



# Garlic Mustard (*Alliaria petiolata*) Early Detection Monitoring at Homestead National Monument of America

Natural Resource Report NPS/HTLN/NRDS—2010/259



**ON THE COVER**

Garlic mustard plant found at Homestead National Monument of America.

Photograph by: Jesse Bolli, Resource Management Specialist, Homestead National Monument of America.

---

# **Garlic Mustard (*Alliaria petiolata*) Early Detection Monitoring at Homestead National Monument of America**

Natural Resource Report NPS/HTLN/NRDS—2010/259

Mary F. Short, Craig C. Young, and Chad S. Gross  
National Park Service, Heartland I&M Network  
Wilson's Creek National Battlefield, 6424 West Farm Road 182, Republic, MO 65738

Jesse M. Bolli  
National Park Service  
Homestead National Monument of America, 8523 W. State Hwy 4, Beatrice, NE 68310



October 2010

U.S. Department of the Interior  
National Park Service  
Natural Resource Program Center  
Fort Collins, Colorado

The National Park Service, Natural Resource Program Center publishes a range of reports that address natural resource topics of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Report Series is used to disseminate high-priority, current natural resource management information with managerial application. The series targets a general, diverse audience, and may contain NPS policy considerations or address sensitive issues of management applicability.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner. This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

This report is available from the Heartland Inventory and Monitoring Network (<http://science.nature.nps.gov/im/units/htln>) and the Natural Resource Publications Management website (<http://www.nature.nps.gov/publications/NRPM>).

Please cite this publication as:

Short, M. F., C. C. Young, Bolli, J. M., and C. S. Gross. 2010. Garlic mustard early detection monitoring at Homestead National Monument of America. Natural Resource Report NPS/HTLN/NRDS—2010/259. National Park Service, Fort Collins, Colorado.

# Contents

	Page
Executive Summary .....	iv
Introduction.....	1
Methods.....	1
Results and Discussion .....	1
Literature Cited .....	3

## Executive Summary

In the spring of 2010 a search for garlic mustard (*Alliaria petiolata*), a non-native invasive plant species, was conducted at Homestead National Monument of America. Garlic mustard occurs throughout eastern and south-central Nebraska, including Gage County where the park is located. On April 26, 2010, prior to our search, a small amount of garlic mustard was found at the monument and hand-pulled. Our comprehensive search of all woodland habitat in the park a few days later found no garlic mustard. We hope that early detection and removal efforts have eradicated garlic mustard from the park.

## Introduction

A non-native biennial, garlic mustard (*Alliaria petiolata*) invades woodlands throughout the Eastern and Midwest regions of the United States (Anderson et al. 1996). Garlic mustard is a shade-tolerant species and prefers shaded habitat, including both disturbed and undisturbed woodland (Anderson et al. 1996, Kaul 2006). Several mechanisms have contributed to the success of garlic mustard invasion in North American forests (Rodgers et al. 2008). Garlic mustard contains secondary compounds that reduce the plant's palatability to herbivores, thereby allowing garlic mustard a competitive advantage over other understory vegetation (Rodgers et al. 2008). Furthermore, garlic mustard produces allelopathic compounds in the soil, inhibiting germination of other plant species and also affecting soil biota (Prati and Bossdorf 2004, Rodgers et al. 2008, Burls and McClaugherty 2008). Garlic mustard's high seed production and rapid growth in the second growing season allow garlic mustard to successfully outcompete other vegetation (Anderson et al. 1996, Rodgers et al. 2008). The impacts of garlic mustard on a habitat can include alterations to soil microbial communities, a decrease in native flora abundance and loss of biological diversity (Anderson et al. 1996, Rodgers et al. 2008).

Since the first recorded occurrence of garlic mustard in Nebraska in 1975, the species has been found in at least 18 counties in the state, including Gage County, the location of Homestead National Monument of America (Kaul 2006). Recent increases in the occurrence of garlic mustard in eastern Nebraska demonstrate the importance of monitoring for this species at the monument (Kaul 2006).

