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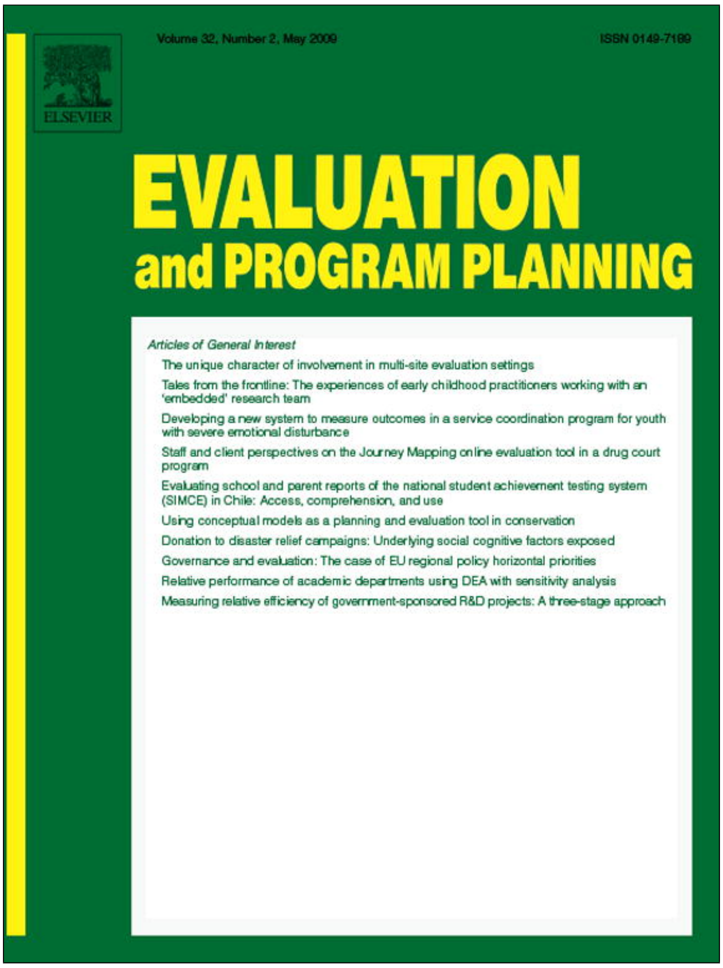
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Using conceptual models as a planning and evaluation tool in conservation

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Conservation projects are dynamic interventions that occur in complex contexts involving intricate interactions of social, political, economic, cultural, and environmental factors. These factors are constantly changing over time and space as managers learn more about the context within which they work. This complex context poses challenges for planning and evaluating conservation project. In order for conservation managers and evaluation professionals to design good interventions and measure project success, they simultaneously need to embrace and deconstruct contextual complexity.

In this article, we describe conceptual models—a tool that helps articulate and make explicit assumptions about a project's context and what a project team hopes to achieve. We provide real-world examples of conceptual models, discuss the relationship between conceptual models and other evaluation tools, and describe various ways that conceptual models serve as a key planning and evaluation tool. These include, for example, that they document assumptions about a project site and they provide a basis for analyzing theories of change.

It is impractical to believe that we can completely eliminate detail or dynamic complexity in projects. Nevertheless, conceptual models can help reduce the effects of this complexity by helping us understand it.

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1. Challenges to evaluating conservation success

Conservation projects[2] employ dynamic interventions to preserve, conserve, or manage ecosystems, habitats, and/or species. They take place in complex situations that usually involve an intricate interaction of social, political, economic, cultural, and environmental factors (Brechin et al., 2002; Hannah et al., 2002). At the same time, they are constantly changing over time and space as managers learn more about and adjust to the context within which their projects take place (Possingham et al., 2001; Meir et al., 2004).

There are two main types of complexity that conservation project mangers must address: detail complexity and dynamic complexity. Detail complexity refers to the large number of variables in a system (Senge, 1990), while dynamic complexity refers to the unpredictable ways in which variables interact with one another (Salafsky, Margoluis, Redford, & Robinson 2002). Since conservation involves addressing natural ecosystems in the context of human societies, conservation managers and evaluators work in systems that are inherently complex both in detail and in dynamic. Thus, evaluating conservation projects requires understanding these types of complexity.

At the same time, the conservation community does not have a long history of documenting project impact and the evidence to unambiguously demonstrate success (Pullin & Knight, 2001; Stem, Margoluis, Salafsky, & Brown, 2005). Only recently has it developed effective monitoring and evaluation systems and approaches that bolster statements of success with real evidence (Ferraro & Pattanayak, 2006). Historically, many conservation organizations have embraced a very simplistic formula for conducting evaluations: define indicators, collect data, analyze data, and write up results. While on the surface this seems like a reasonable process, it begs the question: Which indicators are required in order to truly evaluate impact? At best, conservation managers have used biological indicators to demonstrate the extent to which a project has been successful, but they have rarely analyzed these measurements in the context of project interventions or the intermediate results they intended to achieve (Stem, Margoluis, Salafsky, & Brown, 2005). In effect, they are merely reporting on the status of the biodiversity of concern with little or no consideration about how project interventions have affected that biodiversity. To say that a project has succeeded or failed under this scenario is problematic at best.

In order for conservation managers and evaluation professionals to measure project success, they simultaneously need to embrace and deconstruct contextual complexity. This holds true for all *impact*

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[2] See Box 1 for definition of "project".

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Box 1. Clarification of terminology used in.

In this paper, we use several terms very specifically. We offer the following definitions:

- *Project*: Any set of actions undertaken by a group of actors to achieve some defined end. As such, a project is scale-independent and could include:
  - Activities carried out by a local community to conserve a sacred grove over a couple of months.
  - Government policy to cut greenhouse gases to reduce global climate change over decades.
  - Efforts by a large national environment organization to conserve biodiversity in North America over centuries.

Thus, a project may be a single discrete set of actions carried out by a single team in a particular site, or it may be a group of related actions carried out by multiple actors across multiple sites (program or portfolio).

