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Rapid assessment of biodiversity in Priority Conservation Areas and Corridors in the Alps

Methodological guidelines

WWF

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Executive summary

Standard procedures for the assessment of biodiversity in priority conservation areas (PCAs) in the Alps were identified based on lessons learned in the pilot projects carried out by the WWF European Alpine Programme (EALP), together with WWF Italy and WWF Switzerland. Such standards can be used as guidelines by each National Organization (NO) in assessing biodiversity in their PCAs.

Basically, there are two methodologies for PCA assessments: the expert-based approach and statistical suitability models. The choice of methodology depends mainly on the presence of data.

The expert-based methodology relies principally on expert knowledge. It is the best approach when data is scarce or poor. The methodology can be divided in three main phases. The first phase consists in establishing a group of experts. In the second phase, the experts select important conservation areas for chosen taxa (e.g. mammals, birds, reptiles, etc.). These important conservation areas are mapped and digitalized as taxonomic themes and GIS layers. By overlaying the digitalized maps PCA hotspots can be indentified.

The second assessment method (suitability model) can be implemented when good quality data is available in a significant portion of the area.

In both cases, the result of the analysis is a biodiversity map of the PCA, indicating conservation hotspots that are instrumental in drafting the action plans.

Based in these guidelines, NOs will have the necessary tools to start to prepare action plans and involve third parties. Ideally biodiversity should be analyzed in all PCAs so that WWF may have an exhaustive picture of PCA biodiversity all over the Alps.

The EALP staff will provide NOs with guidance and technical support (especially concerning GIS mapping) to help NOs through the action planning process and the implementation of a comprehensive ambitious conservation strategy.

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PART I

General concepts: setting a minimum standard for the assessment of Alpine Priority Conservation Areas (PCAs)

1 Introduction

The Steering Committee of the European Alpine Programme (EALP), called for a new approach in the assessment of Priority Conservation Areas (PCAs). This new approach is based on the lessons learned in the frame of the pilot project in PCA H1- Laghi Insubrici (formerly Sottoceneri), as well as expert-based activities implemented by the EALP (Gap, 2002) and subsequently by WWF Italy (ecological networks in the Po River plain of Lombardia and Veneto regions, 2007 resp. 2008; and the Alps-Apennines corridor, 2009).

In order to facilitate the work in other PCAs, minimum standard procedures were identified and are described hereunder. These common rules and principles will serve as guidelines for the assessment of conservation values and priority hotspots in all Alpine PCAs (hereunder: PCA assessment). No maximum standard was set, since that would be dependent on the quality and availability of data.

2 Minimum standards for PCA assessment

The first important step is to chose the assessment methodology. Large scale biodiversity assessments rely basically on two different solutions: an **ecological forecasting model**[1] and the **expert based map**[2].

The choice between these two methodologies depends on the availability and quality of data. Table 1 compares the pros and cons of the two options.

For the assessment of PCA H1, both methods were dynamically implemented on the Italian and Swiss side of H1 (Laghi Insubrici, figure 1a, 1b), respectively[3].

In both cases, the results are drawn on maps and digitalized using GIS. Maps are essential tools that facilitate the PCA assessment.

1 Burnham & Anderson, (2002), Carrol et al. (1999), Elith et al. (2006), Trivellini et al. (2007)
2 Bogliani et al. (2006)
3 For a full presentation of the methodology used in Area H1 see the Technical Report (EALP, 2010)

Table 1 – Comparison between different methodologies of PCAs assessment

Ecological modelling	**The expert based approach (and participatory tools)**
Needs very good and detailed data sources	Allows the use of a synthesis knowledge
The method is objective	Subjective and dependent on the expert quality and **number** involved experts
The model should be tested	Experts 'peer-review' each other, but gap analyses are still necessary
It can be locally even more precise than requested	Resolution depends on the scale of work
It always needs common sense for correct interpretation of results	It always needs common sense for correct interpretation of information by different experts
Conclusions:	
If the **best** data sources and databases are available, this methodology can be preferred	At large scale datasets and checklists often lack. In such situations the expert based approach could be the most suitable choice

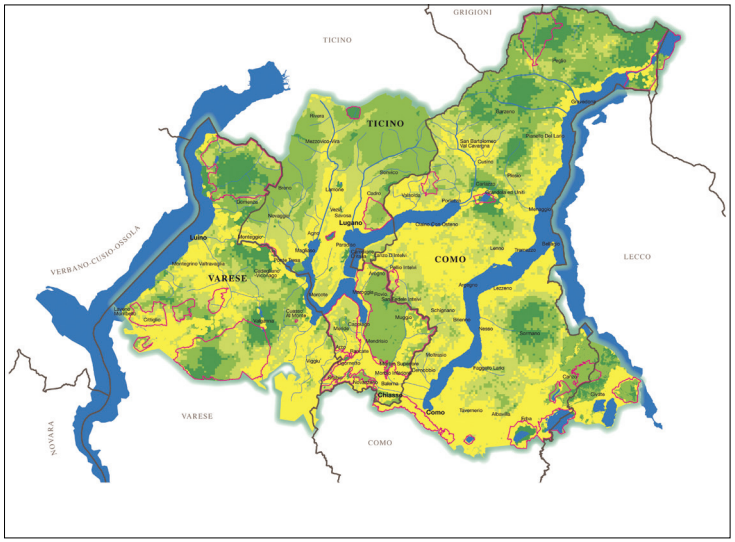

Figure 1a – PCA H1: final map on the Italian side Laghi Insubrici (hotspots of Species richness)

