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Species at Risk Act Implementation Guidance

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Guidelines on Establishing Recovery Goals and Population & Distribution Objectives

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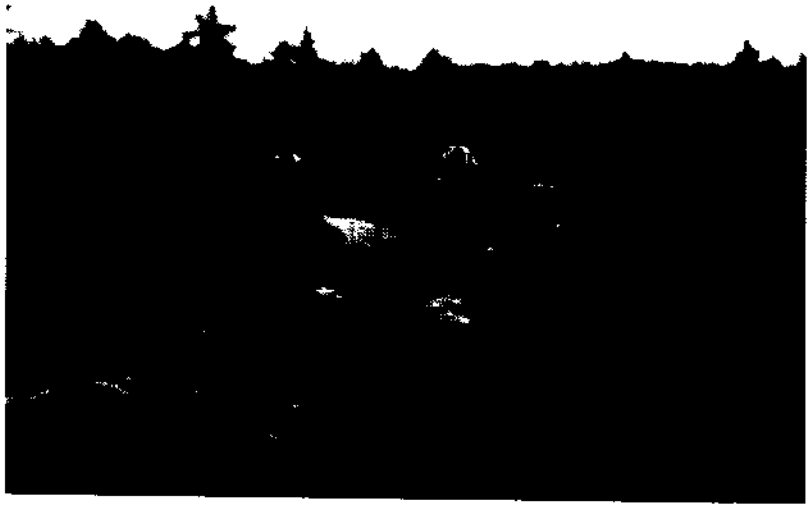

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- As drafted by Environment

Canada

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1.0 Introduction

These guidelines are to assist in establishing recovery goals and population and distribution (P&D) objectives for species[1] listed under the federal Species at Risk Act (SARA). The purpose is to promote the preparation of goals and objectives that (1) are ecologically appropriate, (2) are achievable and defensible, and (3) maximize the conservation of biodiversity in the context of a species at risk recovery strategy or action plan. The guidelines are not meant to be prescriptive, but rather present a general set of best practices to be used to guide the process of setting goals and P&D objectives for the recovery of species at risk.

Within the context of a recovery strategy, this particular task is about setting out the strategic course for recovery planning for a species in terms of (1) establishing the ultimate end-point we want to achieve for the species in the form of recovery goal(s), and (2) quantifying those goals by determining the number and size of populations and/or the biogeographic distribution (dispersion across the landscape) of the species required to achieve that goal. There are number of types of objectives that may be set in order to achieve recovery goal(s). This document deals specifically with setting population and distribution objectives, although some aspects of the guidance may also be applicable to other types of recovery objectives. Within the context of an action plan, the task is about developing ways and options for achieving the goals and objectives, and monitoring and learning from implementation.

1.1 The SARA Context

If recovery is determined to be feasible[2], recovery strategies under SARA require a statement of the population and distribution objectives that will assist the recovery and survival of the species[3]. Population and distribution objectives should be established within the context of the overall recovery goals for the species. If recovery is determined not to be feasible, we recommend that population and distribution objectives still be established, even if they reflect the status quo, particularly if critical habitat is identified[4]—which, as set out in established guidelines, should be based on population objectives (see Environment Canada 2005a).

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[1] Throughout this document, 'species' refers to the entity assessed by COSEWIC.

[2] SARA s40. The competent minister must determine whether the recovery of the species is technically and biologically feasible. Note there is a separate *Policy on the Feasibility of Recovery* in place that provides further interpretation of this section of SARA.

[3] SARA s41(1)(d). If recovery is feasible, recovery strategies must contain a statement of the population and distribution objectives that will assist the recovery and survival of the species.

[4] As required to the extent possible by SARA s41(2).

SARA prescribes a two-part recovery planning process comprised of recovery strategies and action plans. The recovery strategy establishes the framework for development of the action plan and recovery implementation, and is based on biological considerations. Goals and objectives in the recovery strategy should articulate what is biologically required to recover the species. Action plans outline what needs to be done to achieve the recovery goals and objectives identified in the recovery strategy, but also need to include an evaluation of the socio-economic costs and benefits that arise from proposed recovery actions[5].

