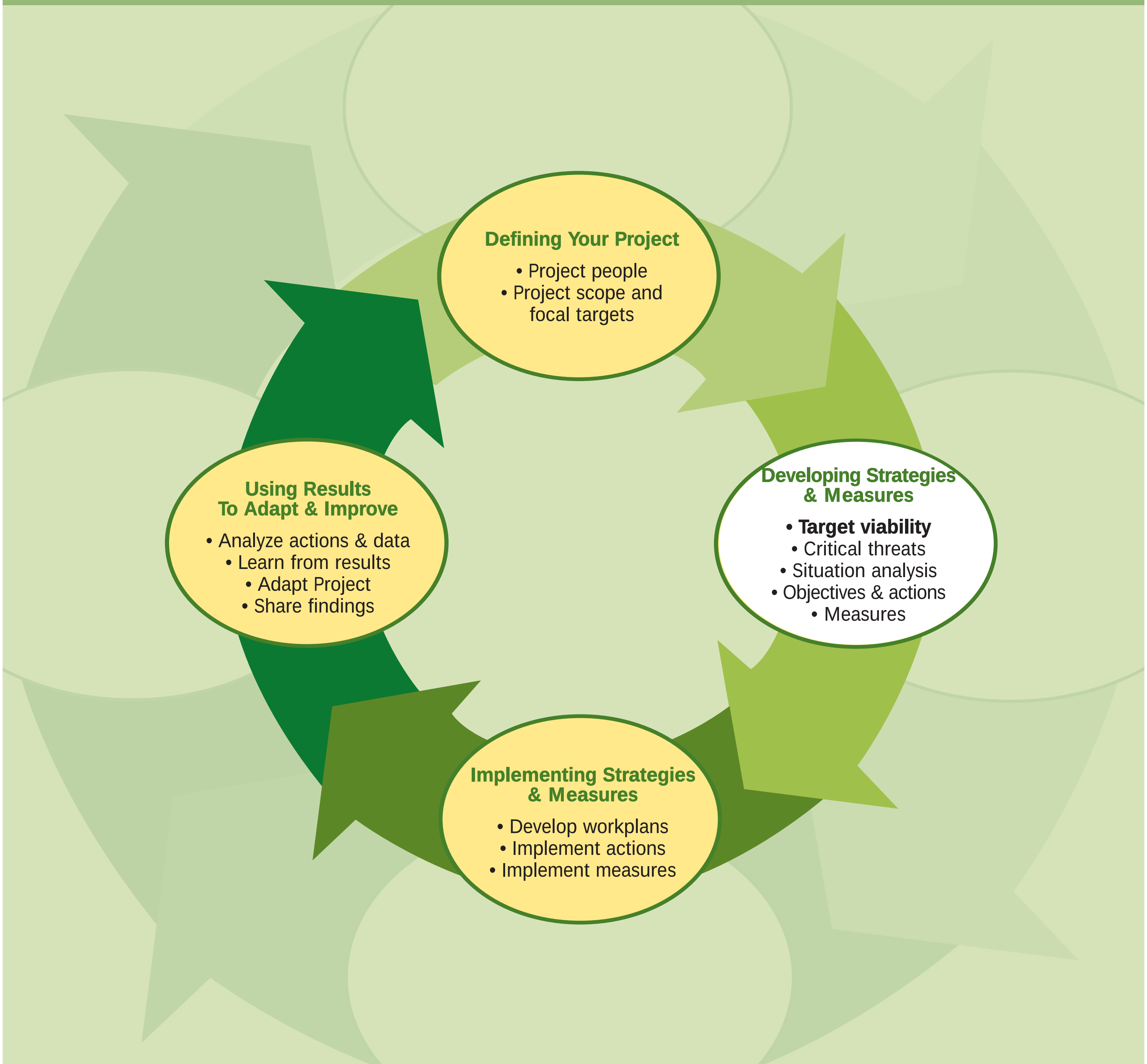
3. Assess viability



Basic Practice Three

This document is a chapter from the Conservation Action Planning Handbook. The complete Handbook is available online at http://conserveonline.org/workspaces/cbdgateway/cap/practices.

The CAP Handbook is intended as a guidance resource to support the implementation of The Nature Conservancy's Conservation Action Planning (CAP) Process - a powerful instrument for helping practitioners get to effective conservation results. The CAP process is a key analytical method that supports Conservation by Design, the Conservancy's strategic framework for mission success.

Suggested citation: TNC, 2007. Guidance for Step 3: Assess Viability of Focal Conservation Targets in Conservation Action Planning Handbook. The Nature Conservancy, Arlington, VA.

Citation for complete document: TNC, 2007. Conservation Action Planning Handbook: Developing Strategies, Taking Action and Measuring Success at Any Scale. The Nature Conservancy, Arlington, VA.

This is a living document that will adapt and change as new information becomes available and as we hear from you about how to improve it. The most recent version will always be available at: http://conserveonline.org/workspaces/cbdgateway/cap/practices

For more information on Conservation Action Planning visit www.conservationgateway.org/cap.

