Ecological Restoration Guidelines

For British Columbia

BRITISH COLUMBIA

FOREST RENEWAL BC

Acknowledgements

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Large parts of these guidelines were informed by Don Gayton's "Groundwork: Basic Concepts of Ecological Restoration in British Columbia" (Gayton 2001), and numerous practical tips were taken from the BCEN's "Healing the Land...Healing Ourselves: A Guide to Ecological Restoration Resources for British Columbia" (Ritchlin 2001).

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INTRODUCTION

One of the most significant changes in recent history is the transformed relationship between humans and their environment. Widespread realization that natural systems are precious and limited has begun to change our values towards the world around us. In particular, there is higher awareness about how our behaviour and actions can degrade the health and integrity of sensitive and valuable ecosystems. One response to concern for the environment is to prevent ecological damage in the first place. The other answer is ecological restoration, to repair what damage has occurred.

> *We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect. – Aldo Leopold, in "A Sand County Almanac" (1949)*

This document gives guidance on developing and implementing restoration projects. These guidelines are designed to inform and guide groups undertaking restoration programs, regardless of funding source or type of project. Because every restoration site is different, the emphasis is on identifying important components common to all restoration projects, and on providing suggestions for finding resources and developing project-specific plans. By using these guidelines, your group will be able to set appropriate and measurable restoration goals, and develop a restoration plan that will define short- and long-term activities. Developing these restoration goals and plans will not only make for a sound project, but will also assist in obtaining restoration funding.

Philosophy of Ecological Restoration

While concepts of nature conservation and restoration can be traced back to classical Greece, modern ideas of ecological restoration are built on the writings of Henry David Thoreau, George Perkins Marsh, and Aldo Leopold. The first restoration projects began in Wisconsin in the 1930's, under Leopold's direction (Gayton 2001).

> *The aim of ecological restoration is to fully restore the components and processes of a damaged site or ecosystem to a previous historical state, to a contemporary standard, or towards a desired future condition (Gayton 2001).*

In more recent times, definitions have evolved to describe an ecological approach to restoration. The Society for Ecological Restoration describes ecological restoration as: *"the process of assisting the recovery and management of ecological integrity"* (SER, 2002), while others describe it as "*the art and science of repairing damaged ecosystems to the greatest possible degree of historical authenticity"* (Mills, 1995). Key to

ecosystem recovery is the restoration of internal processes, as well as ecosystem components (such as rare species, or important habitat features). Implicit in any restoration project is that the cause(s) of ecosystem degradation are identified and controlled (Gayton 2001). Hence, restoration is sometimes as simple as removing degrading agents (e.g., roads, dams, cows, or resource extraction). It may also require long-term efforts, such as reintroducing native species, removing exotic species, or reinstating natural processes including fire and floods. A common concept in restoration is to provide assistance in the context of our incomplete knowledge of how ecosystems function. Given time and removal of degrading agents, natural processes will accomplish most of the work.

Tanis Douglas

Tanis Douglas

Addressing degrading agents is critical to ecosystem recovery

Content and Use of These Guidelines

These guidelines are divided into sections, starting with the development of restoration goals and moving through project planning, implementation, maintenance, and monitoring. Pointers on developing a good restoration plan are included throughout, and an example of a potential restoration plan is found in Appendix 1. The following descriptions will allow you to skip ahead to the section most relevant to your project.

Restoration Goals

Setting appropriate goals is a critical step in the development of an effective project. This section of the guidelines gives an overview of current concepts in ecological restoration and discusses how these concepts can inform your restoration goals.

Restoration Priorities

High priority restoration needs in British Columbia have been at least partially identified, and this section discusses available information on restoration priorities.

Planning

This section is the most extensive part of the guidelines, as it goes into a step-by-step description of how to gather information in order to make restoration prescriptions. This section will be especially useful to restorationists looking for practical suggestions on finding resources and making plans.

Implementation

Logistical tips on items like permits, safety and project timing are included here. Reporting on your project is an important part of project implementation.

Maintenance

Successful projects consider future maintenance requirements, as discussed in this section.

Monitoring

Monitoring is an essential part of restoration that allows you to evaluate the success of your project and adjust plans when necessary. Monitoring design must be included in the planning and implementation stages.

Resources

Resources that compliment this guide, such as web-pages, government agencies and non-governmental organizations are listed here. A glossary of restoration terms is provided, and helpful references are also included

Restoration Plan

A sample restoration plan is included as Appendix 1.

