OREGON DEPARTMENT OF AGRICULTURE

NATIVE PLANT CONSERVATION PROGRAM

Pre and post-fire monitoring of *Kalmiopsis fragrans* on the Umpqua National Forest 2012 progress report

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for
U.S. Forest Service, Umpqua National Forest
(No. 04-CS-11061500-027)
March 18, 2013

Table of Contents

Introduction

Kalmiopsis fragrans Meinke and Kaye is a rare perennial shrub endemic to a narrow band of rocky habitat in the Umpqua National Forest in Douglas County, Oregon (Figure 1). Populations of *K. fragrans* inhabit openings in forested areas, and forest wildfires have been suggested as a threat to the persistence of this species (Carlson 2005, personal communication). However, prior to the initiation of our studies in 2004, the effects of fire on this species had not been evaluated. Wildfires in 1996 and 2002 burned two of the 15 known sites of this plant, providing an opportunity to quantify the effects of burning on the viability of this unusual species.

Figure 1. Flowers of *Kalmiopsis fragrans*.

Our study, begun in 2004, evaluated the effects of fire on growth and reproduction of *K. fragrans* (Amsberry et al. 2007). However, this study focused only on the "after-the-fact" effects of wildfire, and did not include experimental evaluation of fire effects in a controlled study.

U.S. Forest Service's (USFS) plan to use prescribed fire to improve habitat in the Limpy Rock RNA (LRRNA) in the Umpqua National Forest provides a unique opportunity to continue our initial evaluation of the effect of fire on *Kalmiopsis fragrans*. Our previous 2004-2007 study measured growth rates of *K. fragrans* plants after wildfire, but the unplanned nature of the fire did not allow for the collection of pre and post burn data. Combining the creation of a new set of plots in the LRRNA with re-sampling of existing plots will provide a greater understanding of the role of fire in persistence and recruitment of this species. Visiting previously sampled plots will determine

whether trends observed from 2004-2007 have continued, and establishing burn and control plots at the LRRNA will provide data that can be used to more precisely quantify the effect of fire.

Species description

A recently described member of the heath family (Ericaceae), *Kalmiopsis fragrans* is a perennial, evergreen, low-growing shrub which produces bright pink, relatively large, open campanulate flowers (Meinke and Kaye 2007). Plants of this species exhibit stigma height dimorphism, with distinct short- and long-styled flower morphs present in most populations. Flowers appear in April and May, and large numbers of tiny seeds are typically produced in dry, dehiscent capsules later in the summer (Carlson and Meinke 1998). Although copious seed is produced, seedlings are rarely observed, and reproduction is assumed to be primarily vegetative, through adventitious root formation on low-lying branches and elongate underground stems (Meinke and Kaye 2007).

Habitat

Kalmiopsis fragrans grows primarily on rocky outcrops, on or adjacent to pillars or boulders within the Umpqua National Forest (Meinke and Kaye 2007). The altered andesite substrate typical of these sites has a poorly developed soil layer, resulting in harsh and inhospitable growing conditions. The associated cool, mesic, mixed conifer forests are dominated by *Abies grandis*, *Calocedrus decurrens*, *Pinus lambertiana*, *Pseudotsuga menziesii, Thuja plicata*, and *Tsuga heterophylla* (Figure 2). Because only 15 populations of this species have been located since its discovery in the 1970s, *Kalmiopsis fragrans* is listed as a Species of Concern by U.S. Fish and Wildlife Service, and is included on the U.S. Forest Service's (USFS) list of Sensitive Plants (Emerson 2003, ORBIC 2012). This species is also on the Oregon Biodiversity Information Center's G1/S1 list (critically imperiled throughout its range/critically imperiled in Oregon; ORBIC 2012).