Conservation Action Planning

Step 3: Assess Viability of Focal Conservation Targets[6]

As summarized in TNC's CAP Overview of Basic Practices:

This step asks you to look at each of your focal targets carefully to determine how to measure its "health" over time. And then to identify how the target is doing today and what a "healthy state" might look like. This step is the key to knowing which of your targets are most in need of immediate attention, and for measuring success over time. Specific questions that this step answers include:

> *"How do we define 'health' (viability) for each of our targets?"*
> *"What is the current status of each of our targets?"*
> *"What is our desired status for each of our targets?"*

Expected Outputs:
The bottom line output is a rough assessment of the overall viability rank for each target based on key ecological attributes. The components of this overall assessment include:

- At least one key ecological attribute for each focal target.
- A measurable indicator for each key ecological attribute (in some cases, the indicator may be the same as the attribute itself).
- Your assumption - to the best of your current knowledge - as to what constitutes an acceptable range of variation for each attribute.
- Current and desired future status of each attribute.
- Brief documentation of how you arrived at your viability assessments including references, experts consulted, assumptions, and suggested research needs.

The Importance of Assessing Target Viability

A key step in managing any system is to develop a good understanding of what you are trying to accomplish. In particular, you need to be able to define specific future goals, assess the current status of the system today, and measure your progress as you move towards these goals. For example, medical doctors define healthy individuals as having, among other things, a pulse rate and blood pressure within an appropriate range for their age and condition. If a patient is outside of the normal range, then the doctor can prescribe therapy and then monitor the patient's condition over time as they hopefully move towards a desired goal in the normal range.

This process of setting measurable goals is particularly challenging for the focal conservation targets used by biodiversity projects. Most focal conservation targets are themselves very complex systems that vary naturally over time. It is thus not easy to define or measure the "health" of a bear or migratory fish population, a forest, or a coral reef in a systematic and repeatable fashion. Target Viability Assessment is a flexible and yet powerful methodology that has been developed to help solve this problem, based on sound ecological principles. It provides a consistent framework for defining the current status, and desired future condition of focal conservation targets. In particular, the viability assessment methodology can provide the following benefits:

6. This chapter was authored by David Braun, Eastern New York Chapter and Nick Salafsky, Foundations of Success

- An objective, consistent means for determining changes in the status of each focal conservation target over time, the ultimate measure of the success of your conservation efforts;
- An objective and consistent way to compare the status of a specific focal target among different project that share concern for the same target;
- An objective means for comparing the status and effectiveness of different projects, even when they do not share the same focal targets;
- Guides the identification of current and potential threats to a target and identifies past damage to the target that must be undone;
- Serves as the basis of strategy design;
- Creates the foundation of a monitoring plan, and
- Helps summarize and document knowledge and assumptions about the biology and ecology of each target, and identify crucial information gaps and research questions.

Ultimately, viability assessment helps project teams to build a set of hypotheses to guide conservation and research - and then to continue to improve these hypotheses over time. Viability assessment relies on established principles of ecology and conservation science. It uses the best available information on the target's biology and ecology in an explicit, objective, consistent, and credible manner. Viability assessment does not, however, require "perfect" information. Instead it provides a way for your project team to lay out - to the best of your knowledge - what you think healthy targets will look like

The guidance provided here provides an introductory overview of the Assessing Target Viability subject. You'll learn the basics that allow you to produce a credible first iteration of your target viability assessment that will inform your threats assessment and strategy selection. There may be times when you need to a more thorough assessment of target viability and could benefit from a more detailed set of guidance. For example, you may engage external scientists in your CAP to produce a more detailed viability assessment if the uncertainty associated with a target's viability status is serving as an obstacle to determining whether action is warranted. A link to a supplementary resource titled an *"Advanced Guidance for Step 3: Assessing the Viability of the Focal Conservation Targets"* is listed in the *Resources and Tools* section. This supplementary guidance offers an expanded guide to target viability assessment. It provides additional explanations of its core concepts and a more detailed presentation of best practices to help teams make the best use of the information and resources at their disposal.

Terms at a Glance

Viability - The status or "health" of a population of a specific plant or animal species. More generally, viability indicates the ability of a conservation target to withstand or recover from most natural or anthropogenic disturbances and thus to persist for many generations or over long time periods. Technically, the term "integrity" should be used for ecological communities and ecological systems with "viability" being reserved for populations and species. In the interest of simplicity, however, we use viability as the generic term for all targets.

Key Ecological Attribute (KEAs) - Aspects of a target's biology or ecology that, if missing or altered, would lead to the loss of that target over time. As such, KEAs define the target's viability or integrity. More technically, the most critical components of biological composition, structure, interactions and processes, environmental regimes, and landscape configuration that sustain a target's viability or ecological integrity over space and time. The word "attribute" is sometimes used as shorthand for KEA in this document.

Indicator - Measurable entities related to a specific information need (for example, the status of a key ecological attribute, change in a threat, or progress towards an objective). A good indicator meets the criteria of being: measurable, precise, consistent, and sensitive..

Acceptable Range of Variation - Key ecological attributes of focal targets naturally vary over time. The acceptable range defines the limits of this variation that constitute the minimum conditions for persistence of the target (note that persistence may still require human management interventions). This concept of an acceptable range of variation establishes the minimum criteria for identifying a conservation target as "conserved" or not. If the attribute lies outside this acceptable range, it is a degraded attribute.

Current Status - An assessment of the current "health" of a target as expressed through the most recent measurement or rating of an indicator for a key ecological attribute of the target.

