Compilation and Categorisation of Species Conservation Planning Tools:

The CBSG Abruzzi Workshop Final Report

Abruzzi National Park, Italy

31 May – 3 June 2010

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A contribution of the IUCN/SSC Conservation Breeding Specialist Group

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This document reports progress to date on work that began at a workshop held in Abruzzi National Park, Italy, from 31 May – 3 June 2010. It has been prepared on behalf of the Abruzzi Workshop participants: Christine Breitenmoser, Onnie Byers, Frands Carlsen, Sarah Converse, Arnaud Desbiez, Amielle DeWan, Jo Gipps, Bob Lacy, Caroline Lee, Kristin Leus, David Mallon, Phil McGowan, Patricia Medici, Phil Miller, Sanjay Molur, Eric Sanderson, Mark Stanley-Price, Gloria Svampa, Kathy Traylor-Holzer, Sally Walker, Jonathan Wilcken, and Rosie Woodroffe.

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Compilation and Categorisation of Species Conservation Planning Tools

1. Introduction

The conservation of individual species or groups of species in their natural habitats – from mosses and beetles to cycads and whale sharks – remains a primary focus of biodiversity management around the world. The Species Survival Commission (SSC) of the International Union for Conservation of Nature (IUCN) focuses its collective effort on disseminating information on the biology of species and their role in ecosystem health and integrity. This information forms the basis of species conservation plans that are developed by species experts and range country decision-makers, in consultation with SSC authorities within its diverse Specialist Group structure. Broadly defined, these species conservation plans outline a detailed set of action steps that are required to maintain the long-term persistence of a given species or set of species, across all or part of their historic range. These actions are constructed in the context of an explicit understanding of the threatening activities that put the focal species at risk. Therefore, the process of conservation planning systematically describes and evaluates those threatening activities, facilitates the identification of long-term conservation goals, and promotes the construction of shorter-term actions that will achieve the appropriate goals. By carefully considering the range of scientific expertise and stakeholder representation among the participants, conservation planning workshop organizers can dramatically improve the depth of scientific analysis, the quality of recommended actions, and the likelihood of their subsequent implementation.

The SSC's Conservation Breeding Specialist Group (CBSG) has a wealth of experience with *in situ* species conservation planning, conducting more than 120 Population and Habitat Viability Assessment (PHVA) workshops for species ranging from mountain gorillas to goblin ferns, in locales from Poland to Papua New Guinea. In fact, the PHVA process, developed almost 20 years ago, has become CBSG's signature product. Throughout its evolution, the PHVA process has emphasized the importance of broad stakeholder participation, the practical application of quantitative risk analysis, and the development of science-based, achievable goals and recommended actions.

In 2008, the SSC's Species Conservation Planning Task Force developed a set of valuable guidelines for creating a Species Conservation Strategy, or SCS. These guidelines provide a general approach with a number of fundamental planning elements, including developing a long-term vision for conservation of the focal species, a systematic status review of the species and its habitat, and a structured approach to organizing goals, objectives and actions. Some of these core elements are similar to those that define a PHVA planning process, while some represent significant enhancements.

In light of the need for continued evolution of CBSG's planning tools, the advancements provided by the SSC's guidelines for species conservation planning, and the complex challenge of applying these tools at various scales (taxonomic and geographic) and to a wide array of conservation scenarios (e.g., climate change), CBSG convened a Species Conservation Planning Tools workshop from 31 May – 3 June 2010 in Abruzzi National Park, Italy. The primary goal of this workshop was to determine how CBSG and its global network of species conservation planning experts could most effectively contribute to the improvement and implementation of species-based conservation planning. Specifically, workshop participants were tasked with developing planning tools and processes that would result in conservation plans that are most likely to be implemented – thereby enhancing the status of endangered species around the world. The product of this analysis would be a tool kit that defines these various process design elements and the conditions under which each might be most appropriately applied, not only by CBSG and other Specialist Groups within the SSC, but by conservation practitioners worldwide.

To assist with the grouping and description of tools, participants agreed on a sequence of conservation planning steps designed to encompass the spectrum of approaches currently applied in their work. In addition, participants developed a suite of features that could be used to characterise any conservation planning process – the number of stakeholders involved, the quality of species-specific data available and so on – as an aid to evaluating the utility of specific tools in different situations (see Species Conservation Planning Scenarios below). A list of conservation planning tools was assembled and mapped to each of these two frameworks.

Following the meeting these analyses were refined by a subset of workshop participants. The tools discussed were further categorised and a subset of them compiled in a "Tools Selection Matrix" and accompanying "Tools Library" to facilitate access by practitioners.

This document is intended for use by a diversity of species conservation experts worldwide – both within and outside the Species Survival Commission – that seek a practical and accessible reference to the many tools and processes available for designing and implementing a detailed and effective conservation planning approach. We envisage that this product will form the basis of a growing and readily available tools library that will continually respond to the needs of the community and the evolving state of the science in the field of endangered species conservation.

2. Conservation Planning Process Steps

To develop a shared frame of reference for discussing and categorising tools, Abruzzi participants constructed an exhaustive list of the steps which they felt could be incorporated into a species conservation planning cycle, noting that no single process would necessarily incorporate all of these:

Preparation: pre-work that is essential to or which supports and enables the planning process.
Status Review: a description of the past and present situation of the species: current and previous distribution, population structure and numbers; and ecological, cultural and socio-economic functions and values.
Threats Analysis: a comprehensive diagnosis of the primary threats to the species' persistence and/or recovery.
Visioning: a qualitative, inspirational description of the desired future state of the species.
Goals and Indicators: the agreed vision defined in operational terms, in order to help direct implementation, and to specify the measures by which planning success can be evaluated.
Objectives and Indicators: short-term activities that must be completed to ensure that longer-term goals are met, and the measures by which successful completion can be evaluated.
Identifying Possible Actions: actions describe who must do what and when, for specific objectives to be successfully achieved.
Predicting Outcomes: assessing the likely impact of different courses of action on "success", i.e., the achievement of specific objectives.
Deciding Actions: selecting from the available options in a transparent and replicable way, on the basis of all available information.
Implementation Planning: promoting the conditions under which implementation is likely to occur.
Monitoring Outcomes/Outputs and Feedback: tracking progress on conservation actions and recording the results.
Evaluation and Revision of Plan: assessing the efficacy of the planning document, and using the results to modify the plan as needed.
Document, Learn, Share: summarising and disseminating the results of the planning process and subsequent implementation, so that it can inform future planning efforts.

Many of these steps are encompassed within existing conservation planning approaches, though terminologies may differ, for example the SSC's Species Conservation Strategy (IUCN, 2008); the Conservation Measures Partnership (CMP, 2007); and the SSC/CBSG Population and Habitat Viability Assessment (CBSG, 2010). An attempt to cross-walk some of these terminologies is in progress and will be included in the final report.

No further attempt is made to describe these steps. The purpose of this document is not to provide a blueprint for conservation planning but rather to identify useful tools for use within existing or new approaches, based on the generic steps (and therefore tool requirements) that those approaches might contain. For further information on conservation planning steps and approaches, readers are directed to: CBSG, 2010; CMP, 2007; and IUCN 2008.

3. Species Conservation Planning Scenarios

Species conservation planning can take place under a broad spectrum of conditions. Some tools are universally applicable whilst others work well only in particular situations. Workshop participants discussed different planning scenarios and identified those characteristics most likely to affect the choice of planning tool. The main areas considered were:

Social and cultural considerations: some planning tools are better suited than others to addressing socially complex situations. Social complexity in this case refers to the number of participants involved in a planning process, the degree to which opinions on key issues vary among the participants, and cultural complexity represented in the planning process, including diversity with regard to cultural norms, philosophical and ethical concerns, religion, and language.

Project scope: this deals with the size of the conservation planning issue. It considers both the number of species or taxa involved (one, few or many?) and the extent of the geographic range of the species or taxa covered (is the range wide or narrow?). Some tools are a better fit for one or other of these extremes.

Data quality: this takes into account both the quantity and quality of data on the species' demography (life history traits, trends in population size and growth), spatial characteristics (range, distribution, habitat preferences) as well as data pertaining to the effectiveness of specific management activities in reducing threats to populations. Some tools are specifically designed for use in a planning process where data are relatively scarce, while others are designed to take advantage of the full range of quantitative data on species and their habitats.

Available resources: some tools are expensive and/or may require considerable technical expertise for their operation. This may place them out of reach for some projects, and those involved will need to look for simpler and cheaper alternatives. In other cases, these resources will be available or will be sought out by participants.

4. The Tools List

During the Abruzzi workshop, participants proposed a substantial list of conservation planning tools. Though all were considered of value, it was agreed that to be included in the Tools Library, a tool would need to be accompanied by a reference, in the public domain, describing how to access and/or use it. Supporting references were pursued following the workshop and have been gathered for many, though not all, of the tools listed below.

The term "tool" covers a vast array of items that can be useful to conservation practitioners. Those gathered during the workshop can be grouped into the following broad categories:

Category 1: Planning Environments

As implied, this describes the environment in which planning takes place.

Whilst it is possible for a single person in isolation to write a conservation plan, it is generally accepted that both the quality of the plan and the probability of its implementation increase where a larger group of subject matter experts, stakeholders, and decision makers is involved. To interact effectively, these people will need to communicate. Email is a possibility, but as the sole means of interaction it will often be inadequate. Participants may need to gather at a single event or workshop and/or smaller groups may need to gather over time, to target specific issues. Thought needs to be given to the best environment or combination of environments for this interaction, based on project needs and constraints. Whilst at present, "gathering" is usually done in a physical location, virtual workshops, or a combination of virtual and face-to-face venues, are an increasingly feasible alternative.
(*Examples discussed: Face-to-face Workshop, Virtual Workshop)*

Category 2. Planning Philosophies

The "tools" listed in this category may encompass principles or philosophies which can usefully underpin most or all aspects of planning, from process design to the detail of how individual planning decisions will be made and even to the vocabulary used. Though this may not be true in all cases, the philosophies discussed did not seem to be mutually exclusive but were potentially complementary.

In addition to their more general role, some of these philosophies also contain some stand-alone *Component Tools*.

[Examples discussed: Stakeholder Inclusivity (this may include education and training pre and/or post workshop), External Process Design and Facilitation, Evidence-based Planning, Commitment to Post-workshop Follow-up/Monitoring, Open Standards, Live Document Concept, Decision Analysis/Structured Decision Making]

Category 3. Component Tools

These are the building blocks of a planning framework. Each performs a specific planning task, such as stepping participants through the development of a vision; assessing the relative effectiveness of different management interventions; and so on. There can be more than one way of achieving a particular task and which is best will depend on the particulars of the planning scenario. Some of these component tools are relatively stand-alone whilst others are part of a suite designed for application within a particular planning approach – though with modification use within other approaches should also be possible.