Threats

In addition to fire, potential threats to this species include over-collection and disturbance due to timber harvest activities. In the past, plants of *Kalmiopsis fragrans*, and the closely related *K. leachiana*, were commercially collected for the nursery trade, and over-collection may have contributed to the loss of populations of the latter species (Meinke and Kaye 2007). Fortunately, *K. fragrans* is now listed as Sensitive by USFS, and Forest Service policy allows collection of this species for scientific purposes only - commercial collecting is prohibited. Although all populations of *K. fragrans* occur in forested areas, the steep rocky slopes preferred by this species probably preclude

any direct impact from timber harvest activities. Recent wildfires in areas where *K. fragrans* grows most likely present the greatest threat to this species; a need for further data quantifying the effect of fire provided the impetus for the current monitoring studies.

Figure 2. Habitat for *K. fragrans* at the Ash Creek site. Regenerating shrubs and conifers will soon shade this area.

Objectives

- To continue our study begun in 2004, and determine the long-term viability of *Kalmiopsis fragrans* populations damaged during the wildfires of 1996 and 2002.

- To utilize controlled burning to experimentally study the effects of fire on plant growth and reproduction, and seedling germination and recruitment.

Project 1: Wildfire study

To achieve our first objective, we re-monitored plots established in 2004 at three sites (Ash Creek, Dry Creek and 526) during Project 1. (See Amsberry et al. 2007 for details of this earlier study.) Plots were visited May 7-17, 2012. See Appendices A and B for site locations.

Because sites had not been visited since 2007, some plots were difficult to locate. At the Ash Creek and Dry Creeks sites, most nails marking plot centers remained intact, although some were dislodged and needed re-settling into their original positions. One misplaced nail at Dry Creek was found outside the plot and replaced using location information from a photo and old bearings. The "62" pipe used as a reference marker at Dry Creek was found lying on the ground and no hole could be found to indicate its original placement. Based upon old bearing and distance information, an approximate location was chosen to reposition the pipe.

Figure 3. Monitoring at the Ash Creek site. The round plot frame used in both projects can be seen in the foreground.

As predicted in previous reports, fallen trees and debris covered many plots in the burned sites (Ash Creek and Dry Creek). Obscuring material was removed in order to photograph plots clearly. Because much of the canopy is now removed from these sites, growth of shrubs is expected to continue to cover these plots in the future (Figure 3).

At the 526 (control) site, one nail was not found. Despite repeated attempts using information from a photo, old bearings, and a metal detector, this plot could not be located or monitored.

As in the earlier portion of this study, plots were monitored by photographing each plot at a specified height. The number of inflorescences present in each plot was recorded in the field, and percent cover of plants in plots was subsequently determined from these photos using SigmaScan, a computer program designed to produce very accurate estimates of this variable (Systat 2005; see Appendix C for data summary).

Project 2: Prescribed fire study

The prescribed fire scheduled for the LRRNA provided an opportunity to achieve our second objective, the experimental evaluation of the effects of fire. To this end, two sets of plots were established at the Deep Cave and Bradley Ridge sites (Appendices A and B). Fifteen plots were located in the area to be burned (Deep Cave), and another 15 outside the proposed fire boundary were established as controls (Bradley Ridge). Plots in this study (Project 2) were established in a manner similar to that used in Project 1 (Figure 4).

Within each site, plot locations were randomly selected from a pool of potential locations. However, because a photograph that was taken perpendicular to the plot (and fully encompassing the entire plot frame) is necessary for accurate analysis, plots that were excessively difficult to photograph or inaccessible (i.e. on a cliff) were eliminated.

As in Project 1, installation of plot markers was difficult due to the rocky nature of the substrate, necessitating the use of round plots. (Round plots require only one central plot marker, rather than the two needed for square plots or transects.) In Project 1, plot centers were marked using aluminum tags and wiring attached to a masonry nail. However, due to the potential for these types of tags and wires to be damaged by fire, steel wiring and tags were used in Project 2.

To insure easy location of plots after the burn is completed, GPS locations were recorded for each plot. In addition, distance and compass bearings from designated landscape features were recorded.

