Special Technology Development Program
Progress Report

PROJECT NUMBER: R6-00-01

PROJECT TITLE: Noxious Weed Site Revegetation

PROJECT STATUS: Continuing (funds are being requested for the next fiscal year to continue the project)

EXPECTED PROJECT DURATION: 3-5 years. Project began in FY 2000; need funding to monitor the results of the revegetation for a minimum of 3 years (through FY 2003) and, ideally for 5 years (through FY 2005).

EXPECTED COMPLETION DATE OF THE PROJECT: Either FY 2003 or FY 2005 (see notes, above, under Expected Project Duration).

SUBJECT: Revegetation of Noxious Weed Sites.

STATUS OF SUBJECT SPECIES: non-native noxious

PROJECT OBJECTIVES:

The following project objectives were stated in the original project proposal that was submitted in FY 1999:

1. Test the effectiveness of revegetating noxious weed sites using the model developed by Sheley et. al. (1996) (described below under "Research Basis"). Specific questions:
    - Did native plant species effectively colonize the site?
    - Was there a reduction in density, frequency and/or cover of the noxious weed(s)?
2. Develop revegetation prescriptions that enhance native plant community diversity and weed-resistance. Specific questions same as above for #1.
3. Develop and test revegetation method(s) on dry sites with the levels of disturbance commonly encountered in central Oregon. Long-term objectives of testing revegetation on roadside sites are: 1) to determine long-term solutions for reducing noxious weed populations, thereby preventing further transport of seeds into National Forest land, reduce the reliance on herbicides, and 2) meet vegetation management objectives for a variety of agencies (e.g., Oregon Dept. of Transportation, Oregon Dept. of Fish & Wildlife, Deschutes National Forest Service, and Deschutes County Public Works). Specific questions:
    - Did the revegetation project meet road management objectives?
    - Did the revegetation project change the roadside environment to be unfavorable for the establishment of weeds?

As we developed study design and methods, the project objectives have been reworded to be more succinct and are to:

- determine if knapweed populations can be reduced with competitive plantings;
- determine what native and desirable non-native species can survive and increase for a 3-5 year period in a knapweed-infested area;
- provide revegetation guidelines for knapweed sites in the central Oregon area.

BRIEF DESCRIPTION OF THE PROJECT: See attached First Year Project Summary (Appendix A).

CHANGES TO ORIGINAL PROJECT SCOPE OR OBJECTIVES: Essentially, the scope and objectives of the project have not changed. However, several adjustments have been made based on our intensive literature review and discussions with revegetation experts. These are:

1. In the original proposal, we stated that we planned to conduct these tests on sites that represent three disturbance regimes, though we would evaluate this and possibly drop one type of disturbance regime. The original disturbance regimes we planned on testing were:
    1. High frequent disturbance.
    2. High infrequent disturbance.
    3. Low to moderate disturbance.

We ended up dropping the low to moderate disturbance regime because these sites usually have well-established native plant populations that are available to spread naturally into areas cleared of noxious weeds.

2. The original scope of the project intended to involve partners (cooperators) in pulling weeds and collecting native plant seeds. The partners listed in the original proposal are active and engaged in helping us pull noxious weeds on the Deschutes National Forest. However, for this study, we were able to use herbicides to take care of the majority of noxious weeds at our three study plots; therefore, we did not need to use partnership labor to pull weeds. The small amount of hand-pulling (1/2 day) that needed to be done at the Skyliner Road site was done by Forest Service Botanists because cooperator crews (such as YCC and Correction crews) were not available at that time.

Also, in the original proposal, we stated we would attempt to establish at least one study plot within a noxious weed demonstration area as part of an on-going partnership that is funded by a grant from the Oregon Watershed Enhancement Board (OWEB). However, this grant-funded OWEB partnership has not established demonstration areas; instead this consortium of partners has been working on other educational efforts. The Deschutes NF is part of this consortium and very involved with the education efforts, but the opportunity was not there to fold our revegetation study into a large demonstration area.

ADDITIONS TO ORIGINAL PROJECT SCOPE OR OBJECTIVES:

There have been no additions to the original project scope or objectives.

