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DRAFT MANAGEMENT PLAN FOR THE GARRY OAK *(QUERCUS GARRYANA)* STAND IN AND ADJACENT TO THE YALE ECOLOGICAL RESERVE, YALE, BRITISH COLUMBIA (Including Details of Activities to Date)

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Prepared for:
Terrestrial Ecosystem Restoration Program
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1. INTRODUCTION

This document describes initial restoration-related activities and presents a draft restoration plan for the Garry oak (*Quercus garryana*) stand in and adjacent to the Yale Ecological Reserve north-east of Yale, British Columbia (Appendix 1, Fig. 1).

The Yale Garry oak stand is isolated from the main coastal distribution of Garry oaks in British Columbia by about 160 km. One other disjunct Garry oak stand is present between Abbotsford and Chilliwack. Approximately one half of the stand lies within the confines of the Yale First Nations Reserves #19 and #20. Detailed ecological and historical discussion of the site can be found in an earlier report (McIntosh and Sadler 2001).

The two main purposes of this study were:

1. to initiate restoration activities on site, in particular the removal of some human-related debris, and
2. to develop a draft restoration management plan for the site.

Funding for this work was provided by the Terrestrial Ecosystem Restoration Program (TERP; Yale Garry Oak Restoration Project 0-2). This project is a continuation of earlier work that was funded by BC Parks.

At the same time that this project was initiated, additional funding for work and research in the Yale Garry oak stand was supplied by BC Parks. The main focus of the BC Parks project was to provide additional ecological information on the site, and to draft a prescription for a competitive-canopy tree removal, principally of Douglas-fir. This prescription is included in the this report. The BC Parks report will be made available to TERP.

This study has resulted from a cooperative effort between the Yale First Nations, TERP, and BC Parks. Two members of the Yale First Nations community, Larry and Perry Hope, provided excellent assistance in the field.

We thank Kella Sadler and Wayne Erickson for their helpful comments on the manuscript.

2. DESCRIPTION OF THE SITE

2.1 Physical and Ecological Setting

The Yale Garry oak site is a complex of rock outcrops, cliffs, and gullies, Garry oak and associated communities, and Douglas-fir forest (Fig 2 and 3 are photographs of the site from a helicopter, March 2002).

The stand has been cut through by the Canadian National Railway (CNR) line which separates the upper part of the stand from the more open lower portions. The lower section of the stand is dissected by a sandy beach that stretches from the river to the base of a steep talus slope, produced, in part, through the building of the railway.

An interesting mix of vascular plants and bryophytes is associated with the Garry oaks, many of which are characteristic of both coastal and, to a lesser degree, interior

ecosystems. Many of these species also show wide disjunctions from their closest populations. Those with coastal affinities include the vascular plants *Allium acuminatum*, *Carex inops*, and *Perideridia gairdneri*, and the bryophytes *Dendroalsia abietina*, *Zygodon viridissimus*, *Anacolia menziesii*, *Homalothecium nuttallii*, *Antitrichia californica*, and *Orthotrichum lyellii*. Vascular plants with interior affinities include *Elymus spicata*, *Koeleria macrantha*, and *Gailardia aristata*.

A number of small Garry oak sub-communities have been described for the site (W. Erickson pers. comm., McIntosh 2002). This underlines the amount of ecological variation on site. Identified sub-communities include (according to Erickson 1996, 2000):

- c8 Oak – *Symphoricarpos albus – Rosa nutkana – Lonicera ciliosa* sub-community (in the lower part of the stand)
- c10 Oak (Fd) – *Holodiscus discolor – Symphoricarpos albus – Rhydiadelphus triquetrus* sub-community (in the upper part of the stand)
- c14 Oak- *Carex inops* (throughout)
- c46 Oak – *Racomitrium canescens – Selaginella wallacei* sub-community (throughout))

and small patches of (in the lower stand):

- c11 Oak- *Dicranum scoparium- Montia parviflora*
- c13 Oak- *Melica subulata*
- c27 Oak- *Festuca idahoensis*
- c47 Oak- *Elymus glaucus*
- Oak- *Danthonia californica* (Erickson pers. comm.)

Four permanent vegetation plots have been set up in the stand. These plots will serve to measure and monitor vegetation changes through time.