- *Evaluation*: Collection, analysis, and assessment of data relative to project goals and objectives. Although there is some overlap, evaluations can be generally categorized as:
  - Impact *Evaluation*: Evaluation that measures project results in terms of outcomes and impacts (Rossi et al., 1999); or
  - Process *Evaluation*: Evaluation that measures the extent to which planned activities have been carried out (Rossi et al., 1999) and
  - Summative *Evaluation*: A one-time assessment that usually occurs after a project takes place; generally undertaken for accountability purposes or external decision-making about the fate of a project (Scriven, 1967; Scriven, 1991); or
  - Formative *Evaluation*: An assessment that may take place at various stages throughout a project cycle. The underlying purpose is ongoing improvement of a project (Scriven, 1967; Scriven, 1991).

- *Underlying Assumptions*: Beliefs that describe the basic conditions of the place or environment within which projects operate (Margoluis and Salafsky Impact 1998).
- *Project Assumptions*: Beliefs that describe how a project team expects the project interventions will lead to short term outcomes and long term impacts (Margoluis and Salafsky Indicators 1998).
- *Indicators*: Units of information measured over time that document changes in a specific condition.

evaluations, whether *summative* or *formative* (Box 1). To do this, conservation practitioners need to understand and make explicit *underlying assumptions* about the site and *project assumptions* that lie behind the interventions used. This logic and process should guide practitioners to identify key variables to measure and the associated indicators needed for evaluation (Margoluis & Salafsky, 1998).

Project evaluation, especially in the conservation community, is fraught with many challenges. In addition to those mentioned above are the absence of baseline and ongoing monitoring data, the lack of clear and measurable goals and objectives, and the unwillingness of some organizations or managers to devote sufficient staff and financial resources to evaluation activities (Saterson et al., 2004). Yet the demand by conservation organizations and donors for evaluations grows. This has resulted in a nearly ubiquitous practice of conducting *ex-poste* evaluations in which evaluators must attempt to recreate a hypothetical baseline, identify a justifiable theoretical comparison group, or otherwise provide a subjective guess of what the original project planners hoped to achieve. Consequently, if projects are evaluated at all, the evaluations are done in fairly unsystematic and idiosyncratic ways.

Given this situation, how can evaluators best position a project for an objective evaluation? How can conservation project and program designers develop interventions that lend themselves to being evaluated in the future? How can managers and evaluators articulate assumptions that make explicit what the project expects to achieve within a specific timeframe? How can they determine the best indicators to measure project success? In this paper, we describe the use of conceptual models as a powerful evaluation tool to address these questions.

2. Conceptual models as a tool for planning and evaluation

Although it is very important to consider context when evaluating environment and conservation projects, it is often difficult to simultaneously consider all the different forces operating at a site. A conceptual model can help evaluators do this. A conceptual model is a tool for visually depicting the context within which a project is operating and, in particular, the major forces that are influencing the biodiversity of concern at the site (Box 2). A conceptual model uses a series of shapes and arrows to succinctly represent a set of presumed causal relationships among factors that are believed to impact one or more conservation targets. Conceptual models are also useful planning tools for project teams because they can help the teams determine what actions may best influence the situation at their site and what factors they should monitor to determine if those factors are changing with project implementation. Conceptual models – or variations of them – have been used extensively in other fields (Yampolskaya, Nessman, Hernandez, & Koch, 2004) but have only recently been applied to conservation in organizations including the Biodiversity Support Program, The David and Lucille Packard Foundation, Foundations of Success, The Nature Conservancy, the Wildlife Conservation Society, and the World Wildlife Fund.

One of the most useful features of conceptual models for evaluation is that they can help determine what to measure and, just as importantly, what *not* to measure. A well-developed model draws on local and expert knowledge and explicitly links conservation targets to the main direct threats impacting them and the indirect threats and opportunities that influence those direct threats. Ideally, managers should develop conceptual models for planning purposes before they design and implement their project. These initial conceptual models can then provide evaluators with the basis for an evaluation. If, however, a model does not exist for a project, evaluators can work with project managers to retrospectively create a model that can then form the basis of the evaluation (Box 3).

3. Real-world examples of conceptual models in conservation

To understand the utility of conceptual models, it is useful to move from the theoretical realm and examine some real-world examples. Figs. 1 and 2 are conceptual models adapted and modified from conservation projects in which the authors facilitated strategic planning processes. For the marine site in Fig. 1, the project team identified four conservation targets of primary interest. These included a mix of species (sharks and seabirds) and ecosystems (coral reefs and intertidal systems). The team identified a number of direct threats (in pink) that ranged from localized, discrete threats (e.g., illegal shark fishing) to broader national and global threats (e.g., global warming). Once the team identified these threats, it was then able to brainstorm a series of contributing factors (orange boxes) that were driving the direct threats. For example, legal but unsustainable fishing by local fishermen was driven primarily by a need for local sources of income and increasing local population density. Population

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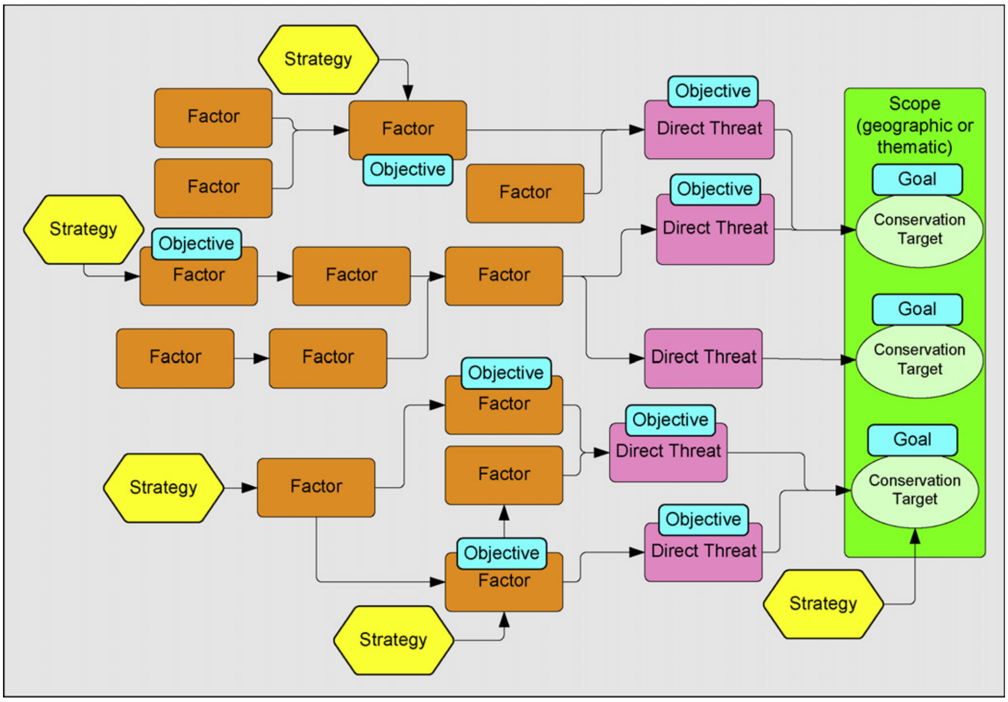
Box 2. Components of a conceptual model for conservation.