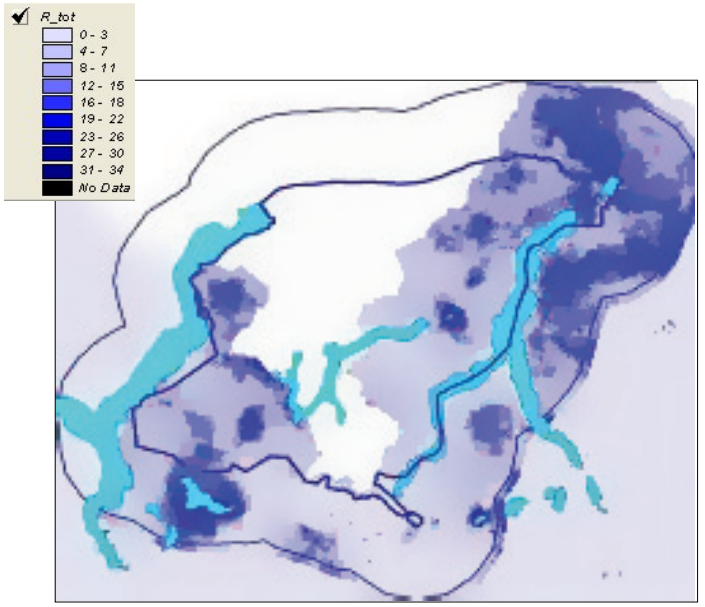

Figure 1b – PCA H1: ecological model on the Italian side Laghi Insubrici (hotspots of Species richness)

Based on effort-results ratio in previous experiences, the **best solution is probably the expert-based ecoregional methodology** which relies on the contribution of the scientific community.

The expert-based methodology is described in detail in part II.

3 Presence of protected areas (minimum standard for the assessment)

If a PCA overlaps significantly with protected areas (PA), data collection is facilitated. If at least 65% of the PCA lies in one or more PAs, the assessment methodology can be simplified. The most useful activity in the simplified procedure is the establishment of a good relationship with PA staff and experts. The portion of the PCA not included in the PA can be assessed starting from the PA itself, by considering the rest of the PCA as a buffer area of the PA. Interviews can be carried out with PA staff and other experts on, for example, population dynamics of focal species, connectivity problems and other major issues, to understand what kind of additional work could be useful to the protected area.

Even in this special case, a map indicating hotspots within the PCA must be elaborated and all further information about the quality of the PA management, conservation values/problems, connectivity, and focal species present in the area must be made available to the EALP.

4 Responsibilities of the National Organizations (NOs)

In principle all 24 PCAs need to be assessed. NOs have the lead in assessing biodiversity in PCAs while the EALP will provide assistance and guidance. Amongst other things, NOs will have to set up a working group to carry out the assessment and involve a GIS expert to map the results. The Core Team and Biodiversity Officer will monitor ongoing activities and provide support whenever requested. If requested, the Biodiversity Officer can provide support in drafting the maps.

Ideally, at least two PCAs in two years should be assessed by each NO, although this goal will have to be confirmed once work has started in at least one PCA per NO. Parallel and combined activities in different NOs will be a major achievement for the entire EALP.

First and foremost, each NO will notify the EALP on the deadlines listed here under:

1) Choice of the first PCA the NO will work on;
2) Start of the work on selected PCA;
3) Presentation of an A0 map with land use and previously communicated layers, scale ranging between 1:100.000 and 1:250.000 depending on area size. **Critical point is the necessary data collection at local scale**;
4) Choice of methodology for the assessment of biodiversity values of the first PCA;
5) Presentation of socio-economic assessment[4].

Please note: this refers only to the timetables. Each NO will have to provide the EALP with a timetable and a timeline with the activities planned for the subsequent two-year period.

Modified and approved:

Vienna programme EALP Conference, December 2009
Zurich EALP Steering Committee meeting, March 2010
Bellinzona EALP programme Conference, May 2010

4 The proposed methodology is based on the reconnaissance phases elaborated by WWF Italy for the area U and A (Documents by Chiara Pirovano and Nicoletta Toniutti – 2008).

PART II

Identifying hotspots within Priority Conservation Areas

1 Introduction

As already mentioned above, there are two main types of biodiversity assessment methodologies. The first method relies on an expert-based approach, whereas the second one is based on an ecological modelling approach. For the lake region between Italy and Switzerland both methods were used. On the Italian side, the natural values of the PCA H1 were assessed by implementing the ecological modelling method, whereas the assessment in the Swiss part was based on expert knowledge and available inventories.

Although the analysis based on ecological models provided good results, this method requires high-quality data in a significant portion of the area and the assistance of experts. Given this, the expert-based approach proposed here has generally the worse efforts/results ratio, since it implies the collaboration of a greater number of scientists and experts.

The expert-based procedure here described corresponds to the method elaborated by WWF International[5] for the identification of the PCAs and previously utilised in Gap (2002) for the biodiversity assessment at the ecoregional level[6]. It is however important to say that the method is even more convenient and precise for an average-size PCA than for an ecoregion or the entire Alpine arc. This methodology was consequently chosen for the biodiversity assessment of PCAs during the WWF EALP workshop in Gap (2002) and further improved through the experiences gained at the regional level by WWF Italy, where the resulting maps reach the precision of a scale of 1:25.000. The ecological networks of the Lombardia and Veneto regions in Italy, which comprehend almost 2/3 of the total Po River plain in Northern Italy, as well as the external macro-corridor between the Alps and the Apennines, have been identified successfully applying this methodology .

The expert-based method has three main phases:

1) Creation of an expert working group
2) Identification of focal species
3) Identification of important conservation areas within the PCA based on a set of focal species as a tool to identify PCA hotspots.

5 Dinerstein et al. (2000)
6 Arduino et al. (2006)

2 Involving the scientific community

Identifying and **involving a good and productive working group is a prerequisite of the assessment procedure,** since results depend mainly on the knowledge and interaction of the experts. The time spent in identifying and involving the experts will most probably be more than what is spent in assessing the biodiversity itself.

Involved scientists will form expert-based break-out groups (5-10 persons per table) that will map important conservation areas for specific categories within the PCA (figure 2).

The categories are typically taxonomic groups that mainly represent: **1) vascular flora and vegetation, 2) invertebrates, 3) freshwater communities, 4) amphibians and reptiles, 5) birds, 6) mammals.** *Fungi* (mycetes), *bryophytes* (non-vascular land plants) and lichens and also "important ecological processes" have also been selected in some cases as further categories, as for example in Lombardy. The last group was avoided in later experiences, due to the fact that it is not compatible with the other categories.