The presence of insect pathogens was investigated by collecting infested leaves, twigs, and acorns later examined by Bob Duncan of Pacific Forestry Center in Victoria. We did not measure the degree of infestation but did make some general observations.

The following pathogens were identified as present on the Yale Garry oaks:

- filbert worm (*Cydia lateriferannus*); damage of some acorns.
- oak leaf Phylloxera aphid (*Phylloxera glabra*); an introduced species; spotty damage throughout the site; appears to be most concentrated in patches of oak trees versus evenly distributed across the stand.
- tent caterpillar (*Hyphantria cunea*); on Saskatoon and a few oaks in the upper portion of the stand); B. Duncan (pers. comm.) noted that it is very unusual to see tent caterpillars on Garry oak.
- unknown aphid damaging leaves leaving large patches of dead tissue and sooty deposits.

W. Erickson also saw evidence on some Garry oaks of the introduced jumping gall wasp (*Neuroterus saltatorius*) at low levels, and moderate effects from a leaf roller, possibly by the native (*Stegophylla essigi*) or the introduced caterpillar, *Pandemis cerasana*. These were not confirmed by B. Duncan.

2.2 Human History

Native people have been accessing and using the Garry oak stand and surrounding habitats for centuries (pers. comm. with Yale First Nations and T. Hoffman, cultural anthropologist). One First Nations' graveyard is located to the south of the site, and at least 10 pit houses are scattered in or near the site. Native implements, for example arrowheads and fish cleaning tools, are fairly common across the site.

The site has been heavily impacted by a number of events over the past century. One of the first major disturbances to the Garry oak stand occurred when the railway was built in 1913. The railway line went directly through the lower portion of the stand, which, before this, likely formed a horseshoe-shaped band around the inlet. Other events that have impacted the oak stand include prospecting and mining activities along the river and into the stand from the 1880's to the 1930's, the building of a now defunct cable system from the west side of the river into the oak stand, road construction, probably with a bulldozer, through the northern portion of the lower site, and the building of various small shacks and related structures, which are now abandoned.

Since then, hydro lines have been built on the slope above the stand. Although this probably did not affect the oak stand directly, there was some disturbance during construction. The characteristically open habitat, especially in the lower portions of the stand, provides an excellent site for industry-related activities, such as field camps, and probably was frequently used as such.

The last major disturbance activity occurred sometime in mid-2000, when eighteen fairly large oak trees were cut down and the trunk wood removed from an area east of the railway line.

Douglas-fir has encroached into all of the Garry oak stand except for the more open and climatically severe areas associated with rock outcroppings.

3. METHODS

This study was encumbered by a number of unusual events that did not allow for some of the proposed activities to be completed. Unforeseen logistical problems included dangerously high water levels, the presence of bears fishing on site, and mechanical problems with the access boat. These problems underline concerns about access, and any project in this site must make allowances for potential cancellations.

This stand, being isolated, does not have a number of the invasive weeds that other sites have, in particular Scotch broom. To ensure that we did not introduce foreign propagules to the site, we cleaned our clothes and equipment of seed and other potentially infective materials that may have been picked up from other areas (e.g., in coastal Garry oak sites).

We completed a number of clean up activities and partially cleared some sites of invasive weeds and some young Douglas-fir. We then walked the site and assessed various sections of the stand with respect to potential restoration activities. Digital photographs were taken at selected locations throughout the stand with a Cool Pix 950 camera.

As part of this contract, we were able to fly over the site and capture the area on video. A copy of this video accompanies this report.

4. ON-SITE ACTIVITIES

We completed the following clean-up tasks:

1. Cleaning up garbage (Fig 4): Most of the clean-up activities were focused on garbage and debris in the lower central portions of the stand. We gathered as much material as possible, and piled it in the center of the sandy beach for removal. Materials removed included old nylon nets and ropes, various pieces of wood, old barrels, glass containers, metal bars, and smaller garbage material. Much of the non-fishing related material has been put there over time by individuals using the railway. There is a large amount of unmovable material, including the base of an old box car and associated metal frames more or less buried in area just south of the beach adjacent to the railway line. Apparently this area had been used, although not recently, by the railway line to dump materials.
2. Removal of an old building site (Fig 5): An old wooden shack was taken apart in the upper part of the stand. This was a difficult operation as it was very well constructed and it took three people three days to dismantle it. The wood from the shack was distributed in the Douglas-fir bush and metal garbage was piled up for removal. A few other old building sites were cleaned of garbage.
3. Removal of exotic plants: We focused weed removal activities on spotted knapweed, common tansy, and common velvet-grass. Weeds were carefully removed and placed on the shore. We did not accomplish as much weed clearing as we wanted to due to the late time of year and access problems.
4. Removal of young Douglas-fir: In addition to the contract requirements, we cut down or girdled over 40 young (<10cm) encroachment Douglas-fir trees in a few Garry oak sites in the lower stand (MZ1) outside the boundary of the Ecological Reserve. These trees were distributed in the Douglas-fir forested section of the site.

