Population monitoring of Allotropa virgata (candystick) on the Nez Perce National Forest: Third-year results

by

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Introduction

This is a report on the third year of population monitoring of *Allotropa virgata* (candystick) on the Nez Perce National Forest. Nine plots were established near Red River Ranger Station in 1990 to follow individual *Allotropa* plants in subpopulations affected by the Sibling timber sale.

Allotropa virgata is a Forest Service Region 1 Sensitive Plant Species that occurs on the Nez Perce National Forest and overlaps into parts of the Payette National Forest. It also occurs in adjacent parts of Montana (Roe 1992). *Allotropa* is disjunct in Idaho and Montana from its main range in the Cascade Mountains. In Idaho, *Allotropa* frequently occupies gently sloping uplands of lodgepole pine suited to timber harvest and road building, and conservation efforts have increasingly come into conflict with these land uses. Besides documenting the effects of logging on *Allotropa* populations, monitoring will provide data on the behavior of representative subpopulations that can be used in devising a conservation plan for the species. For a review of the species' conservation status and a detailed description of methods used in this monitoring study see Lichthardt (1991).

Background

Allotropa is a member of a unique group of plants in the heath family (Ericaceae) that do not contain chlorophyll. Instead of synthesizing carbohydrates they obtain them from specialized soil fungi associated with their roots. The fungi that feed *Allotropa* are in turn associated with the roots of conifer trees. The filamentous body of the fungus (mycelium) is shared with a tree that indirectly supports *Allotropa* .

Because *Allotropa* does not photosynthesize, the only above-ground structures are the inflorescences (flower-bearing stems). These arise from buds on fleshy rhizomes. Because most of the plant is underground it can be difficult to identify separate plants with certainty. For the purpose of this study an objective method was used in which plants were assumed to spread no more than 3 dm in a given year. Therefore if a flowering stalk occurred more than 3 dm from last year's, it was considered a new plant rather than an extension of the old.

Allotropa is associated with lodgepole pine (*Pinus contorta*) forests of the Idaho batholith. It is commonly found in mature lodgepole pine/beargrass (*Xerophyllum tenax*) communities, often with grouse whortleberry (*Vaccinium scoparium*) and/or huckleberry (*V. globulare*) and only sparse regeneration of climax tree species. While about 70% of the known Idaho populations of *Allotropa* occupy lodgepole forests, the species has also been found under ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*), subalpine fir (*Abies lasiocarpa*), and western redcedar (*Thuja plicata*; ICDC).

To determine the effects of logging on *Allotropa*, plots were established in nine locations that would eventually result in three treatments: clearcut ("logged"), adjacent to clearcut ("edge"), and undisturbed ("control"; Appendix 1). Plots are 25 x 25 m and marked with fence posts at the corners and center. Within each plot plant locations are marked with short lengths of rebar.

Results

Cutting units of the Sibling sale were harvested in summer of 1992, which was the third year of data collection. When plots were read this year all of the logged treatments had been harvested except for plot 3. Consequently, counts of 1992 plants may be low because of ground surface disturbance in logged plots and felled trees in both logged and edge plots. Portions of plots 2, 3 and 6 were covered with branches and trunks of felled trees. In plots 1 and 5 there had been severe surface disturbance, making it impossible to tell how many new or previously mapped plants had flowered. In 10 cases the rebar stake marking a plant could not be found (plots 2 and 5). Data for plot 3 (logged) are accurate because it had not yet been harvested.

Some of the fence posts marking plots 1 and 5 were moved or lost during logging operations. These plots will have to be reconstructed next year using the posts that remained intact. Post-harvest prescription for the units called for machine scarification and natural regeneration but an attempt was made to avoid monitoring plots in the scarification process.

Table 1 summarizes three years of data in which we marked and mapped each flowering plant. Each "plant" consisted of one to several inflorescences. "New " plants are those that had not flowered in the previous year or years. A flowering history and inflorescence numbers for each plant can be found in Appendix 2. Each one was given a number in 1992, starting with first-year plants, and these numbers are shown next to the map locations in Appendix 3. In the field, the year in which a plant was marked is indicated by the type of marker used: a smooth metal bar painted yellow (1990), red rebar (1991), and either yellow rebar or a wooden stake (1992).

Table 1. Numbers of plants* recorded in *Allotropa* monitoring plots over three years.