[Examples discussed: Stakeholder Prioritisation Tool, Red List Assessment, Range-wide Assessment (mapping), Habitat Suitability Modelling, Nature Serve Vulnerability Index, O/S Threats Analysis, Population Viability Analysis (PVA),Conservation Vision, "Conservation Scorecard", O/S Setting Goals and Objectives in an Adaptive Management Framework, Conservation Unit Priority Setting, O/S Process for developing indicators around goals and objectives for use in monitoring, Objectives Hierarchies, Multi-attribute Utility, Setting Population Target Levels, Concept Mapping, Portfolios/strategies (considering themed sets of actions), Spatially Explicit Landscape Mapping, Conceptual Modelling, Influence Diagrams, Problem Trees, Results Chains, Bayesian Belief Nets (propagating uncertainty), Consequence Tables, Expert Elicitation (DELPHI), Value of Information, SMART (Simple, Multi-Attribute, Ranking Techniques), Stochastic Dynamic Optimisation, Simulation/Optimisation by Inspection, Project Management (Miradi), Implementation Web-page, Monitoring Framework (Miradi), Live Document Concept, O/S Consistent Standards]

Category 4. Enabling Tools

These are "tools" that provide support to *Component Tools* and for which selection may require specialised technical expertise. For example, there are a number of modelling programs able to support PVA (e.g. Vortex, RAMAS). Diagnosing which to use for a particular planning scenario may require expertise in the area of population modelling, or use of an auxiliary matrix in which this technical expertise is adequately captured. Similarly, Miradi is a computer program that provides a visual interface for shaping plans and recording decisions. However, the processes involved could, if needed, also be illustrated with flip-charts and sticky-notes, and recorded in other software packages. Translating Miradi functionality to other media may require technical expertise in the application of Miradi.

Matrices or decision trees to help practitioners identify and select the most appropriate *Enabling Tools* might be a logical next step for this tools analysis project.

[Examples discussed: Vortex, Miradi, Google Sites, IUCN Species Information System (database structure for data entry), GIS, Conservation Evidence Web-sites, Education Tools, Follow-up/Monitoring Tools, IUCN/SSC Species Information System.]

Category 5. Conservation Planning Approach/Template

These overarching frameworks comprise a series of steps that take planners/stakeholders from identifying what they want to achieve through their species conservation planning exercise, to agreeing how they will achieve it and, in some cases how this will be implemented, monitored and results fed back into the plans.

[Examples discussed: Open Standards, SCS, PHVA, Decision Analysis/Structured Decision Making, Range Wide Priority Setting, Landscape Species Approach]

5. Building a Resource for Tool Selection

In order to pinpoint an appropriate tool for a particular task and planning circumstance, it is useful to be able to compare the utility of available tools across a standard set of relevant criteria. Participants began work on this by collaboratively mapping each tool in the tools list:

1) to one or more of the conservation planning steps previously identified and
2) to the types of planning scenario in which it would be useful (or not useful)

In addition, a grading system was used to allow participants to qualify *how* useful a tool might be in a given circumstance – such as one with poor data or much cultural complexity.

This initial attempt at mapping resulted in two matrices, which were combined post-Abruzzi into a single resource with additional information (such as references and additional tool descriptions) inserted. Further, the initial difficulty experienced in classifying some tools using the matrix criteria served to highlight the importance of comparing like with like – that is, comparing tools *within* tool categories rather than between them, and of carefully tailoring the matrix criteria to the type of tool being classified. To address this, the matrix was modified to include only the Component Tools (the largest Abruzzi tool category) and further work was done to refine the planning scenario classification system.

Despite additional work, the resulting tool selection matrix was too large and visually complex to provide the simple access to appropriate planning tools originally envisaged. It became clear that all of the information captured in Abruzzi could not usefully be encompassed within a single, usable matrix and a further process of re-design and rationalisation was pursued. The results of this are presented below.

6. The Final Tool Selection System

The final tool selection system is a modified version of a system developed during a CBSG-facilitated workshop on disease risk analysis, to capture and retrieve information on tools relevant to that particular type of assessment. The system has three main components which, for the Abruzzi version, comprise the following:

1) **A Conservation Planning Cycle diagram.** This has been created by grouping the Abruzzi planning steps, which were in their original form too numerous to provide a framework fit for purpose. The grouping is based on the CMP framework (CMP, 2007) but modified to reflect the Abruzzi group's terminology and steps, and to maintain useful tool differentiation. This is the framework to which tools are now mapped (see Figure 1.)
2) **A Tool Selection Matrix.** A simplified version of the original, larger matrix. This includes only the larger planning steps resulting from the convergence described above, plus only those planning scenario characteristics that proved most useful in differentiating tools: expertise, resources and data quality. An additional descriptor has been included to indicate whether the tool delivers qualitative or quantitative outputs.
3) **A Tool Description Template.** To avoid loss of information captured about specific tools, and to allow for more subjective descriptions of a tool's strengths, weaknesses and uses, a "Conservation Planning Tool Description Template" has been prepared, which allows additional information to be captured in a standardised way. Information has been migrated across from the original matrix to these tool templates, to create a 1-2 page standardised description of each tool. The compilation of these tools descriptions comprises the "Tools Library".

The system is designed to work as follows:

1) Users identify the step or steps in the conservation planning process that they are interested in, using the Conservation Planning Cycle diagram and associated text.
2) They locate, in the Tool Selection Matrix, the column that corresponds to the planning steps of interest. By looking at the shaded cells in that column they locate those tools expected to be useful for those planning steps.
3) Looking along the row of cells for each relevant tool, users can see at a glance whether it is likely to be useful for their particular planning situation.
4) Having identified one or more tools of interest, the user can access further details and relevant case-studies through the more detailed descriptions of those tools in the Tools Library.

The Conservation Planning Cycle Diagram

To enable the mapping of tools to the individual steps within planning cycle it is necessary to be clear about what those steps are. The text below aims to provide this information and is a combination of SCS, CMP and Abruzzi descriptions.

This is not meant to be a detailed explanation of a planning process, nor is it meant to direct practitioners in how to plan. Users are directed to: CBSG, 2010; CMP, 2007; and IUCN, 2008 for that guidance. The purpose of this framework is to orientate users to the planning step(s) of interest, in order to facilitate access to the relevant tools in the Tool Selection Matrix.

Step 1a. Conceptualise

This step involves setting up the project, assembling an appropriate team, deciding what you wish to achieve and designing a planning process appropriate to the task at hand. Sub-steps included are:

Preparation: completing pre-work that is essential to or which supports and enables the planning process.
Defining Scope: determining the limits of the project (taxonomic, geographic etc).
Defining the Team: assembling the right people for the task at hand.
Designing the Process: determining the right environment, duration, planning framework, tools, facilitation techniques and so on, for the task identified.

Step 1b. Review Status

This step involves a thorough analysis of the situation at hand. Sub-steps included are:

Status Review: building a description of the past and present situation of the species: current and previous distribution, population structure and numbers; and ecological, cultural and socio-economic functions and values.
Threats Analysis: completing a comprehensive diagnosis of the critical threats to the species' persistence and/or recovery.

Step 2a. Characterise Success Indicators

This step involves clarifying the achievements that would be considered to represent short, medium and long-term success, as well as the ultimate vision for the project. Sub-steps included are:
Visioning: developing a qualitative, inspirational description of the desired future state of the focal taxon or taxa.
Goals and Indicators: defining the agreed vision in operational terms, in order to help direct implementation, and to specify the measures by which planning success can be evaluated.
Objectives and Indicators: defining short-term activities that must be completed to ensure that longer-term goals are met, and the measures by which successful completion can be evaluated.

Step 2b. Plan Actions

Involves determining what needs to be done to achieve the desired outcomes, including how outcomes will be monitored. Sub-steps included are:

Identifying Possible Actions and Strategies: describing what actions must happen and when, for specific objectives to be achieved.

Predicting Outcomes: assessing the likely impact of different courses of action on "success", i.e., the achievement of specific objectives.

Deciding Actions and Strategies: selecting from the available options in a transparent and replicable way, on the basis of all available information.

Developing a monitoring plan: to capture the information needed to allow success or failure and the reasons for it, to be evaluated.

Step 3. Implement Actions and Monitoring

This involves putting into practice the previous planning work through the development and implementation of specific work plans whilst ensuring sufficient resources, capacity and partners. Sub-steps included are:

Developing work plans, time-lines and budgets: defining what activities are required, by whom, when and how? How will this be resourced?

Implementation Planning: promoting the conditions under which implementation is likely to occur.

Monitoring Outcomes/Outputs and Feedback: tracking progress on conservation actions and recording the results.

Step 4. Evaluate and Adapt

This involves analysing the data collected on plan implementation and analysing this to evaluate the effectiveness of activities and the relevance of the documented plan to the direction of these activities. Results are used to adapt the plan in the appropriate direction. Sub-steps included are:

Collate and Analyse: collating, preparing and analysing the results of implementation.

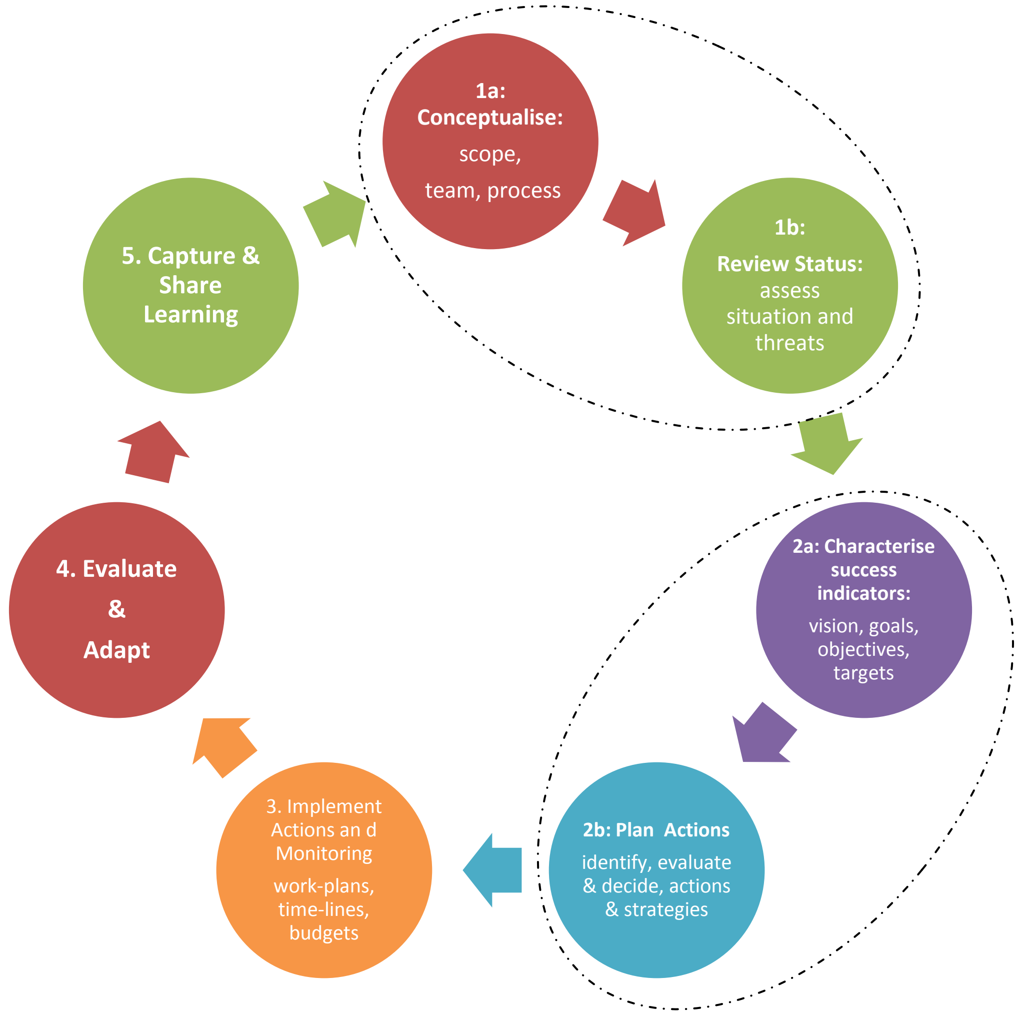
Evaluation and Revision of Plan: assessing the efficacy of the planning document, and using the results to modify the plan as needed.