The main components of a conceptual model include the following:

- *Scope*: Definition of the broad parameters or rough boundaries (geographic or thematic) for where or on what a project will focus (e.g., La Amistad International Park and its buffer zone).
- *Conservation Target*: An element of biodiversity at a project site, which can be a species, habitat/ecological system, or ecological process on which that a project has chosen to focus (e.g., river turtles, high value wetlands, water purification processes).
- *Direct Threat*: A human action that immediately degrades one or more biodiversity targets. For example, logging or fishing.
- *Contributing Factor*: The indirect threats, opportunities, and other important variables that influence direct threats. These include, for example, perverse economic incentives, favorable attitudes about conservation, and stakeholder education levels.
- *Strategy*: A group of actions with a common focus that work together to influence one or more contributing factors, ultimately reducing threats or restoring natural systems.
- *Goal*: A general summary of the desired future state of or impact on a conservation target.
- *Objective*: A specific statement detailing the desired accomplishments or outcomes of a project, such as reducing a critical threat.

The following generic conceptual model illustrates the relationship of these terms:



density was in turn driven by migration from the mainland—a response to the poor economy on the mainland and greater economic opportunities in the marine reserve. By laying out what was happening at their site in a conceptual model, this project team could easily identify some key areas for intervention. For instance, the project team decided to use an alternative income generation strategy to address the need for local sources of income, under the assumption that addressing this economic need would prevent local fishermen from engaging in unsustainable fishing. The model also helped the team determine where it could not practically intervene—for example, on factors related to poor economy and migration. Although the team could not directly influence these indirect threats, it is important to monitor them, as they could influence the degree to which the project team's other strategies are successful. In addition, the conceptual model indicates where the team set goals and objectives. If this were a large, multi-million dollar project, the team might have set more goals and objectives. Conversely, if this were a project with a small budget, the team might have set fewer goals and objectives.

Fig. 2 provides another example of a conceptual model based on a composite of real-world terrestrial sites with which the authors have worked. This project focuses on four conservation targets that include species (sturgeon), ecosystems (Blue River and tributaries, riparian forest), and ecological processes (forest corridors). As with the marine site, the team identified a series of direct threats ranging from local to global levels. In this case, it also identified a direct threat caused by severe weather patterns (drought-induced fires). Even though this was not something the team could directly address, it included this threat in the model because it could influence how successful the team was with its efforts to conserve riparian forest and forest corridors. As such, it was an important variable that warranted monitoring. By laying out the context at its site, the project team was able to use the conceptual model to help them identify potential intervention points for high leverage factors that affect many other factors. In this example, some high leverage contributing factors include: limited government capacity for land use planning and government policies favorable to urban development.

The examples in Figs. 1 and 2 illustrate in practical terms how conceptual models help make explicit the hypothesized cause and effect relationships among the interventions taken, the contributing factors influenced, the direct threats reduced, and

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Box 3. How to build a conceptual model.

Steps...
Constructing a conceptual model involves the following steps:
(1) Define what the project intends to ultimately influence—the project scope and conservation targets (Box 2). A general rule of thumb is to select no more than eight targets (The Nature Conservancy, 2006).
(2) Move from right to left and brainstorm the direct threats affecting the conservation targets. The model should include the *main* direct threats (pink boxes in Box 2) and use arrows to indicate which threats are affecting which targets.
(3) Add the *main* contributing factors (orange boxes in Box 2—also referred to as drivers or underlying or root causes (Wood et al., 2000)). These contributing factors typically include political, social, economic, cultural, and other behavioral variables. Use arrows to show the causal links among contributing factors, direct threats, and targets.
Following these steps leads to a model of what is happening at a site prior to project implementation. The real utility of a conceptual model as an evaluation tool, however, is to show how project managers expect their interventions will influence existing conditions and lead to desired results. Thus, the final step in constructing a conceptual model is:
(4) Add strategies and show what part of the model they are designed to influence.

Keep in mind...
For the model to be most useful it is important to limit the variables represented to the primary direct threats and contributing factors that are affecting conservation at the site. The danger in being overly complete is that the model will become so large and convoluted that it will lose its communication value and, worse yet, it will not be clear which factors are the most influential. One coarse rule of thumb is to limit the number of factors to approximately 25 or 30.
For more information: More detailed guidance for developing conceptual models is available from. Margoluis and Salafsky (1998) and Foundations of Success (2008). In addition, the Conservation Measures Partnership has developed an adaptive management software package, Miradi (www.miradi.org), which includes a component to help build conceptual models.

the conservation targets affected. As discussed below, this feature makes them a particularly useful planning and evaluation tool.

4. Other planning and evaluation tools related to conceptual models

Conceptual models are part of a suite of tools used primarily in theory of change approaches. These approaches assist project design, planning, and evaluation by laying out assumed pathways connecting interventions to results. Most common among these tools – in addition to conceptual models – are concept mapping, logic models, and results (or causal) chains. Concept mapping uses a series of queries to help participants determine key factors in a collective mental model. These variables are usually determined by quantitative analysis of participant responses (Trochim, 1989; Yampolskaya et al., 2004). Logic models, as shown in Fig. 3, generally illustrate the resources managers will invest (inputs) to implement strategies that are designed to achieve certain desired results (outputs, outcomes, and impacts) (den Heyer, 2001; Kellogg, 2001). Results chains are a representation of the specific hypothesized relationships between a given intervention and expected outcomes and impacts (Foundations of Success, 2007).