FHP LEAD CONTACT (FHP person submitting proposal)**:**

Name	**Affiliation (Office or Dept.)**	**Phone, E-mail, Fax**
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PRINCIPAL INVESTIGATOR(S) (add lines as necessary)**:**

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COOPERATORS (contributing to, but not leading, the project) (add lines as necessary)**:**

Name	**Affiliation (Office or Dept.)**	**Phone, E-mail, Fax**
Dave Langland	Oregon Department of Agriculture	541-548-2241

COOPERATOR INVOLVEMENT (add lines as necessary)**:**

Name	**Role**	**Time Commitment**
Dave Langland	Weed Control Specialist	4 days to treat weeds

PRODUCTS AND DUE DATES: The end product of this study will be guidelines for revegetating noxious weed sites based on what we have learned from this study. Assuming we monitor this revegetation project for 5 years, these guidelines would be available in FY 2005 and would be distributed to central Oregon agencies (e.g., Deschutes, Fremont, Ochoco, and Winema National Forest employees, Prineville BLM, Deschutes County Public Works, Oregon Department of Transportation) and private landowners in the communities of Bend, Sisters, Redmond, and LaPine, Oregon.

In addition to the revegetation guidelines, we are compiling a noxious weed literature review that will be made available throughout the region.

STATUS OF PRODUCTS/PRESENTATIONS:

1. Revegetation guidelines will be available in either FY 2003 or FY 2005, depending on how long this study is funded. However, in November 2000, we intend to produce a summary of "important things to consider when planning a revegetation project". These are "decision drivers" – things we considered in designing this project -- and are based on an intensive literature review and interviews with revegetation specialists.
2. A noxious weed literature review will be completed by November 30, 2000.

ACCOMPLISHMENTS TO DATE:

Products: The following documents have been produced:

1. Revegetation of Noxious Weed Sites on the Deschutes National Forest: Study Plan, June 2000. Deschutes National Forest, Bend, Oregon.
2. Revegetation of Noxious Weed Sites on the Deschutes National Forest: First Year Project Summary, October 2000. Deschutes National Forest, Bend, Oregon. (***see Attached Appendix A***).
3. STDP Project Update: Noxious Weed Revegetation. This is a one page project summary created for a project field review in June 2000.

The following document should be completed in November 2000:

Grenier, Katie. 2000. Selected Noxious Weed Literature Review. Deschutes National Forest, Bend, Oregon.

Publications: No publications have been produced at this time.

Technology Transfer: Technology transfer accomplishments will occur when the Noxious Weed Literature Review and Revegetation Guidelines are completed.

FIRST FISCAL YEAR FUNDED: FY 2000

FUNDS OBLIGATED FROM BEGINNING OF PROJECT THROUGH CURRENT FISCAL YEAR (extend table as needed)(Ignore this section if not requesting funds)**:**

	Item	**Requested Funding**	**Expended Funding**	**Unused Funding**
FIRST YEAR ***(= FY 2000)***				
Administration	Salary	26,800	20,577	+6,223
	Overhead			
	Travel	200	815	-615
Procurements	Contracting	0	1,805	-1,805
	Equipment	0	266	-266
	Supplies	400	517	-117
Year Totals		27,400	23,935	3,420
SECOND YEAR **= N/A**				
Administration	Salary			
	Overhead			
	Travel			
Procurements	Contracting			
	Equipment			
	Supplies			

Year Totals				
CURRENT YEAR = FY 2000		**Requested FHP STDP Funding**	**Other Source Funding**	**Source**
Administration	Salary	26,800	9,000	Contributed input from Dr. Helen Maffei & Dr. Gregg Riegel
	Overhead	0	4,740	YCC crews
	Travel	200	0	
Procurements	Contracting	0	0	
	Equipment	0	0	
	Supplies	400	0	
Year Totals		27,400	13,740	
PROJECT TOTALS		27,400	13,740	

FUNDS NOT USED FROM PREVIOUS FISCAL YEAR: The reasons for unused funds:

1. We did not need to use FHP STDP funds for chemical treatment of weed sites because we were able to have these sites sprayed as part of our forest-wide herbicide contract with the Oregon Department of Agriculture.

2. We had requested $7,000 for weed treatments, yet only have approximately $3,420 left over because of unanticipated project costs for travel, equipment, supplies, and contracting.