Step 5. Document, Learn, Share

Involves capturing and sharing results with key external and internal audiences to promote learning. Sub-steps included are:

Document, Learn, Share: summarising and disseminating the results of the planning process and subsequent implementation, so that it can inform future planning efforts.

Figure 1: Conservation Planning Cycle Diagram - used to categorise the Abruzzi tools (modified from the Conservation Measures Partnership Project Management Cycle (CMP, 2007))



The Tool Selection Matrix

The following matrix lists the Component Tools subset of the Abruzzi tools list. It categorises them according to the planning process step that they are most usefully applied to, whether their outputs are qualitative or quantitative, the level of resourcing, expertise and data completeness required for their effective application, and their utility in multi-species planning. Each tool is described in more detail in the Tools Library.

Tools			**Planning Step:**							**Suitable for planning situations with:**			
	Qualitative	Quantitative	Concept.	Status Rev.	Ch. Success	Actions	Implement.	Evaluate	Learn	Many focal taxa*	Little specialist expertise	Few financial resources	Few data
Stakeholder Prioritisation Tool (IUCN/SSC 2008)	■		■							■	■	■	■
Project-specific Web-sites (Lees 2010)	■		■	■	■	■	■	■	■	■	■	■	■
Data Assembly Tools (e.g. Ellis and Seal, 1996; IUCN 2003, 2010)	■	■		■							■	■	■
Red-list Assessment (as a status review tool) (IUCN 2010)	■	■		■									
Population Viability Analysis (CBSG 2010; Miller 2006)		■		■	■	■		■					■
Rangewide Priority Setting (Sanderson et al. 2002)	■			■									
Habitat Suitability Modelling (Hatten et al 2005)	■	■		■	■	■							
Threat Ranking Tool (Miradi)	■			■							■	■	■
Nature Serve Vulnerability Index (Young et al. 2010)	■			■								■	■
Threats Analysis Processes (e.g. IUCN/SSC 2008; CMP 2007)	■			■						■	■	■	■
Meta-modelling (Miller and Lacy 2003; Bradshaw et al., in review)		■		■	■	■		■		■		■	
Conservation Vision (Sanderson et al. 2008)	■				■					■	■	■	■
Score Card (Sanderson et al. 2008)	■				■						■	■	
Setting Goals in an Adaptive Management Framework	■	■			■					■	■	■	■

Tools			Planning Step:							Suitable for planning situations with:			
	Qualitative	Quantitative	Concept.	Status Rev.	Ch. Success	Actions	Implement.	Evaluate	Learn	Many focal taxa*	Little specialist expertise	Few financial resources	Few data
(CMP, 2007)	■	■			■					■	■	■	■
Setting Objectives and Indicators in an Adaptive Management Framework (CMP, 2007)	■	■			■					■	■	■	■
Objectives Hierarchies (Keeney, 1988)	■				■					■		■	■
Multi-attribute Utility (Edwards and Newman, 1982; Keeney and Raiffa, 1993; Clemen and Reilly 2001)	■				■					■		■	■
Setting Population Target Levels (Sanderson, 2006)		■			■							■	■
Concept Mapping and identifying conservation actions(CMP, 2007)	■					■				■	■	■	■
Portfolios/strategies (Runge et al. 2010)	■					■				■		■	■
Landscape Species Approach (Sanderson et al., 2002)	■					■							■
Diagramming Tools (e.g. IUCN/SSC 2008; CMP, 2007; Clemen and Reilly, 2001)	■	■			■	■				■	■	■	■
Bayesian Belief Networks (Wooldridge, 2003)		■				■						■	■
Expert elicitation (DELPHI process) (MacMillan and Marshall, 2006; Kynn, 2008)	■	■		■		■							■
Project Management (Miradi 3.0 Manual)	■						■				■	■	■

* In this instance “many focal taxa” refers to situations in which a number of interacting taxa are planned for within the same process, such as a predator and its prey species. It does not refer to situations in which several similar but non-interacting species are planned for simultaneously – e.g. the freshwater fish of a particular region etc.

The Tool Description Template and Library

The following template has been used to characterise each of the Abruzzi “Component Tools”, in order to build a “Tools Library”.

Name: [Name of the tool]

Reference: [Literature reference or a webpage to link to a more detailed description of the tool itself and where it can be obtained. This should not be a case study – these are housed elsewhere in the template]

Conservation planning stage(s) when this would be used: [This should reference one of the planning stages in the conservation planning cycle diagram provided. Some tools will have multiple entries in this field]

Description of tool use: [A distilled précis of how the tool works and/or how it can be used in the conservation planning context. Also, if the tool is part of a suite of tools commonly used together, this should be recorded here (e.g. the Miradi tool suite)]

Experience and expertise required to use the tool: [A brief description of the types of experience/expertise needed to use the tool effectively]

Data requirements: [A description of the types of data required for tool operation]

Costs: [This should provide a general sense of the costs involved – whether it is likely to run to 10s, 100s, 1000s or 10,000s of US$. Ideally, the purchase cost of the tool would be estimated separately from the cost of any specialist expertise, and from any other costs associated with the effective use of this tool]

Strengths and weaknesses, when to use and interpret with caution: [A description of any limitations and common pitfalls]

Case study: [References to case studies that illustrate the use of the tool in conservation planning or, if not available, case studies for other situations from which extrapolation to conservation planning would be possible]

Author(s) name:

Affiliation:

Email:

Date:

7. The Tools Library

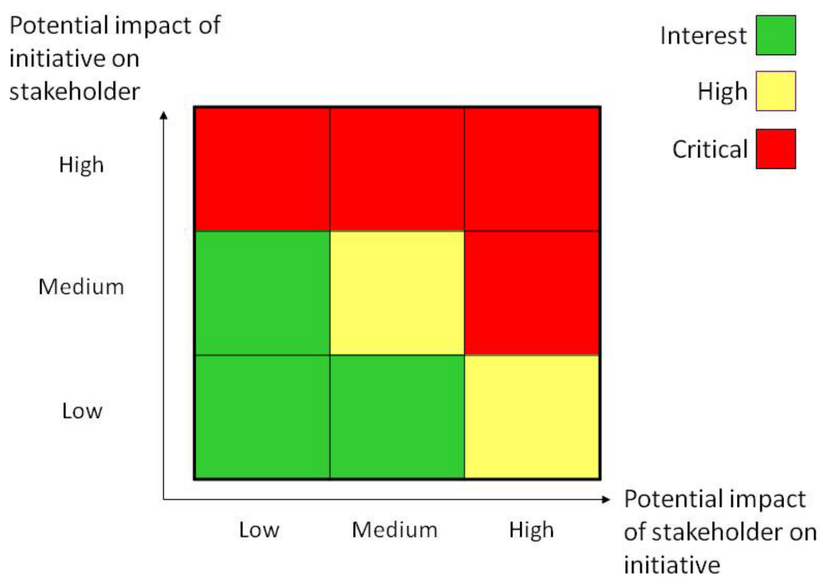
Stakeholder Prioritisation Tool

Name: Stakeholder Prioritisation Tool (IUCN/SSC 2008)

Reference: IUCN/SSC (2008). Strategic Planning for Species Conservation: A Handbook. Version 1.0. Gland, Switzerland: IUCN Species Survival Commission.

Conservation planning stage(s) when this would be used:
This tool would be used at the *Conceptualising* stage, as part of assembling a list of planning workshop participants or other project collaborators.

Description of tool use: This simple tool uses qualitative information to help organisers identify and prioritise potential participants for a planning workshop based on: subject matter expertise; degree of influence over project outcomes; and likelihood of being impacted by project outcomes.



Experience and expertise required to use the tool: Little or none. Once explained, the tool is intuitive to use as a visual aid to collective decision-making.

Data requirements: A list of potential collaborators/attendees and knowledge of their relevant attributes (see above).

Cost: Free

Strengths and weaknesses, when to use and interpret with caution: This can be particularly useful for high profile conservation planning situations where there are many interested parties and relatively few workshop "seats".

Case study: Consider the following set of stakeholders that could be invited to a hypothetical conservation planning workshop for a tropical forest mammal:

- High-level representative of the national wildlife management agency – Given **critical priority** as they have considerable decision-making authority and could be markedly impacted by intensity of future regulatory activities.
- Farmer who owns land within the focal species' native habitat – Given **critical priority** as they are likely to experience significant economic impacts from actions taken within the species' range
- Conservation biologist with expertise on the focal species in the field – Given **high priority** as they have a significant impact on planning outcomes through existing data availability, and the impact that planning outcomes have on their future field study projects.
- Marine ecologist who works in the nearby coastal areas – Given **interest priority** as they are unlikely to deliver a significant impact on the nature of recommendations (low data availability) and will be minimally impacted by actions taken in the tropical forest zone.
- Urban citizen representative who strongly favors development of the local forest resource – At best, given **interest priority** as they are unlikely to offer constructive and collaborative participation in the decision-making process. If they are openly hostile to long-term species conservation efforts, they may be removed from the list of potential participants.

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Date: January 18, 2012

Project-specific Web-sites

Name: Project-specific web-sites
Reference: Lees (2010) CBSG Virtual Workshops - A Resource for Organisers. http://www.cbsg.org/cbsg/workshopreports/26/cbsg_virtual_wkshop_resource.pdf. Downloaded March 10, 2011.

Source: Any web-site building or virtual space providing application able to accommodate the regular manipulation of content, including uploading and downloading briefing materials, will serve this purpose. The one used as an example here can be sourced at Google Sites: https://sites.google.com

Conservation planning stage(s) when this would be used: A virtual space can be used throughout planning and implementation, as a shared repository for briefing materials, progress reports and other key documents and broadcasts.

Description of tool use: A web-site or virtual space is established by project organizers and populated with pertinent materials such as: project aims; planning workshop briefing materials; profiles of project collaborators; literature pertinent to status and threats analyses; project milestones and progress reports; and so on. The site operates as a central, dedicated space where planning collaborators can go to find the latest versions of key documents and to upload and download materials as they need to.