Desired Future Status - A measurement or rating of an indicator for a key ecological attribute that describes the level of viability/integrity that the project intends to achieve. Generally equivalent to a project goal.

Defining Viability Assessment

Viability assessment begins by identifying key ecological attributes (KEAs) for each of your focal conservation targets. At its most basic, a key ecological attribute is an aspect of a target's biology or ecology that if present, defines a healthy target and if missing or altered, would lead to the outright loss or extreme degradation of that target over time. For example, a key attribute for a freshwater stream target might be some aspect of water chemistry. If the water chemistry becomes sufficiently degraded, then the stream target is no longer viable. Key ecological attributes can often be grouped into three classes:

- **Size** is a measure of the area or abundance of the conservation target's occurrence.
- **Condition** is a measure of the biological composition, structure and biotic interactions that characterize the occurrence.
- **Landscape context** is an assessment of the target's environment including ecological processes and regimes that maintain the target occurrence such as flooding, fire regimes and many other kinds of natural disturbance, and connectivity such as species targets having access to habitats and resources or the ability to respond to environmental change through dispersal or migration.

Box 1. One Example of Viability Assessment

A project has selected a grassland habitat and a population of migratory fish as two of its focal conservation targets. The team decides that a key attribute of the grassland is the frequency of fires. The indicator here is merely the years between fires (basically the attribute itself). After consulting local experts, the team makes an assumption that a healthy frequency is to have fires every 5-10 years. If fires happen more or less often then that, then the grassland will lose integrity over time, leading to serious system degradation.

Likewise, the team decides that a key attribute of the migratory fish is population size. An indicator here is a sample of adults observed going over a fish ladder during the peak of the spring spawning season. The team currently has incomplete knowledge of what constitutes a viable population, but based on a review of some past monitoring information makes an initial assumption that at least 10 adults per hour are required. They hope to refine this

			Indicator Ratings						
Target	Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Status	Current Rating	Desired Rating
Grassland	Fire regime(fre-quency)	Years between fires		>10 or <5	5-10		8	Good	Good
Mirgratory Fish species	Population size	Spawning adults observed per hour		<10	>10		<2	Poor?	Good

However, not all classes necessarily apply to all focal targets.

Although key ecological attributes are specific descriptions of an aspect of a target, they are generally still too broad to measure or assess in a cost-effective manner over time. To this end, it is important to develop indicators that can be used to assess the attribute over time. An indicator, in simplest terms, is what you measure to keep track of the status of a key ecological attribute.

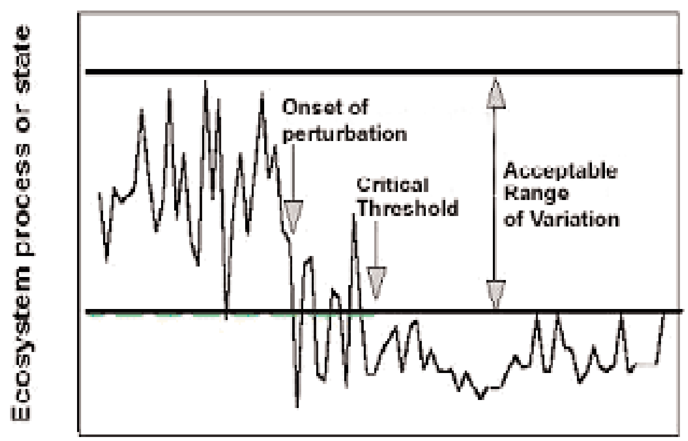
For example, as shown in Box 2, an indicator of fire regime for a grassland target might be years between fires, while an indicator of population size for a migratory fish target might be the number of spawning adults observed per hour during the breeding season. Generally speaking, an indicator may be either:

- A specific, measurable characteristic of the attribute such as the total number of adults in a population, or
- A collection of such characteristics combined into an index such as a multi-species index of forest canopy composition.

Key ecological attributes and their associated indicators provide a way to assess the status of a target over time. But by themselves, they are not sufficient to determine the health of a given target. Instead, they need to be placed in an appropriate context or frame of reference. Just as a healthy person's pulse rate or blood pressure changes over the course of a day and over a lifetime, most key ecological attributes will vary over time. For example, the size of migratory fish population might go up and down on a year-to-year basis. As shown in Figure 1, however, there is a difference between a population size that is within the acceptable range of variation (ARV) and one that is outside this acceptable range. For some attributes, this acceptable range is one-sided (for example, it may be possible to have too little, but not too much of a particular kind of forest within a project area). For other attributes, the acceptable range is two-sided (for example, there can be too many or too few deer per hectare in the forest). In some cases, we may be able to precisely determine thresholds that clearly mark the boundary of this acceptable range, whereas in other cases we can only approximate where these thresholds might be. These thresholds, however, establish what you determine as the acceptable range of variation for your target.

Figure 1. Acceptable range of variation.

Any given key ecological attribute will vary naturally over time; it is "acceptable" when it is in the range as determined by critical thresholds, or your estimate of what constitutes an acceptable range.



