Restoring British Columbia's Garry Oak Ecosystems

PRINCIPLES AND PRACTICES

Chapter 1
Introduction

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Restored Garry Oak ecosystem at Mt. Tzuhalem Ecological Reserve, Duncan, B.C. Photo: Dawn Fizzard

1.1 The Need To Restore Garry Oak Ecosystems

Over recent decades, individuals, organizations, and governments around the world have recognized the decline in our natural heritage, what these days we call "biological diversity" or "biodiversity" (Wilson 1992). The concern is not only that we are losing the diversity of life, which has value in its own right, but also that we are losing the many services biodiversity provides us (Millennium Ecosystem Assessment 2005). The status of British Columbia's biodiversity was summarized comprehensively in a recent report, *Taking Nature's Pulse* (Austin et al. 2008). Among many topics, the report assessed the conservation status of provincial ecosystems, and determined that the Coastal Douglas-fir biogeoclimatic zone, which includes Garry Oak and

associated ecosystems, was one of the most imperilled. The impacts of urban and agricultural development on this zone were particularly noted.

Garry Oak ecosystems are among the rarest ecosystems in Canada, and the area that they occupy continues to decline (Fuchs 2001). Their precarious situation was convincingly demonstrated by Lea (2006), who showed that the range of Garry Oak ecosystems has shrunk by more than 95% since the time of European contact. Losing these ecosystems has had an adverse impact on many animal and plant species—more than 100 species associated with Garry Oak ecosystems are considered at risk provincially, and 55 of these species are federally listed under the *Species at Risk Act* (SARA) (GOERT 2009).

Garry Oak ecosystems are defined as those ecosystems with naturally occurring Garry Oak (*Quercus garryana*) trees, plus a complex of the following closely related ecosystems: coastal bluff, maritime meadow, vernal pool, grassland, and rock outcrop.

For the purposes of this guide, Garry Oak ecosystems are defined as those ecosystems with naturally occurring Garry Oak (*Quercus garryana*) trees, plus a complex of the following closely related ecosystems: coastal bluff, maritime meadow, vernal pool, grassland, and rock outcrop. These latter habitats may not necessarily contain Garry Oak trees, however, they have the assemblages of plants and animals normally associated with Garry Oak ecosystems. Also included are transitional forest ecosystems containing Douglas-fir (*Pseudotsuga menziesii*), Arbutus (*Arbutus menziesii*), and Garry Oak trees. All of these habitats contain some semblance of the ecological processes and communities that prevailed before European settlement.

The endangered status of Garry Oak ecosystems in Canada results from three main causes:

Habitat loss due to conversion of land for urban, industrial, and agricultural purposes. These losses are largely irreversible.

Habitat fragmentation, whereby once-connected habitat patches have become isolated and reduced in size. This partitioning has negative impacts on species persistence and ecosystem integrity. Fragmentation of habitats prevents dispersal and genetic interchange among populations of plants and animals, and reduces the size of habitat patches so much that they can no longer support the full complement of Garry Oak ecosystem species.

Habitat degradation results mostly from the spread of invasive species and the loss of natural disturbance regimes, such as fire. Consequently, even the small remnants of Garry Oak ecosystems are compromised and continue to be degraded by a variety of human activities.

The dire status of Garry Oak ecosystems in Canada is now widely recognized by all levels of government, by not-for-profit environmental organizations, and by the general public. In response to the endangered status of these ecosystems, the Garry Oak Ecosystems Recovery Team (GOERT) was established. GOERT coordinates efforts to protect and restore endangered Garry Oak and associated ecosystems and the species at risk that inhabit them. GOERT is a collaborative partnership of all levels of government, non-governmental organizations, academic institutions, First Nations, volunteers, and consultants. It is the primary organization leading and coordinating efforts to protect and recover Garry Oak and associated ecosystems in Canada.

Since its founding in 1999, GOERT has spearheaded development of a recovery strategy for

Garry Oak ecosystems (www.goert.ca/documents/RSDr_Feb02.pdf). The strategy has two major components: protection and recovery (Fuchs 2001). The need for protection has been emphasized by educating the public and by providing sound scientific data. More and more lands have been safeguarded, either through outright purchase or through other mechanisms such as conservation covenants. The second focus, restoration, involves undertaking activities that enable damaged sites and threatened species to recover, or at least to move along pathways to recovery.