Experience and expertise required to use the tool: A basic understanding of how computer programs work, and some trial and error, are sufficient to set up a Google Site. The process takes approximately 30 minutes though complete customization can take longer. Other web-site applications and virtual spaces can be more complex.

Data requirements: The web-site merely hosts project information; it has no specific data requirements.

Cost: Google Sites web-sites are FREE. Prices can vary enormously for other virtual spaces.

Strengths and weaknesses, when to use and interpret with caution: This tool will be less useful where a proportion of planning collaborators have unreliable internet access. A Google translation facility is available, which can translate Google Sites, instantaneously, into the relevant local language, which may be useful where collaborators do not speak a common language, or do not speak it fluently. However this translation facility may not be adequate, depending on site content and the languages involved.

Case study: Examples of Google Sites used for conservation planning purposes:

https://sites.google.com/site/cbsgbriefingsitebongokenya/
https://sites.google.com/site/cbsgaustralasiamalapilot/

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Date: 16 January 2012

Data Assembly Tools

Name: Data Assembly Tools

Reference: Ellis, S. and Seal, U.S. (1996). Conservation Assessment and Management Plan (CAMP) Process Reference Manual. Apple Valley, MN: IUCN/SSC Conservation Breeding Specialist Group.

IUCN. (2003). Guidelines for Application of IUCN Red List Criteria at Regional Levels: Version 3.0. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. ii + 26 pp. (http://data.iucn.org/dbtw-wpd/edocs/2003-033-EN.pdf)

Source: These tools can be accessed via the references above.

Conservation planning stage(s) when this would be used: Data assembly may be required at several stages in the conservation planning process, and tools may be available or usefully developed for any of these. The examples given are well-tested and regularly used tools that would be applied during the *Status Review* stage.

Description of tool use: These tools help organise the collection of detailed information on the species of interest, and the biological and sociological issues surrounding its conservation, before the species conservation planning process begins. Examples referenced are for the IUCN Red-List and CAMP data sheets.

Experience and expertise required to use the tool: No specific expertise is required though some prior experience would be an advantage.

Data requirements: These are data assembly tools so there are no minimum data requirements. Details of the types of data that can be assembled are described in the references cited.

Cost: Free

Strengths and weaknesses, when to use and interpret with caution: This is a self-explanatory data collection tool that allows compilation of as much or as little data as is available. It should be used in conjunction with the IUCN Red List authority files.

Case study: See CBSG Conservation Assessment and Management Plan Reports (http://www.cbsg.org/cbsg/workshopreports/display.asp?catid=24)

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Date: 17 January 2012

Red-list Assessment (as a status review tool)

Name: Red-list Assessment (as a status review tool) (IUCN 2010)

Reference: IUCN (2010). IUCN Red List of Threatened Species. Version 2010.1. <www.iucnredlist.org>. Downloaded on 9 March 2011

IUCN. (2003). Guidelines for Application of IUCN Red List Criteria at Regional Levels: Version 3.0. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. ii + 26 pp. (http://data.iucn.org/dbtw-wpd/edocs/2003-033-EN.pdf)

IUCN Red List Categories and Criteria Version 3.1 (IUCN 2001)

Source: See references above

Conservation planning stage(s) when this would be used: This tool would be used at the *Status Review* stage of a species conservation planning exercise.

Description of tool use: In this context the Red-list Assessment tool would be used as a framework for compiling published and unpublished information on species distributions, threats, habitats, populations, and trends, to determine the species' conservation status as per the IUCN Criteria (though this would not necessarily be formalised through the Red-List Office).

Experience and expertise required to use the tool: An understanding of how the Red-List criteria should be applied is essential, and some experience in applying those criteria within a workshop situation is advisable.

Data requirements: Effective application of this tool benefits from a large quantity of high quality data on species biology, abundance, distribution, population growth rates and so on.

Cost (excluding expertise): FREE

Strengths and weaknesses, when to use and interpret with caution: Strengths is a robust and organized method to collect and interpret data. Weakness: people can be desperate to attribute a high status to the species of concern and believe that something is wrong if the species is not listed as endangered. It is very important that facilitators understand the application and rules of the IUCN Red List Categories and Criteria.

Case study: During the Jaguar National Action Planning Workshop, a red listing exercise was performed with workshop participants and discussed in plenary sessions. Results from this work are presented in *Jaguar in Brazil Cat News Special Issue No. 7 Spring 2012*. All the rules and definitions in the IUCN Red List Categories and Criteria Version 3.1 (IUCN 2001) were applied to jaguar populations in each Brazilian biome where they occur. Given that individuals can move between biomes, methods for adjusting the results were applied using the IUCN Red List Regional Guidelines (IUCN 2003).

There are important reasons to assess the risk of species extinction at the biome level. Using ecological borders rather than geo-political is often more efficient in terms of conducting explicit practical conservation assessments. In the case of jaguars, the biome-based assessment clearly illustrated how populations in different biomes were under different threats and at varying levels of extinction risk. Results from this exercise were important in assessing populations within each biome and in pinpointing areas where information was lacking.

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Population Viability Analyses

Name: Population Viability Analyses

Reference: CBSG 2010. Population and Habitat Viability Assessment (PHVA) Workshop Process Reference Packet. CBSG, MN.

Source: Various "Enabling Tools" are available for PVA. The one most widely used by CBSG is *Vortex*, available from: http://www.vortex9.org/vortex.html

Conservation planning stage(s) when this would be used: PVA can be used during the *Status Review* stage, to evaluate extinction risk and to assess the relative importance of threats. It can be used during the *Action Planning* stage to evaluate the relative efficacy of different potential management interventions and to identify key parameters for monitoring, and during the *Evaluate* stage where new data from monitoring are used to evaluate progress.

Description of tool use: Using specialised software, computerised simulation models of the focal species are constructed, based on current understanding of the species' biology and of the external factors impacting on it. These models can then be used to predict the future status of the population or populations under study.

For example, models can provide insights into immediate and future extinction risk under existing conditions; they can be used to assess the relative contribution of identified threats, to observed population declines; to evaluate the relative impact on population recovery, of different management interventions; and to identify those aspects of a species' life-history that have the greatest impact on population health, to assist the design of monitoring programmes.

Experience and expertise required to use the tool: Specialised expertise is required to apply these tools appropriately and responsibly.

Data requirements: This can vary depending on the application. Where the questions asked of the models require specific, quantitative answers, the data on which the models are based must be sound, complete and reliable. For more general questions and comparative studies those requirements may be relaxed. Specialist advice should be sought to ensure that the data are sufficient for the required application.

Cost: The *Vortex* software is FREE for non-commercial applications. The costs of other programs can vary considerably based on degree of complexity and sophistication. The cost of the required expertise to build and interpret the models will also vary and may be significant.

Strengths and weaknesses, when to use and interpret with caution: See above. If not interpreted properly, model outputs may encourage confidence in results not warranted given the data on which they are based. Specialist advice should be sought.

Case study:
Miller, P.S. 2006. Population Viability Analysis for the Greater Sage Grouse (*Centrocercus urophasianus*) in Colorado. Apple Valley, MN: IUCN/SSC Conservation Breeding Specialist Group.

Author(s) name: Phil Miller

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Date: January 17, 2012

Rangewide Priority Setting

Name: Rangewide Priority Setting

Reference: Sanderson, E.W., Redford, K.H., Chetkiewicz, C.B., Medellin, R.D., Rabinowitz, A.R., Robinson, J.G., Taber, A.B. (2002). Planning to Save a Species: the Jaguar as a Model. Cons. Biol. 16(1):59-72

Conservation planning stage(s) when this would be used: This would be used during the *Status Review* stage of the planning process.

Description of tool use: This is a tool for assembling and analysing information on species distribution, ecology, habitat needs, threats, and conservation status. It helps to prioritise specific habitat units for conservation action according to criteria derived from the assembled information.

Experience and expertise required to use the tool: Requires GIS. Effective use of this tool requires considerable specialist expertise and experience.

Data requirements: This tool requires a substantial quantity of high quality data relating to species distribution, ecology, habitat needs, threats, and conservation status.

Cost: Costs will be relatively high – estimated at around US$20,000 plus travel.

Strengths and weaknesses, when to use and interpret with caution: Not completed.

Case study: See reference above.

Author(s) name: Translated from the data provided at the Abruzzi workshop.

Affiliation:

Email:

Date:

Habitat Suitability Modelling

Name: Habitat Suitability Modelling

Reference: Hatten et al (2005). A spatial model of potential jaguar habitat in Arizona. *Journal of Wildlife Management* 69(3):1024-1033

Conservation planning stage(s) when this would be used: This would be used at the *Status Review* for threats analysis*,* and at the *Characterising Success Indicators* and *Action Planning* stages of the process.

Description of tool use: Provides known and potential distribution maps of species based on habitat models. The process takes GIS data and allows species parameters to be applied and geographically interpreted, to generate inferred range. During a threats analysis, this can help identify the nature and relative importance of threats.

During the *Action Planning and Success Characterisation Steps*, preparatory work creates the base map of what exists today. Scenarios are then designed and modelled which predict future landscape status and habitat distribution under different possible circumstances such as increased human footprint or climate change, habitat corridor creation etc.

Experience and expertise required to use the tool: This tool requires GIS and considerable specialist expertise and experience.

Data requirements: This tool requires a large amount of good, high quality data.

Cost: Not completed.

Strengths and weaknesses, when to use and interpret with caution: Not completed.

Case studies:

Akçakaya, H.R., M.A. Burgman, O. Kindvall, C. Wood, P. Sjögren-Gulve, J. Hatfield, and M.A. McCarthy (editors). 2004. Species Conservation and Management: Case Studies*.* Oxford University Press, New York.

Carroll, C., Phillips, M.K., Lopez-Gonzalez, C.A., and N.H. Schumaker (2006) Defining Recovery Goals and Strategies for Endangered Species: The Wolf as a Case Study. BioScience 56(1): 25-37.

Author(s) name: Translated from the data provided at the Abruzzi workshop.

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Email:

Date:

Threat Ranking Tool (Miradi software)

Name: Threat Ranking Tool (Miradi)

Reference: Miradi 3.3.2 software available for download: https://miradi.org/?gclid=CIaXxrOwja4CFULd4Aodpz9zgg ; Miradi web tutorial: http://elearn.tnc.org/cap/miradi/player.html; Manual: http://www.rareplanet.org/en/resource/miradi-30-manual; Conservation Measures Partnership (2007) Open Standards for the Practice of Conservation. Version 2.0. www.conservationmeasures.org.

Conservation planning stage(s) when this would be used: This is used during the threats analysis component of the *Status Review* stage.

Description of tool use: This tool uses either a simple or stress-based threat ranking which is based on a combination of scope, severity, and irreversibility. The tool provides specific categories for each ranking (e.g. Low: The effects of the threat are easily reversible and the target can be easily restored at a relatively low cost and/or within 0-5 years (e.g., off-road vehicles trespassing in wetland) and summarizes the overall threat index ranking using a rule-based system. This tool is part of the Miradi software suite of tools, designed to facilitate the planning framework developed by the Conservation Measures Partnership.

