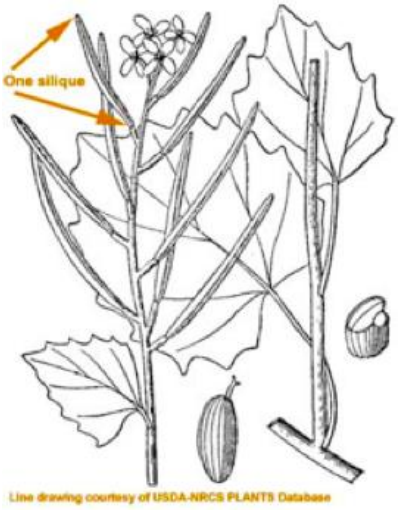
Garlic Mustard Distribution



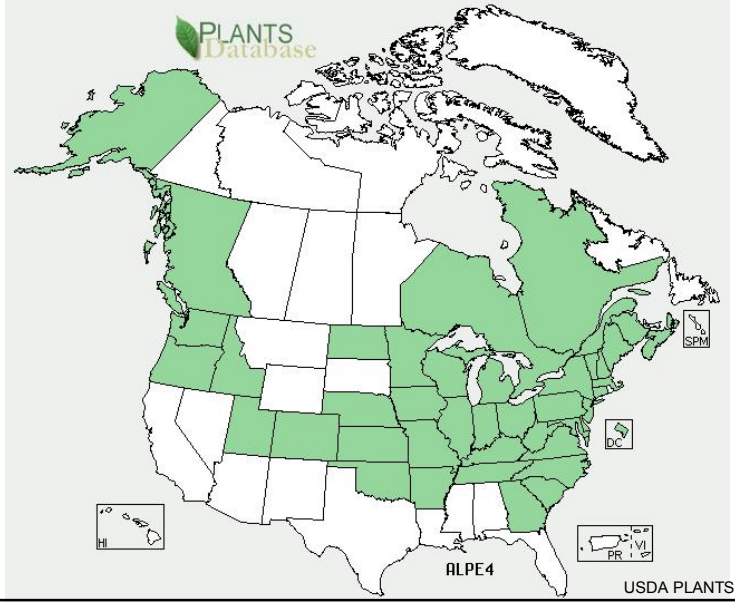
Brian Adair

Solye Brown

Alliaria Petiolata (garlic mustard)

- Biennial
- Brought to North America as a culinary and medicinal herb (useful treating skin ulcers, throat infections, gangrene) and to help control erosion.

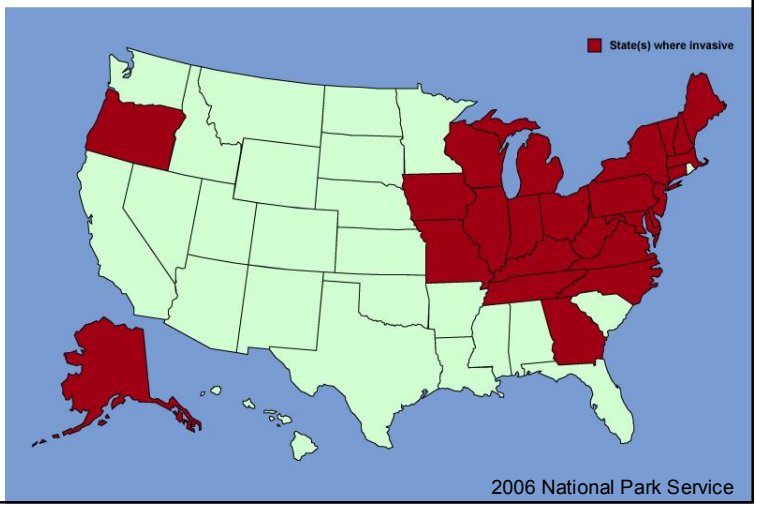
States Where Garlic Mustard is Present



USDA PLANTS DATABASE

States Where Garlic Mustard is Considered Invasive

- Garlic mustard was introduced into the US in 1868
- First documented in Oregon in 1959 in Multnomah County (ODA website)



2006 National Park Service

Infestation

•Invades and dominates woodlands, savannahs, roads, streamsides, trails, and agricultural land
•Releases isothiocyanate compounds into the soil changing the composition of leaf litter and interfering with beneficial mycorrhizal associations between the fungi and woody plants.
• Garlic mustard then forms a dense monocultural understory, displacing native flora and reducing food and habitat for native fauna.