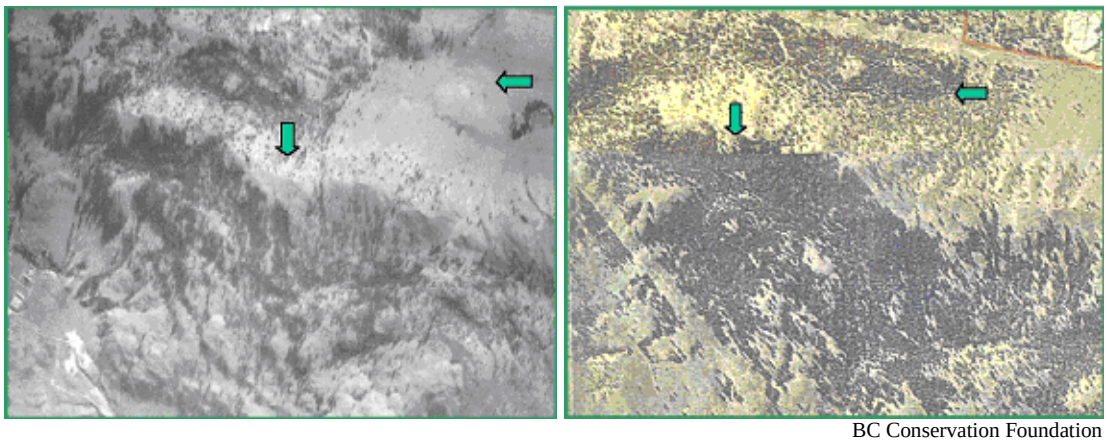
DEFINING RESTORATION GOALS AND OBJECTIVES

"Restore to what?" is a crucial question that every individual interested in restoration must ask. Ecosystems are dynamic, and continually changing over time and space. A common long-term goal (or *desired future condition*) for restoration is that the ecosystem looks and functions as it did before it was damaged or degraded, although exact replication of past conditions is rarely possible. Additionally, a similar ecosystem in good or excellent condition (a *reference ecosystem*) can be used in defining a goal (Gayton 2001). If you are planning a restoration project you no doubt have a goal in mind; this section should help you define your goals based on concepts common to all restoration projects.

What Are Restoration Goals & Objectives?

Restoration goals describe the *desired future condition* of a site, often decades into the future. These long term goals are supported with more short-term objectives, or targets. When establishing these goals and objectives, it is important to have an understanding of the *scale of restoration* (ecosystem processes, habitat, and/or individual species), processes of *ecological succession*, and the concepts of *natural disturbance regimes* and the *natural range of variability*. Taking into account natural healing processes, natural disturbance, and expected variability over time and space will help ensure your restoration prescriptions are appropriate for your site and the landscape you are working in.

Restoration objectives will be as explicit as possible about the *scale* and time-frame for restoration, and will be *measurable* so that progress towards the goals can be assessed. Given the dynamic nature of ecosystems, it is acceptable to state goals and objectives in terms of thresholds and ranges of values, as well as in definite number values.



BC Conservation Foundation

The same area in 1948 (left) and 1995 (right) – note changes in the amount of forest cover, partly as a result of fire suppression. A goal for this park near Kamloops might be to restore the amount of grasslands and open forests to within the natural range of variability, as described by old photographs and surveys

Table 1: Example Goals and Objectives

Example Goals and Objectives	
GOAL Restore valley bottom riparian vegetation composition and structure to former conditions (i.e. restore to a *desired future condition*, based on old surveys and photographs, stump counts, scientific literature describing typical ecosystem conditions, and the former disturbance regime).	**OBJECTIVES** ✓ Remove dykes and deactivate roads to allow flooding and channel movement to occur. ✓ Thin deciduous trees and plant coniferous trees native to the site to help attain target densities within a specified time frame. ✓ Create habitat features (e.g., snags, coarse woody debris, tree cavities, and shrubby gaps) by specified type and number/density.
GOAL Restore a Garry oak ecosystem to a condition of ecological integrity (as described by historic accounts, existing *reference ecosystems*, and professional opinion).	**OBJECTIVES** ✓ Remove specified exotic species to below a certain percentage of ground cover (specify time-frame) ✓ Plant native plants (specify type and number, time-frame) ✓ Re-introduce native butterflies (specify type and number) ✓ Introduce periodic fire to control Douglas-fir ingrowth (specify average fire return intervals)

Establishing Desired Future Condition

Desired future condition (DFC) is a commonly used term for describing a restoration goal, or end-point. The desired future condition may be an ecosystem that functions and looks like it did historically, before it was disturbed. In contrast, the DFC may describe a new reality that takes into account human presence and impacts that cannot be redressed. For example, exotic species and roads may never be removed from some ecosystems, but it is possible to reduce or limit their numbers or extent. Conversely, certain large predators or rare plants and animals may never be restored to some

ecosystems, so the DFC would describe a relatively healthy ecosystem that is missing some of its former diversity.