When indentifying possible participants, these aspects must be considered:

- Experts
  The experts will typically be scientists associated to universities, public administrations, scientific foundations, museums as well as to private or public technical offices. The support of experts from public administrations is especially beneficial during the lobbying work, facilitating communication with decision makers and possibly the development of conservation policies.

- The experts' knowledge
  The experts must have a good general knowledge of at least a part of the area. Having a specific knowledge of a specific taxon or a specific geographical area with no good general knowledge of the area is suboptimal.

- Working climate
  A pleasant working climate is a prerequisite for obtaining good results. Potential rivalries may arise during the working hours that could result in a slowing down of the working progress. It is therefore essential that the NOs act as coordinators and intermediaries for the working group to create a productive climate.

- Group leader
  The key informant acts as group coordinator and intermediate, assisting therefore the work of the NOs. The leader must therefore be a good team-player and have, in addition to her/his expertise, excellent facilitator and personal skills.

- Group size
  A small group will lead to poorer results than a large group. A large group of scientists with good knowledge will guarantee peer control thus reducing subjectivity.

- Remuneration
  The choice of a symbolic remuneration lies within the responsibility of each NO. Costs and logistics during the workshop should be however provided by all NOs.

Figure 2 – Experts of one taxonomic group discuss before drawing on the map (ecological network of the Po Plain, Regione Lombardia). Photo G. Bogliani

3 Biodiversity assessment

The assessment consists in drawing and digitalizing areas that experts consider **important** for given (focal) conservation targets. The overlay of category-specific important areas digitalized as GIS layers results in hotspots. The hotspots will become targets for the development of a conservation action plan. Annex III shows a simplified schematic overview of the GIS process for better undestanding.

Each working table will need to have at least two maps to work[7] on:

1. A geo-referenced full 'data map' with protection (e.g. existence of protected areas) or ecological (altitude, habitat and land cover) information.

2. A "blank GIS map" with only minimal data representing the main geographical elements (boundaries, names, water bodies, etc.) and a few habitat-fragmentation variables (urbanised areas and highways, railroads, etc.). The blank map will be used to manually draw category-specific important areas.

7 Both the 'data map' and the 'blank map' should be adapted to each taxonomic group. For example, the freshwater map will contain more information on water bodies, while another group could choose to emphasize on other habitat variables.

3.1 Identification of focal species

Focal elements are species, habitats and ecological processes that are ideal indicators for the conservation of the entire ecosystem in a given area.

In the assessment process, the working group used mainly focal species but other elements (e.g. freshwater habitats) were integrated to determine PCA hotspots. Focal elements are therefore are means to an end. Experts need concrete targets to focus on since they cannot draw maps for all species found in the area. Thus, experts need to choose representative species for each selected category (normally a category represents a taxon). For each category *(taxon)* a list of suitable criteria will be defined and applied to the widest possible list of species belonging to such group/taxon. The species that cover the widest possible criteria spectrum will be selected as focal species. This procedure will be carried out for each category/taxon, resulting in a set of focal species for each category/taxonomic group.

If the categories represent habitats, not species, a list of focal habitats will have to be selected. In the "invertebrate" taxonomic group, the focal species will represent habitats anyway, because the conservation targets in such taxon will likely be un-mapped communities, not specific species, associated to habitats. A species is not selected as focal based only on its conservation status (e.g. endangered or rare). If a common species depends on a particular ecological process in the area (e.g. migration trough the PCA), it would be a good indicator for the conservation of the area (bio-indicatory behaviour) and therefore should be chosen as focal, even though it is neither rare nor endangered. Table 2 indicates typical criteria used to select focal species; table 3 lists a set of focal species with their relative criteria for the taxon "Amphibians" in The Po River Plain assessment (2007).

Table 2 – Criteria useful to select focal species

Habitat criteria
1. Dependence on large areas to mantain viable populations/ wide-ranging 2. Area sensitive/specalized habitat requirements (e.g. relying on pristine habitat) 3. Dependence on rare, wirely dispersed habitat
Life history criteria
4. Limited dispersal ability 5. Seasonal/daily popilation concentration 6. Large body or largest member of feeding guild 7. Reproductive specialization/low reproducity or fecundity 8. Specialized dietary requirements 9. Climatic sensitive
Other criteria
10. No invasive species 11. Major life history traits and ditribution data should be know about the species (e.g. area requirements)

Table 3 - Set of focal species for the "Amphibians" *taxon* used for the assessment of the Po river plain ecoregion

Species	Motivations
Pelobates fuscus insubricus	Rare, localized, endemic, Annex II* EU Habitat Directive
Rana latastei	Endemic, Annex II EU Habitat Directive, IUCN
Rana italica	Endemic, common in well preserved Apennine suitable habitatsy
Bufo bufo	Common and widespread, migration between wintering and breeding sites
Triturus carnifex	Annex II EU Habitat Directive, linked to the last remnants of standing waters habitats in the Padana Plain
Salamandrina perspicillata	Endemic, Annex II UU Habitat Directive

3.2 Drawing important areas for the set of focal species

Figure 3 – Experts draw important areas for focal species for a given *taxon* (Ecological network of Veneto region, Northern Italy). Photo A. Agapito Ludovici

Considering the previously selected focal species, each break-out group will manually draw on a map the areas that are fundamental for the viability of a given species[8] (figure 3). Through this process experts will acquire a map for each taxonomic group indicating the conservation-important areas of the corresponding focal species.

8 Generally this is unpublished information. Thus, this part of the process highly depends on the knowledge of experts participating in the workshop.

The resulting map will be digitalized. The areas will be dissolved[9] (figure 4 f) in order to create important areas for the whole taxonomic group, without differentiation among the important areas of each single focal species (figu re 4 a-f). This means that all mapped areas of a category will have the same value, independently from the number of species represented in the areas.

This procedure will be repeated for each taxonomic group, resulting in a series of GIS taxonomic themes that all have the same weight.