Infestation

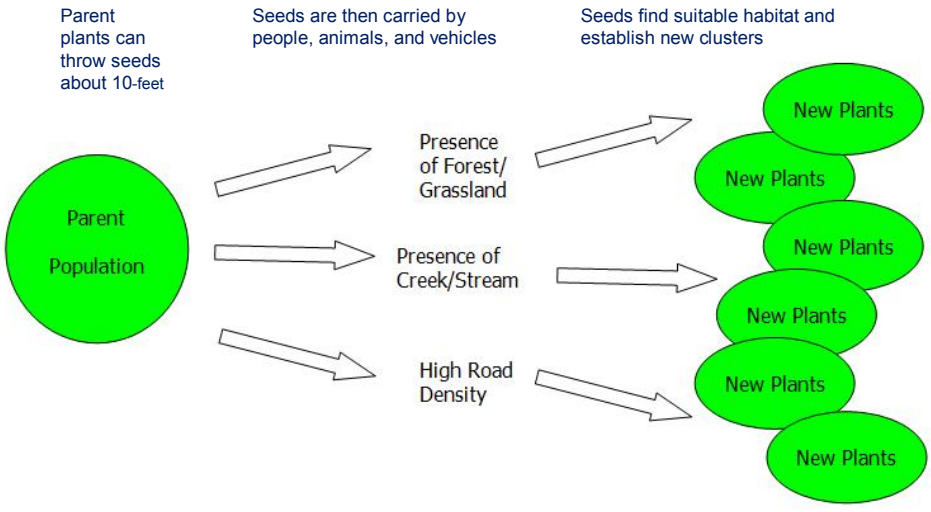
(continued)
•Shows adaptive traits of a colonizer plant (high growth rate, short life cycle, high allocation of resources to reproduction, cross- and self-pollinating by generalist pollinators)
•Acclimates to different irradiance levels
•When established it monopolizes light, moisture, nutrients, and space
•Grows mostly in disturbed areas but the microdisturbance from a deer hoof can give garlic mustard a foothold.
•No natural enemies in North America.

Seeds

Seed rain is up to15K seeds per square meter per year for a dense patch. Seed bank can last 5 years. Seeds spread mostly by people and animals

COURTESY OF USDA-NRCS PLANTS DATABASE

How Garlic Mustard Spreads



Eradication/Management

- Manual removal
- Burns or torching
- Herbicides
- Overplant with fast-growing, shade-tolerant natives
- Treat ground with corn gluten
- Introduce a predator (not really such a good idea…)
- It IS edible

Nature Center Stewardship Stew

FRIDAY, MAY 18, 2007

Garlic Mustard: if you can't beat it, eat it!

NCSL's 2nd annual **Garlic Mustard Pestival** is May 19. Sold out. Like last year.

This month **Lara Roketenetz** led a volunteer battalion to harvest the invasive weed, **garlic mustard**. Lara is NCSL's natural resources specialist. **Sergio Abramof** came up with an unbelievable menu. Staff and volunteers transformed the Center into an Italian bistro. Wine will be served, which always seems to enhance attendance. The 120 guests will enjoy:

Peppered picanha beef sliders *with horseradish garlic mustard pesto sauce*

Grilled summer vegetable platter *marinated with garlic mustard and drizzled with balsamic glaze*

Grilled and chilled salmon *with garlic mustard pesto, kalamata tapenade*

Chilled farfale tri-color pasta *with sweet peppers, garlic mustard, virgin olive oil & sea salt*

Stuffed pasta shells, *mascarpone, spinach and garlic mustard stuffing, fresh marinara sauce*

Trevisana salad: *baby greens, strawberries, pistachio, garlic mustard-balsamic vinaigrette*

This event's not a money maker, just a Friend Raiser and a good way to sneak in some education to a willing group. (Lara created an award-worthy slide show that runs throughout the event.) *It's all mission.* Tickets were $25 and $35 for non-members.