5. DRAFT MANAGEMENT PLAN FOR THE YALE GARRY OAK STAND

5.1 Introduction

This plan roughly follows restoration plan designs outlined in recent reports (including Holt 2000 and Douglas in prep. 2002). The design and implementation of restoration plans of this type are relatively new in British Columbia; therefore, this plan will be considered "draft" until it is reviewed and edited, and more experts are able to visit the

site in order to assist and contribute advice. It must also be reviewed by the Yale First Nations and BC Parks.

5.2 Rationale

The goal of the Terrestrial Ecosystem Restoration Program (Holt 2000) is to:

> "Restore the capacity of ecosystems to provide the natural diversity of processes, habitats and species where they have been significantly negatively impacted by past forest management or harvesting practices."

TERP considers Garry oak ecosystems to be one of the most endangered ecosystems in Canada, and has given it a high priority ranking for ecological restoration work (Holt 2001). Since European settlement, all provincial Garry oak ecosystems have been impacted to some degree and many have been lost. Further, the Yale Garry oak site is unique in that it is isolated from other provincial oak stands, and, even though heavily impacted by human activity in the past, lacks many of the noxious weedy plants of other sites along the coast.

This report is will not dwell on the various philosophical discussions that surround the science of ecological restoration. It is our view that certain areas need to be managed to some degree simply because we have altered them in a negative way, and species or communities may be lost. We cannot return to the past thus we are in some disagreement with the term restoration. However, we will work within the general construct provided by the international Society for Ecosystem Restoration which defines restoration as:

> "the process of assisting the recovery and management of ecological integrity which includes a critical range of variability in biodiversity, ecological processes and structures, regional and historical context, and sustainable cultural practices."

In 1993, the Forest Ecosystem Management Team (FEMAT) working in the Pacific Northwest recommended that ecosystem restoration should be grounded in ecological theory, but must also take a pragmatic approach that would start by:

> "determining all ecosystem restoration needs, then sifting these for the most important processes of concern, "treatability", cost-effectiveness, funding expectations, management situations, and institutional and socio-political considerations to arrive at the best implementable program"

This, in most aspects, is the philosophy that we have initiated here.

5.3 Physical Considerations

1. <u>Access to the Property</u>

   The property can be directly accessed by boat from Yale on the west side of the Fraser River. Although this is the most dependable method of getting to the site, river conditions and other factors may prevent access (this is a very unpredictable and dangerous portion of the Fraser River). If the water levels are too low, or the

proper boat is not available, direct boat access to the site is not possible, and the boat must land about .5km south of the stand on a rocky beach (just north of the railway tunnel). From there, access to the site must be made northwards along the railway tracks on foot. Arrangements can be made with the Canadian National Railway (CNR) office in Hope to be dropped off on the site, but pickup is not dependable. All visits to the site must be coordinated through the Yale First Nations and BC Parks.

2. Internal Roads and Trails

   There are a variety of old and overgrown roads and trails on site, and the only one that is readily passable leads east from the railway tracks into the upper oak stand (MZ 4 as discussed below).

3. Minimizing Impacts from Uses of Adjacent Lands

   Over an undetermined length of time, considerable impact has occurred adjacent to and within the Yale Garry oak stand that appears to have its origin with the railway. The only recent activities (in 2000) were the cutting of about 20 Garry oaks near the railway line. The main portions of their trunks were removed, probably by individuals accessing the area with a railway line truck. The Canadian National Railway has been made aware of this problem. However, a great deal of debris still remains on site. Although much of it cannot be removed since it is buried and its removal would negatively impact on oak habitats, some of it can, and possibly, CNR should be contacted to see if they can supply a work crew to do so.

