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AREA 8, PHASE II ECOLOGICAL RESTORATION RESEARCH PLAN

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

JULY 2000

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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LIST OF ACRONYMS AND ABBREVIATIONS

A8PII	Area 8, Phase II
DOE	U.S. Department of Energy
NRRDP	Natural Resource Restoration Design Plan

1.0 INTRODUCTION

Ecological restoration of Area 8, Phase II (A8PII) at the Fernald site has been initiated pursuant to the A8PII Natural Resource Restoration Design Plan (NRRDP). This project involves the establishment of several habitat types native to southwest Ohio, including forest, wetland, and savanna. The A8PII NRRDP limited the amount of shrub plantings that will be installed in the forest habitats in order to investigate deer control methods and volunteer recruitment of vegetation. This research plan lays out the investigations that will be conducted in A8PII. A thorough description of the project area and its ongoing ecological restoration is provided in the A8PII NRRDP (DOE 2000).

The effects of deer browsing on forest and woodland ecosystems have been well documented (Tierson et. al. 1966). Deer populations have increased in recent years as a result of habitat fragmentation and the resulting increase of woodland edge habitat (Alverson et. al. 1988). At the Fernald site, impacts due to deer browsing have been documented in several restored areas. The success of present and future restoration efforts partly depends on the prevention of deer browsing on installed plant material. Controlled hunting is not permitted at the site, and large-scale use of exclosure fencing is deemed too costly and not aesthetically appealing (DOE 2000). As a result, deer repellent sprays are being used to control deer browsing at the Fernald site. This research plan is designed to evaluate the effectiveness of deer repellent spray on planted shrubs in several restored forest habitats within A8PII.

Volunteer recruitment of woody vegetation will also be investigated in A8PII. Certain aspects of ecological succession may be an effective tool in the process of ecological restoration (Luken 1990). Volunteer recruitment of vegetation into restoration areas may facilitate the development of canopy and more diverse age classes. Seed dispersal of woody recruits can be increased through the use of existing vegetation by birds (Holl 1998). Since shrubs will not be planted in roughly half of the forest patches in A8PII, their influence on seed dispersal will be evaluated.

2.0 DEER REPELLENT METHODS

This research is designed to determine whether or not a commercially available deer repellent is effective in reducing impacts due to deer browsing. To do this, deer repellent will be applied to one-half of all planted shrubs within A8PII, and the extent of deer browsing will be evaluated and compared to untreated shrubs.

2.1 REPELLENT APPLICATION

Every shrub planted across A8PII in Fall 2000 will be labeled and recorded. An aluminum tag will be attached to each shrub, which will be labeled by patch (Figure 2-1), species code (Table 2-1), and sequential number. After all shrubs have been installed, one-half of the planted shrubs will be treated with deer repellent. Shrubs will be randomly assigned a treatment (repellent or control) within each of the 39 planting patches across A8PII. An additional aluminum tag will be attached to each repellent-treated shrub. Figure 2-1 shows the location and habitat type of each planting patch. The A8PII NRRDP set the shrub planting density for forest types at 92 shrubs per acre. Since patches are roughly 0.25 acre in size, approximately 25 shrubs will be planted in each patch. Riparian patches will have a lower density because of the larger amount of existing vegetation. Savanna patches will have a lower density because of the dominant grass and forb structure of the habitat. By randomly treating one-half of the shrubs in each patch, potential biases due to species type and patch location will be avoided.

A latex-based taste repellent called Bitrex will be used in this study and is sold under the brand names "Tree Guard" and "This 1 Works." The repellent will be applied via backpack sprayer according to the manufacturer's directions. One application will be made after leaves have fallen in the fall, once in the spring on early foliage, and once in late spring/early summer on new foliage. All plants will be treated within the same week if possible. The timing of applications will depends on weather, but in general they will be completed by December 1, April 1, and June 1 of each year.

2.2 DATA COLLECTION AND ANALYSES

All plants will be surveyed for evidence of browsing. Each shrub within each patch will be determined to be "browsed" or "unbrowsed." Any evidence of browsing on leaves, branches, and/or lateral or terminal buds will constitute a browsed plant. Surveys will be conducted three times a year: in late

February, late June, and late September. In September, mortality and foliage area will be determined as well. Foliage area will be expressed as cm^2 and calculated as the circular area of the plant, with the diameter measured at the densest portion of vegetation (Brower et. al. 1990). Figure 2-2 provides a schematic for determining foliage area. Measurements will be taken for at least three years.

The data collected will allow for a comparison between protected and unprotected shrubs. Observations of site deer populations indicate a strong correlation between browsing pressure and species and location preferences. Since all individual shrubs across A8PII will be monitored, it will also be possible to evaluate species, habitat, and/or location preferences. All data will be recorded and controlled through an Engineering/Construction Document Control Field Log.

TABLE 2-1
AREA 8, PHASE II ECOLOGICAL RESTORATION SHRUB LIST

Code	Scientific Name	Common Name	Qty.
A	*Ceanothus americanus*	New Jersey tea	24
B	*Cephalanthus occidentalis*	buttonbush	18
C	*Corylus americana*	hazel	41
D	*Euonymus atropurpureus*	burning bush	2
E	*Hamamelis virginica*	witch-hazel	28
F	*Hypericum spathulatum*	shrubby St. John's wort	33
G	*Ilex veticallata*	winterberry	17
H	*Lindera benzoin*	spicebush	29
I	*Physocarpus opulifolius*	ninebark	23
J	*Rhus aromatica*	fragrant sumac	20
K	*Rhus glabra*	smooth sumac	18
L	*Rosa carolina*	Carolina rose	21
M	*Rosa palustris*	swamp rose	15
N	*Rosa setigera*	prairie rose	15
O	*Rubus occidentalis*	black raspberry	16
P	*Salix humila*	pussy willow	15
Q	*Sambucus canadensis*	elder	13
R	*Smilax rotundifolia*	greenbrier	5
S	*Staphylea trifolia*	bladdernut	30
T	*Symphoricarpos orbiculatus*	corralberry	20
U	*Viburnum acerifolium*	maple leaf viburnum	14
V	*Viburnum prunifolium*	black-haw viburnum	27
W	*Xanthoxylum americanum*	prickly ash	31
		Total	475