On April 26, 2010, Jesse Bolli identified a patch of garlic mustard at Homestead National Monument of America. The location of the patch was approximately 0683813 meters east and 4461895 meters north (UTM, Zone 14, NAD83). The patch was approximately 2m x 3m in size and consisted of approximately 200 plants. Kent Pfeiffer of Nebraska Game and Parks and Karola Mlekush of the Heartland Inventory and Monitoring Network confirmed the identification. Jesse Bolli and Jake Warner then removed the plants by hand, collecting a volume of approximately 30 gallons.

## Methods

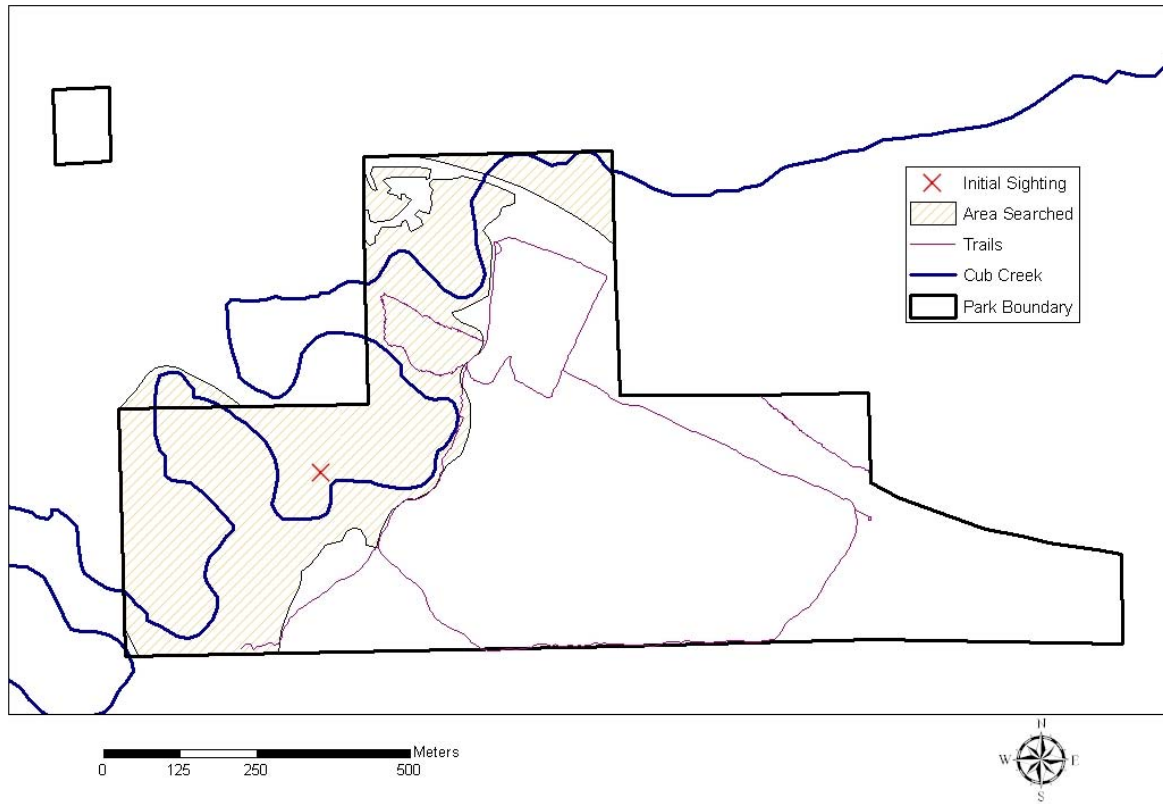
After detection and removal of the plants, on April 28 and 29, Jesse Bolli, Chad Gross, and Craig Young searched all wooded areas within Homestead National Monument of America for garlic mustard (Figure 1). Second-year plants would have been flowering during the search. Observers walked parallel transects, approximately 8 to 10 m apart, across all woodland habitat. While individual plants may have been overlooked, we believe that our search would have detected patches comparable to the one initially found on the park. Due to a GPS error in the field, we were unable to record our exact search paths as intended.