2.0 What is Recovery?

Recovery is defined within the *Policy on the Feasibility of Recovery* (Environment Canada 2005b) as *the process by which the decline of an endangered, threatened or extirpated species is arrested or reversed, and threats removed or reduced to improve the likelihood of the species persistence in the wild*, and a species can be considered recovered when *its long term persistence in the wild has been secured*.

A recovery goal could range from survival to full recovery, as recommended by the recovery planners. In this regard, the *Policy on the Feasibility of Recovery*, as a complement to the definition of recovery, states:

> The appropriate target level for persistence whereby a species would be considered *recovered* differs among species and depends on the current and historical context, including factors such as population abundance, the number of populations and threats. Persistence may range from:
>
> - Precarious and limited occurrence – for example, species that have historically been rare or for which damages caused by threats are irreversible; to
>
> - Highly viable and self-sustaining – for example, species for which formal downlisting to Special Concern or Not at Risk would be warranted. (Environment Canada 2005b)

Thus *recovery* can be viewed as a species-specific concept, and can be defined somewhere on the continuum from *maintenance* (or survival) of the species to *full recovery* (may or may not result in delisting) of the species.

This definition of recovery gives high importance to population objectives since any decisions by responsible jurisdictions on how the species will persist in nature should be based on thoughtful advice from recovery planners.

[5] SARA s49(1)(e). Actions plans must include 'an evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation'.

3.0 Guiding Principles

Whenever possible, recovery planners should follow four guiding principles to inform the process and outcome of setting both recovery goals and population and distribution (P&D) objectives:

1. **Be precautious** – Preventative measures should be taken to avoid harm or secure good in order to safeguard against irreversible damage to a species including extinctions or local extirpations. The establishment of goals and objectives should not be delayed because of a lack of full information or certainty about the species.

2. **Base goals and objectives on the best available information** – Where possible, recovery goals and P&D objectives should be based on quantitative analyses of species viability. However, there will be cases where qualitative estimates, expert opinion, and/or traditional ecological knowledge represent the best available information. Ensure that information is available in an accessible and meaningful form to all concerned.

3. **Document uncertainty** - Species occurrences and habitats are variable and our knowledge about them is often incomplete, therefore conclusions about them (e.g., the number and distribution of individuals required for population viability) are bound to be accompanied by uncertainty. Be upfront about the perceived level of uncertainty, and ensure an appropriate precautionary approach is taken.

4. **Document the process** - Key decisions and justifications relating to the process of establishing recovery goals and P&D objectives should be documented in writing (e.g., meeting minutes, date-stamped maps). The experience of the US Fish and Wildlife Service under the Endangered Species Act suggests that properly managed electronic "administrative records" can serve as valuable evidence, especially when trying to resolve disputes and/or prepare for challenges to any decisions reached (for guidance on documenting decision processes, see Andelman et al 2001).

4.0 Recovery Goals and Population & Distribution Objectives

4.1 What Are They?

A recovery goal helps set out the strategic course for recovery planning by defining what 'recovery' means for each species. This helps establish a framework for adaptive management of the recovery process by identifying 'success' upfront. Setting goals facilitates consensus-building amongst stakeholders, provides clear direction for actions, and increases the probability of successfully recovering the species (Bickerton and Hartley 2004).

A recovery goal can be either a quantitative or qualitative statement of the desired state for the recovery of the species. For example, the recovery goal in the proposed Recovery Strategy for Roseate Terns in Canada is to have no fewer than 150 pairs of Roseate Terns nesting in at least three colonies in Canada. As another example, in the draft National Recovery Strategy for Woodland Caribou, boreal population, the recovery goals are: (1) Prevent extirpation of local boreal caribou populations from all existing ranges; (2) Maintain or enhance local boreal caribou populations at/to self-sustaining levels within all existing ranges; and (3) Maintain or enhance boreal caribou habitat to support self-sustaining local populations.