Sergio (above, right) rocks for donating his talent and time! We look forward to doing lots of creative events partnering with the restaurateur, who runs **Sergio's** in University Circle and **Sarava** in Shaker Square.

Lara (at right) rocks for creating and spearheading the concept. Lara's Stewardship Saturdays attract anywhere

Contributors

Nature Center
Victoria Mills
Jan Zorman

Previous Posts

Bottle Wall
starting to take shape
Wishful Thinking
Breaking ground.
on a stewardship note
What's that fly ash doing in my concrete?
Major shout out to Paul Hummer!
CTE '07
Cob House building at CTE '07
Submit your vision for the Stewardship Center!

Stewardship Center Wishlist

straw bales
lumber for framing, roofing and posts
metal roofing
hardware, nuts to bolts and in-between
lime plaster
bamboo
dowels
rebar
electrical wiring
conduit
fixtures
a big dump truck for transporting 30 yds of clay
skilled carpenters
elctricians
roofers
sculptors
mural artists
metal fabricators
woodworkers
lots and lots of people who want to get their hands dirty and learn how to build a strawbale and cob

Garlic mustard is considered a delicious and nutritious green by some people. It is rich in Vitamin A and Vitamin C and easy to use in recipes. It is free, and easily harvested.

The past few weeks have been the ideal time for pulling out the plants, as they start to get big, and up to the time that they begin to flower, but before they set seed. I only had a few plants in my yard, as I try to pull all of them every year, but I don't have to go far to find vast fields of them. Recently I filled several bags at the Fuerties bird sanctuary here in Ithaca, New York, and another day on the path along the water north of the Farmer's Market. Some delicious ideas:

- Young tender leaves can be torn up a bit and added to salads.
- Sautee garlic in olive oil or sesame oil or bacon grease; add chopped garlic mustard and other greens if available (garlic chives, spinach, arugula, lambsquarters, mustard greens, what-have-you); a little salt or soy sauce; add a bit of water or stock and cook gently. A dash of vinegar, balsamic or otherwise, may be in order. Taste and decide. This could be spread on toast, added to casseroles, eggs, quiche, stir-fries, etc.
- Garlic mustard pesto: crush garlic, slice up garlic mustard and also garlic chives if available, puree both in food processor with olive oil and walnuts (or pine nuts); add parmesan cheese. Start the water for pasta!
- Cream sauce: heat 1/4 cup oil and add 1/4 cup flour and cook; add hot milk. Separately cook finely chopped garlic mustard in a little sesame oil and tamari or soy sauce. Add some of the sauce; puree in food processor and add back to the sauce. Add cheese as desired. Good on stuffed grape leaves for one.
- With leftover garlic mustard sauce, add a little yogurt, balsamic vinegar, and tamari and serve as a sauce for steamed asparagus.
- Make a sauce for roast beef. First the roast beef: make a slurry with crushed garlic and Worcestershire sauce, and make little inch slashes on the roast. Take a teaspoon to inject the slurry into the slashes, and slather the rest of the slurry all over the roast. Add some water to the bottom of the roast pan. Cover with aluminum for part of the cooking time so the outside doesn't burn. Bake at 325 til it reaches the desired internal temperature according to your meat thermometer. Make a cream sauce with the garlic mustard: Chop finely the garlic mustard and garlic chives, which are also in great abundance. Sautee in olive oil; add chicken stock or other liquid and cook gently. Make a cream sauce (as above) and add it all together along with drippings from the roast beef pan. This is so flavorful - cheese is unnecessary.

