

Standardized Impact Monitoring Protocol (SIMP) for *Cyphocleonus achates* and Spotted 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 Standard Impact Monitoring Protocol (SIMP) below to enable land managers to take a more active role in monitoring the progress and weed control ability of the knapweed root weevil, *Cyphocleonus achates* (CYAC) in efforts to control spotted knapweed, *Centaurea maculosa*. 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 CYAC on spotted knapweed throughout the state.

Spotted Knapweed:

Spotted knapweed is an herbaceous, short-lived, perennial reproducing entirely by seed and producing up to 25,000 seeds per plant can remain viable in the soil up to 8 years. Flowers range in color from pink to light-purple and bloom from July to October. The flower head bracts are black-tipped, giving the plant its characteristic “spotted” appearance. Seeds are brown to black in color, smooth, and less than 0.25 inch long. Stems are typically 2 to 4 feet tall with lower leaves that are deeply lobed and upper leaves that are more linear. Spotted knapweed prefers moist rangeland habitats, but is common in waste areas, along roadsides, and in pastures. To date, thirteen biological control agents have been approved for release for the knapweed complex, which includes spotted knapweed.



Knapweed Root Weevil (CYAC):

CYAC is a robust biological control agent that can attack spotted (preferred host) and diffuse knapweeds. CYAC overwinter as larvae in roots. CYAC larvae mine and gall the vascular tissue of knapweed roots. CYAC larval feeding reduces knapweed density and can result in death of small plants. CYAC adults emerge from June to mid-September and feed on knapweed leaves. The adults are 0.5 to 0.6 inches long and

generally live 8 to 15 weeks. Females mate several times and deposit more than 100 eggs during their lifetime. CYAC eggs are laid singly in a notch excavated by the female on the root crown, just below the soil surface. Eggs hatch in 10 to 12 days and larvae begin feeding on roots.

Monitoring:

SIMP protocol is based upon a permanent 20 meter vegetation sampling transect randomly placed in a suitable (at least 1 acre) infestation of spotted knapweed and timed counts of CYAC adults. Annual vegetation sampling will allow researchers to characterize the plant community and the abundance and vigor of spotted knapweed. Timed counts of CYAC adults will provide researchers with an estimate of CYAC 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 **second week of August**. 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 m 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 2 m (see pictures).

Refer to the data collection sheet for how to conduct monitoring. Repeat the frame placement at 2 m intervals for a total of 10 measurements (one at each permanent marker).