Currently, logic models are the most ubiquitous form of theory of change representation used for planning and evaluation. Conceptual models, however, provide a higher level of detail and precision that make it a more useful planning and evaluation tool. A conceptual model differs from a logic model in that it attempts to show all of the hypothesized main forces operating where a project occurs (regardless of whether the project team will act on them), traces back root causes or driving forces that affect threats and targets, and illustrates the interactions among factors. The relationships among factors tend to be clear and direct in conceptual models. In logic models, however, these relationships can be more difficult to discern because logic models typically group all factors related to each of its five main components (inputs, strategies, outputs, outcomes, and impacts). Thus, relationships are depicted as group to group, rather than factor to factor. For this reason, conceptual models usually more explicitly depict the project context and what managers hope to achieve.

Although some believe concept maps and conceptual models are the same tool, they are actually quite different. Both try to graphically present the overall context or situation within which planning or evaluation is happening. Concept maps, however, use multidimensional scaling and cluster analysis to depict variables in a map form (Trochim, 1989). Closely grouped clusters presumably have some association, but, as with logic models, the clusters contain several variables within them. In contrast to concept maps, conceptual models explicitly show assumed causal linkages among multiple factors or trace those causal factors back several layers. One interesting aspect of concept maps, however, is their potential to use the size of clusters within the maps to show the relative importance of the different clusters.

Results chains – another tool related to conceptual models – build off of conceptual models to show in more detail the hypothesized relationship among actions and desired impacts. They explicitly identify key variables and lay out the main assumptions behind interventions, and as such, serve as a very useful tool for project evaluators (Foundations of Success, 2007). Results chains are created by extracting a line of association from a conceptual model and then filling in any gaps to make the underlying logic clear. Conceptual models are most useful in planning and evaluation when used in conjunction with results chains.

Using the marine conceptual model (Fig. 1) as an example, a results chain can be created by starting with the following variables: sharks (conservation target); illegal shark fishing by boats from the mainland (direct threat); and weak law enforcement and low pay for law officers (contributing factors). These variables are then converted into desired results and arranged to form a results chain (Fig. 4). This chain demonstrates how project mangers expect their lobbying efforts to improve budget, pay, and law enforcement will lead to reduced shark fishing and healthy shark populations. Each box in the results chain represents a variable that should be analyzed if this intervention is to be comprehensively evaluated. In addition, the relationships among the boxes should be analyzed to understand the extent to which each box actually influences the subsequent box.

5. Using conceptual models for evaluation

Effective evaluations involve the comparison of actual results to anticipated results over time. They isolate the influence of specific strategies and attempt to demonstrate how a particular project site or subject of interest is different from what it would have been had there been no intervention. Because conceptual models explicitly lay out a set of assumed causal relationships before a project has

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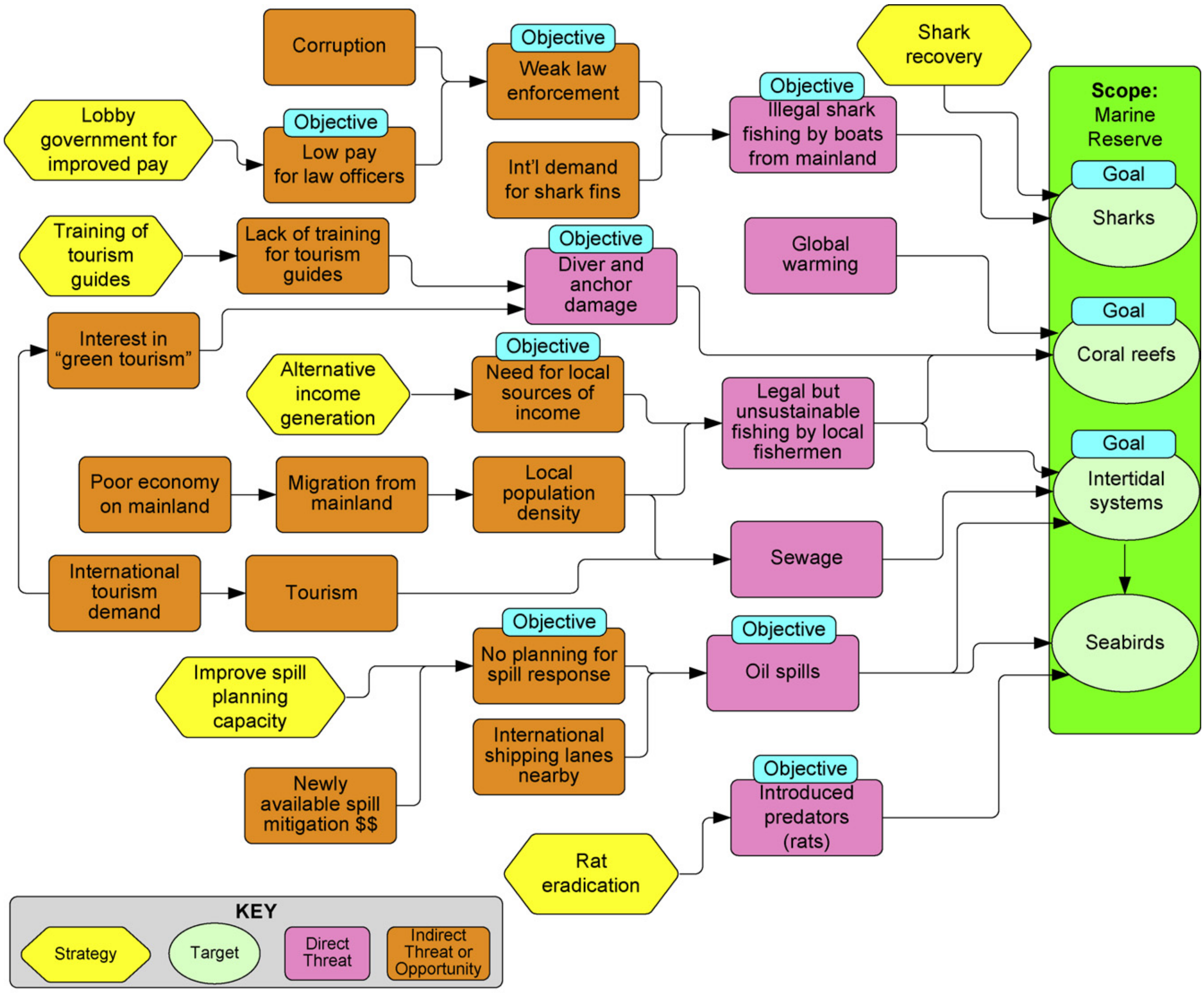

Example Goal (Sharks): By 2020, shark species found in the marine reserve will be reproductively viable (as defined by the latest scientific knowledge), and their population numbers will be at least as high as those recorded in the 1980 biological census
Example Goal (Coral reefs): By 2025, coral reef habitat in the marine reserve covers at least the same area as 1990 levels and supports viable populations of snapper and grouper.
Example Objective (Need for local sources of income): By the end of 2012, local fisherman cover 80% of their household income needs by alternative economic activities
Example Objective (Diver and anchor damage): By 2010, there is no evidence of new anchor damage on priority reefs.

