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Geocaching: A New Instructional Tool for Natural Resources Extension and Outreach

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Cover Page Footnote

We appreciate the insight and support provided by Jim Hancock and Randy Chapin of the Mississippi Forestry Commission, and we also thank the Mississippi Forestry Commission for providing the “Don’t Move Firewood” incentives for the caches. We are grateful for the assistance provided by Kenneth Calcote from the Bureau of Plant Industry division in the Mississippi Department of Agriculture and Commerce, and Jennifer Head of the Mississippi Department of Wildlife Fisheries and Parks. Project funded by the 2016 Farm Bill. This material is based upon work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under Project No. MIS-311330. Comments by Leigh Greenwood (The Nature Conservancy), Mark Megalos (North Carolina State University), and Adam Downing (Virginia Cooperative Extension) on a previous version of this manuscript greatly improved it.

Geocaching: A New Instructional Tool for Natural Resources Extension and Outreach

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Abstract. Nonnative pests and pathogens severely affect forest health and are often spread in firewood. Our objectives were to create an extension education program using “Don’t Move Firewood”-themed geocaches and travel bugs which were placed near campgrounds across Mississippi, and to assess the efficiency and effectiveness of this outreach method. Interactions with caches and travel bugs were monitored over nearly one year and summarized to provide a measure of outreach success. With a one-time per-unit cost of \$45.95 for caches and \$6.75 for travel bugs, these tools provide ongoing, cost-effective educational approaches well suited to augment existing or launch new outreach efforts.

INTRODUCTION

A constant challenge in natural resources education is getting the public’s interest and affecting them in a way that induces behavioral changes. Often, the first step is to get people to think about the problem. Invasive insects can be a challenging topic because many people lack enthusiasm for invertebrates compared to their interest in plants or vertebrates. Using geocaching as a cost- and time-effective educational tool allows access to an untapped demographic of outdoor enthusiasts.

Geocaching is a modern-day global positioning system (GPS)-powered treasure hunt that has been used to promote engagement in outdoor recreation and tourism (Boys et al., 2017; Ihamäki, 2012). The gamelike experience (gamification) allows users to read an online geocache description, find the cache in the real world by using GPS coordinates, and log their experience online. Participants can also find bar-coded trackable items called “travel bugs” that can be moved from cache to cache.

Geocaching has been termed “instructional geocaching” (Mayben, 2010) when used to promote learning. Other digital experiences, such as Pokémon Go, have been correlated with increased user curiosity about insects because insectlike creatures are characters in the game (Schmidt-Jeffris & Nelson, 2018), and gamification has been used to enhance learning across many fields (Zainuddin et al., 2020).

Forest health is the scientific discipline of managing insect and pathogen pests of forests. Outdoor enthusiasts are an obvious target demographic for forest health outreach because they often use and move firewood, which contributes to the spread of invasive forest pests (Jacobi et al., 2012; Muirhead et al., 2006). A survey conducted at outdoor recreation areas in Florida showed that geocaching/hiking was the third-leading visitor activity (Borisova et al., 2016), suggesting that geocaching can engage a key target demographic: outdoor enthusiasts who travel and use recreational areas.

Geocaching has not been previously used as an educational tool to combat nonnative forest pests. Pests such as the emerald ash borer and laurel wilt threaten entire tree genera and have already caused billions of dollars in damage (Aukema et al., 2011; Haack et al., 2010; Herms & McCullough, 2014; Hughes et al., 2017). To prevent damage to trees from invasive insects hitchhiking in firewood, the public needs to know the associated risk. We explored whether geocaching could be used to spread the “Don’t Move Firewood” message. Our objectives were to test the use of geocaching as an educational tool and compare costs between this method and face-to-face Extension programming.