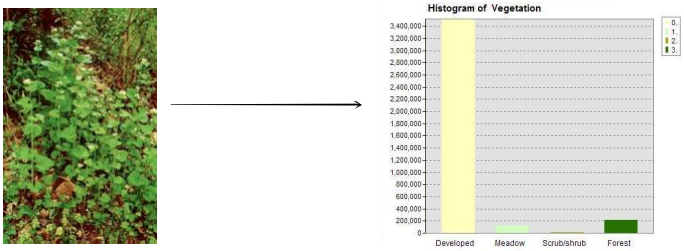
May 13, 2006

Another garlic mustard pull at the Biodiversity Preserve today, and another beautiful day despite (or maybe because of) the dramatic clouds building up and erupting into rolling thunder as we were leaving. We had two smaller groups today, but our group made considerable progress clearing out a lovely wooded area full of wildflowers -- white foam flower, bishops cap, dark-pink flowered geraniums, jack-in-the-pulpit, and blue cohosh -- right near a beaver dam in the Cayuga Inlet. Betsy called it the "Sugar Cup" and said they have been working on that area at least every second year for the past eight years, and the efforts are obviously paying off as the clumps were much fewer than in the past. So that was particularly satisfying to wander around and pick every garlic mustard in sight until after a while we could no longer find any.This time I brought along a garlic mustard appetizer to introduce everyone to its flavor. I modified Jane Brody's "Spinach and cheese squares" recipe from *The Good Food Book*. Instead of the 10 oz frozen spinach spinach, I used almost that much garlic mustard which I had previously cooked as above (2nd delicious idea). The addition of garlic chives is excellent too, if you have it available.

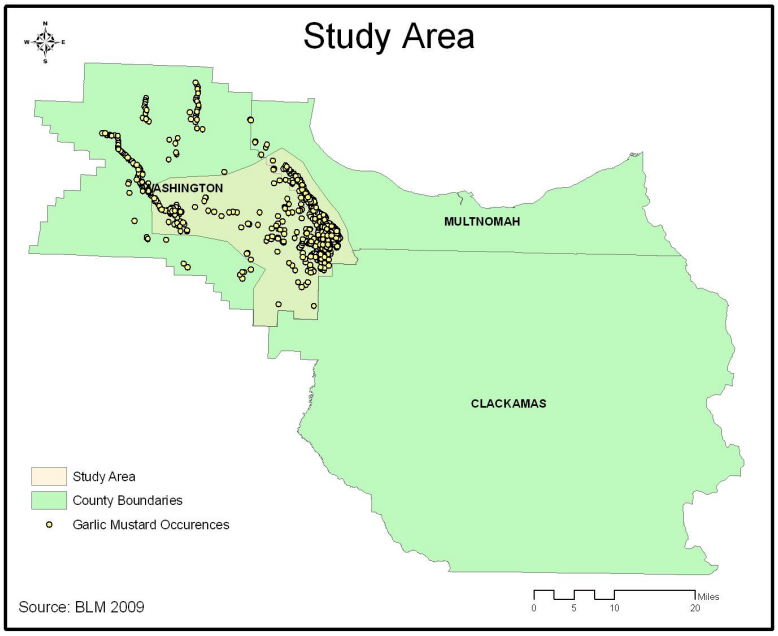
- 2 eggs
- 6 T whole wheat pastry flour
- 8 oz cooked garlic mustard

So, where can you find it?

What landscape habitat factors predict the distribution of garlic mustard in the northwest Portland Metropolitan Area?

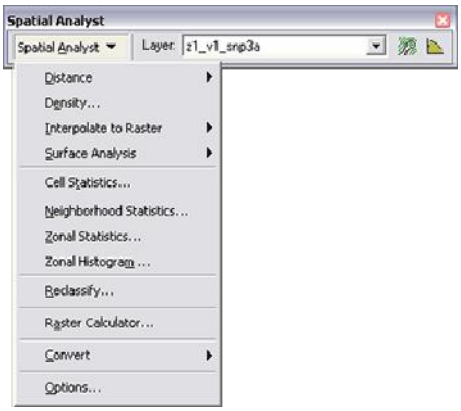


…we looked at forest/grassland, presence of creek or stream, and road density, vacant/developed land, and soil type.



