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## **Biological control of leafy spurge with insects**

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The Animal Plant Health Inspection Service, (APHIS) biological control based management program against leafy spurge (LS) continues with enhanced enthusiasm now that results from earlier releases of insects are available. Currently four species of flea beetles, *Aphthona flava*, *A. cyparissiae*, *A. czwalinae*, *A. nigriscutis*, a stem borer, *Oberea erythrocephala*, and shoot tip gall midge, *Spurgia esulae* have been established in the United States. All except the gall midge are univoltine and will require establishment of field insectary sites (FIS) throughout all states infested with LS. Production of these insects in these FIS has progressed such that redistribution to new sites is now possible. One objective of the program is to set up as many as five FIS for each species of insect in all states. Current follow up sampling is in progress to determine the number of FIS maybe available for redistribution efforts in 1993.

Simultaneously, soil samples are being taken for analysis to investigate the possibility of correlation between soil types and successful establishment of each species. Additionally, soil temperatures, air temperatures, and moisture are being monitored. This information should be useful in developing guidelines for predicting when insects will be available for collection when the FIS are transferred to the individual states.

Studies to determine the compatibility of herbivores and insects are now in the second year. Plots 15.5m x 15.5m randomly selected for treatments with insects and insects/sheep were set up in 1990. Early data from this year suggest that LS populations decreased in each treatment. Plots with the insect/sheep treatments did not have any growth of LS in about one-half of each plot. Characteristic circular patterns of LS reduction appear in these study plots.

Releases of *A. nigriscutis* in 1989, which have been monitored closely, show outstanding results. An area surrounding the release point of about 30 x 10m area was seen in 1991. Native grasses were seen in the core area. In 1992 the area of little or no LS had increased to 60 x 30m in size. The stem density of LS at the release point was 350/m<sup>2</sup> in 1989. Grasses have revegetated this area and LS distribution scattered. Insect populations at these study areas will continue to be monitored to provide information necessary to

determine the number that are available for redistribution. To date over 20,000 insects have been collected from this site.

All states with releases made in 1989-1990 are being surveyed for possible insectary sites that can be utilized for collections and distribution in 1993.