Fig. 1. Conceptual model for a marine site.

commenced, they provide an excellent starting point for both planning and evaluation. Project managers can use conceptual models to determine their strategies, while evaluators can use conceptual models to determine whether a project has successfully influenced factors and to what degree the changes in those factors have led to changes in direct threats and conservation targets. Nevertheless, conceptual models have their limitations (Box 4). Well-conceived conceptual models, however, serve as a key evaluation tool for conservation because they:

5.1. Document assumptions about the project area or theme before interventions take place

An initial conceptual model documents the existing conditions before the project takes place. In essence, it is a cross-sectional view of the situation in its "natural" state – before any intervention is implemented. The initial conceptual model thus is a "snapshot" that represents, in evaluation terms, T_0 – or the baseline against which all subsequent measurements are made. This baseline includes not only specific variables, but also the assumed interactions among these variables – interactions that should be analyzed during the evaluation. Ideally, the model is developed with the entire project team and key stakeholders in order to increase the likelihood that all important variables are included and there is a common understanding.

In conservation projects, however, project teams rarely develop conceptual models. In such cases, an *ex-poste* conceptual model can serve as an effective tool to help evaluators recreate the past in a succinct format. To retrospectively develop a conceptual model, evaluators must work closely with project staff to gather information that permits them to reconstruct the context prior to project implementation. During this reconstruction, conceptual models can serve as effective consensus-building and negotiation tools as they permit evaluators to engage project managers in candid and transparent discussions about the project before interventions began.

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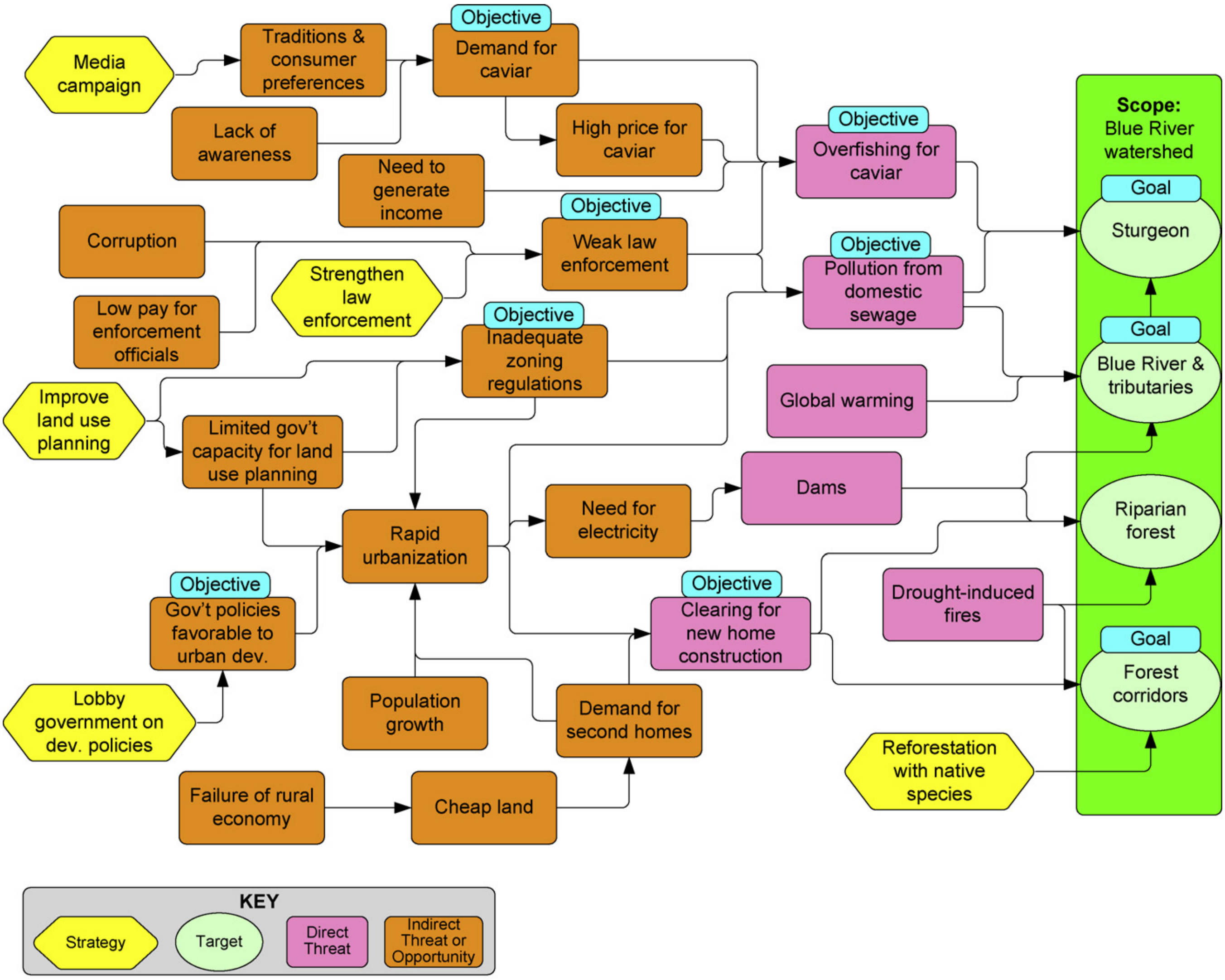
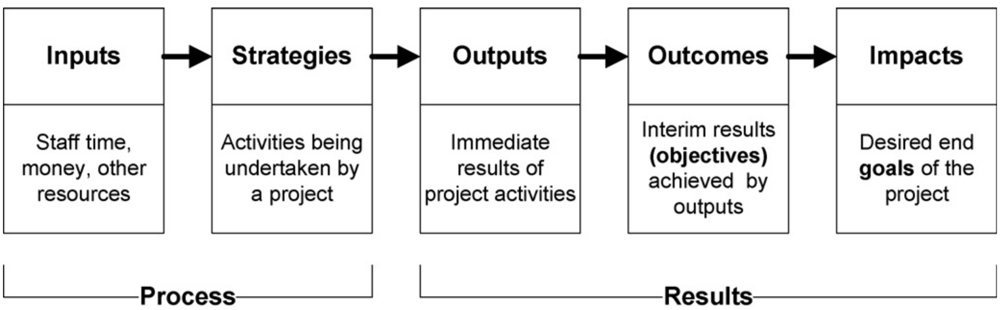