Fiscal Year	**STDP Funding Allocated**	**Funds Obligated**	**Funds Unused**
FY 2000	**27,400**		**3,465**

EXPECTED BUDGET FOR NEXT FISCAL YEAR (extend table as needed)**:**

Please see Appendix B for more details regarding the following budget estimates:

	Item	**Requested FHP STDP Funding**	**Other-Source Funding**	**Source**
Administration	Salary	16,320	9,000	Contributed input from Dr. Helen Maffei and Dr. Gregg Riegel
			400	YCC crews
	Overhead			
	Travel	100		
Procurements	Contracting	338		
	Equipment			
	Supplies	800		
Totals		17,558	9,400	

DIFFERENCE BETWEEN ORIGINAL AND AMENDED REQUESTS AND JUSTIFICATION (the difference between originally requested funds and funds needed based on changes in the budget or scope of the project)**:**

In our original project proposal, we estimated needing $8,515 for FY 2001. However, in our first year of this project, it has become evident that the costs are higher than originally estimated. It takes longer to collect and analyze data and manage the project than originally estimated.

STDP FUNDING NEEDED:

Estimated STDP funding needed in remaining year(s) of the project by fiscal year. Show separately the funding to be requested/provided from other sources (extend the table as necessary).

Fiscal Year	**STDP Funding**	**Other-Source Funding**	**Source**
FY 2002	11,250	2,000	Contributed input from Dr. Helen Maffei & Dr. Gregg Riegel
FY 2003	10,220	2,000	Same as above.
FY 2004	10,220	2,000	Same as above.
FY 2005	10,220	2,000	Same as above.

Appendix A. Revegetation of Noxious Weed Sites on the Deschutes National Forest
First Year Project Summary
October 2000

Project Team

Signe Hurd, Deschutes Project Botanist
Katie Grenier, Deschutes NF Botanist, Project Manager
Helen Maffei, Deschutes NF Forest Pathologist, FHP Lead Contact
Gregg Riegel, Region 6 Area Ecologist

Background

The increase of spotted knapweed (*Centaurea maculosa*) and diffuse knapweed (*C. diffusa*) in Central Oregon and the East Cascades has led to growing concern over noxious weeds management. Knapweeds are especially problematic on roadsides and the margins of agricultural land where soils have been and continue to be disturbed, where native plant communities have been reduced or are absent, and where the possibility of further distribution and encroachment into adjacent habitats is high. Returning a weed-infested area to a native or more desirable non-native plant community may require multiple approaches to be successful. If knapweeds have replaced most native plants in a community, the use of herbicides and other control methods may not be sufficient to restore a diverse or resistant plant community. Revegetation using species chosen for their competitiveness with spotted and diverse knapweeds may be the tool needed to restore some plant communities or to contain the spread of established knapweed populations. This report summarizes work accomplished in the first year of a multi-year (3-5 year) noxious weed revegetation project.

Project Objectives

The objectives of this project are to:

- determine if knapweed populations can be reduced with competitive plantings;
- determine what native and desirable non-native species can survive and increase for a 3-5 year period in a knapweed-infested area;
- provide revegetation guidelines for knapweed sites in the central Oregon area.

Results of this project will be presented in a final report and will establish a set of revegetation guidelines for use by area land managers and the general public.

Study Design

In the spring of 2000, a literature review was conducted, a study plan for the project was begun, and a project study design was developed. The study design (complete random block) consists of 18 plots grouped into 3 blocks laid out at each site. Two different species or combinations of species (treatments) are to be tested at each site. A total of 6 plots will be planted to each treatment per site. Six control plots are also distributed through each site.

Site Selection and Plot Establishment

The three sites chosen for the project represent common weed management problems with different disturbance regimes.

- Lava Butte - A frequently and highly disturbed roadside berm where weed reintroduction possibilities are high.
- Skyliner Rd. - A forest opening adjacent to a weed-infested roadside where high to moderate levels of infrequent disturbance occur.
- Bend Pine Nursery - Field edges characterizing the problems of high past disturbance associated with abandoned agriculture.

Plots were established, marked, and mapped in June. The blocks of plots were laid out perpendicular to roadsides in an attempt to equally distribute any weed density gradient at the sites.