Estimating the acceptable range of variation for each key attribute helps answer two crucial questions: *how much alteration of a key attribute is too much?* And, *how much restoration is enough?* Managing conservation targets within their acceptable range of variation in turn does not mean managing for all the variation that the target might experience under undisturbed conditions. Instead, it means managing only for an envelope of conditions that together are "enough" for target persistence and function.[7]

7. This is why we use the term "acceptable range of variation" rather than "natural range of variation" which corresponds to the variation of the attribute in a world independent of human influence. We use the term "acceptable" because it allows us to sidestep the thorny issue of what is "natural" and instead focus on what our best available science tells us is sufficient to achieve our goal - the long term persistence of the target.

Once you have estimated the acceptable range of variation for an attribute, you can then go on to specify the viability rating scale. This scale involves establishing the following boundaries for an indicator based on your thresholds:

- **Very Good** - Ecologically desirable status; requires little intervention for maintenance.
- **Good** - Indicator within acceptable range of variation; some intervention required for maintenance.
- **Fair** - Outside acceptable range of variation; requires human intervention.
- **Poor** - Restoration increasingly difficult; may result in extirpation of target.

In effect, by establishing this rating scale, you are specifying your assumption as to what constitutes a "conserved" target versus one that is in need of management intervention. This rating scale is directly analogous with the established pulse rate and blood pressure ranges that a doctor uses to determine whether a patient's circulatory system - and thus by extension the entire patient - is healthy. Although ideally you would define all four boxes of the rating scale, in many projects, you may find that you can only define one or two key boxes - for example the threshold between Fair and Good - especially in early stages of your work.

The final step in the viability assessment is to use the rating scale that you have constructed and available evidence and/or expert opinion to determine the current status of your conservation target (where your target is today) and the desired status of your target (where you would like it to be at some point in the future). This desired status becomes a goal for your project.

Although the viability assessment process can seem complex and overwhelming, at its core, it is merely a way to use your best available knowledge to provide a consistent framework for defining and then measuring the health of your focal conservation targets. In effect, you are constructing a model in which your indicators will tell you about the status of your attributes which in turn will tell you about the status of your focal targets which in turn will tell you about the status of the overall biodiversity of the project site. If you can say that your indicators are in their acceptable range, then you say that your key attributes are okay, which in turn means your targets are okay, which in turn means the overall biodiversity is healthy. If your indicators are not in the acceptable range or are headed out of that acceptable range, then you have problems that you need to address.

Commonly Used Methods

A complete viability assessment involves:

1. Identifying the key ecological attributes for a given target;
2. Selecting indicators for each attribute;
3. Building a rating scale for each indicator based on your hypothesis about its acceptable range of variation;
4. Determining the current status and the desired future status of each attribute using the rating scale and data on all available indicators,
5. Recording any issues, gaps in knowledge, or assumptions,
6. Repeating this process for all your targets, and
7. Reviewing and adjusting your assessments as necessary.

As you go through this process, keep in mind:

- **Your Work Does Not Have to be Perfect** - All too often, project teams seem to get stuck on this step in the CAP process because they feel they do not have sufficient information to develop scientifically credible indicators or ratings. The key here is to make the best use of the information you have, document your key assumptions and uncertainties, get started, and move forward. As your knowledge and resources expand and the project progresses, you will be able to refine, expand, and improve your work. DO NOT GET BOGGED DOWN! Do the best you can and keep moving through the process.
- **Make Use of Existing Work** - Your team is probably not the first group to develop a viability assessment for any given type of target. Before you spend a lot of time and energy developing your analysis, see if you can find existing assessments from other groups that you can adapt to your project's situation. The Conservation Project Database (http://conpro.tnc.org) is a good starting point to find these assessments; the references at the end of this chapter provide other places to look.
- **This is a Highly Iterative Process** - Although viability assessment is presented as a linear series of steps, in reality you will have to go back and forth through these steps, for example revising your indicators and even your key ecological attributes as you start to develop your ratings.

The CAP Workbook contains spreadsheets in which to record KEA, indicators, rankings and rationale determined during the viability assessment process. The Viability Wizard can assist you in entering relevant information.

1. Select a target and identify a limited set of key ecological attributes

Select one of your conservation targets to assess. If this is your first time doing a viability assessment, you may wish to select a relatively simple and straightforward target. With your team, identify a small set of ecological attributes that are critical to this target's long-term viability. There is an almost infinite number of attributes that could describe some characteristic of a target. The challenge here is to identify a small selection of critical attributes that if degraded, would seriously jeopardize the target's ability to persist for more than a few decades. If necessary, brainstorm a list of attributes of the target and then try to winnow them down to the most essential ones. It may also be helpful to develop an ecological model of the target. The broad categories of size, condition, and landscape context can be used to inform the selection of specific key ecological attributes. Box 2 provides a flowchart that can help you in the selection of key ecological attributes.

In identifying your key ecological attributes, it is important to ensure that your final selections are - as the name implies - attributes of the target, rather than descriptions of threats to the target. For example, “compatible land use” is not a key ecological attribute for a forest target. Instead, the threat of incompatible land use presumably affects actual key attributes such as connectivity, soil stability, or the hydrologic regime.

The key ecological attributes that you identify for a target actually define the essence of that target. Often, the process of considering and identifying key ecological attributes will cause you to rethink the target and what it represents. There may even be occasions where you may decide to rename your target to more accurately reflect the key ecological attributes that define it.

For example, the Chico Basin project team in Colorado has identified the following key ecological attributes for one of their focal conservation targets.