Example Goal (Forest corridors): By 2025, the forest corridor linking the Blue River watershed to Los Grillos is unfragmented and at least 5 km wide.
Example Objective (Government policies favorable to urban development): By the end of 2008, conservation friendly zoning regulations have been developed and approved by the city council.
Example Objective (Clearing for new home construction): By 2015, there is no new home construction being carried out, permitted, or planned in fragile areas.

Fig. 2. Conceptual model for a terrestrial site.

5.2. Provide a framework for setting goals and objectives against which results can be evaluated

Evaluations often measure what is actually achieved against what project managers hoped to accomplish (i.e., project goals and objectives). Conceptual models provide a clear planning framework for articulating goals and objectives and for demonstrating how managers hope the project will alter the threats to the project's conservation targets. Evaluators can thus analyze before and after models to determine the extent to which



Adapted from W. K. Kellogg Foundation (2001)

Fig. 3. Components of a generic logic model.

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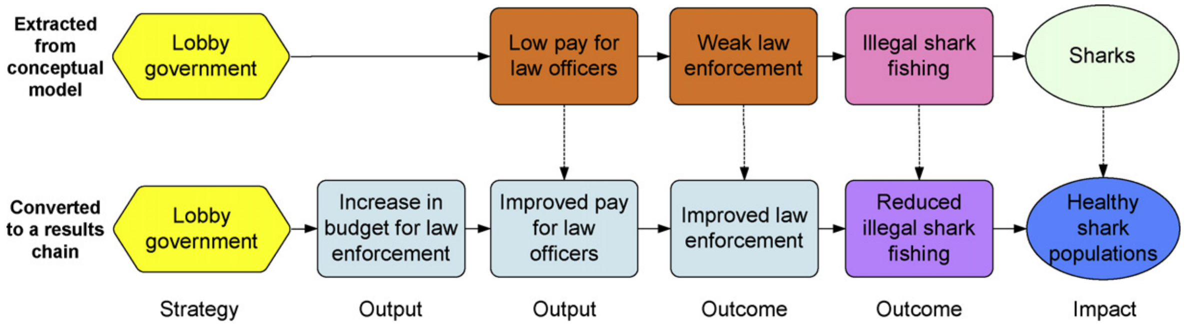

Fig. 4. An example of a results chain: lobbying government.

Box 4. Issues to consider when using conceptual models for evaluation.

Although conceptual models can be very useful tools for evaluation, it is important to use them wisely and to be aware of their limitations. Some issues to consider include:

- *No conceptual model is perfect*: It is impossible to represent in a conceptual model everything that influences a project site or theme. For this reason, conceptual models are never perfectly complete, and evaluators should be the first to acknowledge that some issues are not captured in the model.
- *Conceptual models may represent a biased or incomplete "worldview"*: Conceptual models are completely dependent on who develops them and what knowledge or information participants have. Thus, models do not always provide an accurate representation of reality.
- *The best conceptual models result from a team effort*: Conceptual models require in-depth knowledge of a project area. Ideally, when used for project management, they portray the results of a thorough situation analysis that identifies critical factors influencing the site. Most evaluators will not have sufficient knowledge to adequately capture the reality of a project area or theme. It is essential, therefore, to include in the development of a model people who are knowledgeable about the project and where it takes place.
- *Conceptual models are dynamic*: When used in project management, conceptual models change over time as managers learn new things about their site. Similarly, models used in evaluation should change as evaluators discover new factors and relationships among them. Models must, therefore, be revised over time.
- *Getting the right level of information is an art and a science*: Evaluators should strive to make sure their conceptual models provide enough information to reasonably portray reality but not so much as to confuse it. Conceptual models that include too many factors and show too many relationships end up looking like a plate of spaghetti, and they lose their value as a communications, analytical, and evaluation tool.
- *Building a conceptual model requires time and commitment*: Building a conceptual model as part of an evaluation requires a significant upfront investment of time. Investing the required time, however, will help the evaluator make explicit the project's underlying logic and test whether the logic has held. Ultimately, this will lead to a more meaningful evaluation of project effectiveness.
- *Conceptual models will not effectively reach those readers who are not visual learners*: Evaluation readers who do not learn visually will not experience or appreciate most of the benefits associated with conceptual models For this reason, it is important that conceptual models are accompanied by adequate text descriptions.

project strategies, goals, and objectives led to changes in the underlying conditions that influence conservation targets. For example, the shark target in Figs. 1 and 4 can be converted to the following goal:

> *Goal*: By 2020, shark species found in the marine reserve will be reproductively viable (as defined by the latest scientific knowledge), and their population numbers will be at least as high as those recorded in the 1980 biological census.

This goal is well-defined and measurable—it helps project managers be clear about what they want and need to achieve, while it lets an evaluator know that he/she must examine shark reproductive viability and how it has changed with the implementation of the project. Likewise, the conceptual model can help teams determine where to set objectives which can later be evaluated. Two examples of objectives related to the direct threat of illegal fishing and the indirect threat of low pay include:

> *Illegal fishing objective*: By 2016, there are no incidences of illegal shark fishing by boats from the mainland in the reserve.
> *Low law enforcement pay objective*: By 2012, pay for reserve law enforcement officers is at least the equivalent of $20,000 per year in 2009 US dollars.

Once again, these are well-defined and measurable objectives that help project managers be clear about what they will (and will not) do with their project and that provide evaluators with a clear basis for assessing important intermediate results that project managers believe contribute to project success.

