

Weed Spread Modeling— Adapting An Existing GIS-Based Model

i ADVANTAGES

Advantages of adapting an existing model over building a new one include:

- Less upfront work to develop theory
- Known data requirements
- Easy implementation into a GIS (e.g. an extension)
- An easy-to-use interface (possibly)

i DISADVANTAGES

Disadvantages of using an existing model over building a new one include:

- Requirements for specific data layers that may not be available
- Special data format requirements
- Necessity to adjust and adapt the model to your weed and specific area

i KEYWORDS

For internet searches, try combinations of these words in your favorite search engine:

- “model”
- “prediction”
- “spread”
- “growth”
- “expansion”
- “weed”
- “invasive species”

You can also try adding the common or Latin name of your weed although this will reduce the number of hits.

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Summary

Weed spread models predict the rate and directions of spread of known weed infestations based on the suitability of surrounding areas to invasion. These models may incorporate vectors of spread as well. The rate of spread is predicted based on a set maximum rate for ideal environmental conditions. These types of models are based on the principle that weeds spread faster when growing in areas that are well suited for that species. In less favorable areas, spread is slowed because the weeds must adapt and overcome conditions not well suited to their biological requirements.

Major Steps

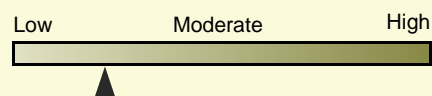
1. Acquire a weed spread model.
2. Evaluate the adaptability of the model.
3. Assemble required data.
4. Run the model and assess the results.

QUICK LOOK

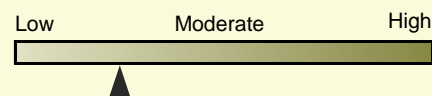
Objective:

This document outlines how to adapt an existing weed spread model to your specific weed and area.

Cost:



Expertise:



Acquire an Existing Weed Spread Model

Currently, relatively few weed-spread models are available. However, with increased awareness of invasive species and interest in identifying areas at risk, more models will likely become available. An internet search is recommended to find additional models. This guide does not recommend one model over any others; however, some predictive weed models are listed below to get you started.

Predictive Weed Spread Models

- WISP – Weed Invasion Susceptibility Prediction model (<http://w3.uwyo.edu/~annhild/WISP.html>)
- Various models of spatial spread (Hastings, A. 1996. Models of Spatial Spread: A Synthesis. *Biological Conservation* 78:143-148).

Assess the Adaptability of the Model

Weeds are incredibly adaptive and will have slightly different environmental requirements across various landscapes. Any model you choose will need to be adjusted based on your field knowledge of the weed’s habitat requirements in



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IMPORTANT

- Does your model have adequate documentation?
- Do you have the required data sets?
- Has the model been used for weeds with similar requirements?



DATA SOURCES

Try searching federal, state, county, and local government agency web sites for data. The data may be more general than you would like but at least you can run the model for a first cut at addressing your invasive species issues.



ASSISTANCE?

For more information or assistance, please contact

USDA Forest Service
Remote Sensing
Applications Center
(RSAC)

2222 S. 2300 W.
Salt Lake City, UT 84119
(801) 975-3750

RSAC Intranet
<http://fsweb.rsac.fs.fed.us>
RSAC Internet
<http://www.fs.fed.us/eng/rsac>

your area. If the weed has not yet arrived in your area, assess habitat requirements in nearby areas or areas similar to yours where the weed is present.

It is recommended that you carefully examine the data requirements for a particular model in order to determine which model is best for your situation. There should also be reasonable documentation on how to use the model and what weed species it has been successfully used with in the past. Inadequate documentation can cause much frustration and possibly inaccurate results. The weed species that a model has been used for should have similar characteristics to the species you are trying to model. Different models have different degrees of specificity. Some models can be easily adapted to a variety of weed species while others cannot. Make sure to choose a model that can be adapted to your weed species with relative ease.

If a sample dataset is provided, run the model with the dataset to assess:

- How the model works
- Ease of use
- Data format requirements
- Whether the model output is what you would expect
- Whether the model can be adapted to fit your needs

Assemble the Required Data

An advantage of using or refining an existing model is that the data inputs have already been established. Review the data requirements to determine what data you already have and what data you will need to gather or generate. Local GIS shops or the internet are good places to start your search for data. Though this guide does not recommend one data source over any others, links to a few of the more common data clearinghouses are provided below. Note that your data may require special formatting before it can be used in the model. Check the model documentation and sample dataset, if provided, for guidance.

Geospatial Data Clearinghouses

- USDA Forest Service Geospatial Data Clearinghouse* (<http://fsweb.clearinghouse.fs.fed.us/>) (*only available to Forest Service users)
- USDA Geospatial Data Gateway (<http://datagateway.nrcs.usda.gov>)
- Geospatial One-Stop (<http://www.geo-one-stop.gov>)
- GeoCommunity (<http://data.geocomm.com>)
- GIS Café (<http://www.giscafe.com>)

Run the Model and Assess the Results

Once the data are prepared, run the existing model for a small area that you are familiar with or where there is good historic weed spread data available. This allows you to evaluate the model results and determine what adjustments need to be made. You may need to modify data parameters and/or incorporate additional data to improve the model output. Continue running and adjusting the model for the small area until the results are satisfactory. When the model is satisfactory, apply it to the entire study area and assess the results, adjusting and rerunning the model if needed.