Attributes for One Target

Adapted from the Chico Basin Project, Colorado, USA

			Indicator Attributes			
Target	Key Attribute	Indicator	Poor	Fair	Good	Very Good
Black-tailed prairie dog complex	Size of complex					
Black-tailed prairie dog complex	Associated species abundance					
Black-tailed prairie dog complex	Connectivity					

2. Select indicators for each key ecological attribute

For each of your key ecological attributes, determine an indicator that can be used to assess the attribute over time. In many cases an indicator can be the same as the attribute itself. For example, if your attribute is population size, the indicator may be the number of individuals in the population if you can count this number directly. If you cannot count this number directly, then your indicator will specify how you will measure this number - for example, for a fish population, as catch per unit effort using a specific technique at a given time of the year. In other cases, however, developing a good indicator will require a bit more thinking to find a way of measuring the attribute over time. For example, if your attribute is the water quality of a stream, it is not possible to measure every physical and chemical parameter. Instead, you would select a few representative parameters - for example water temperature and oxygen levels - that you feel can represent the overall water quality. You can also combine several measurable properties into a composite indicator or index. Indicators frequently involve some type of quantitative assessment - such as number of acres, recruitment rate, age class sizes, percent of cover, or frequency of fire of a given intensity. Other indicators may involve measurable elements that are not numerical, such as the seasonality of fire or flooding. Box 3 provides some tips for selecting good indicators.

In many cases, you may be able to measure a key attribute using just a single indicator. However, sometimes there may be no single best indicator so you may need to track several indicators to get a better picture of what is going on. For example, field surveys and analyses of aerial photographs together may provide complementary information on forest tree composition, more accurate and reliable than either one could provide on its own.

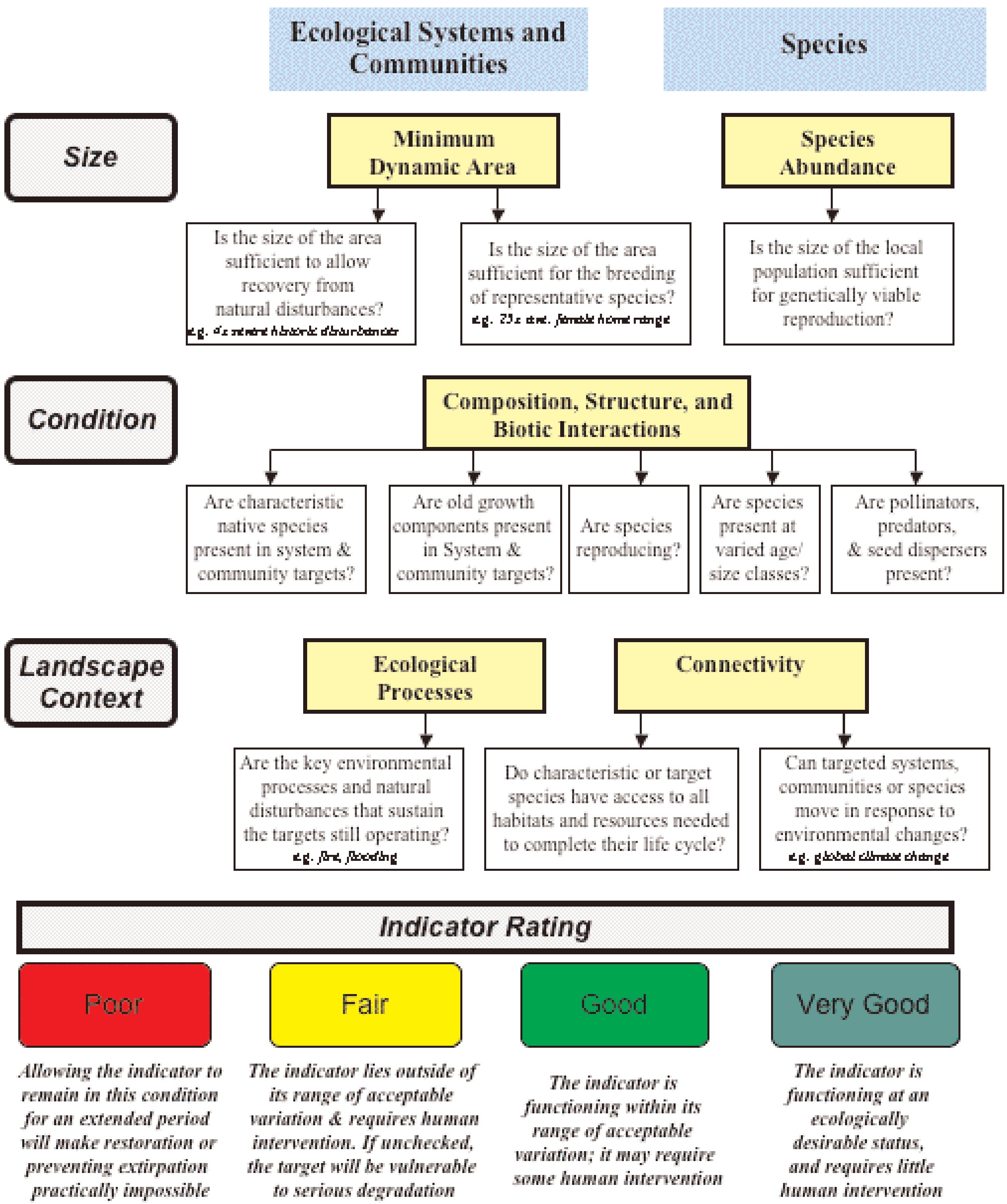
In our example, the Chico Basin project might add the following indicators for their targets:

Indicators for the Attributes
Adapted from the Chico Basin Project, Colorado, USA

			Indicator Attributes			
Target	Key Attribute	Indicator	Poor	Fair	Good	Very Good
Black-tailed prairie dog complex	Size of complex	Acres of occupied prairie dog town				
Black-tailed prairie dog complex	Associated species abundance	Presence of key species (e.g. swift fox, ferruginous hawk, burrowing owls, etc.)				
Black-tailed prairie dog complex	Connectivity	Average distance in km between colonies				

Box 2. Guide to Selecting Key Ecological Attributes

Adapted from Low 2002. Sample questions below are illustrative only - they do not represent an exhaustive list.



Box 3. Criteria for a Good Indicator

Selecting good indicators for your key ecological attributes is as much of an art as it is a science. However, the following criteria can help you in this process.

Scientifically, the most effective and credible indicators are:

1. **Measurable:** The indicator can be assessed in quantitative or discreet qualitative terms by some procedure that produces reliable, repeatable, accurate information.
2. **Precise & Consistent:** The indicator means the same thing to all people and does not change over time.
3. **Specific:** The indicator is unambiguously associated with the key attribute of concern and is not significantly affected by other factors.
4. **Sensitive:** The indicator shows detectible and proportional changes in response to changes in threats or conservation actions.
5. **Timely:** The indicator detects change in the key attribute quickly enough that you can make timely decisions on conservation actions.
6. **Technically Feasible:** The indicator is one that could be implemented with existing technologies, not one that must await some great conceptual or technological innovation.

Institutionally, the most effective and credible indicators will also be:

7. **Cost-effective:** The indicator should provide more or better information per unit cost than the alternatives.
8. **Partner-based:** The indicator should be one that works well for key partner institutions in the conservation effort and/or rests on measurements they can or already do collect.
9. **Publicly Relevant:** The indicator should be useful for publicly communicating conservation values and progress to the community.

Box 4. Viability Ratings

For each focal target, you need to determine key attributes, indicators, indicator ratings, and current and desired status of the indicator. If you are working with a group, you can copy the following table on a flip chart and fill it in for each target. Or you can enter the ratings directly into the appropriate cells of the CAP Workbook. Make sure you also capture any key discussion points that emerge.

Simple Viability Rating Form for Flip Charts

				Indicator Ratings **Bold=Current** *Italics=Desired*			
Focal Target	**Category**	**Key Attribute**	**Indicator**	**Poor**	**Fair**	**Good**	**Very Good**
Target A	- Size - Condition - Landscape Context	KEA 1	Indicator				
Target A	- Size - Condition - Landscape Context	KEA 2	Indicator				

Standard Definitions of Viability Ratings

- Very Good - Ecologically desirable status; requires little intervention for maintenance.
- Good - Indicator within acceptable range of variation; some intervention required for maintenance.
- Fair - Outside acceptable range of variation; requires human intervention.
- Poor - Restoration increasingly difficult; may result in extirpation of target.

3. Determine acceptable range of variation and rating scale for each attribute

Most attributes vary naturally over time, but we can define an acceptable range of variation. This is the range of variation for each key ecological attribute (or technically for its indicators) that would allow the target to persist over time - a range in which we would say the attribute has Very Good or Good status (see Box 4 for a sample data form and definitions of these criteria). If the attribute drops below or rises above this acceptable range, it is a degraded attribute that has Fair or Poor status. Your challenge is to specify - to the best of your current knowledge - your assumption as to what would constitute an acceptable range of variation.

			Indicator Attributes			
Target	Key Attribute	Indicator	Poor	Fair	Good	Very Good
Grassland	**Fire regime**	**Fire frequency**		**fire not frequent enough**	**fire frequent enough**	

Ideally, and over time, you will identify a set of thresholds or boundaries for the four rating increments for each key ecological attribute: Very Good, Good, Fair, and Poor. These thresholds should state clearly where the indicator being measured would fall within each level of the rating scale. For example, is a “good” size for a grassland a minimum area of 50,000 or 100,000 acres?

			Indicator Attributes			
Target	Key Attribute	Indicator	Poor	Fair	Good	Very Good
Grassland	**Fire regime**	**Fire frequency**		**> 10 years**	**5-10 years**	

The scientific information needed to establish these benchmarks is often lacking or inadequate. In these cases, project teams can rely on general ecological concepts, comparisons to other similar systems, well-informed expert opinion - or failing that, the team members' best estimate - to determine a “credible first iteration” of the benchmarks and assessment of the current rating. For

			Indicator Attributes			
Target	Key Attribute	Indicator	Poor	Fair	Good	Very Good
Grassland	**Fire regime**	**% area with 5-10 year fire retun**	**< 25%**	**25-50%**	**51-75%**	**> 75%**

the initial planning, it is often sufficient to describe the benchmarks for Good and Fair, since this distinction is the most important for determining the need for management actions. As shown in the following example, if you treat this as the first step in an iterative process, **you can almost always put some initial thinking down**. Identifying gaps and weaknesses in existing knowledge is also crucial to help you spur investigations to improve the state of knowledge about your focal targets.