Population and distribution objectives should aim to further quantify recovery goals to the extent possible by establishing the number of individuals, populations, and/or geographic distribution of the species required to successfully reach the recovery goal(s). These objectives are established once a recovery goal is in place, and are driven by a range of biological and scientific factors. Population and distribution objectives may differ among populations or conservation units, although collectively they should contribute to the overall recovery goal for the species. The following SMART acronym is often used to describe important characteristics of good objectives:

Specific: clearly and concisely state what needs to be achieved in terms of population size/number and species distribution to reach recovery goal; use action words.
Measurable: present either quantitatively or qualitatively in a way that makes it possible to know when the outcome has been reached; quantify the amount of change to be achieved.
Achievable: be realistic given known limitations and threats.
Relevant and results-focused: relate to recovery goals and measures outcomes rather than activities.
Time-bound: specify a time target by which the objective is to be reached (5 years is a good short-term timeframe).

Long term goals and objectives should represent the ultimate state that we are trying to achieve for the species, while short term objectives establish benchmarks along the way to the overall goal. What constitutes 'short' and 'long' term depends on the life history of the species – for example, targeting 10-20 years for the short term and 100 years for the long term may be appropriate for large mammals, whereas much shorter time intervals might be more applicable for invertebrates (Scott et al 1995). Shorter term objectives can be set to act as benchmarks as appropriate to ensure progress towards the recovery goal.

4.2 General Rules in Setting Recovery Goals and Objectives

To the extent practical, follow these three general rules based on experience and common sense when setting goals and P&D objectives (after Shaffer et al 2002).

- *Representation* – Strive to maximize ecological representation of all populations throughout the range of the listed wildlife species. For example, if

populations of the listed species occupy different types of natural communities (e.g., tallgrass prairie, peatland), then it is advisable to conserve each of those different ecotypes or forms. Otherwise, important components of the species biological diversity and ecological representation may be lost irretrievably.

- *Redundancy* – Maintain multiple populations of the species as a hedge against unpredictable catastrophic loss (e.g., due to severe drought, wildfire, virulent disease). It is widely recognized that the existence of numerous and geographically widespread populations generally tends to reduce the likelihood that any single catastrophe will eradicate all populations.

- *Resiliency* – Aim to assure that each population is large enough so that it is not swamped by the effects of demographic uncertainty or short-term inbreeding. In other words, populations should be large enough so that they can respond to favourable environmental conditions when they occur, and conversely not be trapped in the demographic and genetic vortices that result from existing at very low numbers.

Ideally, goals should be expressed in terms of an ecologically appropriate probability of persistence, and should be accompanied by an acceptable level of risk of extinction. Most recovery goals consider two main concepts: (1) *demographic viability*: the population size and structure required to ensure long term persistence (see Appendix 1 for further information), and (2) *current and historical distribution*: an ecologically appropriate extent of distribution for the species (Bickerton and Hartley 2004). Goals should be based on the biological and/or ecological requirements for the species to persist.

4.3 Steps to Setting Recovery Goals and Objectives

4.3.1. Recovery Strategy

Step 1: Set a long term recovery goal.

One of the first steps in setting recovery goals will be to conceptually and/or analytically determine where on the recovery spectrum the species most appropriately falls. Is the aim to maintain the species or increase its range and abundance? To what extent? What would have to be achieved for the species to be considered recovered? Once answers to these questions are understood, recovery planners can think more specifically about what the species requires for long term persistence (at whatever point on the survival-recovery spectrum).