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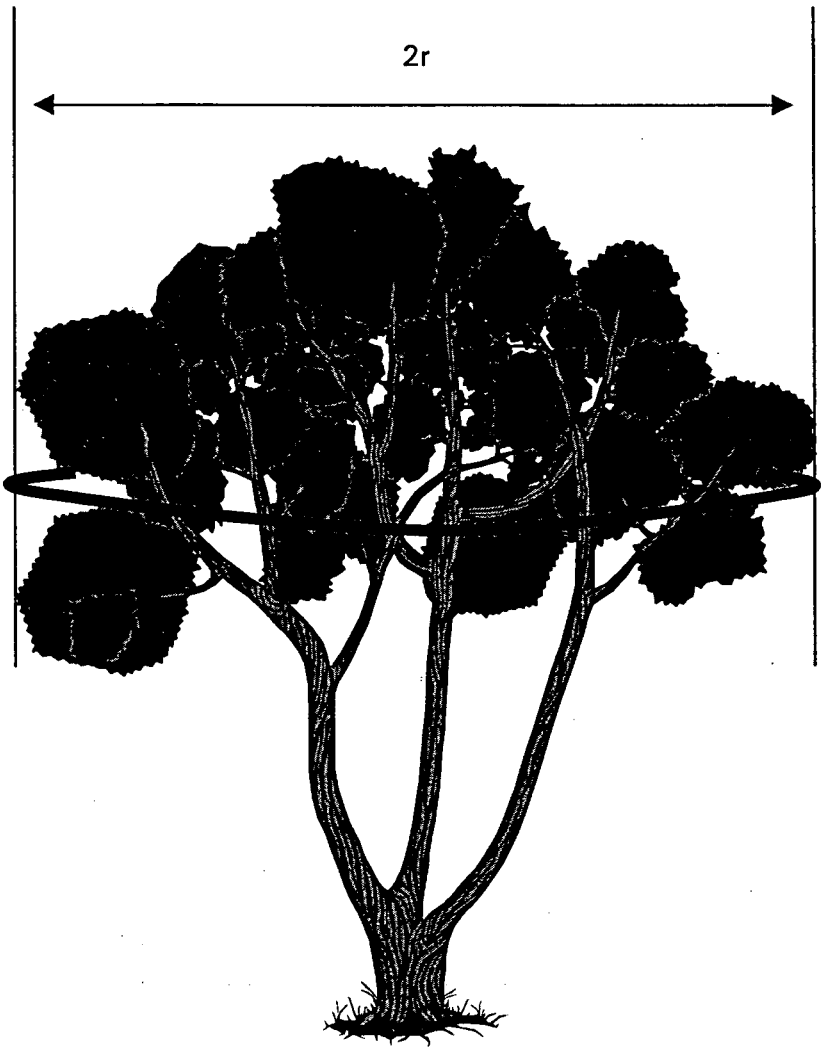
FIGURE 2-2

Determination of Foliage Area



$$A = \pi r^2$$

3.0 VOLUNTEER RECRUITMENT METHODS

This research is designed to evaluate the extent of volunteer recruitment into unplanted and restored areas, and the role shrub plantings play in facilitating seed dispersal. To do this, the number and species of woody volunteer recruits will be determined within plots that will be established in shrub patches, non-shrub patches, and in unplanted areas, as detailed below.

3.1 PLOT PLACEMENT AND SITE PREPARATION

Nine plots will be established across A8PII, as shown on Figure 2-1. The plot size is 100 m^2, measuring 7.07 m wide by 14.14 m long. This rectangular plot design is the optimal size and shape for surveying vegetation (Brower 1990). Three plots will be placed in shrub-planting patches, three will be placed in non-shrub patches, and three will be placed in control areas where no trees or shrubs are planted.

Existing ground cover will be eliminated in the plots as part of the continued A8PII restoration. Roundup herbicide (2 to 5 percent concentration) will be applied in most planted areas to reduce competition from existing grasses and weeds. Herbicide will not be applied to the oak-maple forest type, where native grasses and forbs were seeded into disturbed soil last spring. A backpack sprayer will be used to apply the herbicide. During application, all existing trees and shrubs will be protected with plastic bags.

Tree seedlings will not be planted within the research plots. Aside from the initial application of herbicide, no further treatments will be conducted within the plots. Shrubs and trees within the plots will be maintained through watering, mulching, and staking as necessary. Shrubs specified for deer repellent will be sprayed in accordance with the process set forth in Section 2.1.

3.2 DATA COLLECTION AND ANALYSES

Each plot will be surveyed annually for the presence of volunteer recruits. Surveys will be conducted at the end of each growing season (late September) for at least three years. The first survey will be conducted in 2001. Each recruit will be tagged, identified to species, and measured for height. Numbers of individuals, species numbers and types, and height by species will be compared between each plot.

4.0 REPORTING

An annual report will be submitted to the Fernald site Natural Resource Trustees by February 1 beginning in 2002. DOE will present and discuss all data collected from the previous year for both the deer repellent and the volunteer recruitment research. Findings from these efforts will assist in the design and maintenance of future restoration projects at the Fernald site.

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