		Number of plants flowering				
	Plot	1990	1991		1992	
Treatment	#	Total	Total	New	Total	New
Control	7	18	2	1	3	2
	8	19	10	5	18	10
	9	12	5	3	18	13
Edge	2	12	4	3	19	15
	4	5	0	-	4	1
	6	14	3	2	15	7
Logged**	1	5	2	1	0	-
	3	11	0	-	0	-
	5	5	6	6	1	1
		101	32	21	78	49

* Each "plant" is a location at which one to several inflorescences (flowering stalks) were observed. Plants are not necessarily different genetic individuals (genets).
**Plots 1 and 5 were logged just prior to the data being recorded

In general, the second year (1991) was characterized by low numbers of flowering plants—30% as many as in 1990. This year, the number flowering was back up again even though some plants were likely destroyed prior to our reading the plots. Of 78 plants flowering this year, 49 were in new locations (Table 1), 21 flowered in the alternate years 1990 and 1992, and only five flowered in all three years of the study (Appendix 3).

Although plants commonly flowered in the same location more than once (29 out of 78 plants), the majority of inflorescences observed in the second and third years were in new locations (Table 1, "New"). This is not surprising given that *Allotropa* is rhizomatous. It must be assumed that some of the new locations observed each year are due to vegetative reproduction and therefore do not represent new genets. Even if plants spread less than 3 dm in a given year as we assumed, they could spread two or more times that far before flowering again. Further evidence for this can be seen in the increasingly contagious distribution of flowering sites in some of the plots (Appendix 3, plots 2, 8, and 9). In some cases plants are associated with observable edaphic characteristics such as a decomposed log (plot 2) or an old squirrel cache (plot 8).

Discussion

Third-year data are very valuable because they provide a picture of normal variability in flowering of *Allotropa* that was not previously known. However, they do not yet answer the questions posed by our study concerning effects of timber harvest on population viability. For the next couple of years we will observe the response of these subpopulations to the effects of timber harvest including overstory removal, ground surface disturbance, and the creation of edge habitat. Because of the dependence of *Allotropa* on a conifer host the effects of timber removal are expected to be clearly adverse. Anything other than a clear effect may be difficult to detect considering the small number of plots and the small number of plants in two of the plots. One of the logged plots (#3) is no longer useful because no plants have flowered since the first year.

Wide fluctuations in plant numbers are pertinent to a conservation strategy because they indicate that large "metapopulations" may be required to maintain population viability (Murphy *et al.* 1990). In this case the metapopulation would include all local subpopulations in an area of continuous, suitable habitat. Within such an area random extinction of subpopulations and colonization of new sites could occur without producing a downward trend in total plant numbers.

After the third year of monitoring, the following generalizations can be made based on the flowering pattern in *Allotropa*:

- Individual *Allotropa* plants do not flower each year and, at least in the three years

observed, there is some indication of a roughly biannual flowering pattern.

- Subpopulations like those represented by the monitoring plots may not be long-persistent, even without disturbance. For example, plants in plot 3 have not flowered since the first year of the study (Table 1).

- Although *Allotropa* plants spread by rhizomes, they also commonly produce new inflorescences very close to the old within a 3-yr period (32 out of the original 101 plants mapped).

- Old inflorescences commonly persist for 3 years.

A region-wide conservation strategy for *Allotropa* is currently being planned by Forest Service Region 1. Hopefully this plan will help to resolve conflicts between conservation of this species and logging pressures. All of the largest known inland concentrations of *Allotropa* are in proposed timber-cutting areas (Lichthardt 1991).

In order to obtain more definitive information on the population biology of *Allotropa virgata* I recommend more plots be constructed in at least one other population center, using the same methods as this study.

References

ICDC. Idaho Department of Fish and Game, Conservation Data Center. PO Box 25; Boise, ID 83707.

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D.D. Murphy, K.E. Freas and S.B. Weiss. 1990. An environment-metapopulation approach to population viability analysis for a threatened invertebrate. Conservation Biology 4:41-51.

L.S. Roe. 1992. Status Review of Allotropa virgata. USDA Forest Service–Region 1 Bitterroot and Deerlodge National Forests Montana. Unpublished report on file at the Montana Natural Heritage Program, Helena. 12 pp plus appendices.

Appendices are not included in the CDC home page version of this report.

Appendix 1
Map of plot locations

Appendix 2
Numbers of inflorescences
over three years

Appendix 3
Plants marked in monitoring plots
over three years