In order to compare results, data collection methods for Project 2 were nearly identical to those used in Project 1. All plot data were entered and percent cover calculated using SigmaScan.

Figure 4. Fifteen control (unburned) plots were established at the Bradley Ridge site. After the prescribed burning is complete, all plots will be re-monitored.

2014 Tasks

- Once burning at the Deep Cave site is completed, monitor all control and treated plots.
- Enter data and complete SigmaScan calculations on newly collected monitoring information.
- Analyze results for Project 1 and Project 2.
- Prepare and submit final report.

Acknowledgement

We would like to thank Richard Helliwell for his advice and assistance in the field, and for his inspiration in getting this project started. Thanks to Jordan Brown (ODA) for coordinating and implementing field work, and for managing GIS data and making maps. Photos by ODA/USFS staff.

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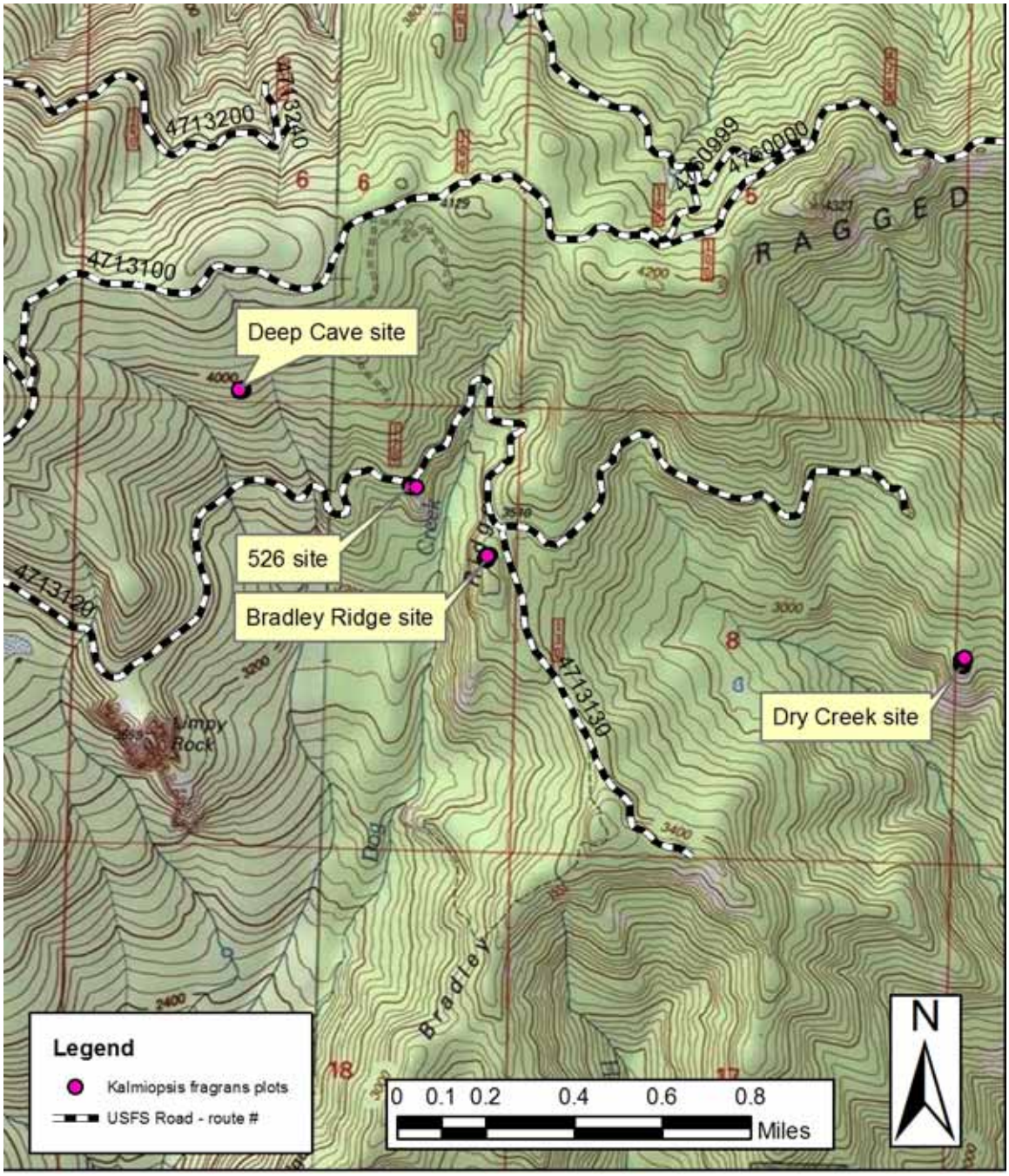
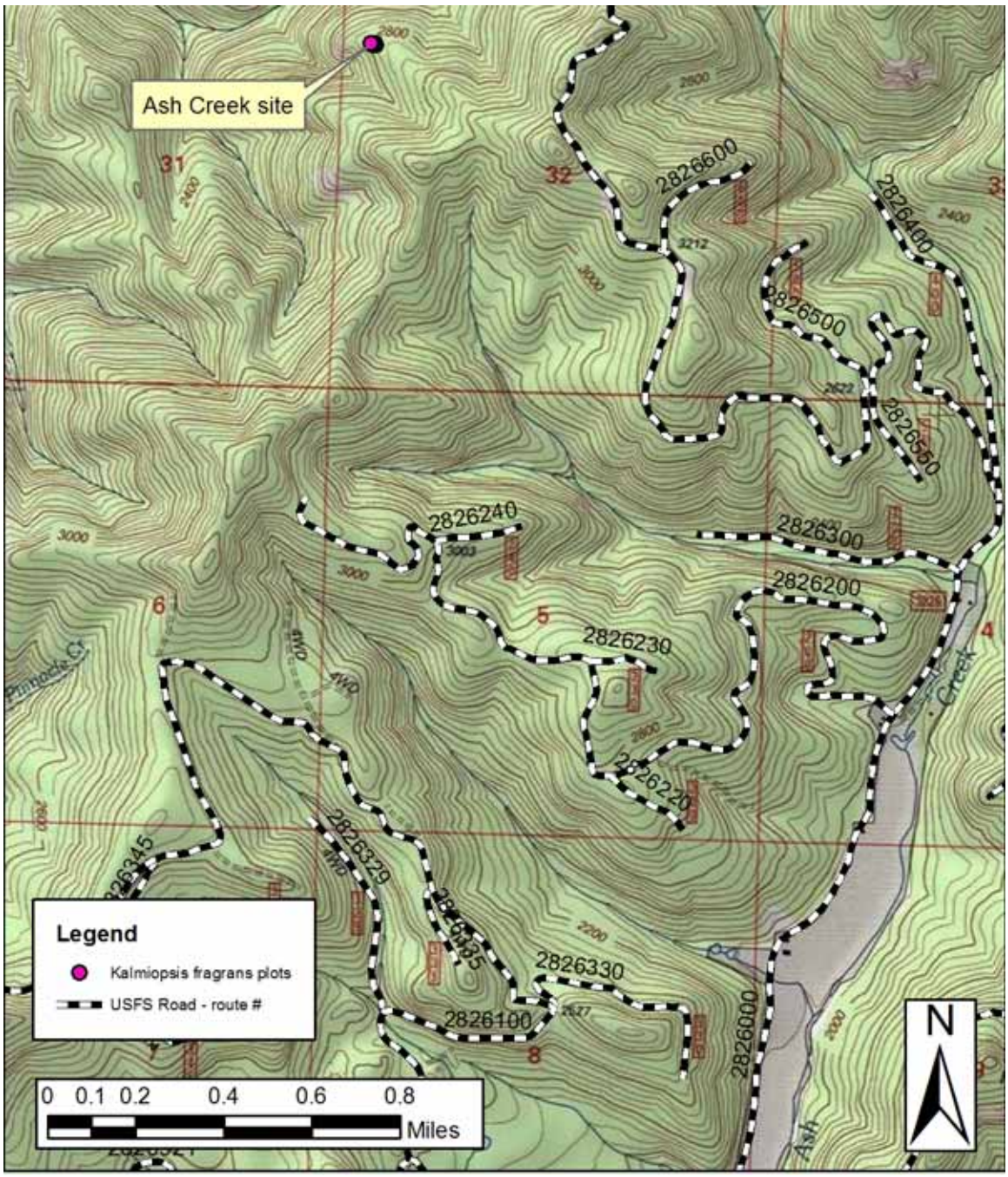
Appendices