5.4 Biological Inventory and Mapping

Physical and biological features of the stand have been discussed in Section 2 and photographs of the site are included in Appendix 1. Further biological inventory needs to be completed, especially in the spring. There are few useful maps showing site features of the stand, and there are no recent aerial photographs of the site, the latest taken in 1991. However, the accompanying video shows the Garry oak stand from south to north along the bottom portion and along the top portion north to south. Also, we have annotated some photographs in order to locate various features discussed below.

5.5 Critical Restoration Needs and Goals for this Project

The Yale site has many of the classic characteristics of a degrading Garry oak ecosystem. Except for the areas adjacent to rock outcrops, much of the oak stand has been invaded by Douglas-fir and various shade-tolerant shrubs that likely would not be prominent in the historical oak ecosystem. Fire scars are evident on veteran Douglas-fir and some of the larger Garry oaks, and fire was likely more common in the past.

The major underlying causes for degradation on site are listed in Section 2.2. However, these activities, including mining, railway construction, and tree cutting, have all ceased, and are now prohibited by BC Parks as well as the Yale First Nations. Because

disturbance has been minimized, we consider that well-designed restoration efforts will lead towards a more complete natural balance within the oak stand.

The overall goal of restoration at Yale is to increase native species that we believe are characteristic of historical Garry oak habitats. The management emphasis is the restoration of native herbaceous communities associated with open Garry oak woodland, removing conifers from the ingrown areas.

Restoration strategies that will receive emphasis include:

- preventing disturbance that could facilitate the invasion of non-native species.
- minimizing damage to the native flora from human activities.
- removing undesirable woody vegetation such as young conifers and native and non-native shrubs that could displace native herbaceous species.

5.6 Recommended Zone-Based Restoration Activities

We propose the following activities that we consider important in achieving the initial goals of this restoration project. We have divided the Yale Garry oak stand into four management zones based on location, physical site dynamics, and ecosystem characteristics to assist in focusing activities. These management zones are possibly temporary in nature in that, following more detailed research, at least two of them, Zone 1 and Zone 2, may be broken into different zones. They are marked on Figure 1 and are as follows:

1. **Management Recommendations in Zone 1** (Figs. 6 and 7)

   Zone 1 comprises the northerly lower portion of the stand. It is a heterogenous mix of Garry oak, open oak-associated outcrop communities (in particular the c46 sub-community), and Douglas-fir forest (in and along gullies and most east facing slopes). Two distinct Garry oak communities are represented here: an area of taller oaks mixed with veteran Douglas-fir along a ridge (c8 sub-community described above), and a widespread community that is adjacent to and around the open rock outcrop areas (mostly a c10 sub-community), showing heavy encroachment by Douglas-fir.

   At present, we do not propose any major restoration activities in either the taller oak stand or the open rock outcrop areas, except for the selective removal of invasive plants. However, we propose that the remainder of the forested area, approximately two hectares in size but patchy, be selectively logged, removing all young (<80years) Douglas-fir and some native shrubs that surround young Garry oak. There has been a great deal of past disturbance along the gullies and on the flats in this area, including mining activities, the building of a cable system from the west side of the river, and some road construction. Vegetation, including young Garry oak, has covered much of these areas and they should be left alone.

2. **Management Recommendations in Zone 2** (Fig. 8)

   Zone 2, comprising the south-west lower portion of stand, is in many ways similar to Zone 1. It is also a heterogenous mix of Garry oak, open oak-associated outcrop

communities (in particular the c46 sub community), and Douglas-fir forest (in and along gullies and most east facing slopes). Only one distinct Garry oak community is represented here adjacent to and around the open rock outcrop areas (mostly a c10 sub community) that is heavily encroached by Douglas-fir. There are fewer open rock outcrop communities in this zone.

At present, we do not propose any major restoration activities in the open outcrop habitats, except the selective removal of invasive plants. However, we propose that the remainder, approximately one hectare in size and somewhat patchy, be selectively logged, removing all young (<80years) Douglas-fir and some native shrubs that surround young Garry oak. There has been some past disturbance in the section of this area adjacent to the beach. Here, the CNR has appeared to have deposited rock fill in a broad gully along with a large amount of debris, including an old box car, in order to construct a landing area. It is presently covered mostly with weedy, introduced vegetation.