5.3. Provide a basis for analyzing theories of change

Conceptual models form the basis for constructing more specific theories of change, especially when complemented by tools such as results chains. Evaluation of conservation projects should focus on not only the status of conservation targets, threats, and contributing factors, but also the effectiveness of interventions. As described above, theories of change document managers' assumptions about hypothesized cause-and-effect relationships. They make intermediate steps and results clear to project managers and evaluators so that they can diagnose successes and failures in project theory and implementation. Evaluators are rarely able to attribute changes in threats or targets exclusively to one or more project interventions. Nevertheless, a theory of change approach (based on a sound conceptual model) allows them to make a more compelling argument that a specific intervention has or has not contributed to a particular outcome or impact.

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For example, returning to the law enforcement example, an evaluator may find that the project successfully lobbied the government to increase their budget and improve law officers' salaries. But, contrary to the assumed theory of change, law enforcement for illegal shark fishing only improved temporarily and then returned to pre-project levels. This would suggest to evaluators and project managers that the theory of change failed at this point and there were other intervening factors that were as important or perhaps more important than officer compensation (e.g., adequate enforcement infrastructure or sufficient personnel).

For project and program managers, the ability to analyze whether their project assumptions have held is crucial for them to be able to practice adaptive management—the design, management, and monitoring of conservation actions to test assumptions, adapt, and learn (Salafsky, Margoluis, & Redford, 2001). Under adaptive management, periodic evaluations become a means for project teams to use results to adapt and improve their conservation interventions over time.

5.4. Provide an indication of the timing of results

Clearly, not all results occur immediately in conservation projects. Yet all too often, project managers and evaluators are expected to show measurable change in key outcome or impact variables almost immediately after the project has commenced. In reality, it can take several years before impacts on conservation targets are apparent. Changes occur most quickly in those factors that are proximate to the actual intervention. As one moves further from the intervention – toward direct threats and ultimately, conservation targets – results take longer to materialize and are more difficult to discern. Therefore, if managers and evaluators are clear about when they expect to see the occurrence of specific project results, they can more realistically communicate the timing of project outcomes to donors and other interested parties. For example, Fig. 5 shows the possible timing of the specific results described in Fig. 4. If indeed, this chronology is correct (and even this is optimistic), then a midterm evaluation in 2015 should not promise to discern any measurable changes in threats or targets.

5.5. Help identify potential comparison or control groups

In their strictest form, evaluations should include comparison or control groups. In reality, however, even the use of comparison groups is rare in conservation. A comparison or control group must be matched to the intervention group on a variety of variables, and conceptual models provide the basis for identifying important factors for carrying out this matching. For example, using the results chain in Fig. 4, project evaluators would wish to analyze the influence of increased law officer salaries on the amount of illegal fishing by mainland boats. To carry out the evaluation, the evaluators might want to compare what is happening in the reserve to another site in which officer salaries have not been increased. To do this, the evaluators could not simply select any other site. Analyzing the conceptual model in Fig. 2 would help them determine that, ideally, they need a comparison site that: is a protected area (a marine reserve); includes sharks as a key target; suffers from the same threat of illegal fishing from the mainland; and is experiencing weak law enforcement because of underpaid officers. In addition to these factors, data collected to create the model may indicate that evaluators need to match on other more basic factors including socio-economic, political, and location variables.

5.6. Identify key factors for which indicators can be developed and used for evaluation

One of the most important functions of conceptual models is to provide the basis for indicator selection for monitoring and evaluation. Just as important as determining what to evaluate is determining what *not* to evaluate. The best conceptual models include only the important factors that must be influenced in order to achieve project goals and objectives. It is crucial to measure indicators for these factors in order to judge success or analyze failure. The factors that are most important to include in an evaluation are those that outline the specific theories of change that link project strategies to impacts. While conceptual models might not illustrate all factors that are important to include in the evaluation process, they do provide a good starting point for indicator selection. Fig. 6 illustrates possible indicators associated with key results described in Fig. 4.

5.7. Provide a powerful means of visually communicating project plans and evaluation results

Conceptual models – and their derivative tool, results chains – provide a lot of information in a simple, concise format. As such, they serve as a powerful visual communications tool.

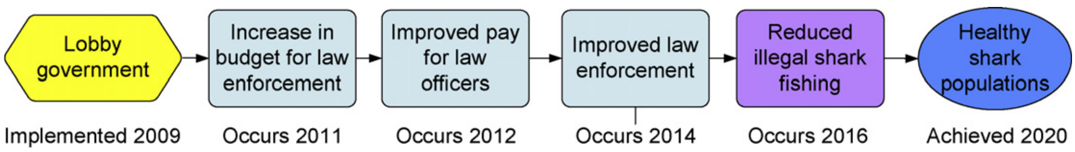

Fig. 5. Timing of results related to lobbying government strategy.

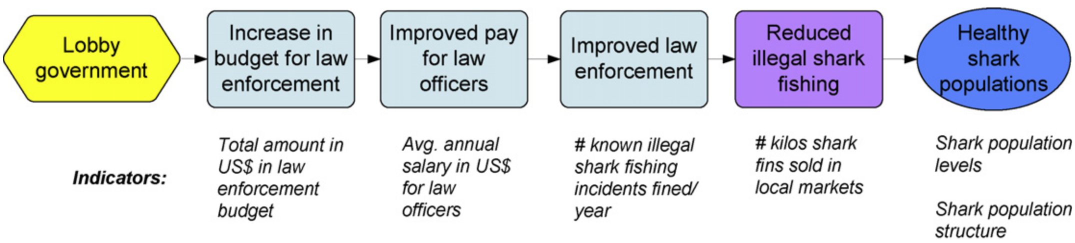

Fig. 6. Indicators associated with lobbying government strategy.

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Project managers can use them to communicate with partners, donors, and other stakeholders about what they are trying to influence and why. Likewise, evaluators can use them in their reports to succinctly and effectively communicate to their audiences what a project intended to do and, drawing upon data from indicators measured along a chain of causation, to what degree it was successful. Text descriptions of similar information could consume several pages of a report and, at the same time, risk losing the reader in lengthy descriptions that can be summarized more effectively in a shape and arrow diagram like a conceptual model.

6. Conclusion

This paper demonstrates that conceptual models are a useful tool in both project planning and evaluation as they help identify key factors and relationships to influence, measure, and analyze. Specifically, they make explicit project managers' assumptions about how interventions are linked to expected results. Although used extensively in other fields, conceptual models have only recently found their way into conservation project planning, management, monitoring, and evaluation.