Experience and expertise required to use the tool: This tool is easily assimilated and does not require a high level of specialist expertise.

Data requirements: The tool can be used effectively in situations that are data poor.

Cost: Standard Subscription - $250 (USD) – A single user can download the current release of Miradi as well as updated versions for one year. Standard Subscribers receive basic email support (up to 5 issues per year). **Nonprofit Subscription – $150 (USD)** – Employees of nonprofit organizations receive all the benefits of the standard subscription at a 40% discount. **Low-income Subscription – $25 (USD)** – Students, and residents of developing countries, can receive Miradi for a deep discount, with limited email support.

Strengths and weaknesses, when to use and interpret with caution:
The strength of the Miradi threat ranking tool is that it guides practitioners through the process of rating direct threats to determine which are the most important to address. After users respond to questions on topics such as the scope and severity of threats, the program uses scoring algorithms to rank the threats to determine those that require priority attention. This allows for users to develop a relative index of threats for their project/plan with associated information that can be used for prioritization.

The accuracy of the threat assessment will only be as robust as the experts who are using the tool or the information that is provided for the tool. In addition, the algorithms that are used to rank the threats can be inconsistent, and can sometimes produce results that are incongruous. The prioritization of threats using this tool should be used in conjunction with other sources of information.

Case study: Hundreds of case studies that use the Open Standards and Miradi framework can be found at conpro.tnc.org/ and at www.rareplanet.org (multiple languages/organizations available).

Example: Gondwana Link, Southwest Australia woodlands; http://conpro.tnc.org/1721/

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Date: 7 February 2011

Nature Serve Vulnerability Index

Name: Nature Serve Vulnerability Index

Reference: Young, B., Byers, E., Gravuer, K., Hall, K., Hammerson, G., Redder A. (2010) Guidelines for Using the NatureServe Climate Change Vulnerability Index. NatureServe, Arlington, VA.
http://www.natureserve.org/prodServices/climatechange/pdfs/Guidelines_NatureServeClimateChangeVulnerabilityIndex_r2.1_Apr2011.pdf

Conservation planning stage(s) when this would be used: This is used during the threats analysis component of the *Status Review* stage.

Description of tool use: This tool is used to assess the relative vulnerability of a species to climate change based on both exposure and sensitivity. Input is Excel-based and relies on expert opinion and peer reviewed literature as available. Components of the tool include a species specific analysis of: direct and indirect exposure to climate change, biological sensitivity, and documented/modeled responses to climate change.

Experience and expertise required to use the tool: The software tool itself is relatively simple and intuitive to use, however, not that the input relies on expert opinion and so access to expert knowledge in the relevant areas is essential for appropriately interpreting the results and application.

Data requirements: Details of species biology, population dynamics, species interactions, and abundance are required for appropriate use (expert opinion preferred). Additional spatial information on current species distributions along with the best available information on projected shifts in temperature, precipitation, and soil moisture at the finest scale possible will allow for improved interpretation of overall impact. When available, documented species responses to climate change will influence and inform the result.

Cost: Tool is free; costs are associated with working with experts and/or securing any distribution or climate change projection spatial data.

Strengths and weaknesses, when to use and interpret with caution:
The strength of this tool is in the ability to take complex climate change impacts and combines them into an interpretable index that incorporates both direct and indirect exposure as well as species-specific sensitivities. It also provides a unique forum for expert elicitation and recognition of the potentially key factors that contribute to a species vulnerability to climate change.

As with many tools, the interpretation of the results will be dependent on the quality of the inputs. Transparency will be key, as supporting information can often be provided by expert elicitation where assumptions about the inputs can be overlooked. Understanding how the index will be used to make decisions or prioritization will also be important. Is one more vulnerable species more important than another? The tool is agnostic on this front, as it should be, but users should be cautious in assuming that it will provide the answers needed for climate change 'triage'. Finally, the tool is species-based, with a terrestrial focus. Use in marine systems and for complex habitats will be limited.

Case study:
Dubois et al. 2011. Integrating climate change vulnerability assessments into adaptation planning. Prepared for the Florida Fish and Wildlife Conservation Commission
http://www.defenders.org/resources/publications/programs_and_policy/gw/integrating_climate_change_vulnerability_into_adaption_planning.pdf

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Date: 7 February 2011

Threats Analysis Processes

Name: Threats Analysis Processes

Reference: IUCN/SSC (2008). Strategic Planning for Species Conservation: A Handbook. Version 1.0. Gland, Switzerland: IUCN Species Survival Commission.

Conservation Measures Partnership (2007) Open Standards for the Practice of Conservation. Version 2.0. www.conservationmeasures.org.

Conservation planning stage(s) when this would be used: This is used during the threats analysis component of the *Status Review* stage.

Description of tool use: A process for brainstorming all of the direct threats to a species, habitat, or ecological system (e.g. habitat loss). Once these direct threats are identified, planners work to identify what the drivers or underlying causes of those threats may be.

Experience and expertise required to use the tool: These tools are easily grasped and do not require a high level of specialist expertise, though some prior experience is an advantage. Most helpful is to have an experienced facilitator to help stakeholders understand the conservation context of the threats analysis and to distinguish the differences between direct threats and their underlying drivers.

Data requirements: These tools are suitable for situations that are relatively data poor, though a thorough knowledge of the site and species context and their conservation threats is most appropriate.

Cost: FREE, though if used in combination with a software package such as Miradi some costs will accrue.

Strengths and weaknesses, when to use and interpret with caution:
Key strengths of this type of analysis include the opportunity for groups of stakeholders to identify the direct threats to species or conservation targets of interest, and allow discussion for why these have been identified.

Weaknesses are generally user based in that understanding the difference between direct threats and underlying drivers will be key for the accuracy of the assessment. Related, the relationship between direct threats and other stressors (e.g. low reproductive rates) can be unclear.

Case study: Hundreds of case studies that use the threats analysis process can be found at conpro.tnc.org/ and at and at www.rareplanet.org (multiple languages/organizations available). Example: Bahia Magdalena, Mexico Coastal Systems; http://conpro.tnc.org/1004/

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Meta-modelling

Name: Meta-modelling

Reference: Miller, P.S., and R.C. Lacy. Metamodels as a tool for risk assessment. Pages 333-351 in: F.R. Westley and P.S. Miller, (2003) eds. Experiments in Consilience: Integrating Social and Scientific Responses to Save Endangered Species. Island Press, Washington, DC.

MetaModel Manager, a software program to facilitate the development and use of metamodels, is still in the development stage but the software, a manual, and further references will eventually be accessible through Dr. Robert Lacy's web-site: http://www.vortex9.org.

Conservation planning stage(s) when this would be used: As for PVA, this tool may be used to assist threats analysis at the *Status Review* stage, and may also be used to assist the *Characterisation of Success Indicators*, *Action Planning* and *Evaluation* of progress

Description of tool use: This is an extension of traditional PVA techniques, in which specialised models of specific biological processes (population demographics, disease, spatial movement, social breeding complexity, etc.) are linked together through a central data handling and communication module. Within a meta-model, the component models run synchronously, and the outputs of each can be inputs to modify other models as they run. The resulting meta-model offers a richer and more realistic depiction of a complex environment-wildlife-human system, thereby facilitating the creation of more effective solutions to species decline.

Experience and expertise required to use the tool: Considerable expertise is required to apply this tool effectively.

Data requirements: This tool is not suitable for use in a data poor situation. Data inaccuracies and gaps will be compounded through the combination of models, in ways that can be difficult to predict.

Cost: MetaModel Manager and some of the component modeling programs such as Outbreak and Vortex, are FREE for non-commercial use. However, the expertise to operate them effectively may be expensive, depending on circumstances.

Strengths and weaknesses, when to use and interpret with caution: Meta-models would be most valuable when processes that are normally studied in isolation interact in dynamic ways – for example, predator-prey or other multi-species systems, population demography coupled to infectious disease, or dispersal dependent on changing configurations of habitat on a landscape undergoing alteration by humans. The overall meta-model, however, will only be as reliable as are the component models used to simulate the individual processes, so any cautions regarding the reliability of PVA models, epidemiological models of infectious disease, habitat models, or other models linked through a metamodel should carry through to concerns regarding the usefulness of higher level metamodel outcomes. Moreover, a metamodel is only useful if the important functional linkages between variables in the distinct component models can be specified.

Case study: Bradshaw, C.J.A., C.R. McMahon, P.S. Miller, R.C. Lacy, M.J. Watts, M.L. Verant, J.P. Pollak, D.A. Fordham, T.A.A. Prowse, and B.A. Brook. 2011. Novel coupling of individual-based epidemiological and demographic models predicts realistic dynamics of tuberculosis in alien buffalo. Journal of Applied Ecology, in press.

Prowse, T.A.A., C.N. Johnson, R.C. Lacy, C.J.A. Bradshaw, J.P. Pollak, M.J. Watts, and B.W. Brook. No need for disease: testing extinction hypotheses for the thylacine using multi-species metamodels. (in review).

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Conservation Vision

Name: Conservation Vision

Reference: IUCN/SSC (2008). Strategic Planning for Species Conservation: A Handbook. Version 1.0. Gland, Switzerland: IUCN Species Survival Commission.

Conservation planning stage(s) when this would be used: This is used to assist "visioning" during the *Characterising Success Indicators* stage of the process.

Description of tool use: The process of developing an inspirational statement describing the desired future state for the species: the desired range and abundance for the species, its continuing ecological role, and it relationship with humans. The Vision should be derived from a range-wide analysis of a species' status and a detailed presentation of the long-term, range wide conservation needs of the species, informed by a threat analysis.

Experience and expertise required to use the tool: Use of this tool is easily grasped and does not require specialist expertise.

Data requirements: The tool can be applied in data poor situations, though a richer vision is created where specific knowledge is available about species biology and behavior, current and historic distribution, abundance, cultural value and so on.

Cost: FREE

Strengths and weaknesses, when to use and interpret with caution: Not completed.

Case study: Sanderson Eric W. Sanderson, Kent H. Redford, Bill Weber, Keith Aune, Dick Baldes, Joel Berger, Dave Carter, Charles Curtin, James Derr, Steve Dobrott, Eva Fearn, Craig Fleener, Steve Forrest, Craig Gerlach, C. Cormack Gates, John E. Gross, Peter Gogan, Shaun Grassel, Jodi A. Hilty, Marv Jensen, Kyran Kunkel, Duane Lammers, Rurik List, Karen Minkowski, Tom Olson, Chris Pague, Paul B. Robertson, and Bob Stephenson et al. (2008). The Ecological Future of the North American Bison: Conceiving Long-term, Large-scale Conservation of Wildlife. Cons. Biol. 22(2): 252-266

Author(s) name: Translated from the data provided at the Abruzzi workshop.

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Email:

Date:

Score Card

Name: Score Card

Reference: IUCN/SSC (2008). Strategic Planning for Species Conservation: A Handbook. Version 1.0. Gland, Switzerland: IUCN Species Survival Commission.