3. Management Recommendations in Zone 3 (Fig. 9 and 10)

Zone 3, comprising the south-east lower portion of stand, is comprised of a heterogenous mix of Garry oak (principally c8 and c10 sub communities) and Douglas-fir communities (in low areas and east facing slopes). The Garry oaks here are heavily encroached by Douglas-fir.

We propose that much of this area be selectively logged, removing all young (<80years) Douglas-fir and some native shrubs that surround young Garry oak. There has been little past disturbance in this area, except for a number of mid-aged Garry oaks that have been cut down recently (in 2000) along the railway line.

With respect to this zone, we have developed a draft prescription for a competitive-canopy tree removal plot (McIntosh 2002). Initially, we examined two sections of the site for this work: one in Zone 3, and the second in Zone 4. Both are good candidates for this experiment, as ingrowth by Douglas-fir is common and both older and regenerating oaks are present. However, we decided that the best location for this work would be in Zone 3 since it is readily accessible and the hazard potential of falling trees is less.

We designed the prescription based on using two, roughly 40m X 40 m circular plots with similar stand and community characteristics. One site will be treated, i.e., invasive Douglas-fir removed, and the other left untreated. No Douglas-fir veterans are in either area. We have marked the center of each plot with flagging tape and recorded UTM's with a Global Positioning Unit (GPS). We plan to set up permanent vegetation monitoring plots in both of the larger trial plots. These will include two parallel transects approximately 10m apart and running along the slope to measure tree and shrub canopy, and ten 2m X 2m plots along each transect will be used to measure cover of species in the understory

We suggested the following methodology once plots are ready for treatment:

- permanently mark all plots and transects.
- complete baseline vegetation sampling in both sites.

- photograph each trial plot in order to document its general appearance; take photographs along both transects as well and in all or selected understory plots.
- in the treatment trial plot, mark all Douglas-fir trees.
- mark and describe the general condition of all Garry oak trees and seedlings/regenerating stems in the circular plot.
- remove all of the Douglas-fir trees through cutting[1]; a professional feller must be in charge of this operation for safety reasons as well as care since one of our aims is to minimize damage and disturbance to the Garry oaks.
- remove all Douglas-fir debris and distribute it in the adjacent forest.
- re-measure the vegetation after trees have been removed.

4. **Management Recommendations in Zone 4** (Fig. 11).

Zone 4, comprising the upper portion of stand, is similar to Zone 3 and is primarily comprised of a heterogenous mix of Garry oak (principally c8 and c10 sub communities) and Douglas-fir communities (in low areas and east facing slopes), although a rock outcrop community (the c46 sub community) is present in the north portion of this zone. The Garry oaks here are heavily encroached by Douglas-fir.

We propose that much of this area be selectively logged, removing all young (<80years) Douglas-fir and some native shrubs that surround young Garry oak. There has been minimal past disturbance in this area, except an old shack that we removed and some garbage that still remains. There are very few invasive weedy plants in the open outcrop association.

5.7 Monitoring, Data Collection, and Data Management

Monitoring of any restoration project is critical, and must be in place before restoration activities begin. Monitoring provides a measure of how the local ecosystems respond to treatments, and how successful the project is in terms of achieving specified objectives. Monitoring demonstrates how treatments are modifying the ecosystem properties, e.g. towards pre-determined restoration goals. Gaboury and Wong (1999) provide a good discussion of effectiveness monitoring.

We have suggested an initial design for the canopy removal trial in Zone 3. Monitoring designs for work at Yale are premature at present, although monitoring plots could be set up immediately for insects and the presence of invasive weedy species, including Douglas-fir. All monitoring projects should be photo-monitored, both from fixed photopoints, as well as throughout the project from sites that show the work in progress and best represent noticeable changes.

[1] girdling has been suggested as a method for killing the trees; however, this method is effective but we cannot predict which way dead trees will fall and damage may occur to the Garry oaks. Also, as much debris as possible should be removed from the site.

6. DISCUSSION AND RECOMMENDATIONS

The Yale Garry oak site is a very complex site and before any further restoration work proceeds, except perhaps the competitive tree removal trail, a number of activities need to be completed. These include:

- a detailed spring biological inventory, which will assist in focusing future management or biodiversity studies.
- a detailed inventory of the insect pathogens on Garry oak is needed, by a specialist on site.
- a detailed map of the Yale Garry oak area should be prepared; our map is not particularly accurate, partly due to the inadequate aerial photographs of the site.

