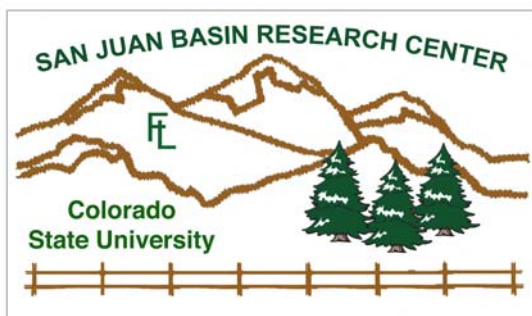


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Fact Sheet 2002-WE1

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Comparison of Traditional and Alternative Methods to Control Noxious Weeds near Cropland, Rangeland and Waterways

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The San Juan Basin Research Center received funding from the Agricultural Experiment Station for a 5-year study that will establish an approximately 20-acre project area to demonstrate the use of herbicidal, cultural and biological control methods. This strip of land has a variety of ecosystems including oak brush, irrigation ditch, grassland/riparian and a former oak brush stand. It serves as a barrier between the station's irrigated hay fields and several of our rangeland pastures and has the Big Stick irrigation ditch running through the North end of it.

The proposed site will include three different invasive weed treatments: intensive goat/sheep grazing, beneficial insects and herbicide treatments. Because of its unique shape (it is approximately 50 yards wide and .8 mile long) and variety of ecosystems, these treatments will be repeated across climates and for different weeds. Objectives include:

- Complete comprehensive GPS mapping of weeds and ecosystems.
- Demonstrate aggressive weed control methods using various levels and timings of herbicides.
- Introduce goats and/or sheep to control noxious weeds with intensive grazing.
- Introduce beneficial insects for long-term sustainable weed control.
- Replicate treatments across ecosystems and weed infestations to compare how each of the methods affects yellow toadflax, knapweed, Canadian and musk thistle.
- Monitor changes in weed infestations using GPS
- Use project area for county-wide weed management activities.

Four distinct ecosystems, four prevalent weeds and three different treatments will be studied for the duration of this proposal. They are listed in the following table:

Ecosystems	Weeds	Treatment Method
Oak Brush	Yellow ToadFlax	Intensive Grazing
Irrigation Ditch	Musk Thistle	Herbicide
Grass/Riparian	Canadian Thistle	Beneficial Insects
Dead Oak Brush	Spotted Knapweed	

Beneficial Insect Treatment

The insect release areas (IRA) in each ecosystem will be located to minimize re-infestation and to avoid herbicidal drift. Each release area will be approximately 20' x 20' and will have a buffer zone of at least 100 feet from herbicide treatment areas. An IRA may be targeting more than one of the weeds being studied because of the combination of weeds found in some of the ecosystems. The first summer approximately 4,300 insects will be released. Insects will be released from early spring to late summer, depending upon the lifecycle and method of attack. There will be no mowing, herbicide treatments or cultivation done in the IRA during the duration of the project. Monitoring will be done using pin transect and plant sampling to determine amount of insect infestation and change in plant populations. We plan to release the following insects:

Ceutorhynchus litura, the Canada Thistle Stem Weevil attacks the young Canada thistle plants as they sprout from the soil in the early spring. The developing "litura" larvae internally mine the stem of the thistle plant as the shoot elongates during the summer. Fully developed larvae will exit the Canada thistle plant at the root crown causing multiple exit holes. Larvae will pupate in the soil and emerge as adults later in the summer. Adults will over winter in the soil, ready to attack the emerging Canada thistle the following spring. The adults are cold hardy and can tolerate wet spring snow storms without difficulty.

The Thistle Stem Gall Fly, *Urophora cardui*, attacks the primary and lateral stems of Canada thistle. Adults will lay their eggs on the thistle plant in the early summer when bolting plants are 12 inches tall or more. The developing larvae stimulate the plant to form a hard, woody, stem gall. Gall formation directs nutrients away from the normal metabolic and reproductive functions of this aggressive weed. Abnormally developed flower heads frequently occur above the gall, often reducing seed production. Multiple "cardui" galls are possible on a single Canada thistle plant.

