SUSTAINABLE FOREST MANAGEMENT NETWORK
RÉSEAU DE GESTION DURABLE DES FORÊTS
Networks of Centres of Excellence
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SFM Network
Research Note Series
No. 32

Identifying Rare Species in a Forest Management Area

Highlights

- One of the most important objectives relating to the maintenance of biodiversity in forest management is the conservation of species.
- Although provincial and national regulations promote coarse-filter management for species conservation, many rare species require forest-level, fine-filter approaches to ensure their conservation.
- A species can be rare for numerous reasons, and may present direct management concerns to forest managers.
- A six-step process for identifying rare species in a forest management area is presented.

A major objective of sustainable forest management is the conservation of biodiversity values. Biodiversity can be defined in several ways, but broadly refers to the number and abundance of species in a given area. One of the most important components of managing biodiversity in forestry is the conservation of species which include the prevention of species loss, either locally (referred to as extirpation) or globally (referred to as extinction). Since the number of individuals of a rare species is by definition low, rare species tend to be more vulnerable to extirpation or extinction. Because of this vulnerability, rare species are often the focus of efforts to prevent species loss in a given area, and become very important to managers. A structured method for identifying rare species of concern would therefore be helpful. This research note presents a six-step process for forest managers working to identify rare species in their area for inclusion in forest planning and management activities.

How are rare species currently protected?

Species at risk legislation such as the Canadian Species at Risk Act (commonly referred to as SARA) applies to specific species identified within the legislation as rare (e.g., Schedule 1 of SARA), and is applicable at large spatial scales (e.g., national or provincial scale). However, the legislation may not provide any protection to the broad range of rare species in a given forest management area that fall outside the species listed in the SARA legislation.

Beyond species at risk legislation, most forest management jurisdictions are subject to broad forest practices regulations and guidelines designed to maintain, enhance, or minimize the effects of forest management activities on biodiversity and other ecological values. Examples of these kinds of regulations include the British Columbia *Forest Practices Code Biodiversity Guidebook* guidelines, the *Forest/Wildlife Guidelines and Standards* for Nova Scotia, and the *Forest Management Guidelines for Wildlife* in Manitoba. Many jurisdictions have adopted forest management approaches intended to emulate natural disturbances such as those described by the Ontario

Ministry of Natural Resources' *Forest Management Guide for Forest Disturbance Pattern Emulation*. All of these kinds of approaches – often referred to as coarse-filter approaches[1] – are designed to address the majority of species in a management area. However, some species are not adequately managed by broad guidelines, often as a result of very specific habitat requirements or low numbers. These species, often the rare species, require more focused management attention and specialized management approaches – often referred to as a fine-filter management approach (Figure 1).

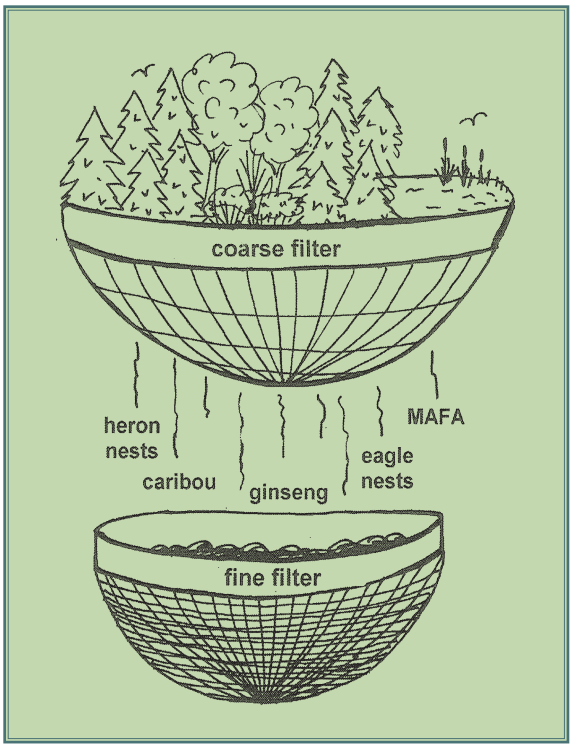

Figure 1. A conceptual model of the relationship between coarse and fine filters in habitat management.
Source: Ontario Ministry of Natural Resources.
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What is a rare species?