For example, suppose a project team is working on a project with a grassland target. They decide that one of the key ecological attributes is fire regime and the indicator of the fire regime is fire frequency. They know that the grassland that they are responsible for managing is full of woody species and the grasses and forbs are not flowering well and they haven't seen some grassland nesting bird species in a few years. As a result, they are pretty certain that the grassland needs to burn, but they don't know how frequently the grassland would burn in a natural state. So in their first pass, the team fills out the viability rating scale as follows:

This team has defined Fair as being “fire not frequent enough” and Good as being “fire frequent enough.” This is perfectly acceptable for their first attempt. Later, the team locates a local grassland expert. She tells them that fire should occur every 5-10 years to maintain the structure of this type of grassland. This additional information enables them to fill out the table as:

Reviewing the literature and consulting with experts, the team comes to realize, however, that it is not just the presence of fire anywhere on the site that matters, but that a sufficient portion of the site should burn on a regular interval. To this end, over a few years, the team does some more research about the frequency of fires and they redefine their indicator and ratings as follows:

Any of the above outcomes is acceptable for a first iteration CAP depending on the level of information available.

4. Determine current and desired future status of each attribute

Once you have determined a limited set of attributes and indicators for each focal conservation target and determined the rating scale, the next task is to assess the current status rating and set the desired status rating of the attributes relative to your rating scale. The current status rating describes the indicator rating category where your key ecological attribute is today; the desired status rating describes where you want to be in the future. You should consider the appropriate spatial extent and time frame for achieving the desired status; some changes may require long time periods (50-100 years). If you know the actual specific current indicator status information, record it as well as the desired indicator rating category (e.g., if a Very Good size indicator rating is $>$ 30,000 acres, and you know the current extent is 55,000 acres, record the specific acreage as well as assigning the indicator to the Very Good rating category).

The four-category framework for categorizing the viability status for each KEA and target provides little opportunity to describe and keep track of incremental changes. The CAP workbook provides data fields in which you can record information on *incremental change* in indicators.

5. Record any assumptions

As you go through this work, make sure you write down any relevant issues or comments that emerge. In particular, you should note how you arrived at your viability assessments including references and experts consulted, data analyzed, assumptions you made, your level of confidence in your assessments, and suggested research needs. If you are using the CAP Workbook, capture the issues or comments using the comment feature available for many of the key decisions.

6. Repeat for your other targets

Go through Steps 1-5 for your remaining targets.

7. Review your viability assessments and adjust as necessary

Review the results of the viability assessments for all of your targets (if you are using the CAP Workbook, the summary page is useful) and discuss with your team. If necessary, you may have to revisit some of your attributes or even your choice of targets. The end product should be a completed viability table as shown in the following example.

Complete Viability Summary for Three Targets
Adapted from the Chico Basin Project, Colorado, USA

			Indicator Ratings			
Target	Key Attribute	Indicator	Poor	Fair	Good	Very Good
Mid grass priairie	**Size of ecosystem**	**Acres of prairie**	**< 10,000**	**10,000-20,000**	**20,000-30,000**	**> 30,000**
Mid grass priairie	**Species composition**	**% of system in weed patches and number of patches > 5 acres**	**> 5% of system; some patches much > 5 acres**	**3-5% of system; few patches > 5 acres**	**1-3 % of system; no patches > 5 acres**	***< 1% of system; no patches > 5 acres***
Mid grass priairie	**Compatible land uses**	**% natural surrounding vegetation developed or tilled**	**> 50%**	**25-50%**	**< 25%**	**< 5%**
Black-tailed prairie dog complex	**Size of complex**	**Acres of occupied prairie dog town**	**< 5000**	**5000-10,000**	**10,001-25,000**	**> 25,000**
Black-tailed prairie dog complex	**Associated species abundance**	**Presence of key species (eg swift fox, ferruginous hawk, burrowing owls, etc.)**	**None**	**Some presence of a few species**	**Large presence of a few species**	**Large presence of many species**
Black-tailed prairie dog complex	**Connectivity**	**Average distance in km between colonies**	**> 10 km**	**7-10 km**	**< 7 km**	**< 7 km**
Landscape mosaic	**Intactness of landscape**	**Size of pronghorn population**	**< 2000**	**2000-5000**	**2500-3000**	**> 3000**
Landscape mosaic	**Connected-ness of native vegetation**	**Fragmentation index?**	**?**	**?**	**?**	**?**

Opportunities for Innovation

Although the viability assessment process has been developed and tested over several years and many workshops, there are still many aspects of the framework that could benefit from further innovation. We offer the following suggestions and encourage you to innovate and communicate additional suggestions:

- **Developing general-purpose KEA lists for broad target types**. Certain broad types of conservation targets may lend themselves to the development of generic lists or diagrams of KEAs that can serve as templates for use by other projects. For example, river ecological systems invariably call for the recognition of KEAs related to the hydrologic regime, water quality, channel and bank morphology, up-downstream connectivity, and usually river-floodplain connectivity as well. When you develop lists of KEAs for particular target types, you should bear in mind that your work may provide examples for others; and teams working on similar types of targets may benefit from cooperating to develop generic lists or templates. If you develop such a list, consider making that information available to others.