Species Selection

Only seeds will be used for revegetation in this project. This decision was made for the following reasons:

- When this project began, the optimal period for transplanting (spring) had passed. To leave a weed site that had undergone herbicide treatment for a season would be to invite weed reinfestation.
- Problems associated with transplant requirements for supplemental water decreased the feasibility of using plugs or cuttings.
- In normal management decision situations, the likelihood of using transplants for noxious weed revegetation seemed low for the very reasons given above, while the use of seed seemed more probable.

Revegetation species were carefully chosen to perform particular functions at each site. A compilation of early colonizing and disturbance-tolerant native species was made. Native species adjacent to the sites were briefly surveyed. Plants both present in the area and competitive in disturbed situations became revegetation candidates. Rooting depths, phenology, and environmental tolerances were weighed. Feasibility of seed collection or purchase was then considered. After consultation with regional and local native plant experts and a search of pertinent literature, the plant species in Table 1 were selected**.**

Table 1. Characteristics of selected revegetation species for noxious weed study plots, Deschutes National Forest.

Species	Growth form	Root type and depth	Growth period and rate	Moisture requirements	Light requirements	Soil type	Site
Squirreltail (Elymus elymoides)	upright perennial bunchgrass	fibrous; at least 30cm	spring; moderate growth	12-40cm/ yr.	high; shade intolerant	fine - med. pH 6 - 8.4	Lava Butte; Skyliner Rd.
Thickspike wheatgrass (Elymus lanceolatus ssp. lanceolatus var. "Critana")	erect perennial grass	rhizomatous; at least 40cm	spring and summer; moderate growth	20-60cm/ yr.	high; shade intolerant	fine - coarse pH 6.6 - 8.4	Bend Pine Nursery
Idaho Fescue (Festuca idahoensis)	erect perennial bunchgrass	fibrous; at least 35cm	spring; moderate growth	30-50cm/ yr.	intermediate; some shade tolerance	fine - coarse pH 5.6 - 8.4	Lava Butte; Skyliner Rd.
Sandberg's bluegrass (Poa secunda)	semi-erect perennial bunchgrass	fibrous; at least 25cm	spring and fall; slow growth	25-55cm/ yr.	intermediate; some shade tolerance	med. - coarse pH 6.5 08.2	Bend Pine Nursery
Bluebunch wheatgrass (Pseudoroegneria spicata) var. "Secar"	erect perennial bunchgrass	fibrous; at least 25cm	spring and summer;	20-45cm/ yr.	intermediate; some shade tolerance	med. - coarse pH 6 - 8	Skyliner Rd; Bend Pine Nursery
Dwarf lupine (Lupinus lepidus)	prostrate herbaceous perennial	taproot; at least 15cm	spring and summer; rapid growth	25-40cm/ yr.	high; shade intolerant	med. - coarse pH 7 - 8	Lava Butte
Wild flax (Linum lewisii)	herbaceous perennial to woody sub-shrub	taproot; at least 35cm	spring; moderate growth	24-60cm/ yr.	high; shade intolerant	Med. - coarse pH 5.6 - 8.4	Lava Butte

Pretreatment Data Collection

Density, frequency, and foliar cover data were collected in June, July, and August. This information represents site conditions prior to treatment. It was hoped that data could be collected prior to herbicide application, but the need to spray the knapweeds during their early phase of rapid growth required treatment be carried out before all data had been collected. All plants effected by the herbicide within the plots were still present and readily identifiable and measurable when data was gathered.

Soils at each of the three sites were evaluated. The study plan summarizes in detail the methods used for data collection. This should allow exact replication of data gathering in subsequent years.

Seed Collection and Purchase

Seed from four selected native species (Idaho fescue, squirreltail, dwarf lupine, and wild flax) was collected on the Deschutes National Forest in August and September. The seed was taken to the R6 Seed Extractory in Bend where it was cleaned to a level satisfactory for hand-sowing.

Non-native seed for the project (thickspike wheatgrass, bluebunch wheatgrass, and Sandberg's bluegrass) was purchased from Granite Seed. All of those seed lots originated in Washington. Since we were unable to collect sufficient viable seed locally, additional dwarf lupine seed was purchased from Frosty Hollow in Washington.

Seed Planting

When conditions are optimal for the species selected (mid to late November), seed will be planted. This should ensure the availability of moisture for germination and decrease the seeds' exposure to bird and rodent predation.

Seed will be hand-sown and lightly raked into the ground in the treatment plots.