Rarity has several forms and causes, and is therefore difficult to isolate and identify. Expert opinion is often required. A species can be considered rare for a number of reasons, including:

- low numbers of individuals across the landscape,
- very specific habitat requirements,
- low numbers due to predation or disease,
- an immobile species with limited ability to move to new areas,
- inhabiting an area with a low capacity to support many individuals.

It is often normal for a species to have low numbers from time to time, due to periodic reductions in critical resources such as food, or a catastrophic event such as an abnormally harsh winter. In these situations, a survey of this species will result in low recorded numbers and may suggest that the species is rare. Given the many causes and patterns of rarity, it becomes difficult for managers to determine which species to be concerned about. The stepwise process described below is designed to help managers identify priority species that may require additional management and/or conservation considerations. Biodiversity conservation strategies should be designed to maintain forest heterogeneity, natural dynamics and landscape patterns at a landscape level, with fine filter approaches designed to address rare species requirements.

Management implications

A procedure for identifying rare species of concern within a forest management area

Working with forest managers, Dr. Susan Hannon and her colleagues at the University of Alberta saw the issue of identifying rare species and the appropriate management actions to conserve them as a challenge in forest management. In response, they developed a systematic procedure for identifying rare species of concern using a step-by-step decision-tree approach (see Figure 2).

Step 1: Determine relative abundance, and which species are rare within a management area. Abundance of individuals within a species is typically measured using a variety of surveying techniques from bird surveys to track counts. Relative abundance is then a measure of how abundant one species is compared to other species. Expert opinion can then be used to determine which species are considered rare given its relative abundance. In an example application, Dr. Hannon considered a species rare if it represented less than 1% of the total number of individuals among all species combined.

[1]The coarse filter approach focuses on managing whole ecosystems and their natural processes.

Step 2: Determine geographic distribution and remove peripheral species. Range maps for most species are widely available in field guides and other natural history literature. Species range maps can then be compared to eco-region maps (broad ecological zones at a provincial or national scale, e.g., boreal mixedwood; are available from provincial agencies) to determine the amount of overlap between the two. Species with less than 25% overlap between the species range and the ecoregion can be considered peripheral species with the majority of their core breeding range outside the eco-region, and therefore are not considered a priority for local forest managers. Transients (individuals or species just moving through an area) should also be removed from the list.

Step 3: Determine habitat associations and remove species that occur primarily in non-commercial habitats. Forest managers have little influence outside of commercially productive forest land. Therefore, species that are rare, but whose primary occurrence and dependence is in non-forested or non-commercial habitats, can be removed from the list.

Step 4: Determine the temporal variability. Identify species that are abundant in some years, and rare in other years. Many bird species, for example, are known as irruptive species that show high population variability over time. These species typically depend on cyclical resources such as insect outbreaks and seed crops, and follow a pattern of high abundance followed by decline. A short-term species decline can also be caused by a periodic lack of food or weather extremes. It is important to distinguish between species that are merely at a low in their cycle or otherwise displaying short-term rarity, versus those species that are truly displaying long-term rarity.

