POPULATION MONITORING OF DISJUNCT PACIFIC DOGWOOD (*CORNUS NUTTALLII*) ON THE CLEARWATER AND NEZ PERCE NATIONAL FORESTS : SECOND-YEAR DATA

by

Juanita Lichthardt
Conservation Data Center
Nongame and Endangered Wildlife Program

December 1992

Idaho Department of Fish and Game
600 South Walnut, P.O. Box 25
Boise, Idaho 83707
Jerry M. Conley, Director

Cooperative Challenge Cost-share Project
Clearwater and Nez Perce National Forests
Idaho Department of Fish and Game

Purchase Order Nos.
CNF 43-0276-1-0573
NPNF 93-0295-2-0384

INTRODUCTION

Pacific dogwood (*Cornus nuttallii*) is a small, native tree that is disjunct in Idaho, far outside its main range in the Cascade and Sierra Nevada ranges. In Idaho, it is restricted to the lower Lochsa and Selway Rivers within 20 miles of their confluence, where it occurs on lower slopes and benchlands along the two rivers. Pacific dogwood is a US Forest Service Region 1 sensitive species due to its restricted range, a high rate of mortality due to disease, and the potential value of the isolated gene pool. Most of the Idaho population occurs on Forest Service land administered by the Clearwater and Nez Perce National Forests.

High mortality among Idaho's Pacific dogwoods was noted in 1987 and documented shortly thereafter by Johnson (1988). Plant pathologists later identified several root diseases as probable causes of the observed mortality (Bertagnolli and Partridge 1990). Both of the above studies were part of a conservation plan developed by the US Forest Service and the Idaho Conservation Data Center (ICDC) to assess trends in the Idaho Pacific dogwood populations and to determine what could be done to save them (Lorain 1991). In 1991, long-term community and demographic monitoring was initiated as part of this same plan.

Demographic studies measure population attributes such as birth and death rates, growth, size, density, and distribution, that can be used to predict the future size and age structure of a population. The primary objective of demographic monitoring is to acquire data on life history, growth, and population trends over time. This report summarizes second-year data from permanent, demographic monitoring plots in Idaho populations of Pacific dogwood.

Pacific dogwood is single- or multiple-stemmed tree that sprouts from the base when damage occurs to a stem. The base can expand to become quite large as additional stems are produced, but usually forms a distinct crown 1 square yard or less in size. Pacific dogwood trees growing in forest understory usually have a single main trunk with one to several much smaller stems at the base. For a compete description of Pacific dogwood and its habitat see Lichthardt (1991) and Roper (1970).

METHODS

Last year, twenty-one permanent, tenth-acre plots were established (Appendix 1), within which every dogwood stem (ramet) greater than 0.25-inch basal diameter was measured, numbered, and tagged. (The term "ramet" is used to indicate that the stem is one unit of a clone and is genetically the same as all other stems arising from the same "genet", or genetically unique individual.) Each stem was evaluated for disease symptoms and the amount of dead material. Stems less than 0.25-inch basal diameter ("basal sprouts") were simply counted. Methods, and baseline community and population data are reported by Lichthardt (1991). Data sheets are included in Appendix 2.

This year our objectives were to relocate all tagged stems, assess the amount and pattern of die-back, observe disease symptoms, and tag any stems that had attained a minimum 0.25-inch basal diameter. In all, 630 stems were examined. Previously tagged stems were not remeasured.

As in the first year, stems less than 0.25-inch basal diameter were counted and classified as "green" or "woody". Therefore, any live stem that was not tagged was tallied as either a green or woody basal sprout. Green sprouts appear to be only one or two years old while woody sprouts are older but have been suppressed by the larger stems or by browsing.