Also, we strongly recommend that all visitors to the site ensure that they do not carry "accidental" seeds from other areas, including coastal Garry oak habitats. Although some weedy species are present in the area, it does not have many of the pernicious weeds that are so common along the coast, and all efforts should be made to keep it in this condition.

7. REFERENCES

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APPENDIX 1. FIGURES

Figure 1. Location and details of Yale Garry oak site with corresponding 1991 aerial photograph.

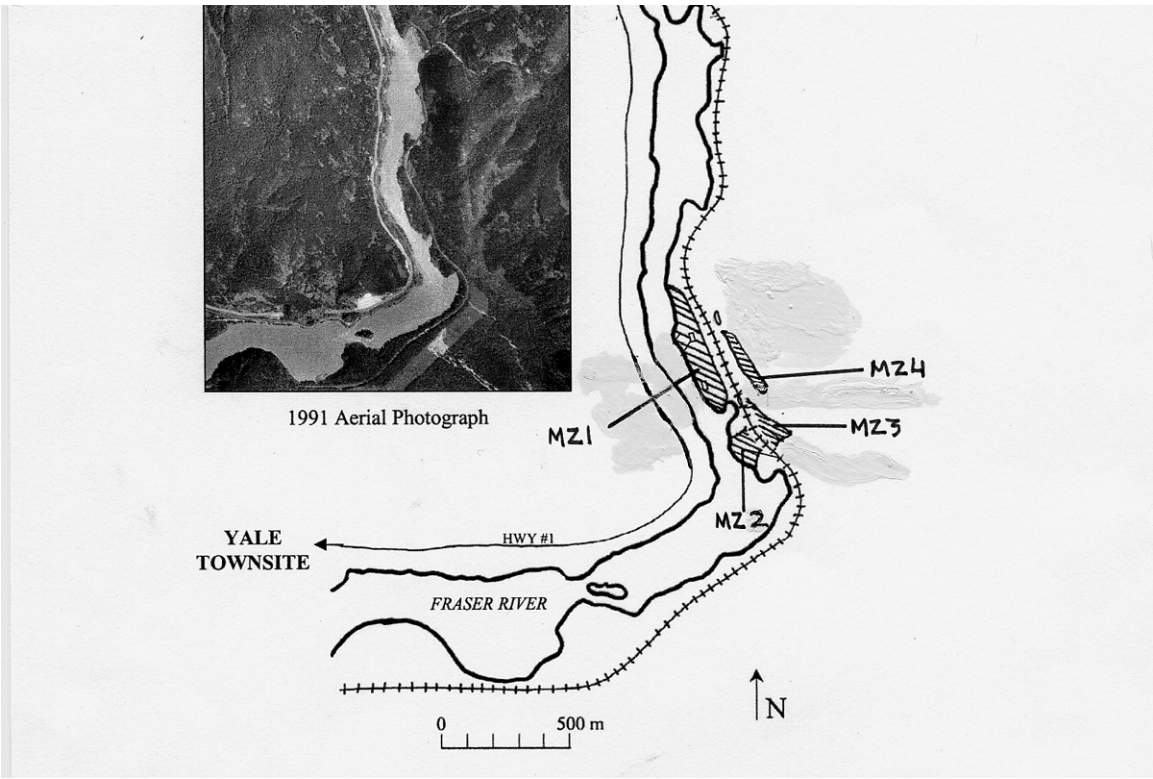

Figure 2. Southern and upper portions of the Yale Garry oak stand.

Figure 3. North section of the Yale Garry oak stand.

Figure 4. Cleaning of garbage in and around Garry oak stand.

Figure 5. Broken apart old building in Zone 4 (with Larry Hope).

Figure 6. Regeneration in Zone 1, showing Douglas-fir encroachment behind and to right, as well as small Douglas-fir in open on left (with Perry Hope and Terry McIntosh; photograph by Wayne Erickson).

Figure 7. Douglas-fir encroachment into Garry oak in Zone 1; dead tree in lower left is black cottonwood.

Figure 8. Example of Garry oak responding to overgrowth of Douglas-fir in Zone 2.

Figure 9. Looking up from tracks into Zone 3.

Figure 10. Knockdown in Zone 3.

Figure 11. Encroachment in Zone 4 (with Perry Hope and Tanis Douglas).