To address this broad question it is helpful to consider that, from a conservation perspective, not all species are equivalent with respect to the extent to which we should seek to improve their probability of persistence. As a starting point, recovery goals for individual species should be decided on by considering the species' historical status in relation to its current status. For example: Was the species' distribution once relatively

widespread or narrow? Was the species once relatively abundant or rare? Did the species increase in range and/or numbers due to human-made conditions that are now changing? Ideally, the goals set for the species should facilitate the maintenance or re-establishment of *appropriately viable* populations of the species. With this in mind, categorizing species as one of four general species types can be helpful in guiding preliminary thinking about recovery goals. The four general species types are as follows:

1. *Distribution within Canada was historically, and is currently, very restricted.* Examples include species with only the very northern edge of their range occurring in Canada, as well as highly localized endemics. These species have not declined drastically from historic levels and are usually listed due to very small populations or limited distributions. High probability of persistence may be an inappropriate goal for these species as they were never particularly viable. Recovery goals might aim to maintain or re-establish only (approximately) historical levels of occurrence and appropriate viability (e.g., moderate probability of persistence) within Canada, even if the species remains dependent on immigration from outside Canada or continued conservation activities. Examples of this type of species include the Banff Springs snail, Yellow-breasted chat, Aurora trout, and Eastern mountain avens.

2. *Historically more widespread, with little opportunity for re-introduction into former range.* Species in this category have generally lost large portions of formerly occupied habitat, and are often listed due to declining numbers in combination with habitat loss. Restoring these species to their historic levels is likely no longer possible, however some improvement in the probability of persistence may still be achievable. Recovery goals might aim to curb, halt, or reverse the rate of population decline or habitat loss. Plains bison and Gaspésie population of woodland caribou are examples of this type of species.

3. *Historically more widespread, with some opportunity for re-introduction into former range.* Species in this category are also no longer found in large portions of formerly occupied habitat but, in contrast to above, habitat loss is not as severe or the potential to restore habitat is high. Therefore, it may be possible to restore these species to near historic levels of viability. Recovery goals may focus on improving upon the species' current population size, distribution, and probability of persistence. Boreal population of woodland caribou and marbled murrelet represent species of this type.

4. *Historically more widespread, but still potentially viable within remaining habitat.* Although species in this category may no longer be found in portions of their former range, the remaining habitat may still be capable of supporting a viable population(s) of the species. In these cases, recovery goals might focus on preventing further habitat loss and degradation and increasing population size closer to carrying capacity.

The COSEWIC assessment criteria for the species will provide background on why the species was listed as well as give insight into future conditions that could lead to its delisting.

Questions useful for refining recovery goals include (Nelson et al 2004):

- Are there biological or environmental factors that will limit recovery?
- Will recovery involve increasing the number of individual occurrences and filling in distribution gaps?
- Will recovery involve expanding the current range of the species, and to what extent?
- Is there suitable habitat available for population expansion?
- How serious and numerous are the threats to the species and can they be reversed?

Step 2: Set long term population and distribution objectives that communicate the recovery goal.

Long term population and distribution objectives should establish the number of individuals, populations, or geographic distribution of the species required to successfully reach the recovery goals. Ideally, they should be quantifiable targets that are practically measurable at an operational level. There are a number of types of quantifiable metrics that might be set as specific population and distribution objectives, including (Gerber and Hatch 2002):

- Population size or number of populations
- Population trend
- Habitat quantity, trend, or quality (e.g., total range, quantity of habitat, quality of habitat)
- Demographic rates (e.g., recruitment rate)

Viability analysis (either conceptual or computer simulated) provides a framework for estimating quantifiable targets required to reach a particular goal. There are many possible methods for estimating viability, ranging from approximations by species experts to predictions based on computer simulation modelling such as PVA (Appendix 2). Which method is most suitable will depend on the amount of information known about the species (i.e., level of uncertainty) and the complexity of the particular situation. Detailing various methods for determining viability is beyond the scope of this guidance, but for further information refer to: Morris et al 1999, Andleman et al 2001, Beissinger and Mccullough 2002.

