESTS: TERRESTRIAL COMPONENT
EXECUTIVE SUMMARY

Cuesta, F., F. Baquero, A. Ganzenmuller, B. Rivera, M. Sáenz, G. Riofrío, M. L. Larrea, R. Cisneros y K. Beltrán. 2005. Evaluación ecorregional de los páramos y bosques montanos de la Cordillera Real Oriental: componente terrestre. EcoCiencia, The Nature Conservancy.
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Ecoregional Assessments are suites of ecological and socio-political analyses that prioritize and inspire conservation actions through the development of a lasting vision for conservation success. Ecoregional Assessments are the first step in The Nature Conservancy framework for mission success – Conservation by Design – in that they set the biodiversity priorities for which strategies are developed, action is taken, and success is measured. This vision is accomplished by designing a network of priority sites (portfolio) that captures the biological variety of a given region. The planning units of this analysis are the proposed World Wildlife Fund ecoregions. An Ecoregion has been defined as relatively large geographic areas of land and water defined by common climate, vegetation, geology and other ecological patterns. Ecoregions offer a better alternative to political boundaries in capturing ecological variation.

The ecoregional assessment of the "Eastern Cordillera Real Oriental Paramos and montane forests" (CRO) was carried out considering TNC set of standards that define the minimum requirements for a conservation assessment to be scientifically rigorous and effective. The resulting network of conservation areas or portfolio was based on four principles: efficiency, representation, irreplaceability, and functionality. This portfolio vision aspires to propose a common understanding of biodiversity conservation priorities within the Ecoregion.

The Cordillera Real Oriental is part of the Northern Andes bioma; it is an area typified by a mountain ecosystem's landscape, characterized by humid paramos and evergreen mountain forests. These kinds of ecosystems are well known for its high beta-diversity and high degree of endemism. The total area includes 9'236.067 ha, of which 68% are distributed in Ecuador, 21% in Peru and 12% in Colombia.

The ecoregional assessment it's a science based exercise that includes six steps. However, for this assessment only the first four were carried out: (1) Identify conservation targets, (2) Viability and ecological integrity assessment, (3) Establish conservation goals, and (4) Assemble a portfolio of conservation areas. Steps five (setting conservation strategies) and six (measuring success), will be carried out on the future.

1. Conservation targets selection (identification of focal biodiversity)

To represent the biodiversity of the ecoregion we focus on conservation targets, the features for which a conservation plan is attempting to ensure long-term persistence. We chose three types of conservation targets based on the coarse-fine filter concept in order to comprehensively represent the biodiversity of the ecoregion: terrestrial ecosystems, guilds and species.

Twenty-seven terrestrial ecosystems were chosen and eight ecological guilds representing radiation patterns within the Andes and/or ecosystem dynamics. As fine filter targets, 720 species were selected among thousands based on three criteria: level of threat, endemism-rarity, and landscape species.

2. Viability and ecological integrity assessment

The main purpose of this step is to evaluate the ability of conservation targets to persist. For species, we used a habitat-based approach, which allows us to carry out a species viability analysis by means of studying the overall landscape context of the species distribution. Using occurrence data from Museums and Herbarium collections we produced predictive species distribution models. The model output was overlaid with an updated vegetation cover map to produce the specie's current distribution models. The combination of both models outputs provides us the information to generate a Landscape Viability Index (LVI). The LVI measures the degree of fragmentation, connectivity and effective area of the remnant distribution patches.

The LVI analysis was carried out for 69 target species. A LVI coverage was created for each species; the coverage contains an ordinal rank classification, where rank 1 represent the best areas and rank 5 the worst scenario in terms of species viability at a landscape scale.

Of the 69 species analyzed, 80% of the cases show a high proportion of their distribution attached to a LVI rank of 1 or 2, which means the overall context of their distribution shows a high level of viability. On the other hand, four of the 69 species have a higher proportion of their range within LVI ranks 4 and 5; these are highly threatened species regarding its persistence as viable populations within the portfolio from a landscape point of view.

For terrestrial ecosystems we created a landscape integrity index (LII) that measures the overall landscape pattern of its distribution to find out if the remaining fragments are sufficient in size and connectivity to ensure survival and re-colonization from natural or human-caused disturbances.

The LII was analyzed on a landscape scale at two temporal scenarios using the sub-watersheds as the analysis units. The terrestrial ecosystem maps (potential and present) were use as the base information to produce the time scenarios. Of the 74 watersheds present on the ecoregion, 24% of them presented a very high level of integrity. On the other hand 16% of these units are highly threatened due to its high degree of fragmentation and exposure to human impacts.

This information was used in the next two steps in two ways. The species viability coverage helps us to establish the conservation goal more efficiently. The conservation goals were analyzed only for the distribution patches showing LVI ranges between 1 and 3. On the other hand, the output of the terrestrial ecosystems analysis was used as an important factor for the design of the portfolio.

3. Establish conservation goals

Define quantitative goals for the conservation targets allow us to answer to the key question how much area of each target should be conserved for long term persistence?

