

Idaho's Statewide Monitoring Guidelines for *Larinus* spp. and Diffuse Knapweed:



Overview:

A critical part of successful weed biological control programs is a monitoring process to measure populations of biological control agents and the impact that they are having on the target weed. Monitoring should be conducted on an annual basis for a number of years. The Idaho State Department of Agriculture, in conjunction with the University of Idaho, Nez Perce Biocontrol Center, and federal land management agencies has

developed the monitoring protocol below enables land managers to take a more active role in monitoring the progress and weed control ability of the knapweed flower weevils, *Larinus* spp. (LA) in efforts to control diffuse knapweed, *Centaurea diffusa*. This monitoring protocol was designed to be implemented by land managers in a timely manner while providing data which will enable researchers to better quantify the impact of LA on diffuse knapweed throughout the state.

Diffuse Knapweed:

Diffuse knapweed is a biennial or short-lived, perennial reproducing entirely by seed and producing up to 18,000 seeds per plant. Flowers occur singly or in clusters, bloom from July to September and may be white, pink or lavender. The bracts of the flower heads are tipped with a long, slender spine fringed with smaller spines. Seeds are blackish-brown with vertical brown and gray stripes and about 0.1 inch long. Stems are typically 6 inches to 2 feet tall with deeply divided leaves. Diffuse knapweed prefers well-drained, light textured soils and is intolerant of shade. This plant is common along roadsides, at disturbed sites, and in abandoned areas. To date, thirteen biological control agents have been approved for release for the knapweed complex, which includes diffuse knapweed.

Knapweed Flower Weevil (LA):

LA is an abundant biological control agent that can utilize spotted, diffuse, and squarrose knapweeds. LA overwinters as an adult. Adults emerge in the spring when they begin to feed on knapweed foliage. Females produce between 28 and 130 eggs which they lay in clusters in open flowers. Eggs hatch into larvae which feed on seeds and receptacle tissue for about a month. Larvae construct cocoons within the seedheads using pappus hairs and pupate. Emerging adults chew a characteristic round hole in the top of the cocoon that is visible when viewed from above (see below).



Monitoring:

The Statewide Biological Control monitoring protocol is based upon a permanent 20 meter vegetation sampling transect randomly placed in a suitable (at least 1 acre) infestation of diffuse knapweed and sweep net samples of LA. Annual vegetation sampling will allow researchers to characterize the plant community and the abundance and vigor of diffuse knapweed. Sweep net samples of LA adults will provide researchers with an estimate of LA population levels.

Permanent Site Set-up:

To set up the vegetation monitoring transect, you will need: 1) a 25 x 50 cm Daubenmire frame made from PVC (preferred) or rebar, 2) a 20 m tape measure for the transect and plant height, 3) 10 permanent markers (road whiskers and 16 penny nails – see picture below), 4) a post (stake or piece of rebar) to monument the site (see pictures for examples of field equipment), and 5) 30-45 minutes at the site during the **2nd week of June**. To set up the transect, place the 20 m tape randomly within the infestation. Mark the beginning of the transect with a post. Place permanent markers every 2 m (for a total of 10 markers) beginning at the 2 m mark and ending with the 20 meter mark on the tape measure. Place the Daubenmire frame parallel to the tape on the 50 cm side with the permanent marker in the upper left corner starting at 2m (see pictures). **Refer to the “sweep” data sheet for how to conduct monitoring.** Repeat the frame placement at 2m intervals for a total of 10 measurements (one at each permanent marker).