Conservation planning stage(s) when this would be used: [to serve as orientation in the flow diagramme which will serve to keep each stage in context, some tools will have multiple entries in this field]

Description of tool use: A device for assessing the extent to which a given population or similar unit that is the subject of range wide conservation management, can contribute to the long-term conservation vision for the species. This is best used in combination with the Range Wide Priority Setting suite of tools.

Experience and expertise required to use the tool: The fundamentals of this tool are relatively easy to grasp and do not require specialist expertise. Some priori experience of using this tool would be an advantage.

Data requirements: This is not suitable for data poor situations as it requires comprehensive data about species distribution, abundance, biology and ecology. However, it may be possible to modify this tool for use in less well-charted circumstances.

Cost: FREE

Strengths and weaknesses, when to use and interpret with caution: Not completed.

Case study Case study: Sanderson Eric W. Sanderson, Kent H. Redford, Bill Weber, Keith Aune, Dick Baldes, Joel Berger, Dave Carter, Charles Curtin, James Derr, Steve Dobrott, Eva Fearn, Craig Fleener, Steve Forrest, Craig Gerlach, C. Cormack Gates, John E. Gross, Peter Gogan, Shaun Grassel, Jodi A. Hilty, Marv Jensen, Kyran Kunkel, Duane Lammers, Rurik List, Karen Minkowski, Tom Olson, Chris Pague, Paul B. Robertson, and Bob Stephenson et al. (2008). The Ecological Future of the North American Bison: Conceiving Long-term, Large-scale Conservation of Wildlife. Cons. Biol. 22(2): 252-266

Author(s) name: Translated from the data provided at the Abruzzi workshop.

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Setting Goals in an Adaptive Management Framework

Name: Setting Goals in an Adaptive Management Framework

Reference: Conservation Measures Partnership (2007) Open Standards for the Practice of Conservation. Version 2.0. www.conservationmeasures.org.

Conservation planning stage(s) when this would be used: This would be used in the *Characterising Success Indicators* stage.

Description of tool use: This approach builds on a concept map of indirect and direct drivers in a threats analysis and identifies management intervention points, or conservation strategies, that can be implemented to reduce both direct and indirect threats. Once these strategies have been identified, a "theory of change" approach asks the planners how they think those activities will influence the target. This is designed for use in the context of the Conservation Measures Partnership framework for planning, which is supported by the Miradi software tool.

Experience and expertise required to use the tool: The principles involved are intuitive and easily grasped. Specialist expertise is not required though some prior experience is of benefit. The definition of specific, quantitative species population or other types of habitat goals will certainly require expert input in order to set realistic indicators.

Data requirements: The tool can be used in data poor situations but will be most appropriate when goals are realistic and tied to conservation actions as well as the best available data.

Cost: The tool itself can be applied at no cost, though if used in conjunction with the Miradi software a cost may be incurred and some prior training required. Goal setting is best used under guidance of a facilitator or conservation coach who understands but the conservation context as well as some guidelines for setting appropriate goals.

Strengths and weaknesses, when to use and interpret with caution: Goal setting in conservation is a constant challenge. The strength or weakness of this tool will be relative to the availability of data related to the target species, and the understanding of how conservation actions may lead to the specific impact and success metrics identified in those goals.

Case study: Hundreds of case studies that use the threats analysis process can be found at conpro.tnc.org/ and at and at www.rareplanet.org (multiple languages/organizations available).

Example: Andean Campaign for Habitat Preservation/San Antonio Bay, Argentina**;** http://www.rareplanet.org/en/campaign/campaign-habitat-preservationsan-antonio-bay-argentina

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Setting Objectives and Indicators in an Adaptive Management Framework

Name: Setting Objectives and Indicators in an Adaptive Management Framework

Reference: Conservation Measures Partnership (2007) Open Standards for the Practice of Conservation. Version 2.0. www.conservationmeasures.org.

Conservation planning stage(s) when this would be used: This would be used in the *Characterising Success Indicators* stage.

Description of tool use: Using a "theory of change" approach, planners formally consider the route through which potential management interventions will influence conservation outcomes. Goals and objectives are tied to these management intervention points in the system. This is designed for use as part of the Conservation Measures Partnership framework for planning, which is supported by the Miradi software tool.

Experience and expertise required to use the tool: The principles involved are intuitive and easily grasped. Specialist expertise is not required though some prior experience is of benefit. Setting realistic objectives for each step in the theory of change may require additional research or input from experts.

Data requirements: The tool can be used in data poor situations. Quantitative objectives may require additional data collection for refinement and accuracy.

Cost: The tool itself can be applied at no cost, though if used in conjunction with the Miradi software a cost may be incurred and some prior training required.

Strengths and weaknesses, when to use and interpret with caution: The strengths of this tool include the ability to set both short and long term impact assessment indicators and a framework for evaluating how conservation actions are leading to success. They are associated with clear SMART indicators and provide a consistent framework for short and long term monitoring.

A weakness of the tools will be associated with the availability of data that are aligned with specific objectives and indictors. The accuracy of setting objectives will be dependent on the experts available as well as available knowledge on how conservation actions will influence those objectives as well as how long that impact may take.

Case study: Hundreds of case studies that use the threats analysis process can be found at conpro.tnc.org/ and at and at www.rareplanet.org (multiple languages/organizations available).

Example: Agassiz Beach Ridges, Minnesota, USA native prairie; http://conpro.tnc.org/206/

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Objectives Hierarchies

Name: Objectives Hierarchies

References: Keeney, R.L. (1988) Structuring Objectives for Problems of Public Interest *Operations Research* 36(3):396-405

Keeney, R.L. (1992) Value-focused thinking: a path to creative decisionmaking. Harvard University Press, Cambridge, MA.

Conservation planning stage(s) when this would be used: This would be used in the *Characterising Success Indicators* stage.

Description of tool use: A tool for illustrating and organizing the objectives relevant to a given decision and the relationships among the objectives. Developing an objectives hierarchy requires involving the decision maker and relevant stakeholders in characterising the objectives across multiple and potentially competing sectors (e.g. economic, social, environmental and so on.). The tool focuses on recognition of the hierarchical nature of objectives, for example, increasing survival may be a means objective, which influences a fundamental objective such as reducing probability of persistence for a given species. Survival would fall below probability of persistence in the objectives hierarchy.

Experience and expertise required to use the tool: The tool requires no specific expertise for use, but the tool will be used most effectively when facilitated by a decision analyst with experience in objectives elicitation.

Data requirements: The tool is suitable for use in data poor situations.

Cost: Apart from the expertise, the tool itself can be used for FREE.

Strengths and weaknesses, when to use and interpret with caution: This tool is powerful for understanding the objectives relevant to a decision-making problem, and the relationship among those objectives. It is critical to frame the problem as a decision, with an established context and decision-maker, before relevant objectives can be identified and organized. If used in a poorly-defined decision-analytic context, or if facilitation of the objectives elicitation is poor, the resulting objectives and relationships among them may be faulty.

Case study: Maguire, L (2004) What can decision analysis do for invasive species management? Risk Analysis 24: 859-868.

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Multi-attribute Utility Analysis

Name: Multi-attribute Utility

Reference: Edwards, W. (1977). How to use multi-attribute utility measurement for social decision making. IEEE Transactions on Systems, Man and Cybernetics, 7, 326-340.

Edwards, W. and Newman, J.R (1982). Multivariate Evaluation. Quantitative Applications. In, J.L. Sullivan and R.G. Niemi (Eds.) The Social Sciences 26, 96.

Keeney, R.L., and H. Raiffa. 1993. Decisions with Multiple Objectives: Preferences and Value Trade-Offs. Cambridge, England: Cambridge University Press.

Clemen, R.T., and R. Reilly (Eds.). 2004. Making Hard Decisions with Decision Tools. Boston, MA: South-western College Publishing.

Conservation planning stage(s) when this would be used: This would be used in the *Characterising Success Indicators* stage.

Description of tool use: A tool for helping to deal with the tradeoffs and uncertainties inherent in decision-making where multiple, competing objectives are involved. Utility, or the value associated with a particular decision alternative, is measured as some function of the performance of that alternative on multiple different objectives.

Experience and expertise required to use the tool: This is not suitable for use in the absence of tool-specific expertise.

Data requirements: The tool is suitable for use in data poor situations.

Cost: Apart from the expertise, the tool itself can be used for FREE.

Strengths and weaknesses, when to use and interpret with caution: Eliciting preferences and translating those preferences into numerical values can be difficult. In particular,

Case study: Store, R. and J. Kangas (2001). Integrating spatial multi-criteria evaluation and expert knowledge for GIS-based habitat suitability modeling. Landscape and Urban Planning 55:79-93.

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Setting Population Target Levels

Name: Setting Population Target Levels

Reference: Sanderson (2006). How Many Animals Do We Want To Save? The Many Ways of Setting Target Population Levels for Conservation. Bioscience 56(11): 911-922

Conservation planning stage(s) when this would be used: This would be used in the *Characterising Success Indicators* stage.

Description of tool use: Identifies alternative criteria that can use used to set population target levels for species conservation. Demographic sustainability, ecological integrity, sustainable use, and restoration of historical numbers of individuals are used as themes for setting conservation targets.

Experience and expertise required to use the tool: The tool is easy to understand and to use, though a basic understanding of some of the population biology theories that underpin would be an advantage.

Data requirements: The tool is suitable for use in data poor situations.

Cost: Free

Strengths and weaknesses, when to use and interpret with caution: Not completed.

Case study: Not completed.

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Date:

Concept Mapping

Name: Concept Mapping

Reference: Conservation Measures Partnership (2007) Open Standards for the Practice of Conservation. Version 2.0. www.conservationmeasures.org.

Conservation planning stage(s) when this would be used: This is used during the *Action Planning* stage to identify possible actions.

Description of tool use: A process through which direct and indirect threat drivers are mapped, allowing identification of key areas for management interventions, and key players in those interventions. It is designed for use as part of the Conservation Measures Partnership planning framework which is supported by the Miradi software application.

Experience and expertise required to use the tool: This tool can be used with relatively little expertise, however will be most effective with a facilitator and experts who understand the conservation context of the species of interest.

Data requirements: The tool is suitable for data poor situations.

Cost: The tool concept itself is free though if used in conjunction with the Miradi software costs may apply.

Strengths and weaknesses, when to use and interpret with caution: A strength of this tool is the ability to bring diverse stakeholders together to understand the underlying drivers for why there are threats to conservation targets. There are no limits to underlying condition (just time for the facilitation) and as such novel or unexpected drivers can sometimes be uncovered in the facilitation process.

One weakness of the concept mapping process as it is currently defined in the Open Standards (CMP 2007) is that it is not directly tied to the biological conditions that enable those threats unless they are identified as stressors.

Case study: Hundreds of case studies that use the threats analysis process can be found at conpro.tnc.org/ and at and at www.rareplanet.org (multiple languages/organizations available).