Conservation goals for species were set based on the following: (1) Distribution range within the ecoregion, (2) Degree of rareness, (3) Percentage of habitat loss, and (4) Fragmentation index.

For ecological systems conservation goals were based on (1) the distribution pattern within the ecoregion (patch, class, matrix), (2) Degree of rareness (3) Percentage of habitat loss, and (4) Fragmentation index

Determining goals is important for several reasons. They allow us to evaluate the effectiveness of a proposed portfolio by asking whether those areas represent the targets at an adequate level for their long-term subsistence. They also have a strong influence on determining how many conservation areas are needed in a planning region and the extent of area within the region that they will occupy.

4. Assemble a network or portfolio of conservation areas

This final step integrates all the information produced in the previous steps by selecting a network of priority sites for biodiversity conservation (portfolio). The rationale behind the portfolio is to ensure that all the biodiversity components of the ecoregion, represented in the conservation targets, are adequate included in the selected sites.

We produced two different portfolios; one for the total extension of the ecoregion, and a second one only for the Ecuadorian portion of the Cordillera. The first one considered the criteria of biodiversity, ecological integrity and species viability; while, the second scenario also included a socio-economic analysis. We were forced to create two different portfolios due to a lack of social descriptors for the Colombian and Peruvian portions of the study area.

The portfolio was designed using a computer-based algorithm to prioritize areas for conservation. The primary advantage of using this type of algorithms is that they allow planners to delineate explicit "rules" to identify a set of conservation areas and to assess alternative portfolios of conservation areas by making changes in these rules.

The algorithm requires dividing the study area into a set of discrete analytical units, which are the basic geographic elements upon which the priority areas are constructed. To generate the units of analysis, the study area was divided in 16.793 hexagons of 600 ha each. The algorithm was implemented using the software SPOT and SITES.

Several scenarios were created using the algorithm. The first scenario that included the whole study area recognized 48 areas all over the cordillera with special emphasis on the paramo and the Andean foothills ecosystems. The areas incorporated on the portfolio represent 42% (3´916.800 ha) of the ecoregion´s surface, of which only 28% is under the national protected area systems. The remaining 72% belong to private land owners, indigenous communities or national forestry reserves.

The most important areas regarding size, diversity and habitat contiguity between countries are the Podocarpus-Nangaritza, the Serranías of Cóndor-Kutukú, Llanganates-Sangay National Parks and the Cayambe-Coca Ecological Reserve.

This first scenario has acceptable results in terms of goals accomplishment; 50% of the conservation goals were met. However looking only at the coarse filter level, 96% of the conservation targets had an appropriate representation within the portfolio; meanwhile at the fine filter scale 32% of the conservation targets achieved the conservation goals.

In the case of the portfolio produced exclusively for the Ecuadorian portion of the ecoregion we created three different scenarios. Each one of them based on slightly different criteria with the aim of combining the 3 scenarios to obtain a portfolio that efficiently meets the conservation goals established for species, systems and highly endangered conservation targets.

The first scenario was created using the same conservation goals as before, and including socio-economic variables. The second one ensures accomplishment of conservation goals for species. The third scenario was built focusing on the conservation targets that needs a conservation goal higher than 35% of its original distribution.

The first scenario includes 3´824.400 ha divided in 21 areas that accounts for the 50% of the study area. The second version of this portfolio includes 23 areas with a high overlap with the areas included on the first scenario. The third case is made up of 23 areas with a slightly different setting. This scenario covers 44% of the Ecuadorian portion of the ecoregion.

As a result of combining the three scenarios a portfolio of 26 priority areas was produced. A high proportion of these 26 areas are redundant for the three scenarios. However, important areas are defined for only one or two of the scenarios. This is quite obvious in the southern portion of the study area; where south of the Paute Girón valley the selected areas are different on each case.

The combination of the three scenes increases significantly the achievement of the conservation goals, especially at the species level. A total of 83% of the conservation goals are met.

5. Conclusions

Biodiversity conservation under this planning scheme should be based on three cornerstones: identification of conservation areas (portfolio), design and implementation of conservation strategies and measuring the impacts of our work under an adaptive management model.

We have several recommendations in order to achieve the objective of having a common vision shared by stakeholders of the region that can ensure biodiversity conservation of the portfolio:

- The information generated on this process should be used by the government (Ministry of the Environment) as a planning tool that can guide the work of different organizations and individuals working on the region.

- The resulting portfolio should be incorporated under the National Strategy of Biodiversity, and should be used as a tool to design priority strategies for the region.

- The information should be used to fulfill country commitments under Convention of Biological Diversity, in special what refers to the Gap Assessment.

- Conservation actions at a local level should be tied to a monitoring system at different scales, including ecoregional scale.

- Regional visions should consider local visions. It is important to emphasize that local actions are critical to ensure conservation impact, and also provide a social sense to conservation activities

- This ecoregional assessment has created a decision support system for conservation and should be used by conservationists to ensure the smartest, most efficient and most scientifically defensible decisions. Data should be regularly updated and conservation measures established to evaluate the impacts of our actions on biodiversity conservation on the future.