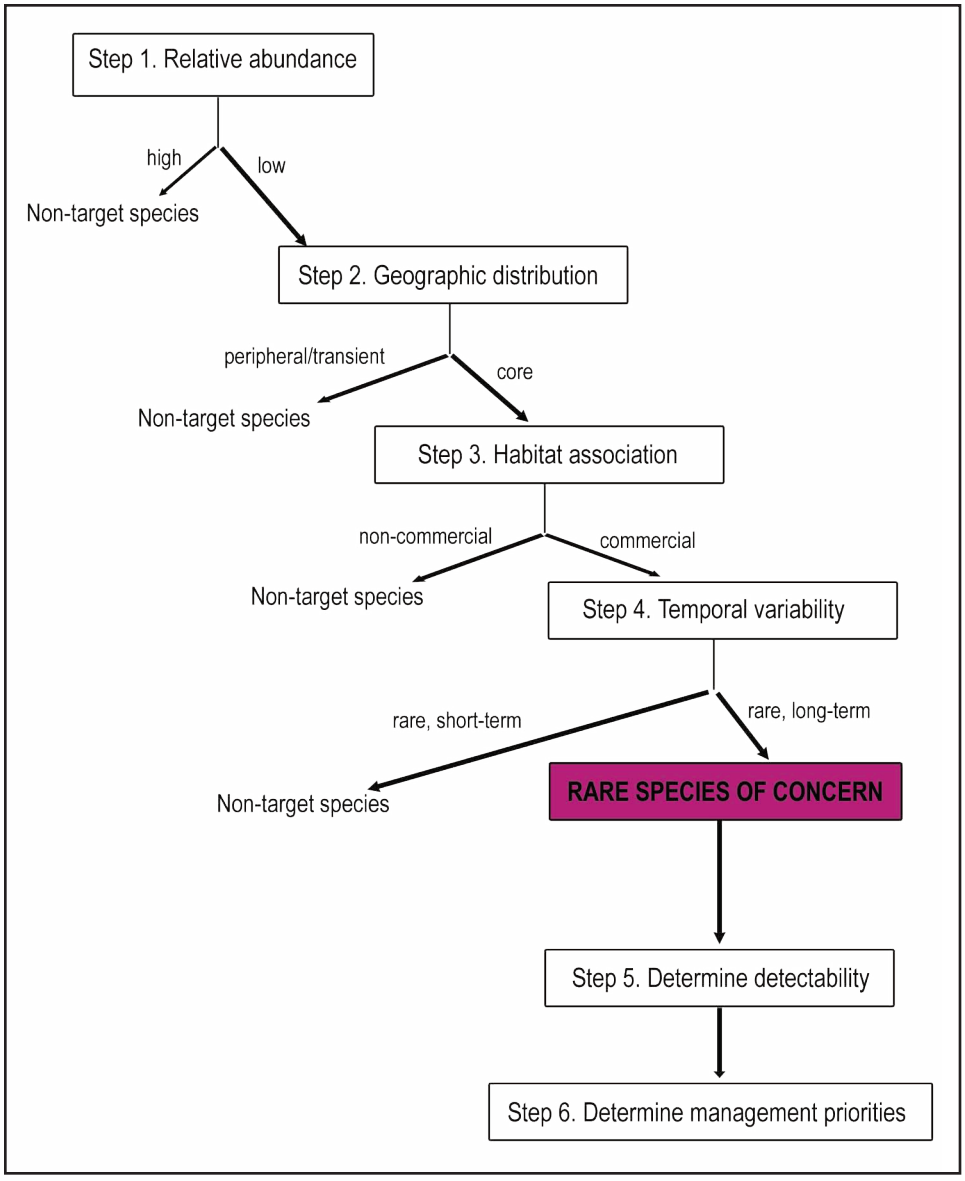

Figure 2. Adapted from *A decision-tree for identifying rare species of concern to forest managers*, developed by Susan Hannon and colleagues at the University of Alberta.

Step 5: Determine the species detectability and identify species that may be difficult to detect with standard sampling methods. Some species might be classified as rare because it is hard to detect them in the field or due to other survey-related problems results indicate the species is low in numbers. For example, songbirds with high-pitched songs are difficult to hear and can be under-represented in songbird surveys (they are there, but they aren't heard or counted). As well, species that breed earlier or later than other species may not be adequately sampled by traditional survey methods. These species should be identified so that appropriate sampling methods can be performed to confirm their status. In the meantime, as a conservative measure, they should remain on the rare list until their status is confirmed.

Step 6: Determine the management priorities. Once rare species relevant to forest management have been identified they should be prioritized for fine-filter management. Species with the following characteristics should receive the highest priority:

(1) species that occupy habitats that will be reduced (in availability and quality) by forest operations,

(2) species already listed as sensitive or at risk by other agencies,

(3) species with restricted continental ranges that overlap substantially with the eco-region where the forest operations are taking place. This is referred to as high local responsibility (see box).

Identifying rare species in a forest management unit is a necessary part of managing biodiversity and conserving species. The process outlined in this note provides forest managers with a framework when considering the management of rare species in their forests.

Local responsibility

Local responsibility is a measure of a given forest area or landscape's obligation or responsibility to maintain a species. An index of responsibility can be calculated by determining how much of a species' range occurs within a specific area, compared to its entire range.

For example, if a large portion of a species' range occurs within the boundary of a given area, then that area has a large responsibility for maintaining that species or a high local responsibility. Conversely, if the species is very widely ranging and the area represents a very small portion of the species' total range, then the area has a lower responsibility for this species.

For a given forest management area, species with high local responsibility scores should be given higher management priority.

Further reading

For a more detailed description and example application of this method, please refer to:

Hannon, S.J., S.E. Cotterill, and F.K.A. Schmiegelow. 2004. *Identifying rare species of songbirds in managed forests: application of an eco-regional template to a boreal mixedwood system.* For. Ecol. Manage. 191:157-170.

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Graphics & Layout: K. Kopra

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ISSN 1715-0981