An alternative to estimating probability of persistence and risk of extinction based on population size (i.e., typical PVA methods) is to base estimates on population trends. For example, goals might be phrased as a 95% probability of a statistically significant increase in population size, or no greater then 5% probability of significant population decline (Reed 2002).

In many cases, there may not be enough information about population size, trends, demography, or habitat quantity or quality to set quantitative objectives. In such situations, what is thought to be needed to achieve recovery goals can be stated qualitatively (e.g., specifying whether the population or distribution will need to be expanded or merely maintained). However, it must be noted that the more vague population and distribution objectives become, the harder it is to evaluate the success of recovery actions and to justify the amount of critical habitat required to recover the species. When information is lacking to establish quantifiable objectives, this should be addressed within the knowledge gaps section and studies to obtain the necessary information should be included in the recovery planning approaches.

Defining population objectives should be an iterative process, especially in situations where little is known about the species at the time of listing. The objectives can be refined as data is gathered and knowledge increases. Appropriate studies to strengthen population objectives should be identified as part of the recovery actions to be undertaken. Solid, biologically-founded population objectives will provide the best foundation for developing recovery measures and for defending them in debates around conflicting land use. Remember, when the process is highly iterative, it will be important to document any changes to objectives, including the rationale behind them.

Step 3: Break long term population and distribution objectives into manageable targets over shorter time horizons.

While long term population and distribution objectives quantify what is required to reach the recovery goal based on the biological and ecological requirements of the species, short term objectives should strive to be achievable given current limitations. Setting P&D objectives as shorter term benchmarks may help break down the recovery process into manageable components while still striving for the long term goal. Five-year timeframes could represent useful milestones as they coincide with SARA requirements for reporting on progress towards meeting action plan objectives.

Special Consideration: For highly endangered species, set a survival threshold

A 'survival threshold' should be established for endangered species for which there is believed to be a high degree of risk of extinction or extirpation from Canada within the next 5 years. The threshold would represent the number of individuals, populations, or geographic distribution of the species below which recovery would no longer be feasible. Establishing a critical point below which the species could not recover will provide leverage for imposing a stopping point for accommodating socio-economic interests and will help to clarify the costs vs. benefits of implementing recovery actions. The threshold should be based on the biological requirements for the survival of the species, and should reflect the best scientific advice.

Note that setting a survival threshold does not necessarily mean it becomes the overall goal for the species. It should be viewed as a line we are not willing to cross and used when progress towards reaching recovery goals is failing.

4.3.2. Action Plan

Step 4: Evaluate recovery actions; can goals and objectives be met? If not, document reasons and risks

Basing recovery actions solely on biological criteria can result in actions that are not practical or achievable given the known or perceived limitations facing the species recovery (Scott et al 1995). Distinguishing between biological and non-biological factors enables better evaluation of the reasons behind the success or failure of recovery actions. In essence, recovery actions should take into account (1) the threats to the species, (2) how effective recovery actions are at mitigating the threats, and (3) the extent to which socio-economic factors might influence (either positively or negatively) the carrying out of recovery actions (Fig 1).

There may be various strategies or options for taking threats, effectiveness of recovery actions, and socio-economic factors into account, creating multiple potential 'pathways' to achieving population objectives. When threats or other limitations are factored into setting the course for recovery actions, it is of critical importance that it is conducted as *alternate scenarios* to objectives based purely on biological factors, with the biological costs to the species clearly presented as changes in expected viability (i.e., to the probability of reaching long term recovery goals; Scott et al 1995). Thus, at a minimum, 'biologically-based' recovery actions should be considered. This would document the actions required to fully meet established recovery goals. In addition, one or more alternative options for how recovery goals might be met may be established. If various options are considered, document the respective benefits and risks to the species.