3.3 Identification of hotspots within a PCA (overlay phase)

The hotspots within the PCA areas will be selected by overlaying GIS taxonomic themes.

By overlaying the different taxonomic themes the resulting layer will come to represent a given number of overlapping important areas: e.g. one GIS layer will show the areas where at least two taxonomic groups overlap.

The working group will decide through a participatory process in a plenary session how many themes will need to be overlapped. The decision depends on the selection of a specific conservation goal. For example, if the goal is to guarantee connectivity within the PCA, than the number of layers must be chosen in order to ensure such connectivity.

Remember that "if everything is a priority, nothing is a priority". It will be necessary to choose the number of overlapping themesa selecting something and neglecting something else. The hotspots inside the PCA will become conservation targets at the management (ground) scale.

9 See Annex VI: GIS technical notes

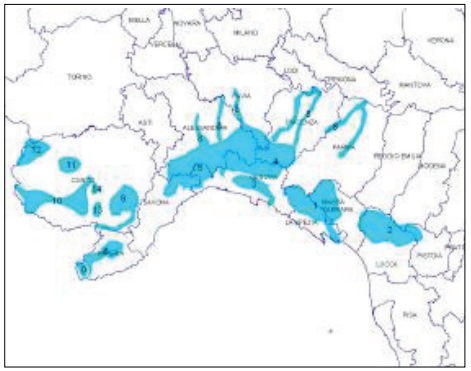

Figure 4 a – Freshwater

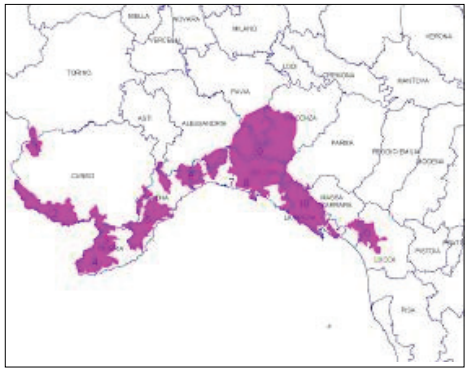

Figure 4 b – Herpeto-fauna

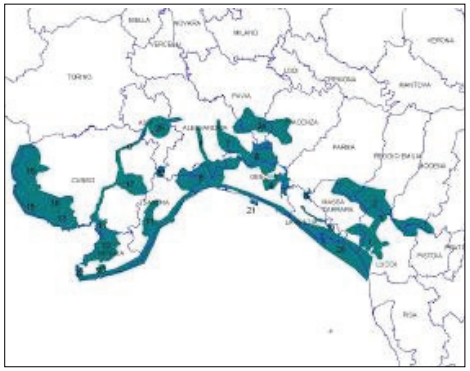

Figure 4 c – Birds

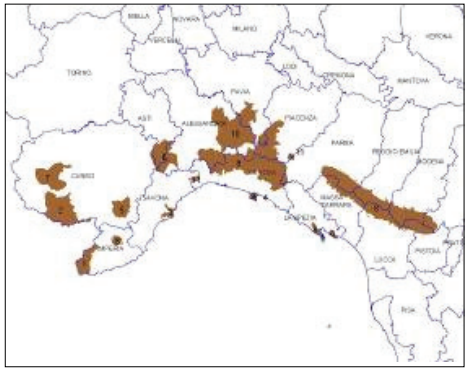

Figure 4 d – Flora and Vegetation

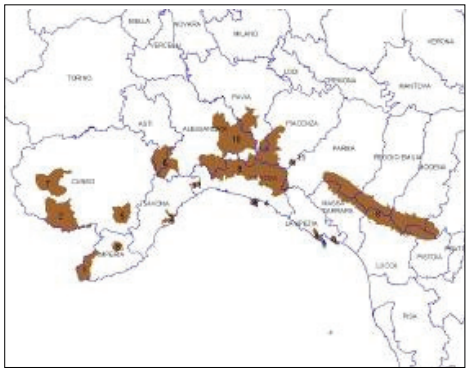

Figure 4 e – Invertebrates

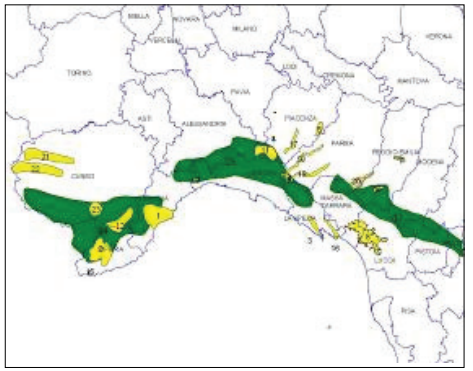

Figure 4 f – Mammals (wolf and other mammals)

Figure 4 a, b, c, d, e, f – Examples of important areas in the process of identification of the external macro-corridor Alps-Appennine. All layers and colours have the value of 1 (one) when dissolved. In the case of mammals, (fig. f), important conservation areas are shown before dissolving the theme and it is explicative of the drawing methodology. The final mammal level will however not be more than 1.