Methods

- Rasterize features
- Reclassify rasters
- Build models
- Validate models

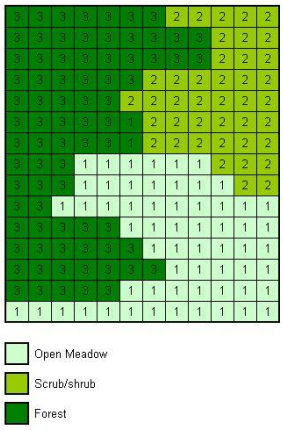


Rasterizing Features

- Kernel density plot of garlic mustard occurrences
- Line density plot of streets and roads
- Convert vegetation polygons to rasters
- Calculate a Euclidean distance for streams

Reclassifying Rasters

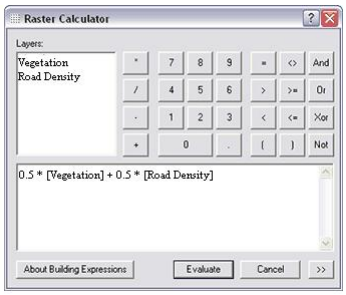
- All rasters reclassified to 3 ordinal categories
  - 1 = unsuitable
  - 2 = marginal habitat
  - 3 = good habitat



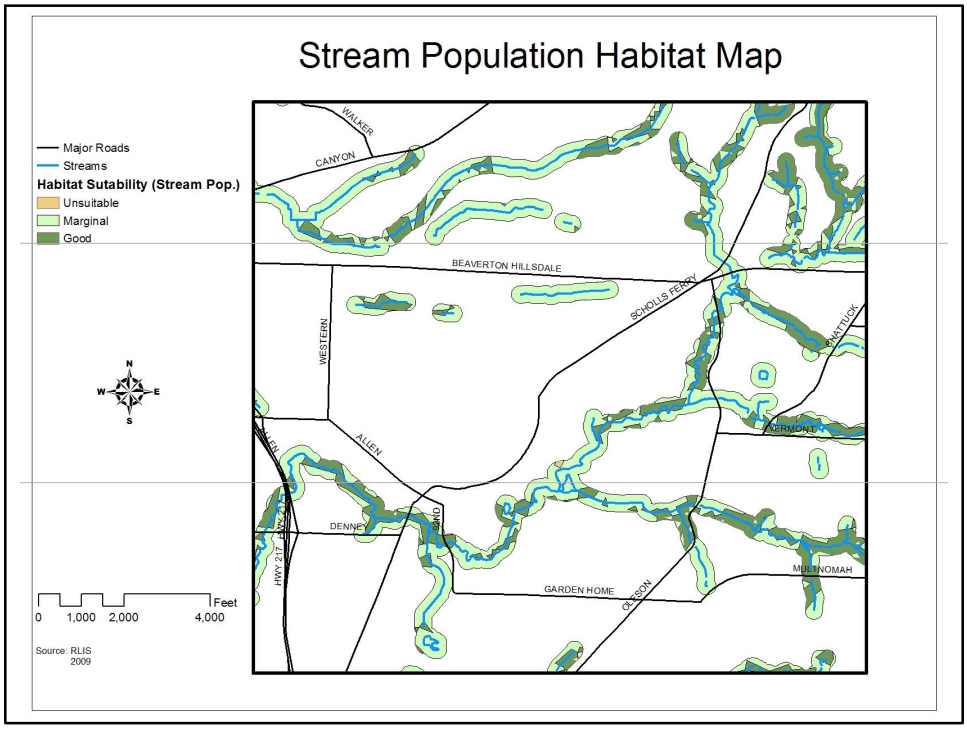
Build Models

- Based on earlier analyses garlic mustard occurrences were separated into two distinct populations.
  - Stream population
  - Satellite population
- Models were built for each population using the raster calculator and all variables were given equal weight.

