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GIS/GPS applications in USDA-APHIS redistribution of leafy spurge biocontrol agents

H. W. ZIOLKOWSKI, R. D. RICHARD, and R. W. HANSEN

USDA-APHIS-PPQ, Bozeman, MT.

Geographic Information Systems (GIS) are computer-based systems used to store, manipulate and analyze geographic information. Global Positioning Systems (GPS) are hand-held units that utilize three dimensional position fixes by satellites to determine locations in map coordinates. USDA-APHIS-PPQ is making use of this technology to collect, store, analyze and display weed and weed biocontrol agent information in its programs on rangeland weeds.

Field personnel are currently collecting field insectary site location data in sixteen states with GPS units for use with the GIS. A map showing USDA-APHIS redistribution of three species of leafy spurge flea beetles in Colorado was displayed. Maps depicting the spread of leafy spurge over a sixty-year period in five Pacific Northwest states and a dot-density map of leafy spurge acreage in Montana and North Dakota were displayed.

GPS units are used to map sites where natural enemies of rangeland weeds have been released. The map features depicted in a leafy spurge field insectary site map were collected with GPS methods. GIS programs enable the user to determine the area of both the leafy spurge infestation and of the flea beetle impact. Percent cover of leafy spurge was reduced from over 85% to 0% at the initial point of release of the leafy spurge flea beetle *Aphthona nigricutis*.

Personnel at the Bozeman Biocontrol Facility have developed a phenological model to predict the eclosion and peak collecting period of *Aphthona* flea beetles and to plan adult beetle sampling and collection efforts. Daily temperature data from fifteen states are referenced for the development of this model. The spatial analysis features of the GIS were used to select climatological stations within a fifteen mile radius of leafy spurge field insectary sites from thousands of possible stations. An example of this analysis for Montana and northern Wyoming leafy spurge field insectary sites was displayed. USDA-APHIS plans to utilize GIS decision making capabilities as more climatological and ecological data pertinent to biocontrol of weeds become available.