Figure 5 a – GIS layer showing the overlap of at least 6 taxonomic themes

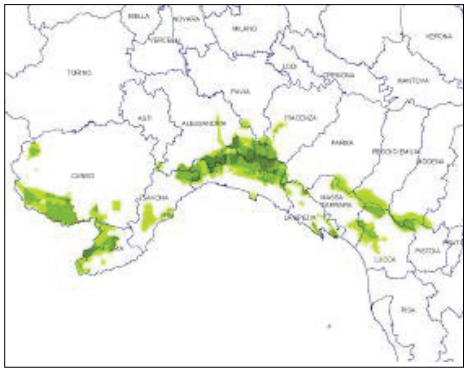

Figure 5 b – GIS layer showing the overlap of at least 5 taxonomic themes

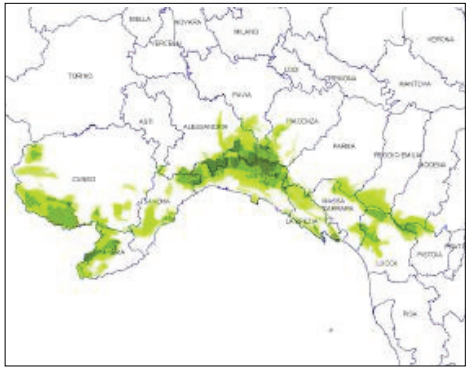

Figure 5 c – Overlapping areas of at least 4 GIS-layers

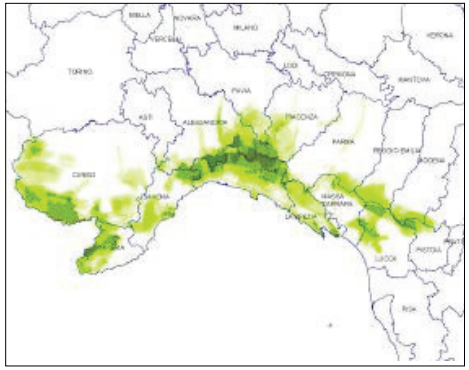

Figure 5 d – Overlapping areas of at least 3 GIS-layers

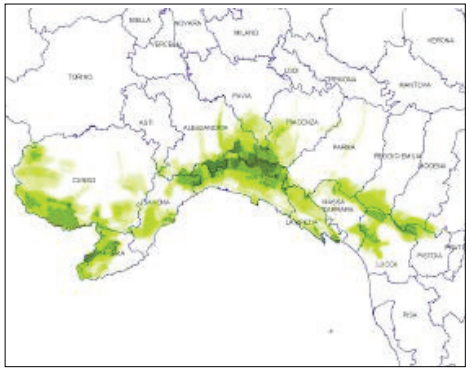

Figure 5 e – Overlapping areas of at least 2 GIS-layers

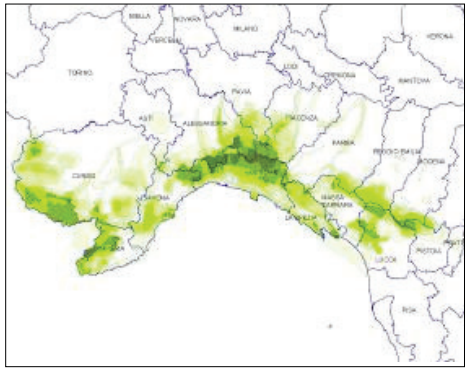

Figure 5 f – Overlapping areas of at least 1 GIS-layer

Figure 5 a, b, c, d, e, f – Overlap of important areas to build different levels of priority conservation areas

3.4 Ecological corridors

Ecological corridors both between and within PCAs (inter- and intra-PCA corridors) are essential for the population viability and therefore a preliminary identification of corridors at a large scale is useful. This preliminary identification will have to be validated on the field by local experts during the implementation of the action plan.

The methodology used to identify the corridors can be proposed directly by the NO and subsequently approved by the EALP.

In order to assess ecological corridors, the EALP can provide basic GIS maps indicating potential corridor areas based on a methodology described in Annex V. Based on these maps, the experts of the working group will have to validate or adapt the corridors and include them in the final maps of the PCA assessment. The same procedure will be used to map corridors between PCAs. This will be done by designing a base-map of neighbouring PCAs, where the study area will be the area among the PCAs and not inside one of them.

3.5 GIS Data

As already mentioned above, the EALP will provide NOs with a first dataset, which describes the main geography, habitats and fragmentation aspects of the PCA (table 4).

The results of the assessment must be mapped so that the biodiversity picture becomes immediately visible and geographic priorities can be made.

Table 4 – Example of GIS layers necessary to start the PCA assessment

Shapefile	Description	Type
1	Perimeter of the PCA	Polygon
2	Lakes, main water areas	Polygon
3	Rivers (large and small)	Line
4	Protected areas	Polygon
5	SCI (Natura 2000, dir. Habitat)	Polygon
6	SPA (Natura 2000, dir. Birds)	Polygon
7	municipalities (Nation x, y, z)	Polygon
8	National boundaries	Polygon
9	Regional boundaries	Polygon
10	Provincial boundaries	Polygon
11	Railroads	Polygon
12	Highways	Line
13	Main roads	Polygon
14	**Urbanised areas**	Polygon
15	**Corine land cover (Land use and habitats)**	Line
16	Local major infrastructures	Polygon
17	Aerial photographs if available)	Raster
18	ANY OTHER KIND OF DATA CONSIDERED USEFUL	Any

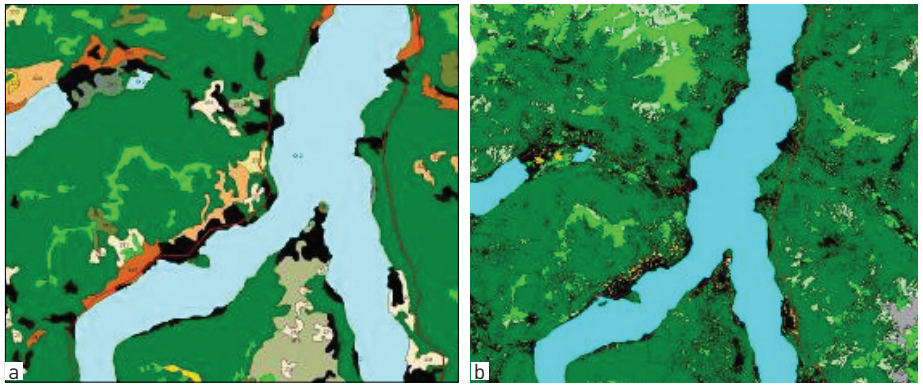

Figure 6 – Differences in the quality of data used to draft a base map can lead to differences in the quality of the assessment. a: corine land cover (European Union); b: DUSAF (regione Lombardia).

On request, the EALP can provide support in drafting the first maps, provided NOs collaborate in the data collection at the local scale (national, regional, provincial offices).