Step 5: Monitor the species and provide feedback into the iterative process of establishing goals and objectives

Action plans must include the methods to be used to monitor the recovery of the species and its long term viability (SARA s49(d.1). Monitoring should provide feedback on recovery progress—are goals being met and objectives being reached? Can data be collected to further refine goals and objectives? It is important to establish indicators for measuring progress toward goals and objectives before monitoring begins. For example, important considerations might include:

(1) What metrics will be used to assess the status and trends in individuals of the species (e.g., the number of individuals, redds, dens, or nests) and/or the quality of individuals (e.g., individual size, age, or stage)?

(2) What population metrics will be used to assess the status and trends of populations of the species (e.g., the number of populations, geographic distribution) and/or the quality of populations (e.g., the size, density, or growth rate, connectivity)?

(3) What metrics will be used to measure threat reduction (e.g., amount or rate of habitat quality or loss, changes in amount of persecution and public perception).

Indicators used for monitoring must be measurable, precise, consistent and sensitive to population-level change. Progress towards P&D objectives will be the baseline against which the viability of the species will be measured and implemented.

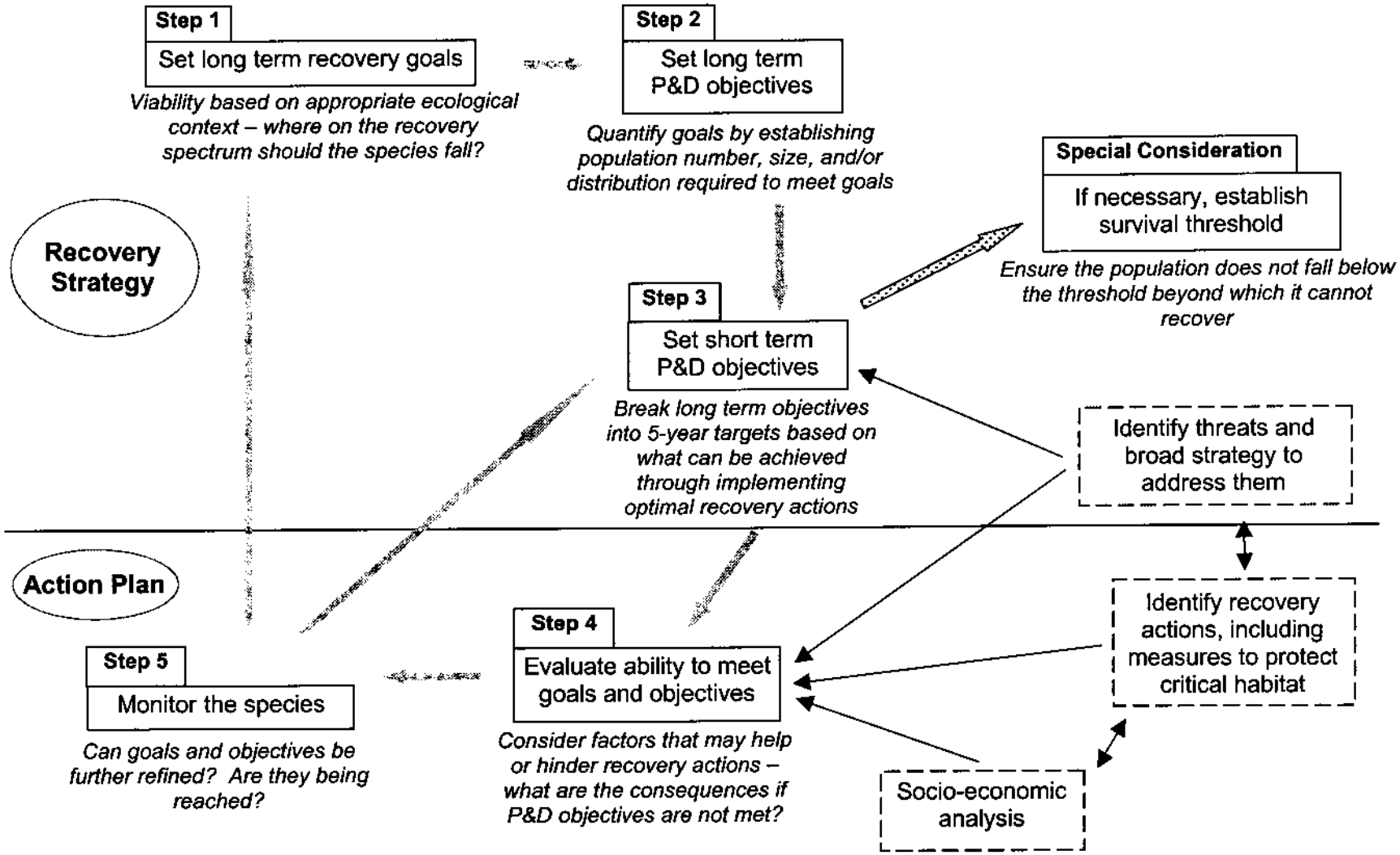

Figure 1. General approach to setting recovery goals and population and distribution objectives for species at risk. Solid horizontal line separates steps conducted at the recovery strategy stage (top) from those conducted as part of the action plan (bottom). Boxes with dashed borders indicate areas for which separate pieces of guidance have been developed.

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Appendix 1. Related Concepts

Viability

Viability is a measure used to estimate the capacity of a species or population to persist through time and thus is a useful criterion to consider when establishing recovery goals. *Persistence* refers to the continued existence of a species through time, and is closely related to the concept of viability. Viability estimates have two components – a particular probability and a length of time. Viability can be expressed both as a probability of persistence (e.g., 95% probability of persisting for 20 years) or as a probability of extinction (e.g., 10% probability of extinction over 50 years). The length of time chosen can greatly influence the quantification of recovery goals. For example, the number of individuals required to ensure a 95% probability of persistence over 5 years will likely be much smaller than the number required to ensure a 95% probability of persistence over 100 years.