RESULTS

Observations of disease symptoms, basal sprout production, and stem sprouts (epicormal sprouting) were similar to those made last year. Fewer basal sprouts were produced overall in 1992 (Table 1), but there were more of the woody type. Some genets in which all older stems were dead still produced a crop of basal sprouts. Basal sprouts are commonly browsed causing them to branch, often very close to the ground. As observed last year, basal sprouts appeared healthy. Although they exhibited all the same disease symptoms as larger stems, the sprouts were affected to a much lesser degree.

Mortality—Figure 1 shows the overall stem size distribution as measured in 1991. It is assumed that the shape of the distribution would not change much in one year due simply to stem growth, but could change markedly as a result of stem mortality. Mortality in the smaller size classes, however, was partially offset by growth of some of last year's crop of basal sprouts.

Twelve genets (8%) died since last year. Most were noted as having very little live growth last year. Stem mortality by size class was also assessed. Some mortality occurred in most size classes and mortality rate seems to be independent of size (Fig. 2). Stems without any leaves were not recorded as dead if the bark still appeared viable. Tags were left on dead stems or noted otherwise on the data sheet.

Recruitment—The almost total lack of seedlings or young trees has been the most notable observation made during the study. Only six seedlings were observed in monitoring plots the first year. This year, four of these were dead or could not be relocated. The two remaining seedlings had grown very little and showed leaf ailments similar to mature trees.

The number of newly tagged stems represents recruitment from last year's basal sprouts (Fig. 3). Fifty-nine new stems had to be tagged this year. Two of these had obviously been overlooked last year. A few of the smaller stems may have been overlooked as well, but the majority represent recruitment of last year's basal sprouts into larger size classes. Two sprouts grew to 0.5-inch diameter and several attained heights up to 4.5 ft. Exceptionally high stem recruitment was exhibited at plot CN017. Robust, relatively healthy stems had little bark formation but had already produced a whorl of branches.

Reproduction—Only 1 genet out of 143 produced fruits in 1992. Flowers were noted on 12 genets, but flower development had been arrested at a very early stage, before bracts had fully expanded and well before anthesis could occur. Comments by Forest Service personnel indicate that some of these flowers matured in late summer.

Disease symptoms—Leaf symptoms showed necrosis (dead areas at the margins and tips), spot, curl (a puckered appearance probably caused by insects). Stems showed canker (small, oval-shaped sunken "wounds") and insect ovipositor damage (incision-like wounds in the young wood of twigs). These symptoms were much the same as last year with one exception. This year we did not see the prevalence of dead terminal twigs with still-attached, dry, dead leaves. This symptom is characteristic of the disease dogwood anthracnose. Although we saw insect ovipositor damage more often this year than last, it was still not common.

Since the presence of stem canker was noted last year for each stem, canker was only recorded when it occurred on new (1992) growth. Canker was rare on new growth and did not seem serious.

Insert Table 1

Figure 1. Size distribution of all Pacific dogwood stems measured in 1991.

Disease—During summer of 1992, in a separate study, leaf and shoot samples were taken from ten Pacific dogwood trees and analyzed for the disease dogwood anthracnose. Samples were taken from trees near monitoring plots. Every sample was found to contain the anthracnose-causing fungus *Discula* sp. (Hibben 1988). Anthracnose is a disease that attacks eastern flowering dogwood (*Cornus florida*) and Pacific dogwood. Moist conditions facilitate growth and spread of the leaf- and stem-borne pathogen, and it was previously thought that the Idaho site was too dry for the disease to spread. However, a pathology study recently brought to our attention indicates anthracnose in Idaho populations as early as 1983 (Salogga and Ammirati 1983). There is no effective treatment for the disease.

Effects of fire—In October of last year a ground fire spread to the canyon bottom on the north side of the Selway, affecting dogwood trees in or near three of the monitoring plots. Twelve burned trees were tagged shortly after the fire and revisited this year. Five of these resprouted, two with more than 40 sprouts. In two cases the sprouts were very unhealthy looking, with silvery, dull surfaces.