The Thistle Rosette Weevil, *Trichosiocalus horridus*, attacks the rosettes and interrupts the apical dominance of the plant. Females often lay over 2000 eggs with the subsequent larval feeding stimulating the plant to form a multi-branched growth habit. This habit favors attack by musk thistle seed head weevil, *Rhinocyllus conicus*, and should be considered if one already has "Rhinos" established. Monitoring done in August of 2001 found that the *R. conicus*, were already prevalent on the musk thistle found in the project area.

The Knapweed Root Weevil, *Cyphocleonus achates* is a large weevil that lays approximately 100 eggs at the base of older/larger spotted and diffuse knapweed plants. The developing larvae mine the central taproot, damaging the weed's vascular tissue and cause root-gall formation.

The Toadflax Flower-Feeding Beetle, *Brachypterolus pulicarius*, is a tiny 2mm long insect with a big appetite for toadflax. Adults and larvae feed inside the flowers, destroying the floral parts that produce seed. Their feeding is so effective that very few, if any, viable seeds are produced. This insect is very winter cold hardy and can tolerate hot summer temperatures as well.

Intensive Grazing

Goats/sheep will be placed in 100' x 100' fenced paddocks. There will be two paddocks in the irrigation ditch, oak brush and grass/riparian ecosystems and only one in the dead oak area. If possible, they will contain primarily one weed. From the preliminary GPS work, this will be easy to do with the yellow toadflax. However, the musk thistle and knapweed have not been found in large infestations so they will probably be studied in mixed paddocks.

The animals will be placed in the paddocks at the most opportune times. Transects will be done each spring to track the change in plant populations over the years. Plant height, density and stage of maturation will be recorded before the animals are introduced as well as when they are removed.

Herbicide Treatments

For the herbicide treatment portion of this proposal, we would like to look at not only different products but also different application rates and timing of application. We will be comparing the effects of Redeem, Curtail, Tordon, 2-4D and a 2-4D/Tordon mix in replicated treatments within each ecosystem. For all products we will do a spring, summer and fall application. We will also apply one rate to an entire 20' x 25' plot and measure the effect of the herbicide on all plant material. Recommendations obtained for the 4 weeds we will be studying indicate that there is an upper and lower range depending upon the weed. For example, Redeem is recommended at 2 pints per acre for musk and spotted knapweed, and 4 pints per acre for Canada thistle. Herbicide plots will be approximately ½ of an acre including buffer zones between treatments. Pending results of GPS data, two 250' x 70' herbicide plots will be placed in each ecosystem. Each application zone will be 20' wide, 250' long with a 5' buffer zone between them. Each individual herbicide treatment will be 25' deep and 20' wide. The treatment area will be followed by a 5'x20' buffer zone. A diagram follows:

Spring Application	Buffer 5'	Summer Application	Buffer 5'	Fall Application
Redeem-low rate		Redeem-low rate		Redeem-low rate
5' Buffer		5' Buffer		5' Buffer
Curtail-low rate		Curtail-low rate		Curtail-low rate
5' Buffer		5' Buffer		5' Buffer
Tordon-low rate		Tordon-low rate		Tordon-low rate
5' Buffer		5' Buffer		5' Buffer
2-4 D-low rate		2-4 D-low rate		2-4 D-low rate
5' Buffer		5' Buffer		5' Buffer
2-4D/Tordon-low rate		2-4D/Tordon-low rate		2-4D/Tordon-low rate
5' Buffer		5' Buffer		5' Buffer
Redeem-high rate		Redeem-high rate		Redeem-high rate
5' Buffer		5' Buffer		5' Buffer
Curtail-high rate		Curtail-high rate		Curtail-high rate
5' Buffer		5' Buffer		5' Buffer
Tordon-high rate		Tordon-high rate		Tordon-high rate
5' Buffer		5' Buffer		5' Buffer
2-4 D-high rate		2-4 D-high rate		2-4 D-high rate
5' Buffer		5' Buffer		5' Buffer
2-4D/Tordon-high rate		2-4D/Tordon-high rate		2-4D/Tordon-high rate