

Evaluating the Costs and Benefits of Alternative Weed Management Strategies for Three Montana Landscapes

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Montana Glaciated Plains Summary

Invasive plant species management at the landscape scale in the Western U.S. is generally based on fine-scale experience and arbitrary decisions (“rules of thumb”) with limited understanding of the ultimate outcome across broad areas or over long periods. Range managers are often faced with dilemmas in applying limited resources to the control of invasive plants across a complex landscape, and few tools are available to guide real-world decision making across large landscapes. In order to develop the best strategies to maintain landscape values and prevent the spread of invaders, quantitative tools are needed to compare the effectiveness of proposed management strategies over several decades. Due to uncertainty about invasive plant management across large areas and over long periods, research and demonstrations have generally focused on the refining control techniques at fine scales (e.g. small patches of weeds or experimental plots), rather than prioritization across thousands of acres.

Computer models have been used by managers to evaluate alternative management strategies of invasive species while taking into account uncertainties about the landscape, weed biology, and strategies. We modeled the spread of leafy spurge and spotted knapweed and the effects management for three Montana landscapes. We compared several management strategies under a variety of budget constraints to evaluate the long-term benefits of different approaches, identify appropriate resource allocation levels, and assess costs and benefits of strategies within an economic analysis framework.

This summary provides highlights of results for the Montana Glaciated Plains (MGP) from our full report (Frid et al. 2011), which should be consulted for further details and explanation. The report and additional resources are available at <http://conserveonline.org/workspaces/montanaweedmodel>.

Methods

The model worked by dividing the MGP into roughly 2.5 acre parcels and simulating the change in weed infestation for each parcel over 40 years. Simulations started with weed locations and patch sizes collected from public and private landowners. The simulation allowed for weed patches to be eradicated, persist, expand, or spread seeds. The economic return of management weighed the expense of searching and treating weed patches against the value of grazing AUMs not being reduced by weed cover. We ran 40-year simulations under both no management and unlimited management scenarios.

Results

- With no management, knapweed and leafy spurge increased 450 to over 800 fold.
- With unlimited management, total area invaded can be maintained at less than 0.01% of the landscape.
- Treatment levels increased nearly five-fold over 40 years to account for new invasions occurring from sources outside the landscape
- Economic benefits of management over a 40-year period range from a gain of \$944 to a gain of approximately \$86,000 over that time.

Management Implications for MGP

- Consistent, effective management can keep spotted knapweed and leafy spurge at low densities and dramatically reduce spread.
- Since spotted knapweed and leafy spurge are at the initial stages of invasion in the MGP, significant benefits of management become more apparent in the future (i.e. the greatest benefit of management is the prevention of future invasion rather than the immediate effects of control).
- Efforts to detect and treat new infestations as soon as practical should be a priority.
- Prioritizing treatment of small patches (early detection-rapid response) is more effective than focusing on large patches.

Overall, the model results suggest that long term success for the MGP is within reach with dedicated management continuing at a modest annual capacity. In addition, strategic management creates economic value on the landscape that is greater than the cost of management.

References

Frid, L., D. Hanna, N. Korb, B. Bauer, K. Bryan, B. Martin, and B. Holzer. 2011. Evaluating the Costs and Benefits of Alternative Weed Management Strategies for Three Montana Landscapes. Prepared by The Nature Conservancy of Montana, Helena, MT and ESSA Technologies Ltd., Vancouver, B.C., **Error! Bookmark not defined.** pp. + appendices. Available at <http://conserveonline.org/library/evaluating-the-costs-and-benefits-of-alternative>