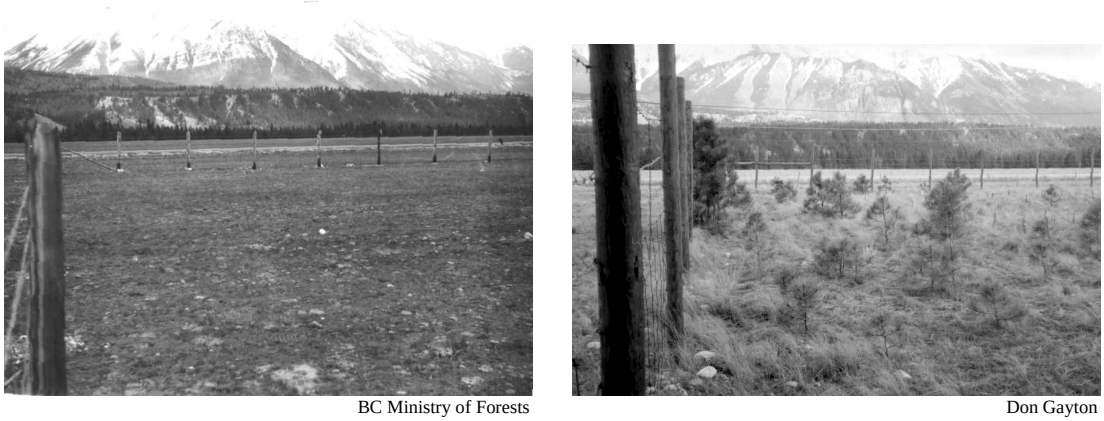
Constructing a desired future condition is a fundamental step in a restoration project. *Reference ecosystems*, whether contemporary or historical, can often be of assistance in developing goals. The DFC is usually constructed using a variety of sources, such as reference ecosystems, knowledge of the former *natural disturbance regime* and the *natural range of variability*, local knowledge, historical references and maps, scientific literature, on-site clues, and professional opinion.

Using Reference Ecosystems

Undisturbed or less disturbed contemporary "reference" areas and historical landscape descriptions can be used in the development of restoration goals. Plant, animal, soil, and water data from these reference ecosystems provide useful "templates" for restoration work in similar sites (Gayton 2001). The potential and problems of using both contemporary and historical reference area information are discussed here in turn. The serious restoration practitioner should always consult a number of historical and contemporary sources before constructing a template for restoration (Gayton 2001).

Using Contemporary Reference Conditions as Templates

Ecological Reserves, Wildlife Management Areas, Parks, Protected Areas, Rangeland Reference Areas, and other relatively undisturbed sites, on both public and private land, can act as sources of restoration information (Gayton 2001). However, European influence on our ecosystems has been so pervasive that undisturbed areas are rarely found, particularly in zones of level, fertile land, in riparian communities, and near populated areas where restoration projects most often occur. Because reference areas are frequently small parcels, surrounded on all sides by early *successional* and disturbed lands, they are usually not fully representative of "pristine" ecosystems because of edge effects, invasion by introduced or undesirable native species, or "overrest" (too little natural disturbance), yet they still offer many useful clues. For example, at a Rangeland Reference Area near the East Kootenay community of Skookumchuck, even though the biodiversity and vigour of many species of grasses and herbs has increased inside the protected area, the accumulation of grass litter over the past fifty years has allowed for the establishment of a Ponderosa pine forest inside the exclosure. Normally the combined action of ungulate grazing and frequent fire on this dry site would not permit the establishment of a forest (Gayton 2001).



BC Ministry of Forests Don Gayton

The Milroy Grazing Exclosure in the East Kootenays. The photograph on the left was taken in 1951, the year the exclosure was built. The right-hand photograph was taken in 1995. Note the changes due to the exclusion of grazing cows and elk. This exclosure can be used as a reference area for grassland restoration.

Using Historical Reference Conditions as Templates

Another common reference point for ecological restoration is the way an ecosystem appeared to function historically (Gayton 2001). Such historical *benchmarks* are generally selected from within our modern climatic period, but before significant European influence. In British Columbia, this period is from about 1600 to 1880, and in some very remote areas this period may even extend to the present. Early published accounts, old-timers' recollections, early research projects, First Nations' accounts, archival photographs, tree rings, pollen cores, and fire scars are typical sources of data for this era, but many others are available to the creative investigator (Gayton 2001). Older air photos also add to an understanding of the site, though these generally date back only to the 1950s.

Don Gayton

Cross section of an old fire-scarred larch from the Canal Flats area of the East Kootenays. The tree germinated in 1600 and contains 10 separate fire scars.