Species viability is determined by understanding a number of factors including:

- Population size and structure - number of individuals, distribution among stages & subpopulations, density, trends
- Habitat – quality, amount, arrangement
- Demography – survival, fecundity, dispersal rates
- Trends and fluctuations in these rates
- Breeding system, sex ratio
- Relationships between demographic rates & habitat; demographic rates & population size
- Threats to the species and its habitat
- Consideration of the species 'natural' role in the ecosystem

Risk

Recovery goals could be accompanied by an appropriate level of risk of not achieving the goal. The chosen level of risk can influence the quantification of recovery goals. For example, the number of individuals required for a population to have a 50% probability of persistence over 20 years will likely be fewer than that required for a 99% probability of persistence over 20 years. Similarly, accepting a 10% risk of extinction over 25 years sets a more stringent goal than accepting a 30% risk of extinction over 25 years.

Due to uncertainty stemming from incomplete knowledge and stochasticity in natural systems, there is also risk that the goals and objectives set to recover the species are in fact either not sufficient or not necessary to do so. Setting insufficient goals jeopardizes the recovery of the species while unnecessary goals are difficult to defend against competing interests. It is important to communicate the perceived level of uncertainty and risk involved in setting goals and objectives. Application of the precautionary principle suggests that when setting goals and objectives in situations where uncertainty about what is required for long term persistence of a species is high,

recovery planner(s)s should err on the side of ensuring persistence. This principle and others are defined and explored further below.

Appendix 2. Model types and associated data requirements for estimating population objectives or viability.

Selecting the appropriate model should be based on the type of data available.

Type of Data Available	Appropriate Model
Experts, collateral data, allometrics, qualitative data	Develop conceptual model; N (current and target) based on educated guess
Above + single count (census in one time step)	Estimate N
Above + counts over time (census in multiple time steps)	Scalar model (estimate N, trend)
Above + life history information (censuses include data on stage, age, sex)	Structured model
Above + demographic data (survival, reproduction)	Structured model
Any of the above with spatial data	Same models with spatial structure (e.g., habitat-based PVA)