Restoring British Columbia's Garry Oak Ecosystems: Principles and Practices addresses the second focus of the strategy. Its purpose is to provide the best available information about approaches, strategies, and methods for restoration. To achieve this purpose, this guide summarizes the principles and concepts of restoration, reviews the ecology of Garry Oak and associated ecosystems, and provides a wealth of practical information on restoration techniques.

Ecological restoration is the process of assisting the recovery of ecosystems that are damaged, degraded, or destroyed (Society for Ecological Restoration International, 2004). Considerable efforts, both by government and non-government organizations, often acting in concert, have gone into restoring Garry Oak ecosystems. Restoration efforts have ranged from private individuals converting their backyards into Garry Oak habitat, to community-based removal of invasive species, such as Scotch Broom *(Cytisus scoparius),* from parklands, to studies of ecological processes and practical techniques. Some lessons learned from these activities have been recorded, but not always in readily accessible sources; other lessons have not been written down but reside in the minds of seasoned practitioners.

This guide is meant to be a comprehensive, straightforward, and reliable source of knowledge that will assist the reader in the practice of ecological restoration of Garry Oak ecosystems.

Thus, the knowledge of how to restore Garry Oak ecosystems is widely scattered and not readily accessible. This guide is meant to be a comprehensive, straightforward, and reliable source of knowledge that will assist the reader in the practice of ecological restoration of Garry Oak ecosystems. It is not intended to be a scientific treatise, although sound science is fundamental to good ecological restoration. Instead, it is a technically-oriented user's guide on how best to approach restoration. It is intended to provide a synthesis of current knowledge and practice that will contribute to successful restoration of these endangered ecosystems.

1.2 Organization of This Guide

Restoring British Columbia's Garry Oak Ecosystems: Principles and Practices consists of eleven chapters grouped into five parts.

Part I introduces the publication and presents key principles used to guide restoration (Chapter 1).

Part II provides the background understanding of Garry Oak ecosystems that is needed to undertake restoration. Chapter 2 sketches the geographic scope of Garry Oak ecosystems in Canada and describes the ecological units that make up Garry Oak ecosystems. The next two chapters provide important ecological perspectives: the natural disturbance processes that historically shaped these ecosystems (Chapter 3) and the endangered species and ecosystems that are associated with Garry Oaks (Chapter 4).

Part III focuses on how to undertake a restoration project. Chapter 5 addresses project initiation and planning by specifically explaining the organizational structure of a restoration project. Then, Chapter 6 addresses the importance of outreach and how to engage the public. The final chapter in this part, Chapter 7, provides principles and practices for inventory and monitoring, and key elements of an adaptive management approach to restoration.

Part IV explores ways of implementing restoration projects. Chapter 8 outlines various strategies and approaches that can be used in restoration. The thorny issue of dealing with invasive species forms the content of Chapter 9. The propagation and supply of native species for use in restoration is the subject of Chapter 10.

Part V summarizes key points made throughout the publication in the concluding Chapter 11.

1.3 Strategic Working Principles

The authors adopted six principles to guide the scope and content of the publication, and the team encourages all practitioners to consider following them in their restoration projects. The six principles are:

1. Put protection before restoration
2. Adopt an eco-cultural approach
3. Apply the best available knowledge
4. Apply adaptive management
5. Set clear objectives
6. Document all phases of all restoration projects

Restoration, no matter how well executed, will never re-create what has been damaged, degraded, or destroyed.

Protection is the first priority in the conservation of Garry Oak and associated ecosystems. Whenever possible, current Garry Oak and associated ecosystems must be protected, whether by outright purchase, by conservation covenant, or by some similar means that ensures their long-term security. The reason for highlighting this principle is that restoration, no matter how well executed, will never re-create what has been damaged, degraded, or destroyed. The focus on protection serves to emphasize that restoration is not an acceptable excuse for the loss of these ecosystems in the past and certainly not in the future.

The second principle encourages restoration practitioners to adopt a definition of ecological restoration that includes both human culture and the conventional biophysical elements or dimensions. Good ecological restoration requires the application of the best available ecological knowledge in a human context, where humans are considered to be part of ecosystems and are meaningfully involved in all stages of the restoration process from planning to after-care. Experience demonstrates repeatedly that unless as many people as possible are consulted and involved at the start of the process, restoration projects are likely to fail. Given the tremendous amount of effort that usually goes into restoration projects, it is critical to involve people in order to ensure long-term success (Sauer 1998).