Some general data are available from websites[10] but working at PCA scale (= sub-regional scale) implies higher resolution data. For example, the level of map detail in Province of Como (Italy) has different resolutions when downloaded from the EU website than when purchased from the province administration. PCA maps will need to have the highest possible resolution (figure 6). In any case, all data sources will need to be available with sufficient advance prior to the workshop[11].

10 Websites in the EU: http://www.eea.europa.eu/data-and-maps/figures/corine-land-cover-2000-by-country and http://www.eea.europa.eu/data-and-maps/data#c5=all&b_start=0&c9=vector%2520data

11 Habitat and land-use data in Switzerland is mainly downloadable (http://liber-maps.kb.nl/articles/1zaugg.htm) for a fee. This problem must be solved by WWF Switzerland, possibly in collaboration with other organisations that already have access to GIS data for habitats and land-use.

Conclusions

Following the decisions made by the SC of the EALP and the lessons learned by the EALP and some NOs, minimum standard procedures for the assessment of biodiversity in PCAs were selected and are described in this document. No maximum standard was set, since the level of work is related to the quality and availability of data.

Based on the situation on the ground, and on the availability and quality of data, a choice must be made between two different methodologies: the expert-based approach or the statistical model. In those PCAs where a large portion of the territory is included in one or more protected areas, data collection is facilitated and, therefore, the assessment can be limited to unmapped areas outside the protected areas.

In all cases the final goal is to have a map of biodiversity in PCAs, with the intent of identifying PCA hotspots. NOs are called upon to indicate when and where they will be implementing their PCA biodiversity assessment and by which methodology.

The use of GIS mapping is a crucial tool, as it allows to turn the information into layers that can be turned on and off. These maps are instrumental in drafting the PCA action plan, namely the conservation objectives. Actions, conducive to PCA objectives, will be then shared in a participatory process, with local stakeholders and other actors.

The idea behind this document is to incrementally enhance the number of PCAs where biodiversity has been assessed. Ideally, all PCAs should be assessed in the medium term so that WWF may have a complete and exhaustive picture of PCA biodiversity all over the Alps. Additionally NOs will have the necessary tools to prepare action plans and to involve third parties.

The EALP staff will provide NOs with guidance and technical support (especially concerning GIS mapping and modelling) but it is in the NOs responsibility to start and see the process through.

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Acknowledgments

This paper tries to explain, circulate and standardize already implemented methodologies. We especially tried to report personal experiences we made while facing typical problems which can be encountered during the implementation of this kind of work. Experience comes from previous works shared with friends and colleagues in WWF Italy and other organisations or universities.

For this reason we'd like to thank Serena Arduino, Giuseppe Bogliani (University of Pavia), Mattia Brambilla, Valentina Bergero, Fabio Casale, Riccardo Falco, (Fondazione Lombardia per l'ambiente), Damiano G. Preatoni (University of Insubria) and Paolo Siccardi (Cariplo bank Foundation).

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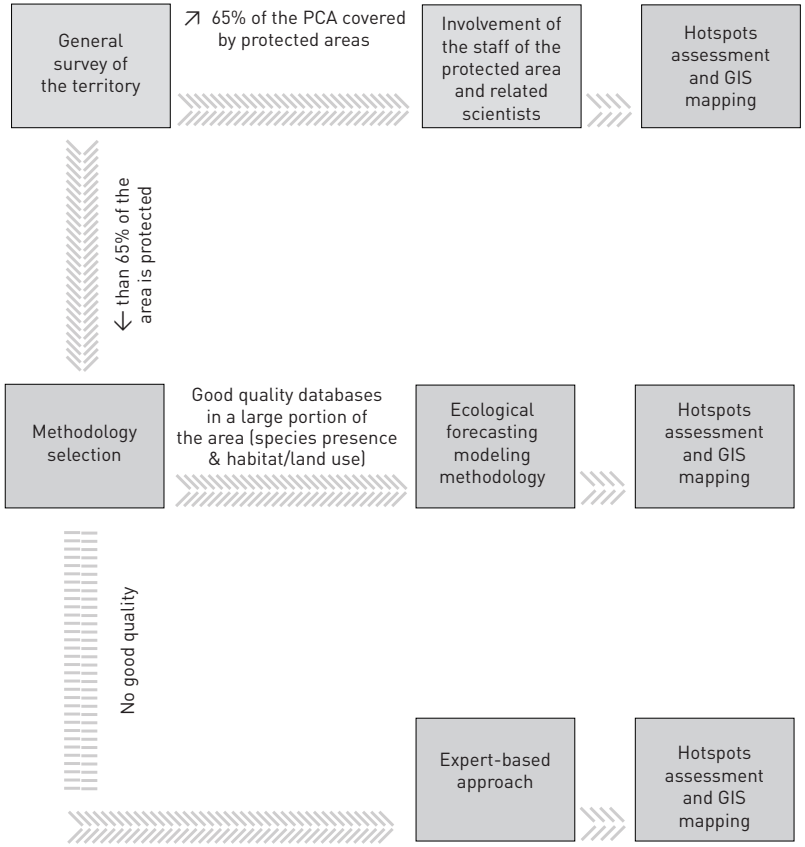
List of abbreviations

PCA – Priority Conservation Areas
PA – Protected Areas
NO – WWF National Organisations
GIS – Geographic Information System, mapping software

Annexes

Annex I - Choosing a methodology for PCA assessment: flow chart



Annex II - Flow chart of ecological forecasting model as applied in H1 PCA (WWF EALP & University of Insubria, 2007)