ASSESSMENT AND RECOMMENDATIONS

Population modeling requires data on input (birth) and output (death) of individual genets making up a population. Trends in numbers of individuals over time depend on the lifespan of individuals and the time required to reach reproductive maturity. Selway and Lochsa dogwood populations are clearly not recruiting new individuals through seedling establishment (i.e. new genets), and haven't for some time. This is probably the single most significant result of this study because it means that the size of the population is directly related to the death rate, which for 1991 to 1992 was 8%. New stems (ramets) continue to be recruited but may not reach reproductive maturity because of diseases affecting the trees. New ramets will be equally susceptible to diseases as the old because no genetic recombination is occurring. The population is apparently quite old already and likely decreasing in its ability to fight diseases and to continually produce new crops of basal sprouts.

Most trees (genets) appear to be quite old, based on the sizes of dead stems still present. The absence of young trees indicates that the observed lack of reproduction may date back to the time of onset of disease in the population, probably sometime in the late seventies.

In order to fill remaining gaps in our knowledge of Idaho's Pacific dogwood, I recommend the following:

- Continue demographic monitoring for at least one more year. There is no way of knowing whether the first year of the study was representative. Persistence of the population seems to depend solely on the production of new stems, and each year of data improves our estimate of stem growth and survival. This year's data provided initial information on of the growth rate of new stems. Changes in growth rate of these stems, their rate of mortality, and the time of onset of disease may determine how long Pacific dogwood can persist in this range.

- Investigate the potential role of fire in population dynamics and ecology of Pacific dogwood. Small-scale experimental burning and overstory removal should be initiated on a trial basis using the methods of this study to obtain baseline data. Experimental burns in portions of Pacific dogwood populations would add to our knowledge of the species' ecology. Because the effect of fire on the anthracnose pathogen or on pathogens in general have been poorly studied, there is a significant gap in our knowledge that might be clarified by experimental manipulation of the habitat.

- Continue genetic studies currently being carried out by Brunsfeld at the University of Idaho to quantify the amount of difference between inland and coastal ranges of Pacific dogwood.

REFERENCES

Bertagnolli, C.L. and A.D. Partridge. 1990. Mortality of Pacific dogwood, a coastal disjunct population in northern Idaho. Unpublished report prepared for Clearwater and Nez Perce National Forests; on file at Idaho Department of Fish and Game, Conservation Data Center, Boise. 13 pp.

Hibben, C.R. 1988. Dogwood anthracnose in northeastern United States. Plant Disease 72:199-203.

Johnson, F.D. 1988. Damage survey of *Cornus nuttallii* in northern Idaho. Unpublished report prepared for Clearwater and Nez Perce National Forests; on file at Idaho Department of Fish and Game, Conservation Data Center, Boise. 30 pp.

Lichthardt, J. 1991. Initiation of long-term population monitoring of Pacific dogwood, *Cornus nuttallii*, on the Clearwater and Nez Perce National Forests. Unpublished report prepared for Clearwater and Nez Perce National Forests; on file at Idaho Department of Fish and Game, Conservation Data Center, Boise. 16 pp plus appendices.

Lorain, C.C. 1991. Conservation Plan for *Cornus nuttallii* (Pacific dogwood), in Idaho. Unpublished report prepared for Clearwater and Nez Perce National Forests; on file at Idaho Department of Fish and Game, Conservation Data Center, Boise. 15 pp plus appendices.

Roper, L.A. 1970. Some aspects of the synecology of *Cornus nuttallii* in Northern Idaho. MS Thesis, Univ. of Idaho, Moscow.

Salogga, D.S. and J.F. Ammirati. 1983. *Discula* species associated with anthracnose of dogwood in the Pacific Northwest. Plant Disease 67:1290.

APPENDIX 1

PLOT LOCATIONS

Map A.	Coolwater Mountain Quadrangle
Map B.	Lowell Quadrangle
Map C.	Lowell Quadrangle
Map D.	Goddard Point Quadrangle
Map E.	Stillman Point Quadrangle

APPENDIX 2

DATA SHEETS