Other observations

The presence of viable residual knapweed plants at the Lava Butte and Skyliner Road sites appeared to be the result of low herbicide levels applied. Hand pulling of spotted knapweed was required at the Skyliner Road site due to herbicide failure. Pulling was done to maintain the premise that no living mature knapweed plants were present and that no additional seed was produced on any of the plots this year. Should herbicides be reapplied in the future, greater attention paid to individual weed coverage may improve herbicide effectiveness.

Despite initial appearances, soils were not found to be highly uniform within the sites. This will have to be taken into consideration when evaluating the success or failure of selected species.

If budgets allow, signage explaining weed problems and the search for solutions could be a tool for education at the Lava Butte site. This site is in a highly visible, often visited area that would lend itself to interpretive uses.

Literature Review

A rigorous review of pertinent literature was conducted in April. Especially helpful in preparation of the study plan were publications on weeds and particular species (Myers and Berube 1983) (Roche and Roche 1999)(Sheley et al. 1998) (Sheley et al. 1999a), weed ecology (Tyser and Key 1988) (Rice et al. 1992) (Sheley et al. 1999b), revegetation (Larson and McInnis 1989) (Sheley et al. 1996a) (Sheley et al. 1996b), and information on species to select for revegetation (Hironaka and Sindelar 1973) (USDA NRCS. 1999) (Hickman 2000 personal communication). When species had been chosen and seeding information was needed, additional publications and persons provided needed input (Rose et al. 1996)(Doescher 2000 personal communication) (Sexton 2000 personal communication).

Future Work

The following is an outline of future activities proposed to complete this project:

FY-01	November	- Site preparation and seed sowing.
	December	- Add process and results of seed planting to Progress Report.
	May/June	- Herbicide and/or manual treatment of weeds in study plots.
	June/July	- Collect post-treatment data.
		- Evaluate need to reseed sites (or portion of sites).
	July/August	- Collect native seeds (if necessary).
	September	- Possible purchase of additional seed.
		- Enter data and preliminary analysis of 1st year results.
		- Complete progress report.
FY-02	November	- Site preparation and seed sowing (if necessary).
	May/June	- Herbicide and/or manual treatment of weeds in study plots.
	June/July	- Collect post-treatment data.
		- Evaluate need to reseed sites (or portions of sites).
	September	- Enter data and preliminary analysis of 2nd year results.
		- Complete progress report.
		- Possible purchase of additional seed.
FY-03	November	- Site preparation and seed sowing (if necessary)
	May/June	- Herbicide and/or manual treatment of weeds in study plots.
	June/July	- Collect post-treatment data.
	September	- Enter data and preliminary analysis of 3rd year results.
		- Complete progress report.
FY-04	May/June	- Herbicide and/or manual treatment of weeds in study plots.
	June/July	- Collect post-treatment data.
	September	- Enter data and preliminary analysis of 4th year results.
		- Complete progress report.
FY-05	May/June	- Herbicide and/or manual treatment of weeds in study plots.
	June/July	- Collect post-treatment data.
		- Prepare revegetation guidelines.
	August	- Enter and analyze 5 years of data.
	September	- Prepare final report.
		- Publish revegetation guidelines.

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Appendix B. Budget Summary for Noxious Weed Revegetation Study, Deschutes National Forest, FY 2001.

A. Salaries

Timeline	GS-Level	Cost/Day	# Days	Total Cost per Task	Task
November	GS-9	180	10	1,800	Site preparation and seed sowing.
December	GS-11	246	2	492	Add sowing process & results of seed planting to Progress Report.
May - Sept	GS-11	246	8	1,968	Project management.
May	GS-9	180	6	1,080	Create database. Enter FY 2000 data.
June/July	GS-11	246	20	4,920	Collect post-treatment data.
July/August	GS-9	180	20	3,600	Collect native plant seeds, if necessary.
September	GS-11	246	10	2,460	Enter 2001 data; preliminary data analysis; complete progress report.
subtotal				***16,320***	

B. Procurements

Supplies	500	
Seed Purchasing Costs	300	
Weed Treatments	113	Herbicide Treatment of 3 plots (= 150/acre due to backpack spraying; ea. Plot = about .25 ac.)
	225	Manual Treatment of Plots (= 300/acre)
Travel	100	
subtotal	***1,238***	

Total **17,558**