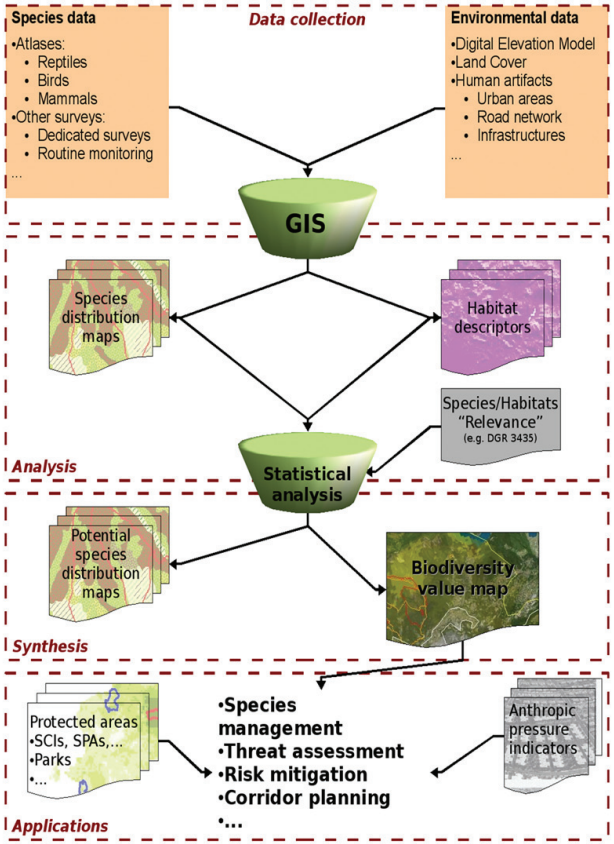
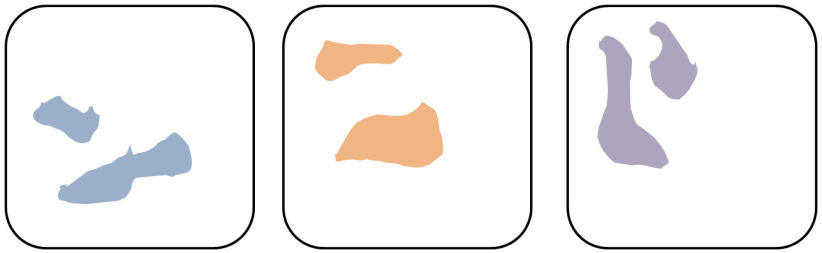


Figure 7 – Logical scheme for an ecological forecasting model

Annex III - Schematic overview of the GIS layering process with the example of focal species

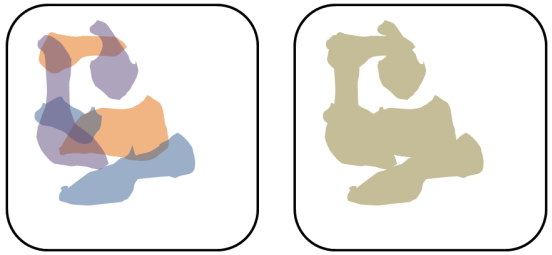
A Important conservation areas for focal species of a taxonomic group in a given area



Species 1 | Species 2 | Species 3

Important conservation areas are drawn and digitalised using GIS for each chosen focal species of a taxonomic group in a given areas (PCA).

B Dissolving conservation areas of focal species of a taxonomic group in a given area



Overlay of important conservation areas for a set of focal species of a taxonomic group

Dissolving important conservation areas for the set of focal species of a taxa: a taxonomic theme

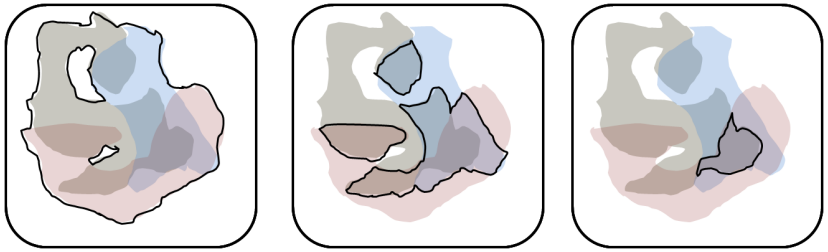
The three GIS layers showing the important conservation areas of the set of considered focal species (species 1, species 2 and species 3) are dissolved to obtain important conservation areas of the whol taxonomic group.

C Creation of taxonomic themes for chosen categories in a given area

Taxonomic theme 1 | Taxonomic theme 2 | Taxonomic theme 3

The same process is repeated for each set of focal species of each taxonomic group, obtaining thereby a series of taxonomic themes (theme 1, theme 2 and theme 3 in the example)

D Identification of important hotspot in a given area in a given area



GIS layer showing the overlapping area of at least 1 taxonomic theme

GIS layer showing the overlapping area of at least 2 taxonomic themes (theme 1 x theme 2; theme 2 x theme 3; theme 3 x theme 1; or theme 1x theme 2 x theme 3)

GIS layer showing the overlapping areas of at least 3 taxonomic themes (theme 1 x theme 2 x theme 3)

By overlaying all resulting taxonomic themes, the experts can create GIS layers that show areas with different degrees of overlap. The GIS layer for example showing the overlpapping areas of at least 3 taxonomic themes will show the area that is in common to all three taxonomic groups.

Annex IV - Tools for the expert based approach

A) National staff and experts in working groups

One NO staff should coordinate the activities of the working group and at least one WWF person should participate in each working-table.

A major key informant from the scientific community should be involved as co-coordinator.

B) Financial resources

A two days participatory workshop is foreseen in a place able to host A two-day 50-60 person workshop has to be organized. Paying the expert is not mandatory but it can help involve and motivate experts.

The choice of location will be based on the need to minimize travel/ accommodation costs. External partners can take up some of the costs (e.g.: catering costs)

GIS experts could be WWF staff or hired for the occasion. From our experience the needed financial resources amount to less than a € 2000.

C) GIS software

ESRI: *Arc GIS, Arc view, map info*

OPEN SOURCE: *Quantum GIS, GV SIG*

Download for free QGIS at **www.qgis.org** and GV SIG at **www.gvsig.org**

Annex V - Elaboration of basic GIS maps for the identification of ecological corridors

The basic external corridor map is developed by **(I) removing unsuitable habitats (both natural and anthropogenic) from the Corine land cover, (II) exporting selected parts (suitable habitats) and (III) exporting them in Google earth for a first check.**

"Yes" areas will be selected and "no" areas will be removed based on habitat quality and suitability. The gap analysis of the areas selected as 3rd and 4th level with main roads and highways will allow to outline the most important fragmentation area and to understand where to look for a potential corridor.

