

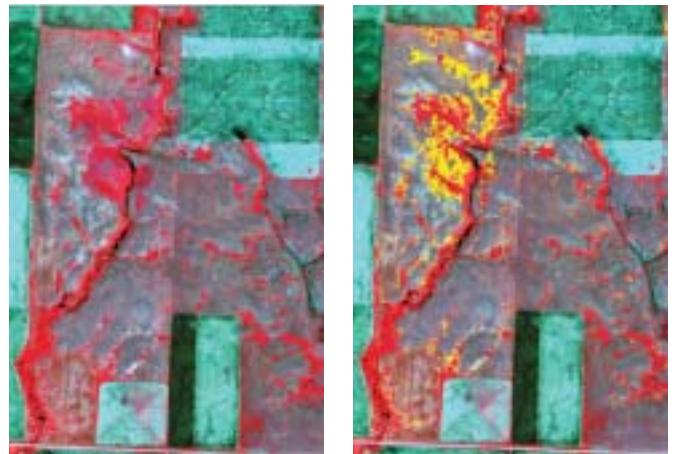
Detecting Leafy Spurge Infestations

Background:

Leafy spurge (*Euphorbia esula*) is an aggressive perennial weed introduced to North America in the early 1800s. It has now spread over much of the United States, with the greatest infestations occurring in Idaho, Montana, Nebraska, North Dakota, South Dakota, and Wyoming. Leafy Spurge invades and destroys rangeland by displacing native plants and producing milky latex from the leaves and stems that is poisonous to most livestock. A deep, persistent root system and a seed life of up to ten years make this plant extremely competitive, and very difficult to control. Specialists with the natural resources department for the Three Affiliated Tribes of the Fort Berthold Indian Reservation in western North Dakota have been locating and monitoring leafy spurge infestations on the reservation lands with the use of ground collected GPS data. These methods are effective, however they are time intensive and as the reservation is spread over approximately 1600 square miles, progress on this effort is slow.

Use of Imagery:

In order to investigate a remote sensing solution to the weed monitoring effort, high resolution IKONOS satellite images were collected on June 9 and July 17 of 2001. A field visit was made to the area. Using GPS-location data collected by the affiliated tribes, infested areas were visited and ground-truthing data were gathered to help with the development of an automated detection algorithm to be used with the IKONOS imagery. It was noted that a number of factors influence the accuracy of detection from remote sensing imagery. Plant growth stage, percent cover of the spurge infestation, and contrast with the background matrix have some effect on the efficacy of remote detection methods. The plant shows up especially well in recently grazed areas where other vegetation has been selectively removed by grazing animals. It also shows up well where surrounding vegetation is senescent, as spurge stays green later into the season.



Standard false color IKONOS imagery (left) and Leafy Spurge classification overlain in Yellow (right). © Space Imaging

Economic and Environmental Benefits:

As classification methods and accuracies are improved, imagery can be used to detect previously unknown infestations as well as monitor infestations under management regimes. Remote sensing methods provide faster and cheaper results in mapping of large areas compared to the conventional methods. Locating areas that are most likely to be infested and visiting those areas first can reduce search areas. This saves time spent by land managers and reduces the time that infestations are allowed to spread before being detected and controlled. The predictive model could identify spots where environmental conditions might support leafy spurge infestations. These highlighted spots could be closely monitored to hit outbreaks long before they become severe.

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