Example: Campaign for Effective Watershed Management/Guam, http://www.rareplanet.org/en/campaign/campaign-effective-watershed-managementguam

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Portfolios/Strategies

Name: Portfolios/Strategies**Reference:** Runge MC, JF Cochrane, SJ Converse, JA Szymanski, DR Smith, JE Lyons, MJ Eaton, A Matz, P Barrett, JD Nichols, and MJ Parkin. 2009. Course Notes *for* An overview of structured decision making, pilot edition. U.S. Fish and Wildlife Service, National Conservation Training Center, Shepherdstown, West Virginia, USA.

Conservation planning stage(s) when this would be used: This is used during the *Action Planning* stage to establish a set of possible actions.

Description of tool use: A tool for considering sets of actions together. This tool is designed to facilitate development of a good array of potential management actions. Portfolios are composed of like sets of actions, for example: various sets of land parcels represent different portfolios. Strategies are composed of different kinds of actions, frequently linked thematically; for example, ex situ conservation and translocations combined with ongoing habitat management may be grouped into a "management intensive" strategy for conservation of a threatened species.

Experience and expertise required to use the tool: The tool requires specialist expertise and prior experience for effective application.

Data requirements: The tool is suitable for data poor situations.

Cost: The tool itself is free though the requisite expertise may need to be resourced.

Strengths and weaknesses, when to use and interpret with caution: Applying portfolio- or strategy-type alternatives is frequently likely to result in a larger number of alternatives to consider than when individual actions are considered alone. Furthermore, when predicting the impact of these alternatives on management objectives, it is not necessarily adequate to simply sum across the impacts of the individual management actions. Therefore, more extensive analysis may be required when using portfolios or strategies.

Case study: Szymanski, J.A., Runge, M.C., Parkin, M.J. and M. Armstrong (2009) White-nose Syndrome Management: Report on Structured Decision-making Initiative (2009). US Fish and Wildlife Service and State Natural Resource Agency Report.

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Landscape Species Approach

Name: Landscape Species Approach

Reference: Sanderson, E.W., Redford, K.H., Vedder, A., Coppololllo, P.B., and S.E. Ward (2002). A conceptual model for conservation planning based on landscape species requirements. Landscape and Urban Planning 58:41-56

Conservation planning stage(s) when this would be used: This is used during the *Action Planning* stage to help predict the outcomes of potential actions.

Description of tool use: A spatially explicit mapping technique that defines a species' biological landscape and its intersection with the landscape of human activities. "Focal landscapes" that are sufficient to meet species requirements are defined and threats from human activity are evaluated with respect to biological requirements. It is designed for use as part of a broader Landscape Species Approach planning process.

Experience and expertise required to use the tool: Effective application requires specialist expertise and experience.

Data requirements: The tool is not suitable for use in data poor planning scenarios.

Strengths and weaknesses, when to use and interpret with caution: Not completed.

Case study: Not completed.

Author(s) name: Translated from the data provided at the Abruzzi workshop.

Affiliation:

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Diagramming Tools

Name: Diagramming Tools

Reference: IUCN/SSC (2008). Strategic Planning for Species Conservation: A Handbook. Version 1.0. Gland, Switzerland: IUCN Species Survival Commission.

Conservation Measures Partnership (2007) Open Standards for the Practice of Conservation. Version 2.0. www.conservationmeasures.org.

Clemen, R.T., and R. Reilly (Eds.). 2001. Making Hard Decisions with Decision Tools. Boston, MA: South-western College Publishing.

Jones, Morgan D. (1995). The Thinker's Toolkit: 14 Powerful Techniques for Problem Solving. Three Rivers Press, New York, NY.

Conservation planning stage(s) when this would be used: These tools can be used to assist the *Action Planning* stage of the process, by helping to build a shared understanding of the system of interest, and of the likely impact of specific actions or strategies on it.

Description of tool use: Influence Diagrams, Problem Trees, Decision Trees, Causal Flow Diagrams, Results Chains, all illustrate a given issue or proposed decision in a way that facilitates a greater understanding of it and a greater appreciation of the alternative outcomes of a set of possible solutions.

Experience and expertise required to use the tool: This covers a large range of tools, many of which are easy to grasp and can be used without specialist expertise.

Data requirements: This varies but tools are generally adaptable to data poor situations whilst others are specifically designed to deal with uncertainty.

Cost: Generally low cost or FREE, though there are some more sophisticated software packages that are more expensive.

Strengths and weaknesses, when to use and interpret with caution: These tools are generally straight forward and instructions for using them are readily available. They are particularly useful for dissecting out, and making transparent, the elements of situations about which there are many different perspectives.

Case study: Briggler, J., J. Utrup, C. Davidson, J. Humphries, J. Groves, T. Johnson, J. Ettling, M. Wanner, K. Traylor-Holzer, D. Reed, V. Lindgren, O. Byers (eds.). 2007. *Hellbender Population and Habitat Viability Assessment: Final Report.* IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, MN.

Case studies can be found at conpro.tnc.org/ and at www.rareplanet.org (multiple languages/organizations available).

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Bayesian Belief Networks

Name: Bayesian Belief Networks

Reference: Wooldridge (2003). Bayesian Belief Networks. CSIRO, Australia.

Conservation planning stage(s) when this would be used: This is used during the *Action Planning* stage to help predict the outcomes of potential actions.

Description of tool use: A decision-support framework allowing evidence from observed events to be propagated through a model of the system, to help predict the outcome of events that have not yet been observed.

Experience and expertise required to use the tool: This tool requires specialist expertise.

Data requirements: This tool is suitable for data poor situations

Cost: Use of BBNs is greatly facilitated by use of an "Enabling Tool" tool such as Netica. An educational license is currently priced at < $300. A limited license is available for free.

Strengths and weaknesses, when to use and interpret with caution: It is necessary to develop probability estimates for events when using this tool, but the tool also facilitates estimating probabilities by breaking them down into simpler sub-events. When empirical data are not available, expert judgment can be a suitable stand-in for estimating these probabilities.

Case study: Marcot, B.G., J.D. Steventon, G.D. Sutherland, and R.K. McCann (2006) Guidelines for developing and updating Bayesian belief networks applied to ecological modeling and conservation. Canadian Journal of Forest Research 36:3063-3074.

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Elicitation of Expert Opinion

[Note that this tool description was first completed for a Disease Risk Analysis tool library and is biased towards that specific application. Some minor modifications have been made to increase its relevance to the Conservation Planning Tools Library, but further work is required.]

Name: Elicitation of Expert Opinion

Reference: MacMillan, D. C. and Marshall, K. (2006), The Delphi process – an expert-based approach to ecological modelling in data-poor environments. Animal Conservation, 9: 11–19.

Kynn, M (2008). The 'heuristics and biases' bias in expert elicitation. J. R. Statist. Soc. 171 (1): 239–264

Murray N, MacDiarmid SC, Wooldridge M, Gummow B, Morley RS, Weber SE, Giovannini A, Wilson D (2004). *Handbook on Import Risk Analysis for Animals and Animal Products, Volume 2. Quantitative risk assessment*. OIE, Paris. 73-76.

Vose D (2000). *Risk Analysis: A quantitative guide*. Second edition. John Wiley, Chichester. 264-290.

Conservation Planning Stage(s) when this would be used: This tool would be used during the *Action Planning* stage, to predict the outcomes of different potential actions. It might also be applicable to other stages in the process where paucity of information is inhibiting planning progress.

Experience and expertise required to use the tool: A high degree of expertise is required in the elicitation of expert opinion. When quantitative inputs are derived from expert opinion, experience in appropriate use and interpretation of probability distributions is essential.

Data requirements: Elicitation of expert opinion is used where there is a paucity or absence of data (Vose 2000).

Cost: Completely dependent on circumstance and is likely to be high.

Case study: Gale P, Brouwer A, Ramnial V, Kelly L, Kosmider R, Fooks AR, Snary EL (2010). Assessing the impact of climate change on vector-borne viruses in the EU through the elicitation of expert opinion. *Epidemiology and Infection* 138. 214-225.

Gallagher E, Ryan J, Kelly L, Leforban Y, Wooldridge M (2002). Estimating the risk of importation of foot and mouth disease into Europe. *Veterinary Record* 150. 769-772.

Description of tool use: Elicitation and combination of expert opinion to generate inputs for a risk assessment are best conducted through a workshop approach using a modified Delphi process (Murray *et al* 2004).

Murray and colleagues (2004) consider that twenty is the maximum number of experts that can be managed appropriately in a workshop. The choice of experts is crucial and each should be selected impartially through a consultative process based on of their knowledge of the given subject. Experts should be selected from a variety of disciplines appropriate to the subject under consideration. It may be useful, however, to include subsidiary experts who do not necessarily have quite the same degree of expertise as core group. Subsidiary experts may provide extreme values in their estimates, which can be used to generate discussion and provide evidence of overconfidence, overestimation or underestimation. Discussion of these extreme values can be used to reduce biases and obtain more accurate estimates from the second questionnaire (see below). It may be considered that it is not appropriate to include the estimates of subsidiary experts in final analysis; such a decision should be made prior to the workshop.

The workshop method is conducted as follows[1];

Introduction

- Explain the background to the project and aims of the workshop.
- Briefly introduce the discipline of risk analysis, the use of expert opinion and probability theory.
- Explain the questions to be asked, the definitions used in the questions and the assumptions made.

Conditioning the experts

- Explain the importance of accurate estimates, emphasising that this is an elicitation of opinion, not a test of knowledge.
- Provide in an easily understood format any data that may be available associated with the question(s) being asked.

Questionnaire 1

- Prior to the workshop, conduct a pilot questionnaire with a different group of individuals to insure that each question is clear and to gauge how long it will take to answer.
- Ensure that the questionnaire is clear, easy to understand and not too long. Where possible, break the questions down into parts.

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[1] Adapted with permission of the World Organisation for Animal Health (OIE) from Murray N, MacDiarmid SC, Wooldridge M, Gummow B, Morley RS, Weber SE, Giovannini A, Wilson D (2004). *Handbook on Import Risk Analysis for Animals and Animal Products, Volume 2. Quantitative risk assessment*. OIE, Paris.

- Allow the questionnaire to be answered individually and anonymously.
- Ask the experts to provide estimates for the maximum and minimum values followed by a most likely value for each question. Asking for estimates in this order reduces anchoring bias.
- Ask the experts to provide percentage estimates rather than probabilities because percentages are conceptually easier to estimate.
- Provide aids such as computer software, graph paper or pie charts to help experts visualise percentages.
- Allow enough time during the workshop to complete the questionnaire.

Analysis 1

- Produce PERT (Beta-PERT) distributions to describe each expert's uncertainty around each question using the minimum, most likely and maximum values elicited.
- Combine the distributions from each expert regarding a particular question using a discrete distribution, appropriately weighted (if necessary) for each expert.

The discussion

- Use a facilitator to ensure that all experts are included equally in the discussion so as to allow a free exchange of information between them.
- Discuss the combined distribution for each question in turn.

Questionnaire 2

- Present the questionnaire to the experts again, ideally the next day, to allow them to amend their previous answers, if they consider it appropriate.

Analysis 2

- Analyse the answers to Questionnaire 2 as described for Questionnaire 1.
- Depending on what was decided before the start of the workshop, answers from subsidiary experts may or may not be included.

