Standardized Impact Monitoring Protocol (SIMP) for *Mecinus janthiniformis* and Dalmatian Toadflax:

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 toadflax stem-mining weevil, *Mecinus janthiniformis* (MEJA) in efforts to control Dalmatian toadflax, *Linaria genistifolia* ssp. *dalmatica*. 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 MEJA on Dalmatian toadflax throughout the state.

Dalmatian Toadflax:
Dalmatian toadflax is a perennial that grows up to 4 feet tall. Its waxy green leaves are heart shaped, 1 to 3 inches long, and clasp the stem. Flowers are 1 inch long (excluding the 1/2-inch spur), yellow, often tinged with orange or red, and similar in shape to a snapdragon. Plants flower from midsummer to fall. Seeds are produced in a ½-inch pod and are irregularly wing angled. A single plant may produce up to 500,000 seeds in a season which may remain viable in the soil for up to 10 years. This plant also reproduces vegetatively by stems that develop from adventitious buds on primary and creeping lateral roots. It is usually associated with sparsely vegetated areas, such as roadsides, abandoned or unmanaged land, gravel pits, and disturbed pastures and rangelands. It is found in most counties in Idaho. This invasive plant and other *Linaria* species are reportedly toxic to livestock.

Toadflax Stem-Mining Weevil (MEJA):
Adult MEJA are small, somewhat elongated bluish black weevils which emerge from last year's infested Dalmatian toadflax stems in April-May. Adult MEJA feed on toadflax stems that are at least 0.04 inches in diameter and feed on leaves and stems from June to mid-July before mating and laying eggs inside new shoots. The eggs typically hatch in 6-7 days. Larvae tunnel within the toadflax stem for 23 to 34 days moving no more than 1.2 inches from where the egg was laid. Pupation

occurs within the stem. Adult feeding on stems and leaves has a limited impact on the plant. Larval mining impacts the plants by causing premature wilting of shoots and suppressing flower formation. MEJA overwinter as adults inside their pupation chamber. The effects of the weevil on the plant are reportedly enhanced under drought stress.

Monitoring:
SIMP is based upon a permanent 20 meter vegetation sampling transect randomly placed in a suitable (at least 1 acre) infestation of Dalmatian toadflax and timed counts of MEJA adults. Annual vegetation sampling will allow researchers to characterize the plant community and the abundance and vigor of Dalmatian toadflax. Visual counts of MEJA adults will provide researchers with an estimate of MEJA 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 **week before Memorial Day**. 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).