- **Working with target function versus viability.** It is important to recall the reasons why targets are selected. They matter not only for their own sake, but also to represent various parts of the biological spectrum so that their conservation will provide a safety net for these many other parts as well. We therefore note that there may be a difference between ensuring that a target merely persists, and ensuring that it provides the ecological functions for which it was selected. For example, the population of a keystone predator may be sufficient to allow the population to persist at some minimally viable level, but not sufficient for its predation to significantly affect prey populations. There is much room for innovation to ensure that our "viability assessments" address the ecological function of our targets rather than their mere persistence alone.

- **Improving criteria for the Poor/Fair boundary**. When we categorize the status of a KEA or a target as Poor, we are saying that the target is in immediate danger of disappearing from the project area within perhaps 15-25 years. A Poor rating is a call to action rather than a failing grade. It should not take into account estimates of whether restoration is feasible - that should come in the assessment of threats and strategies. However, even though intended to be objective, the Fair-Poor distinction nevertheless can involve some subjective decisions based on estimates of the consequences of current conditions and trends. There is a need for more examples of methods for establishing and objectively documenting this distinction.

Resources and Tools

The following documents provide additional information about the viability assessment process:

Parrish, J.D., D.P. Braun, and R.S. Unnasch. 2003. Are we conserving what we say we are? Measuring ecological integrity within protected areas. Bioscience 53: 851-860.

Braun, D.P. 2007. Advanced Guidance for Step 3: Assessing the Viability of the Focal Conservation Targets. The Nature Conservancy.

In addition, there are many different resources to help you develop your lists of KEAs, identify indicators, and develop estimates for their acceptable range of variation. These specific resources will obviously vary depending on your project location and targets, but some good general suggestions include:

- Examples developed by or for other CAP teams. Hundreds of CAP teams across the world have captured their viability analyses within the CAP Workbook and this information can now be accessed through the Conservation Project Database (http://conpro.tnc.org). These workbooks provide examples of how other CAP teams have grappled with the same or similar targets to those under consideration in your project. Not all of these examples will have received scientific review, but all will be instructive. Additionally, several groups have compiled templates or basic versions of KEA models for a range of target types that you can consult for further examples. Many of these include information on ways to estimate the acceptable range of variation, as well.

- General ecology. The general ecological literature provides numerous discussions of the ecology of broad types of ecological systems, the types of KEAs that affect them, and the ranges of variation for the KEA that distinguish these types. The same may be said of the literature on species that fulfill specific roles in ecosystems, such as top predators, dominant herbivores, or members of freshwater feeding guilds. This information establishes general-purpose models for many kinds of targets, with which to guide the search for more detailed information on each specific target.

- The information used to justify the selection of a focal conservation target. Often this will include invaluable information on the role(s) played by species in their larger communities or ecological systems, the sensitivity of each target to particular kinds of alterations, the major driving processes and critical environmental constraints for each target, and nested targets.

- Scientific and natural historical studies specific to the target or project area. When they exist, there is no substitute for actual scientific and natural historical studies or species recovery plans on which to base your ideas about the KEAs and their ARV. Such studies will never be free from weaknesses in their data and differences in assumptions and methods, but they will capture all that past and present experts have seen fit to record. Where information is lacking for your specific target, you may find useful information on related taxa or similar types of species, communities, or ecological systems in the same or similar ecoregions.

- Expert advice. Often a crucial source of information will be individuals who have studied the project area and/or the specific target the most and know the scientific literature on it as well. Not only can experts help identify KEAs and help estimate their ARV, they can also guide you in identifying crucial publications to review for your own understanding. Of course, you should be careful to not ask too much of your experts. It will often be best to prepare yourself for a full consultation by reviewing important publications beforehand and preparing specific questions and ideas to discuss.

- Natural heritage databases. Many databases exist that provide information on the biology and habitat requirements of thousands of species and ecological communities worldwide. IUCN-The World Conservation Union and NatureServeĺ provide major databases and links to other organizations and agencies with additional natural heritage data, often organized in ways that readily permit the identification of KEA and estimated ARV. Again, where information is less substantial for your specific target, there may exist useful comparative information on related taxa or similar types of species, communities, or ecological systems in the same or similar ecoregions.

- Evidence from the impacts of threats. Evidence and studies that show how different human activities or environmental changes affect the target may be as useful as studies of the target in less altered conditions. Any human activity or environmental change that results in stress to a target (e.g., reduced abundance, density, or range; reduced species diversity; etc.) clearly has affected and provides evidence of one or more KEA, and helps pinpoint critical thresholds of degradation on which to base estimates of the ARV.

- Ecological simulation models. Computer simulation provides a powerful means for evaluating assumptions about KEAs and their interactions, and for exploring the extent to which limits or thresholds in some KEAs may affect variation in others. Results from computer modeling and fresh modeling efforts can provide useful information on which to base hypotheses that can inform CAP efforts and help highlight needs for research.

- Governmental plans and reports. State and Federal agency species and habitat plans and other similar documents may provide viability and status information on species and systems. Some examples of these include: the US Fish and Wildlife Service's Endangered Species Act Species Recovery Plans; State Wildlife Plans.