ESTABLISHMENT OF MONITORING PLOTS FOR CONSTANCE'S BITTERCRESS (*CARDAMINE CONSTANCEI* DETL.)

North Fork Ranger District
Clearwater National Forest

by

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INTRODUCTION

Constance's bittercress (*Cardamine constancei)* is a rhizomatous forb endemic to tributaries of the Clearwater and St. Joe River Rivers in Idaho. It is a Forest Service sensitive species and has a Federal rank of C3 (previously a candidate but now considered secure). The two main centers of distribution are the lower Selway River and the North Fork Clearwater River. Although the species occurs extensively along the lower Selway, along the North Fork it is much rarer, occurring in widely scattered, mostly small populations.

Areas where Constance's bittercress occurs are also core areas of a unique refugium ecosystem. Extensive survey has been conducted for rare plants associated with this ecosystem and an initial conservation strategy has been written (Lichthardt and Moseley 1994).

Constance's bittercress occurs in a range of successional stages within the western redcedar/maidenhair fern habitat type. Ecology of the species has been inferred from field observations (Crawford 1980; Odegard 1994; Lichthardt and Moseley 1994). Lichthardt and Moseley (1994) recommended monitoring populations of Constance's bittercress under different habitat conditions, to help land managers predict the impacts of management activities on the species. The only monitoring data previously available were from a site in Aquarius RNA on the North Fork (Lichthardt 1992).

In 1994, permanent monitoring plots were established at seven locations on the North Fork District. This report documents monitoring plot locations, presents rational for site selection, describes sites, presents baseline data, evaluates the monitoring design relative to stated objectives, and makes recommendations for future monitoring.

BACKGROUND INFORMATION

Latin name: *Cardamine constancei* Detl.

Common name: Constance's bittercress

Family: Brassicaceae

Status: 3C (USFWS); Sensitive (USFS Region 1)

Land ownership: Mostly Federal government

Description: a delicate, perennial herb growing 6-12 inches (0.5-3 dm) tall from a slender rhizome. Leaves are oval with several shallow lobes that make them look like a "duck's foot". Leaves appear "whorled" near the top of the stem. Flowers are 1-1.5 inches (2.5-4 cm) across and consist of four white to pink petals.

Distribution: Constance's bittercress is endemic to the Clearwater Mountains in Idaho where it is strongly associated with the coastal refugium ecosystem. It is known from the North Fork Clearwater, Middle Fork Clearwater, Selway, Coeur d'Alene and St. Joe River canyons and is most abundant along the lower Selway River.

Habitat: Constance's bittercress grows in low-elevation (<3400 ft), moist, shaded to partly open habitats within the western redcedar zone. It is mostly associated with the western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) series, especially western redcedar/maidenhair fern (*Thuja plicata/Adiantum pedatum*), western redcedar/oakfern (*Thuja plicata/Gymnocarpium dryopteris*), and western hemlock/wild ginger (*Tsuga heterophylla/Asarum caudatum*) habitat types. Constance's bittercress appears to be favored by light disturbance and tends not to flower under dense shade.

Phenology: Flowers from May to June. Flowering is a rare event occurring mostly in canopy openings. Mature fruits seldom observed, shed by July. Leaves remain green to the first frost. Some insect predation of leaves occurs.

Current Status: Despite the fact that the species is rather abundant in certain portions of its limited distribution, as a restricted endemic it correctly receives special consideration.

MONITORING

Increased pressure from timber harvest on the habitat of Constance's bittercress is thought to threaten populations of the species. It is also possible that long-term fire suppression could pose a threat because many populations occur in mid-successional forest types (Lichthardt and Moseley 1994). Previous observations of Constance's bittercress growing in different habitats have led to the following assumptions:

- Populations persist for long periods of time without flowering
- Flowering is stimulated by increased light brought about underburning or opening of gaps in the forest canopy
- Ability of plants to set seed is restricted by soil moisture (Crawford 1980)

Monitoring results could indicate to what extent timber cutting and fire suppression represent threats to the species.

Objectives:

- To detect changes in ramet density and population size of Constance's bittercress over time, under different habitat conditions.

- To detect changes in ramet density, population size, and reproductive output of Constance's bittercress following disturbance.

Methods

Sites for monitoring were selected to represent contrasting community types in which Constance's bittercress is found. Three sites are in old-growth stands, four are in pole-to-medium mixed conifer stands, and one is in the lower end of a 1992 clearcut (Table 1). Plot locations are shown in Appendix A. Detailed plant composition data are included in Appendix B. At each site, a permanent plot was located to be representative of the dominant plant community, and to encompass numerous stems of Constance's bittercress. At plots CC004, CC007 and JL002 an additional transect was located specifically to represent the margin of the population.