The third principle emphasizes the importance of using the best available knowledge. In this publication, knowledge includes understanding gained from scientific research, as well as traditional and local ecological knowledge and practice. As part of this approach, we recognize

that our understanding of ecological restoration techniques and methods continually improves; users of this guide should view its content as a starting point. This publication is intended as a living document and will be updated periodically. Please check the GOERT website for updates (www.goert.ca/restoration).

The fourth principle—the application of adaptive management—could be described as "learning by doing". However, "learning by doing" oversimplifies the real meaning of the concept and overlooks the important features and benefits that make up adaptive management (Holling 1978; Walters 1986). The concept of adaptive management arose from the realization that land management activities, including ecological restoration, are often experimental because their outcomes cannot be predicted with certainty; their results will be known only after ecosystems have responded to treatments. This uncertainty is a common feature of Garry Oak restoration projects. For example, mowing and mulching are being used to replace fire as a disturbance agent in projects like the ongoing restoration at the Somenos Garry Oak Protected Area near Duncan, B.C. The long-term outcome of these techniques in terms of how well they replicate burning has yet to be seen.

The vital role of monitoring in restoration projects cannot be over-emphasized; all Garry Oak restoration initiatives must include a well-designed monitoring component.

To learn as much as possible from management experiments, adaptive management practitioners use a systematic process to plan, conduct, and learn from their activities. Nyberg (1998) summarized adaptive management as a series of steps:

i. problem assessment
ii. project design
iii. implementation
iv. monitoring
v. evaluation
vi. adjustment of future decisions

By identifying knowledge gaps and uncertainties during problem assessment, then deliberately designing the management treatment or program to address these gaps, practitioners can achieve both on-the-ground results and—just as importantly—gain new knowledge about how and why the ecosystem responded the way it did. Note that careful monitoring of field results is a critical step in the adaptive management process because it ensures that reliable information is gathered to address the knowledge gaps and uncertainties identified at the outset. The vital role of monitoring cannot be overstated, and all Garry Oak restoration initiatives must include a well-designed monitoring component.

The fifth principle of setting clear objectives is closely related to adaptive management and is central to successful restoration (Hebda 2010). Project objectives drive the actions of a project, set criteria for evaluating success, and directly shape budgets. A project with unclear objectives may generate confusion among the participants, can lead to selecting incorrect methods, and may lead to conflicts when making decisions. It is hard to communicate to the public and to project supporters if the project's desired outcomes and targets are not clear. The importance of establishing clear, shared objectives cannot be overstated, for it can determine the success or failure of a restoration project. Furthermore, adaptive management decisions cannot be made

without clear objectives for the management actions taken.

The sixth principle of documenting project activities may seem obvious. Yet for so many projects there are only brief or scattered records of what was attempted and what actually happened. Restoration is a recent field of activity, and the literature is only beginning to accumulate. Thus, even the most basic observations are critical to advancing our understanding, and it is especially important to document failures so that unsuccessful approaches are not repeated. All new knowledge needs to be compiled and passed on to future restoration projects and practitioners.

1.4 Experience Beyond the Canadian Region

Restoration work does not exist in a vacuum, and there is much useful information available in other regions, including those with Garry Oaks and other oak species. There is considerable interest in oak ecosystems in the various Mediterranean climatic zones around the world, as demonstrated by the recent publication *Cork Oak Woodlands on the Edge: Ecology, Adaptive Management, and Restoration* (Aronson et al. 2009). In this publication, the editors state that "cork oak woodlands can be viewed as a system on the edge of radical change and at clear risk of collapse" (p. 5), a statement that sounds all too familiar to those working on Garry Oak ecosystems.