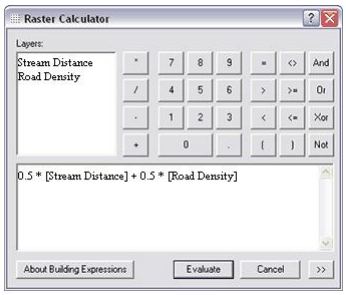
Stream Population Model



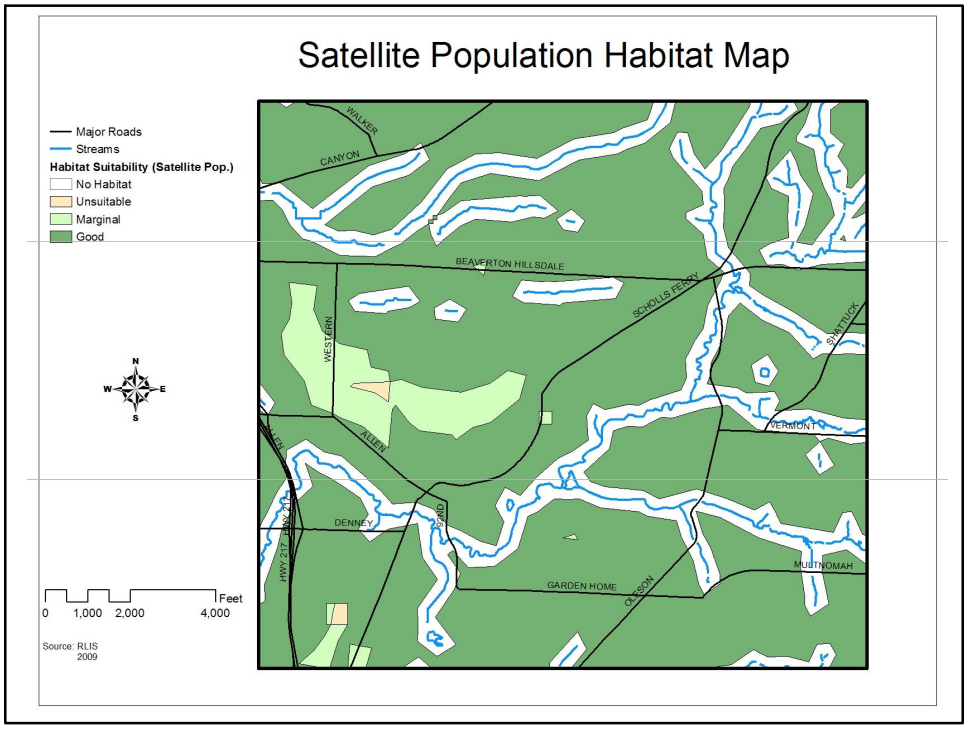
- Vegetation type
  - 1 = meadow
  - 2 = scrub/shrub
  - 3 = forest
- Road density
  - 1 = low
  - 2 = moderate
  - 3 = high