Table 1

Plot no.*	Site name	Community type**
94 CC 001	Dog-Salmon Unit 7	1992 clearcut; wild hollyhock/bracken fern
94 CC 002	Washington Ck A	Medium THUPLI-ABIGRA
94 CC 003	Washington Ck B	Medium THUPLI-PSEMEN
93 CC 004	Larson Ck A	Pole THUPLI-PSEMEN
no Ecodata	Larson Ck B	Closed, pole THUPLI
93 CC 006	Isabella Ck. terrace	Old-growth THUPLI
94 CC 007	Aquarius River Trail	Medium THUPLI-ABIGRA
94 CC 008	Fish-Bate	Old-growth ABIGRA
91 JL 002	Aquarius South	Old-growth THUPLI

*Last 7 digits of Ecodata key i.d.
** Pole=5-9" dbh, medium=9-21"

Each plot consists of a 30-ft long belt transect divided into 10, 3 x 3 ft microplots. Transects are marked at both ends with steel fence posts. The post marking the beginning or zero end of the transect is inscribed with the plot number. Most transects run parallel to the slope contour, in which case microplot #1 is always on your left as you stand downslope facing the transect. Notes concerning location and orientation of each transect and general nature of the site are given in Appendix C and on the field data sheets. Ramets of Constance's bittercress were simply counted by microplot. A separate column was reserved for flowering ramets. Although flowering plants were observed in one population, no flowering individuals occurred in the transects.

At each plot an Ecodata general form (GF) and plant composition form (PC) were completed (Appendix B). The zero end of the transect was used as the center of a tenth-acre, circular Ecodata plot, unless specified otherwise on Form GF.

Results

Baseline data from the five plots established in 1994, and the previously existing plot in Aquarius RNA, are contained in Appendix D. No plants were observed flowering within plots. Ecodata for each monitoring location are included in Appendix B.

Recommendations

1. Expand sampling design

The monitoring design described above requires some refinement and expansion in order to meet stated objectives. The low number of plots at each site and their subjective placement limit us to level one monitoring (Menges and Gordon 1993) which is basically qualitative. Menges and Gordon (1993) suggest that monitoring levels be nested, with a few populations receiving the highest effort and the rest tracked with minimal effort. The quantitatively monitored populations are then assumed to reflect overall trends.

Qualitative monitoring may be sufficient for the Dog-Salmon and Fish-Bate plots in which major changes in habitat are predicted to have drastic effects on plant vigor that will be easy to detect. Higher level monitoring may not be productive for these sites, because the lack of treatment replication (i.e., other comparable sites) would inhibit our ability to draw conclusions about the cause of any observed trends. Because Fish-Bate is such a large population, the number of permanent plots should be increased to better represent the population as a whole, preferably through the use of randomly located plots (see below). In Dog-Salmon, the population is small enough in extent that the single transect represents a large proportion of the population.

I recommend that level 2, quantitative monitoring be used at a minimum of 4 sites (2 old-growth, and 2 mid-successional stands). Level 2 monitoring involves subsampling a population to provide an estimate of abundance, density, condition or other parameters. Data can be graphed and assessed visually for trends, or subjected to linear regression to examine trends over time (Menges and Gordon 1993). Long-term quantitative data can be analyzed using time series methods. Population estimates and trends can also be compared among community types. Methods for level 2 monitoring are discussed briefly below.

2. Level 3 monitoring can be initiated to look at demographic parameters (e.g., flowering and seedset) if such an opportunity presents itself. Opportunity for such observations will be limited because of the low incidence of flowering in Constance's bittercress.

3. Timing. Plots should always be sampled at approximately the same time of year. This is especially important if seedset is to be recorded, as fruits fall off early. After baseline data are collected for level 2 monitoring, the sampling schedule is flexible and can be done every 2-3 years to start. However, plots should be visited in the growing season immediately following any management activity or natural disturbance.

Methods for quantitative (level 2) monitoring

A rectangular macroplot will be superimposed on each population. The macroplot should encompass as much of the population as possible. One corner will be permanently marked and documented. The macroplot will be defined by recording azimuth and length of plot sides from this point. These baselines will then be used as axes for randomly locating transects.

The number of transects may differ depending on the size of the population but their size should be the same. Transects should probably not be larger than 3 x 60 ft (or 1 x 20 m) or they may not fit within the boundaries of the smaller populations. The number of transects will be determined by the level of variance obtained. From the sample, estimates will be obtained for population size and density.

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APPENDICES NOT AVAILABLE ON WEB PAGE

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