## Results and Discussion

Our thorough search of woodland habitat at Homestead National Monument of America found no garlic mustard on the park. We hope that the early detection and removal of this invasive plant eradicated garlic mustard within the park borders. In this case, early detection was a fortuitous finding while Jesse Bolli was conducting control of invasive tree species. Because prevention and early detection are principal strategies for successful invasive exotic plant management, monument staff should continue to work with the Heartland I&M program and Exotic Plant Management Team to monitor for future garlic mustard colonization. Because invasive exotic plants quite often undergo a lag period between introduction and subsequent colonization, managers can take advantage of early detection monitoring to identify invasive exotic species and eradicate these plants before populations become well-established. While there is a need for long-term suppression programs to address very high-impact species, eradication efforts are most successful for infestations less than one hectare in size (Rejmanek and Pitcairn 2002). Costs, or impacts, to ecosystem components and processes resulting from invasion also increase dramatically over time, making ecosystem restoration improbable in the later stages of invasion. Further, in their detailed review of the nonnative species problem in the United States, the U.S. Congress, Office of Technology Assessment (1993) stated that the environmental and economic benefits of supporting prevention and early detection initiatives significantly outweigh any incurred costs, with the median benefit-to-cost ratio being 17:1 in favor of being proactive. (Paragraph uses text directly from Welch 2007)



Homestead National Monument of America  
Garlic Mustard Survey 2010



**Figure 1.** Search area for garlic mustard (*Alliaria petiolata*) at Homestead National Monument of America.

## Literature Cited

- Anderson, R.C., S.S. Dhilloni, and T. M. Kelley. 1996. Aspects of the Ecology of an Invasive Plant, Garlic Mustard (*Alliaria petiolata*), in Central Illinois. *Restoration Ecology* 4(2): 181-191.
- Burls, K. and C. McClaugherty. 2008. Landscape Position Influences the Distribution of Garlic Mustard, an Invasive Species. *Northeastern Naturalist* 15(4): 541-556.
- Kaul, R.B., D. Sutherland, and S. Rolfsmeier. 2006. The Flora of Nebraska. School of Natural Resources, University of Nebraska-Lincoln, Lincoln, Nebraska.
- Office of Technology Assessment. 1993. Harmful non-indigenous species in the United States. OTA-F-565. U.S. Congress, Government Printing Office, Washington, D.C., USA.
- Prati, D. and O. Bossdorf. 2004. Allelopathic Inhibition of Germination by *Alliaria petiolata* (Brassicaceae). *American Journal of Botany* 91(2):285-288.
- Rejmanek, M., and M. J. Pitcairn. 2002. When is eradication of exotic pest plants a realistic goal? Pages 249-253 in C. R. Veitch and M. N. Clout, editors. *Turning the Tide: the Eradication of Invasive Species*. IUCN SSC Invasive Species Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.
- Rodgers, V.L. K.A. Stinson, and A.C. Finzi. 2008. Ready or Not, Garlic Mustard is Moving In: *Alliaria petiolata* as a Member of North American Forests. *Bioscience* 58(5): 426-436.
- Welch, B.A. 2007. Chapter 1. Introduction. Pages 1-11 in B.A. Welch and P.H. Geissler, editors. *Early Detection of Invasive Species Handbook*, United States Geological Survey, unpublished draft.

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 368/105868, October 2010

**National Park Service**  
**U.S. Department of the Interior**



---

**Natural Resource Program Center**  
1201 Oakridge Drive, Suite 150  
Fort Collins, CO 80525

[www.nature.nps.gov](http://www.nature.nps.gov)

**EXPERIENCE YOUR AMERICA™**