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Mapping leafy spurge with airborne color video and microcomputer image processing

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Vertical color or color infrared images can be economically gathered using a local aircraft and a video camera and recorder or a 35 mm camera. If these images are gathered at time of peak inflorescence of a specific weed type and from suitable altitude, they can be used to prepare a reference map for control measures. The companion image interpretation and mapping operation can also be economically completed using a desktop based microcomputer image interpretation system which can be easily operated by the weed control agent. Uses of such maps and procedures include:

- initial weed stand detection,
- documenting requests for State cost-sharing programs,
- planning private landowner cooperative programs,
- pre-eradication contract negotiations,
- monitoring effectiveness of earlier treatments, etc.

A test utilizing these low-cost image collection and analysis procedures was completed in a portion of Cook County, Wyoming, with vertical color video images. The images were flown for the area of a township at the time of yellow inflorescence of leafy spurge (*Euphorbia esula*) in mid-July. Individual video frames were interpreted using a personal computer equipped with a color video digitizer (video frame grabber) and color image computer display interface and monitor. The user simply advances the video tape to the frame of interest, strikes a key, and that frame of video is digitized in color in a fraction of a second. A sample yellow area (i.e., a display cell) representing a known occurrence of spurge in flower is then pointed out on the stationary image using a mouse and all areas of similar color are flagged or color coded in red by the program. The user continues to select additional sample points until the stands of spurge are marked in red on the current frame. Usually pointing out 10 to 20 sample points would be sufficient if good quality video is available.

This computer aided interpretation system has been designed to be very simple to operate so that it can be directly used by someone experienced with the weed conditions in the local area but not experienced with computers. Only this local agent can select various colors and sample points representing weed stand density to prepare a map of various levels of infestation. For example, they can decide that they wish to color-code the dense

and most severe stands or portions of stands in bright red, medium in bright orange, and low levels in bright yellow. They simply select these colors from a legend on the right side of the screen and point to the sample cells selected to represent that severity based upon their intimate knowledge of the field conditions or upon the original color of that point in the image displayed. All similarly colored points are assigned the color-code selected for that severity level. Every time they add or subtract a sample point to a category, the color identification legend at the right of the screen is updated to show the area in acres of each severity class mapped up to that point. After the user is satisfied with the map of the specific frame, a legend can be added from the keyboard such as its location in section, township, and range notation and a hardcopy color map prepared on a color printer. The whole process, from digitizing the frame to the display of a completed map with area legends and identifying annotations, takes less than 5 minutes, not including the time to prepare a color hardcopy print or a 35 mm slide and print.