While there is much we can learn from work in these other ecosystems, it is important to realize that there are unique aspects to be considered closer to home within the context of southern British Columbia. Considerable work has been completed and continues to be done in similar oak-meadow-dominated ecosystems in Washington and Oregon (e.g., Vesely et al. 2004). Much can be gained by continued (and enhanced) communication and collaboration with Garry Oak restoration efforts in these neighbouring states. An excellent example of this collaboration is the "Cascadia Prairie-Oaks Partnership" that was highlighted at a recent conference (March 24–27, 2010) in Washington state, and which spans both Canada and the United States. The *Prairie Landowner Guide for Western Washington* (The Nature Conservancy 2011) has recently become available at www.southsoundprairies.org, and *Restoring the Pacific Northwest*: *The Art and Science of Ecological Restoration in Cascadia* (Apostol and Sinclair 2006) provides another good example of integration of restoration work across the region, and includes a chapter on oak woodlands and savannahs.

1.5 Restoration for All Concerned

There is a clear need to restore Garry Oak ecosystems because many serious issues threaten their existence. In addition to providing ecological and biological benefits, restoration activities and projects provide participating individuals, communities, and organizations with opportunities to gain a remarkable sense of accomplishment and to reconnect in a meaningful way with the natural world around us. Even though restoration seems to be a never-ending process, it creates a long-term connection between participants and their natural surroundings. It is our hope that this guide will be a valuable aid both to restoring Garry Oak ecosystems and to building human and natural communities in our special places. We encourage you to apply what we offer here to your restoration efforts, and to add your knowledge and experience to the growing body of knowledge on successful restoration. We wish you well in all you do for restoration!

1.6 References

Apostol, D. and M. Sinclair (editors). 2006. Restoring the Pacific Northwest: the art and science of ecological restoration in Cascadia. Island Press, Washington, D.C.

Aronson, J., J.S. Pereira, and J.G. Pausas (editors). 2009. Cork oak woodlands on the edge: ecology, adaptive management and restoration. Island Press, Washington, D.C.

Austin, M.A., D.A. Buffett, D.J. Nicolson, G.G.E. Scudder, and V. Stevens (editors). 2008. Taking nature's pulse: the status of biodiversity in British Columbia. Biodiversity BC, Victoria, B.C. www.biodiversitybc.org (Accessed March 30, 2010).

Fuchs, M.A. 2001. Towards a recovery strategy for Garry Oak and associated ecosystems in Canada: ecological assessment and literature review. Environment Canada, Canadian Wildlife Service, Pacific and Yukon Region. Technical Report GBEI/EC-00-030.

Garry Oak Ecosystems Recovery Team (GOERT). 2009. Species at risk. www.goert.ca/pubs_at_risk.php (Accessed Jan. 20, 2010).

Hebda, R.J. 2010. Course guide and course manual ER311: principles and concepts of ecological restoration. Division of Continuing Studies, University of Victoria, Victoria, B.C.

Holling, C.S. (editor). 1978. Adaptive environmental assessment and management. John Wiley & Sons, Toronto, Ont.

Lea, T. 2006. Historical Garry Oak ecosystems of Vancouver Island, British Columbia, pre-European contact to the present. Davidsonia 17(2):34-50.

Millennium Ecosystem Assessment. 2005. Ecosystems and human well-being: synthesis. Island Press, Washington, D.C.

Nyberg, J.B. 1998. Statistics and the practice of adaptive management. In: V. Sit and B. Taylor (editors). Statistical methods for adaptive management studies. B.C. Ministry of Forests, Research Branch, Victoria, B.C. Land Management Handbook 42, pp. 1-8.

Sauer, L.J. 1998. The once and future forest: a guide to forest restoration strategies. Island Press, Washington, D.C.

Society for Ecological Restoration International. 2004. The SER primer on ecological restoration. Version 2. October, 2004. Society for Ecological Restoration International, Tucson, Ariz. www.ser.org/content/ecological_restoration_primer.asp (Accessed January 28, 2009).

The Nature Conservancy and E.S.A. Adolfson. 2011. Prairie Landowner Guide for western Washington. www.southsoundprairies.org (Accessed 2011).

Vesely, D., G. Tucker, and R. O'Keefe. 2004. A landowner's guide for restoring and managing Oregon white oak habitats. United States Bureau of Land Management, Salem District, Oregon. www.blm.gov/or/districts/salem/files/white_oak_guide.pdf (Accessed March 30, 2010).

Walters, C.J. 1986. Adaptive management of renewable resources. McGraw-Hill, New York, N.Y.

Wilson, E. O. 1992. The diversity of life. Harvard University Press, Cambridge, Mass.