Results 2

- Provide the experts with preliminary results as soon as possible after the workshop and send out a validation questionnaire to ensure results are reproducible.
- Provide the experts with the final results as soon as possible.
- Invite feedback on the usefulness of the results and the process itself.

Strengths and weaknesses, when to use and interpret with caution: Potential sources of bias and dealing with disagreement among experts need to be considered carefully (Murray *et al* 2004).

Bias

A person's estimate of a distribution's parameters may be biased by a number of factors. People tend to:

- weight information which comes readily to mind
- be strongly influenced by small unrepresentative sets of data with which they are familiar.

They may;

- be overconfident and estimate uncertainty too narrowly
- resist changing their mind in the face of new information
- try to influence decisions and outcomes by casting their beliefs in a particular direction
- state their beliefs in a way that favours their own performance or status
- knowingly suppress uncertainty in order to appear knowledgeable
- persist in stating weakening views to simply remain consistent over time.

Expert disagreement

In cases of expert disagreement, it is usually best to explore the implications of the judgements of different experts separately to determine whether substantially different conclusions are likely. If the conclusions are not significantly affected, one can conclude that the results are robust despite the disagreement among experts. In some cases, experts may not disagree about the body of knowledge; rather, they may draw different inferences from an agreed body of knowledge. In such cases one needs to make a judgement about which expert is more authoritative for the problem under scrutiny.

Choice of probability distribution

The PERT (Beta-PERT) distribution is used most commonly when eliciting quantitative estimates from experts (see Gallagher *et al* 2002) although other distributions such as the uniform, general, cumulative or discrete may sometimes be used (Murray *et al* 2004, Vose 2000). The uniform distribution is used in situations where experts are unable to propose a 'most likely' value but will propose a minimum and a maximum value. However, the uniform distribution is a very poor modeller of expert opinion and should be avoided if possible. It is very unlikely that an expert will be able to define a maximum and minimum value but have no opinion on a most likely value (Vose 2000). Individual PERT (Beta-PERT) distributions elicited from each expert are combined in a discrete distribution to produce the input value for each variable in the risk assessment model (Vose 2000, Gallagher *et al* 2002).

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[Modifications relating to conservation planning were taken from the Abruzzi workshop data.]

Project Management (Miradi)

Name: Project Management (Miradi)

Reference: Miradi 3.3.2 software available for download: https://miradi.org/?gclid=CIaXxrOwja4CFULd4Aodpz9zgg ; Miradi web tutorial: http://elearn.tnc.org/cap/miradi/player.html; Manual: http://www.rareplanet.org/en/resource/miradi-30-manual;

Conservation planning stage(s) when this would be used: This tool is for use in the *Implementation and Monitoring* stage.

Description of tool use: Miradi provides a built-in project management tool that allows the user to track project budgets, action items, and who is responsible for which activities. In addition, the management is tied to specific goals, objectives, and indicators that are tied to the planning process. This is designed to be used within the Conservation Measures Partnership planning framework.

Experience and expertise required to use the tool: This is relatively easy to use and does not require a high level of specialist expertise.

Data requirements: Dependent on inputs

Costs: Comes with the cost of Miradi (see above)

Strengths and weaknesses, when to use and interpret with caution: Project management tool provides an efficient way for tracking project management (spending, high level data etc.) that is associated with specific indicators and objectives identified in the planning process. As a strength, this provides a convenient next step for working a plan through implementation with associated resources and tasks.

This tool is earlier in its development in Miradi, and could use some more real world functionality, ease, and more seamless integration in reporting. Bugs are common.

Case study: See conpro.tnc.org

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Gap Analysis

A preliminary gap analysis indicates that the library is currently relatively well-equipped with tools for carrying out status reviews, setting goals and objectives and identifying and predicting the outcomes of potential actions. It is less well-equipped with tools for objectively determining which actions should be taken, and is poorly equipped with tools that could assist implementation planning, monitoring and feedback, evaluation and revision, and information sharing (see Table 1 for a breakdown by planning process step). Further work will be required to determine whether additional tools are needed in these areas, what kinds of tools would be most valuable and how they can be accessed or developed for the conservation community.

Table 1. Library breakdown - number of component tools per planning step.

Planning Step	Number of Tools
Preparation	2
Status Review	5
Threats Analysis	6
Visioning	1
Goals and Indicators	2
Objectives and Indicators	5
Identifying Possible Actions	2
Predicting Outcomes	7
Deciding Actions	1
Implementation Planning	1
Monitoring Outcomes/Outputs and Feedback	0
Evaluation and Revision of Plan	0
Document, Learn, Share	1

Tools References

Akçakaya, H.R., M.A. Burgman, O. Kindvall, C. Wood, P. Sjögren-Gulve, J. Hatfield, and M.A. McCarthy (editors). 2004. Species Conservation and Management: Case Studies. Oxford University Press, New York.

Bradshaw, C.J.A., C.R. McMahon, P.S. Miller, R.C. Lacy, M.J. Watts, M.L. Verant, J.P. Pollak, D.A. Fordham, T.A.A. Prowse, and B.A. Brook. 2011. Novel coupling of individual-based epidemiological and demographic models predicts realistic dynamics of tuberculosis in alien buffalo. Journal of Applied Ecology, in review.

Carroll, C., Phillips, M.K., Lopez-Gonzalez, C.A., and N.H. Schumaker (2006) Defining Recovery Goals and Strategies for Endangered Species: The Wolf as a Case Study. BioScience 56(1): 25-37.

CBSG 2010. Population and Habitat Viability Assessment (PHVA) Workshop Process Reference Packet. CBSG, MN.

Clemen, R.T., and R. Reilly (Eds.). 2001. Making Hard Decisions with Decision Tools. Boston, MA: South-western College Publishing.

Conservation Measures Partnership (2007) Open Standards for the Practice of Conservation. Version 2.0. www.conservationmeasures.org.

Drechsler, M. and Burgman, M.A. (2004) Combining population viability analysis with decision analysis. *Biodiversity and Conservation* **13**: 115-139

Edwards, W. (1977). How to use multi-attribute utility measurement for social decision making. IEEE Transactions on Systems, Man and Cybernetics, 7, 326-340.

Edwards, W. and Newman, J.R (1982). Multivariate Evaluation. Quantitative Applications. In, J.L. Sullivan and R.G. Niemi (Eds.) The Social Sciences 26, 96.

Ellis, S. and Seal, U.S. (1996). Conservation Assessment and Management Plan (CAMP) Process Reference Manual. Apple Valley, MN: IUCN/SSC Conservation Breeding Specialist Group.

Gregory, R.S. and Keeney, R.L. (2002) Making smarter environmental management decisions. *Journal of the American Water Resources Association* 38(6): 1601-1612

Hatten et al (2005). A spatial model of potential jaguar habitat in Arizona. *Journal of Wildlife Management* 69(3):1024-1033

IUCN. (2003). Guidelines for Application of IUCN Red List Criteria at Regional Levels: Version 3.0. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK. ii + 26 pp. (http://data.iucn.org/dbtw-wpd/edocs/2003-033-EN.pdf)

IUCN/SSC (2008). Strategic Planning for Species Conservation: A Handbook. Version 1.0. Gland, Switzerland: IUCN Species Survival Commission.

IUCN (2010). IUCN Red List of Threatened Species. Version 2010.1. <www.iucnredlist.org>. Downloaded on 9 March 2011

Keeney, R.L. (1988) Structuring Objectives for Problems of Public Interest *Operations Research* 36(3):396-405

Keeney, R.L., and H. Raiffa. 1993. Decisions with Multiple Objectives: Preferences and Value Trade-Offs. Cambridge, England: Cambridge University Press.

Kynn, M (2008). The 'heuristics and biases' bias in expert elicitation. J. R. Statist. Soc. 171 (1): 239–264

Lees C. (2010) CBSG Virtual Workshops - A Resource for Organisers. http://www.cbsg.org/cbsg/workshopreports/26/cbsg_virtual_wkshop_resource.pdf. Downloaded March 10, 2011.

MacMillan, D. C. and Marshall, K. (2006), The Delphi process – an expert-based approach to ecological modelling in data-poor environments. Animal Conservation, 9: 11–19.

Miller, P.S., and R.C. Lacy. Metamodels as a tool for risk assessment. Pages 333-351 in: F.R. Westley and P.S. Miller, (2003) eds. Experiments in Consilience: Integrating Social and Scientific Responses to Save Endangered Species. Island Press, Washington, DC.

Miller, P.S. 2006. Population Viability Analysis for the Greater Sage Grouse (Centrocercus urophasianus) in Colorado. Apple Valley, MN: IUCN/SSC Conservation Breeding Specialist Group.

Miradi 3.0 Manual: http://www.rareplanet.org/en/resource/miradi-30-manual

Nyhus, P.J., Williams, J.S., Borovansky, J.S., Byers, O., and P. Miller (2003) *Incorporating Local Knowledge: Landowners and Tree Kangaroos in Papua New Guinea.* In: Experiments in Consilience: Integrating Social and Scientific Responses to Save Endangered Species. P. Miller and F. Westley (Eds). Island Press. Washington.

Szymanski, J.A., Runge, M.C., Parkin, M.J. and M. Armstrong (2009) White-nose Syndrome Management: Report on Structured Decision-making Initiative (2009). US Fish and Wildlife Service and State Natural Resource Agency Report.

Sanderson, E.W., Redford, K.H., Vedder, A., Coppolollo, P.B., and S.E. Ward (2002). A conceptual model for conservation planning based on landscape species requirements. Landscape and Urban Planning 58:41-56

Sanderson, E.W., Redford, K.H., Chetkiewicz, C.B., Medellin, R.D., Rabinowitz, A.R., Robinson, J.G., Taber, A.B. (2002). Planning to Save a Species: the Jaguar as a Model. Cons. Biol. 16(1):59-72

Sanderson (2006). How Many Animals Do We Want To Save? The Many Ways of Setting Target Population Levels for Conservation. Bioscience 56(11): 911-922

Sanderson Eric W. Sanderson, Kent H. Redford, Bill Weber, Keith Aune, Dick Baldes, Joel Berger, Dave Carter, Charles Curtin, James Derr, Steve Dobrott, Eva Fearn, Craig Fleener, Steve Forrest, Craig Gerlach, C. Cormack Gates, John E. Gross, Peter Gogan, Shaun Grassel, Jodi A. Hilty, Marv Jensen, Kyran Kunkel, Duane Lammers, Rurik List, Karen Minkowski, Tom Olson, Chris Pague, Paul B. Robertson, and Bob Stephenson et al. (2008). The Ecological Future of the North American Bison: Conceiving Long-term, Large-scale Conservation of Wildlife. Cons. Biol. 22(2): 252-266

Wooldridge (2003). Bayesian Belief Networks. CSIRO, Australia.

Young, B., Byers, E., Gravuer, K., Hall, K., Hammerson, G., Redder A. (2010) Guidelines for Using the NatureServe Climate Change Vulnerability Index. NatureServe, Arlington, VA. http://www.natureserve.org/prodServices/climatechange/ccvi.jsp Downloaded February 14 2011

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