Satellite Population Model



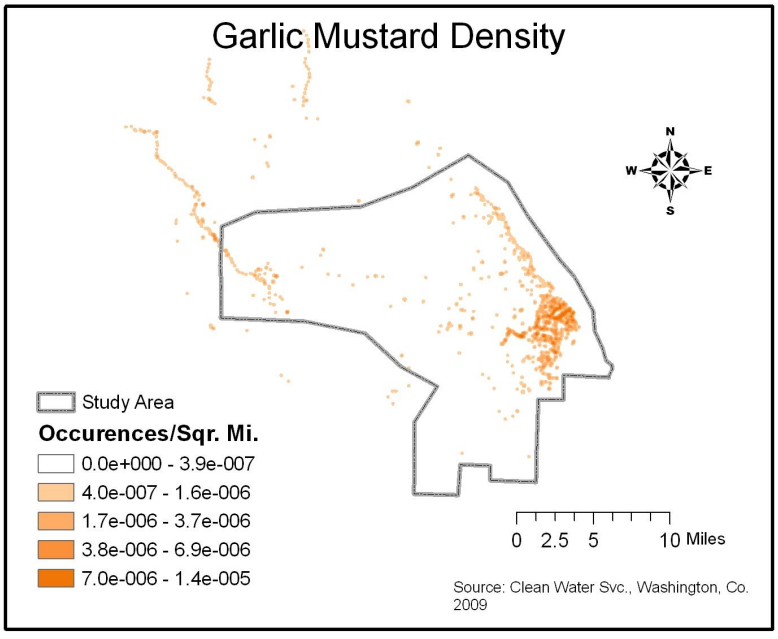
- Distance from stream
  - 1 = far
  - 2 = medium
  - 3 = near
- Road density
  - 1 = low
  - 2 = moderate
  - 3 = high

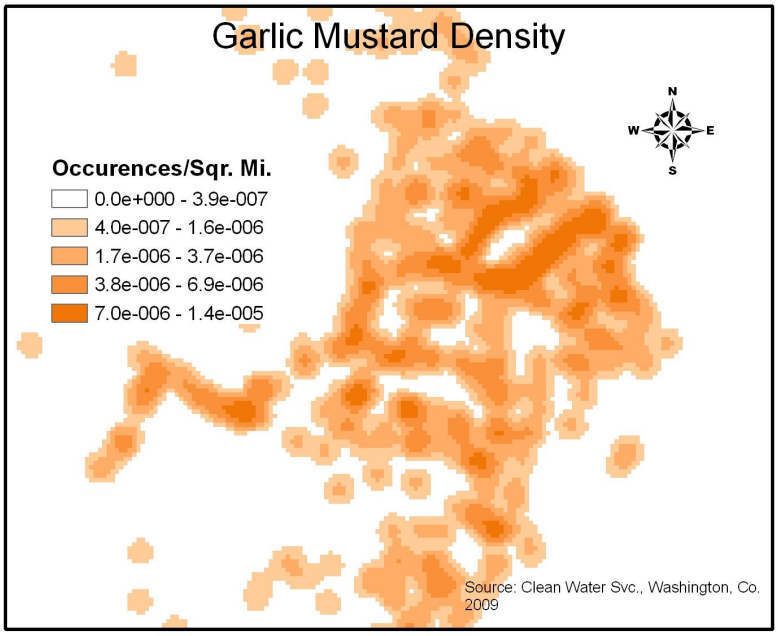


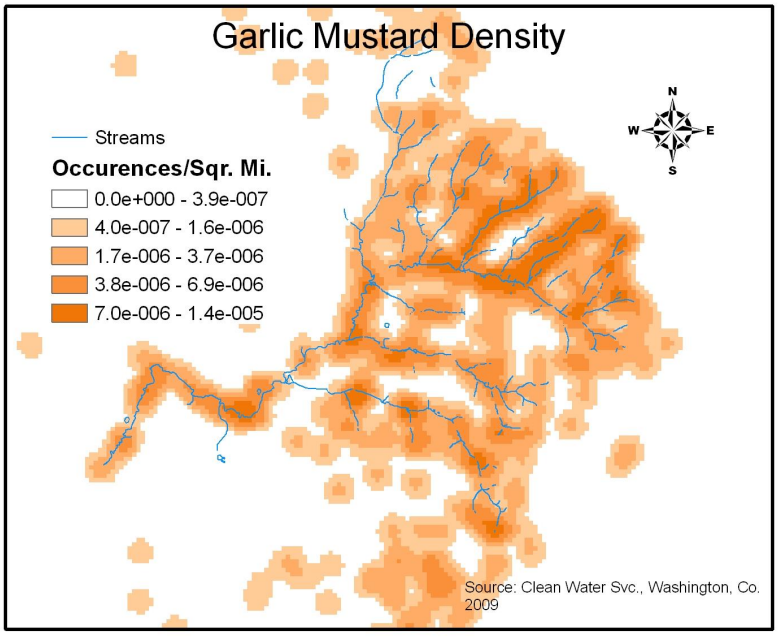
Model Validation

- The Chi-Square test was used to determine if actual garlic mustard distribution differed significantly from a homogeneous distribution among habitat types.