To some conservation practitioners, conceptual models may appear to be intricate and complex depictions of a given situation. To others, conceptual models may seem to represent a gross simplification of reality. If developed and used properly, conceptual models need not fit either of these characterizations. In fact, a conceptual model should ideally be a relatively concise and abridged representation of reality that may show only the main points of a more complete situation analysis conducted during the project design phase.

In this paper, we have referred often to project teams as the developers and users of conceptual models. While the tool is particularly useful to project managers, it is equally useful to project evaluators. Indeed, in many cases in which project managers practice adaptive management, it is the managers themselves who evaluate their own interventions. In these cases, there is no distinction between manager and evaluator. Whether the evaluation is summative and carried out by an external evaluator or formative and carried out by the project team itself, conceptual models are an important diagnostic tool that managers and evaluators alike can use to determine which strategies have worked, which have not worked, and why.

It is impractical to believe that we will ever be able to completely eliminate detail or dynamic complexity in projects—that we will understand all variables and the interactions among them. Nevertheless, conceptual models can help us significantly reduce the effects of these types of complexity by helping us understand them better. The greater our success in understanding complexity, the higher the probability that we will be able to more successfully design, implement, and evaluate effective conservation projects.

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References

Brechin, S. R., Wilshusen, P. R., Fortwangler, C. L., & West, P. C. (2002). Beyond the square wheel: Toward a more comprehensive understanding of biodiversity conservation as social and political process. *Society and Natural Resources, 15*(1), 41–65.

Caldwell, R. (Ed.). (2002). *CARE project design handbook*. Atlanta, GA: CARE.

Conservation Measures Partnership (2004). *Open standards for the practice of conservation, conservation measures partnership*, http://www.conservationmeasures.org, p. 21.

den Heyer, M. (2001). *A bibliography for program logic models/logframe analysis*. Ottawa, Ontario: International Development Research Centre. p. 5.

Ferraro, P. J., & Pattanayak, S. K. (2006). Money for nothing? A call for empirical evaluation of biodiversity conservation investments. *PLoS Biology, 4*(4), 105.

GTZ (1997). *ZOPP: Objectives-oriented project planning: A planning guide for new and ongoing projects and programme*. Eschborn, Germany: GTZ, p. 32.

Hannah, L., Midgley, G. F., Lovejoy, T., Bond, W. J., Bush, M., Lovelett, J. C., et al. (2002). Conservation of biodiversity in a changing climate. *Conservation Biology, 16*(1), 264–268.

Kleiman, D. G., Reading, R. P., Miller, B. J., Clark, T. W., Scott, J. M., Robinson, J., et al. (2000). *Improving the evaluation of conservation programs, 14*(2), 356–365.

Meir, E., Andelman, S., & Possingham, H. P. (2004). Does conservation planning matter in a dynamic and uncertain world? *Ecology Letters, 7*(8), 615–622.

Possingham, H. P., Andelman, S. J., Noon, B. R., Trombulak, S., & Pulliam, H. R. (2001). Making smart conservation decisions. In M. E. Soulé & G. H. Orians (Eds.), *Conservation biology: Research priorities for the next decade* (pp. 225–244). Washington, DC: Island Press.

Pullin, A. S., & Knight, T. M. (2001). Effectiveness in conservation practice: Pointers from medicine and public health. *Conservation Biology, 15*(1), 50–54.

Rossi, P. H., Freeman, H. E., & Lipsey, M. W. (1999). *Evaluation: A systematic approach*. Thousand Oaks, CA: Sage Publications.

Saterson, K. A., & Christensen, N. L., Jackson, R. B., Kramer, R. A., Pimm, S. L., Smith, M. D., et al., (2004). Disconnects in evaluating the relative effectiveness of conservation strategies. Conservation Biology *18*(3), 597.

Scriven, M. (1967). The methodology of evaluation. In R. W. Tyler, R. M. Gagné, & M. Scriven (Eds.), *Perspectives of Curriculum Evaluation* (pp. 39–83). Chicago: Rand McNally & Co.

Scriven, M. (1991). *Evaluation thesaurus*. Newbury Park, CA: Sage Publications.

Senge, P. (1990). *The fifth discipline: The art and practice of the learning organization*. New York: Currency Doubleday.

Sutherland, W. J., Pullin, A. S., Dolman, P. M., & Knight, T. M. (2004). The need for evidence-based conservation. *Trends in Ecology and Evolution, 19*, 305–308.

The Nature Conservancy (2006). *Conservation action planning workbook user manual (Version 5a)*. Arlington, VA: The Nature Conservancy.

Trochim, W. M. (1989). An introduction to concept mapping for planning and evaluation. *Evaluation and Program Planning, 12*(1), 1–16.

W. K. Kellogg Foundation (2001). *Logic model development guide: Using logic models to bring together planning, evaluation, & action*. Battle Creek, MI: W. K. Kellogg Foundation.

Wood, A., Stedman-Edwards, P., & Mang, J. (Eds.). (2000). *The root causes of biodiversity loss*. London, UK: World Wildlife Fund and Earthscan Publications, Ltd.

Yampolskaya, S. N., Nesman, T. M., Hernandez, M., & Koch, D. (2004). Using concept mapping to develop a logic model and articulate a program theory: A case example. *American Journal of Evaluation, 25*(2), 191–207.

Foundations of Success (2007). Results Chains to Improve Strategy Effectiveness. An FOS How-To Guide. Bethesda, MD, Foundations of Success: 15.

Margoluis, R. & N. Salafsky (1998). Measures of success: Designing, managing, and monitoring conservation and development projects. Washington, DC, Island Press.

Salafsky, N., Margoluis, R., & Redford, K. (2001). Adaptive management: A tool for conservation practitioners. Washington, DC: Biodiversity Support Program.

Salafsky, N., Margoluis, R., Redford, K., & Robinson, J., (2002). Improving the Practice of Conservation: A Conceptual Framework and Research Agenda for Conservation Science. Conservation Biology, 16(6), 1469–1479.

Stem, C., Margoluis, R., Salafsky, N., & Brown, M., (2005). Monitoring and Evaluation in Conservation: a Review of Trends and Approaches. Conservation Biology, 19(2), 295-309.

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