Appendix A. Location of Dry Creek and 526 sites (Project 1) and Deep Cave and Bradley Ridge sites (Project 2); North Umpqua Ranger District, Umpqua National Forest.



Appendix B. Location of Dry Creek site (Project 1); Tiller Ranger District, Umpqua National Forest.

Appendix C. 2012 summary of percent cover in all sites. DC1 = Dry Creek, AC = Ash Creek, BR = Bradley Ridge, DC = Deep Cave.

Plot ID	KAFR cover	Plot cover	% cover
526-1	577211	1702571	33.90232
526-2	837709	1593232	52.57922
526-3	781950	1637061	47.76548
526-4	516730	1579681	32.71103
526-5	773904	1562036	49.54457
526-6	N/A	N/A	N/A
526-7	273224	1693956	16.12934
526-8	1138951	1636108	69.61344
526-9	804224	1504482	53.45521
526-10	192016	1628223	11.79298
		Site average	40.83262
DC1-21	70017	253974	27.56857
DC1-22	4246	74829	5.674271
DC1-23	547906	3487898	15.70877
DC1-24	420322	3591485	11.70329
DC1-25	764089	3706728	20.61357
DC1-26	359148	2835055	12.66811
DC1-27	462569	3779015	12.24046
DC1-28	402021	1525737	26.34930
DC1-29	844250	3484597	24.22805
DC1-30	1139360	3684523	30.92286
		Site average	18.76773
AC-11	500637	1569558	31.89669
AC-12	288389	1640827	17.57583
AC-13	503093	1621958	31.01763
AC-14	135069	1690973	7.98765
AC-15	505706	1686608	29.98361
AC-16	757134	1666001	45.44619
AC-17	294340	1552580	18.95812
AC-18	65786	1732834	3.79644
AC-19	64153	1460099	4.393743
AC-20	313846	1672315	18.76716
		site average	20.98231
BR-431	569879	1250978	45.55468
BR-432	657565	1311851	50.12498
BR-433	619375	1260409	49.14079
BR-434	112279	1366371	8.217314
BR-435	544680	1315702	41.39843
BR-436	475466	953861	49.84647
BR-437	1232328	1521531	80.99263
BR-438	465922	1606841	28.99615

BR-439	423124	1412798	29.94936
BR-440	613628	1633322	37.56932
BR-441	451808	1379132	32.76032
BR-442	306061	1575790	19.42270
BR-443	254269	1617479	15.72008
BR-444	339080	1326818	25.55588
BR-445	686421	1180663	58.13861
		site average	38.22585
DC-446	557774	1644384	33.91994
DC-447	1133274	1536458	73.75887
DC-448	676626	1482824	45.63090
DC-449	933927	1548920	60.29537
DC-450	1089847	1684633	64.69344
DC-451	640382	1600382	40.01432
DC-452	278058	1493949	18.61228
DC-453	1124616	1648223	68.23203
DC-454	1127671	1570493	71.80363
DC-455	1384469	1713858	80.78085
DC-456	1083410	1733207	62.50898
DC-457	351730	1645701	21.37266
DC-458	1338954	1564420	85.58789
DC-459	997169	1656393	60.20123
DC-460	1031757	1576957	65.42709
		site average	56.85596