These rapidly identified corridors will not be species-specific. Here they have the generic meaning of a still pristine or less anthropised area. General rules were followed in order to define suitable and unsuitable habitats, namely:

1. Forty-one corine habitat and land use classes have been reclassified as 1 (lowest)-2-3-4 (highest) level of quality.
2. Only 3 and 4 level classes have considered as a first suitable base. 1-2-levels have included urban areas plus relative buffers (differential, according to the altitude), intensive agriculture, but also glaciers.
3. Altitude above 2700 meters have been considered suitable only for particularly adapted species, not for most of the biodiversity. Thus those areas are not proposed as generic corridors and they have been removed from the suitable areas to develop generic corridors.
4. Slopes → than 50° will be calculated by the DTM (Digital elevation model) and not considered suitable for some fauna. Thus, areas at lower altitudes than 2700 with a slope degree of → than 50° have been removed too.
5. Corridors hypotheses will be drawn on NO request, after receiving the list and timetable of the PCA work from the NOs.

This pan-alpine GIS methodology will not be able to give back reliable corridors. Thus, corridors will have to be drawn anyway in the PCA assessment, with the same participatory method used for the PCA.

Annex VI - GIS Notes

1) Database

Ensure that all important drawn areas are listed in a database with a registration number and the reasons why they were chosen. After digitalising the drawn areas, all meta-data will be listed in the database and linked to the shapefile (values and threats).

2) Dissolving features

The final layer at *taxon* level (e.g.:" important areas for mammals") will be dissolved in GIS environment starting from n single areas drawn for different reasons. "Dissolving" means that if the *taxon* layer is composed by different polygon features drawn on the map and linked to different database lines in the same GIS theme, a peculiar GIS tool allows to dissolve all the themes to a unique database line. This is extremely important to avoid counting more times the *taxon* value with overlapping sub-polygons linked to different focal species. The value of the layer of a *taxon* should be the same everywhere, regardless of the number of focal species in the *taxon* layer

3) The GIS overlay process

In Arc view 3.2 (ESRI) the overlay process will be enabled by using the "Union polygon theme" button from the "X tools" extension menu. A first box will request selecting the theme to be united to another one and a second box will ask in which field the value of the first layer has been listed.

All this will be repeated for the second theme to be united to the first. The first intermediate result will be a new shapefile with a numeric field corresponding to the sum of the two layers (0+0=0, 1+0=1, 0+1=1, and 1+1=2). Repeat the operation between the new layer and the third, then with the new result you will get, with the fourth..., then again with the fifth and the sixth... until all the taxonomic layers will be summarized in the field "value". More details on the procedure can be given by the biodiversity officer.

The final layer will be composed by polygon features with a value between 1 and 6. Colour the shapefile with the option "graduated colour" according to the field "value" and you will get a map where a darker colour corresponds to the areas with the highest level of overlap among the important areas previously drawn by experts during the workshop.

Build a power point file and compare the images with different levels of priority. It will be very useful to see different maps corresponding to different levels of overlap and priority.

photo: M. Trentin

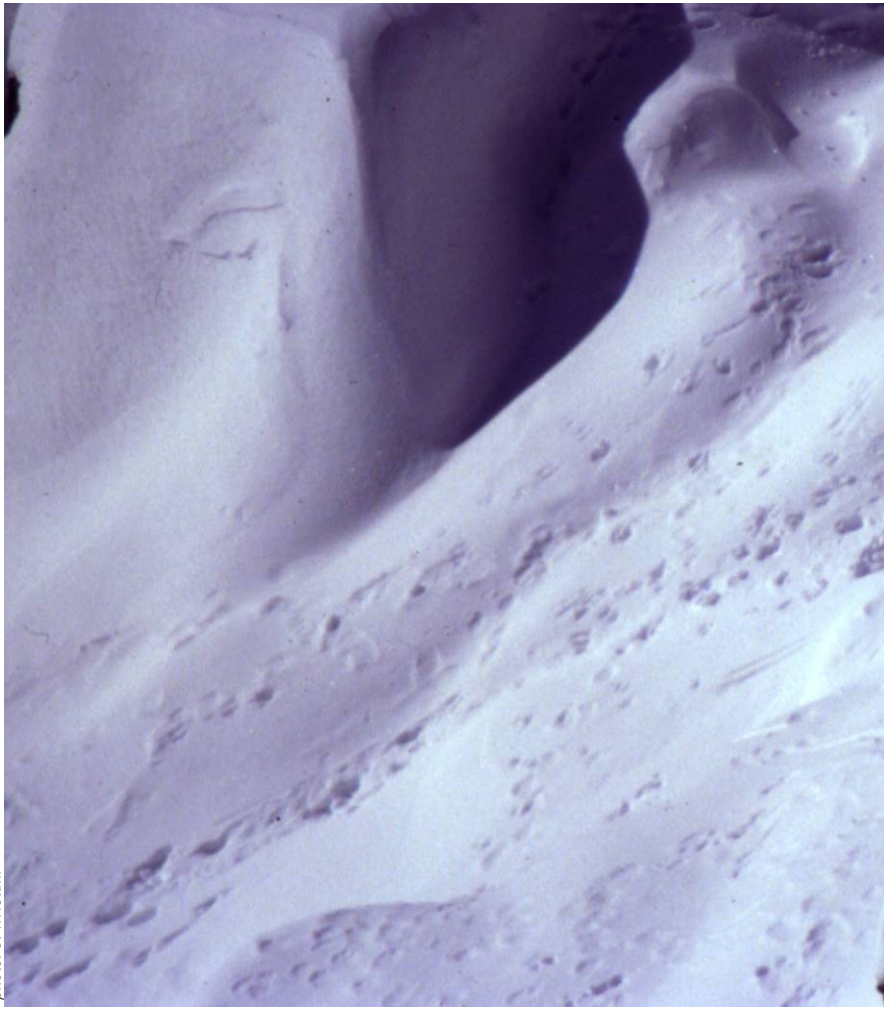


photo: G. Trivellini

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