Results


Garlic Mustard Density
N
W
E
S
Study Area
Occurences/Sqr. Mi.
0.0e+000 - 3.9e-007
4.0e-007 - 1.6e-006
1.7e-006 - 3.7e-006
3.8e-006 - 6.9e-006
7.0e-006 - 1.4e-005
0 2.5 5 10 Miles
Source: Clean Water Svc., Washington, Co. 2009


Garlic Mustard Density
N
W
E
S
Occurences/Sqr. Mi.
0.0e+000 - 3.9e-007
4.0e-007 - 1.6e-006
1.7e-006 - 3.7e-006
3.8e-006 - 6.9e-006
7.0e-006 - 1.4e-005
Source: Clean Water Svc., Washington, Co. 2009


Garlic Mustard Density
N
W
E
S
Streams
Occurences/Sqr. Mi.
0.0e+000 - 3.9e-007
4.0e-007 - 1.6e-006
1.7e-006 - 3.7e-006
3.8e-006 - 6.9e-006
7.0e-006 - 1.4e-005
Source: Clean Water Svc., Washington, Co. 2009

Where is the Stream Population?

Landscape Habitat Value	Area* (%)	Expected Occurences	Observed Occurences	Observed Occurences (%)
Unsuitable	56%	341	0	0%
Marginal	40%	239	315	52%
Good	4%	23	288	48%
Total	100%	603	603	100%

Predicted Rates

Unsuitable 0.0%
Marginal 9.4%
Good 90.6%

Chi-square test results: Stream Population

- **P value and statistical significance:**
  - Chi squared equals 3418.428 with 2 degrees of freedom.
  - The two-tailed P value is less than 0.0001
  - By conventional criteria, this difference is considered to be extremely statistically significant

Where are the Satellite Populations?

Landscape Habitat Value	Area (%)	Expected Occurences	Observed Occurences	Observed Occurences (%)
Unsuitable	17%	91	1	0.2%
Marginal	38%	201	21	3.9%
Good	45%	241	511	95.9%
Total	**100%**	**533**	**533**	**100.0%**

	Predicted Rates
Unsuitable	0.5%
Marginal	4.7%
Good	94.8%

Chi-square test results: Satellite Population

- **P value and statistical significance:**
  - Chi squared equals 552.695 with 2 degrees of freedom.
  - The two-tailed P value is less than 0.0001
  - By conventional criteria, this difference is considered to be extremely statistically significant.

References:

1)“Aspects of the Ecology of an Invasive Plant, Garlic Mustard (Alliaria petiolata), in Central Illinois” by Roger C. Anderson, Shivcharn S. Dhillion, and Timothy M. Kelley, 1996
2)Wild Ones Journal, July/August 2006
3)USGS; accessed online
4)Oregon Department of Agriculture; accessed online
5)USDA; accessed online
6)Invasipedia (University of California Davis); accessed online
7) “Invasive Species Summary,” Columbia University, 2001, accessed online
8) consider-the-lillies.org
9)“Invasive Species Definition Clarification and Guidance White Paper,” 2006, National Invasive Species Council; accessed online
10) Wisconsin Department of Natural Resources; accessed online
11) “Allelochemicals Isolated from the Tissues of the Invasive Weed Garlic Mustard (Alliaria petiolata)”; Vaughn and Berhow, Bioactive Agents Research, USDA, ARS, National Center for Agricultural Utilization Research, 1999

No deed is too low for garlic mustard, the state's most devious weed

It's hard to kill, ducks mowers and poisons other plants

BY BETH CASPER • STATESMAN JOURNAL

GARLIC MUSTARD

Questions?