METHODS

We constructed nine geocaches (materials cost \$45.95 each), with durability and longevity being priorities over cost. Each cache hiding site was in or near a major outdoor recreational area (see Figure 1) to target potential firewood users/transporters. Each cache’s “Don’t Move Firewood” theme (see Figure 2A) was customized to the forest type in which it was placed and to potential nonnative pests that could affect that forest type. Each cache description contained background information on the area in which the cache was hidden, information about the nonnative pest of concern and potential damages if the pest were to be introduced into that forest type, and links to relevant web resources (see Appendix A).

We also created travel bugs (see Figure 2B; \$6.75 each) using resin-cast exotic forest insects. When encountered, users log the tracking code stamped on the travel bug at www.geocaching.com, which tracks who picked it up and where it traveled (see Figure 2B). Each travel bug’s individual website included information on pest origin, point of introduction, preferred hosts, and the pest’s potential damage should it be moved in firewood. Like the geocache descriptions, travel bug write-ups contained additional weblinks and infographics (see Appendix B).

The seven travel bugs we “released” into our geocaches traveled nearly the circumference of Earth and visited 349 caches in almost one year (see Figure 3A). Whenever a new user interacted with one of our travel bugs, a potential new audience (cache creators and subscribers) was exposed to our message.

Interactions for our caches and travel bugs were summed from deployment to April 30, 2019 (see Figure 4). If the same user serially moved a travel bug to multiple caches, we considered each of these an individual interaction.

Invasive Forest Insect Pest Outreach Geocaches

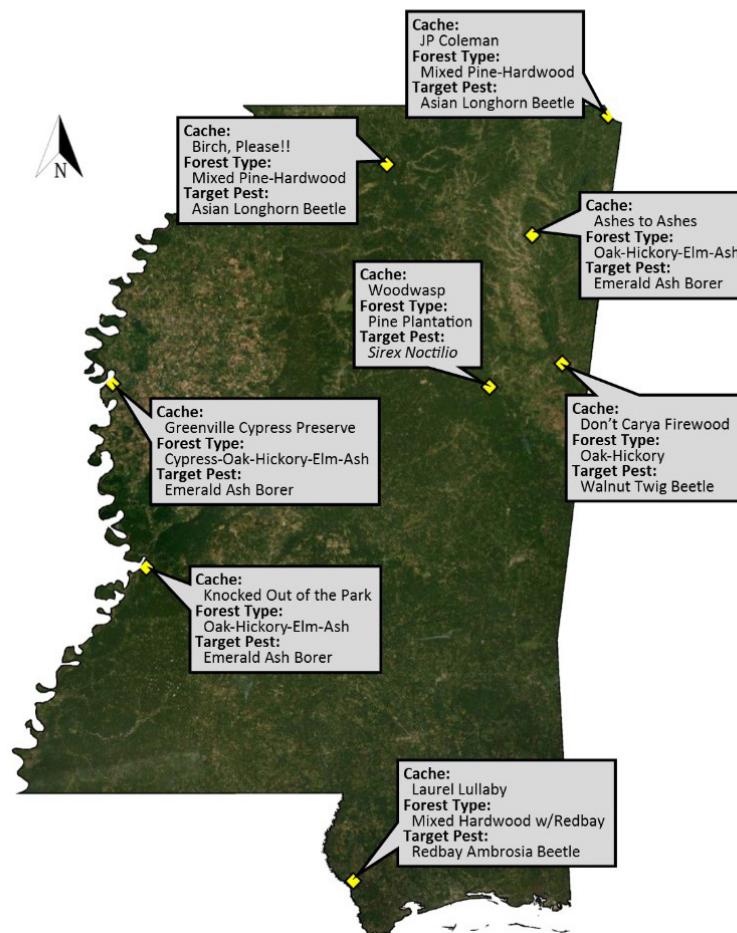


Figure 1. Map of instructional geocaches hidden in Mississippi as outreach tools for informing users about invasive forest insect pests.

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Figure 2. (A) Example geocache container and “Don’t Move Firewood” swag, including a pencil, fan, key chain, earplugs, and mobile electronics charger. (B) Travel bug (trackable) example with a resin-cast exotic forest insect pest placed in each cache.

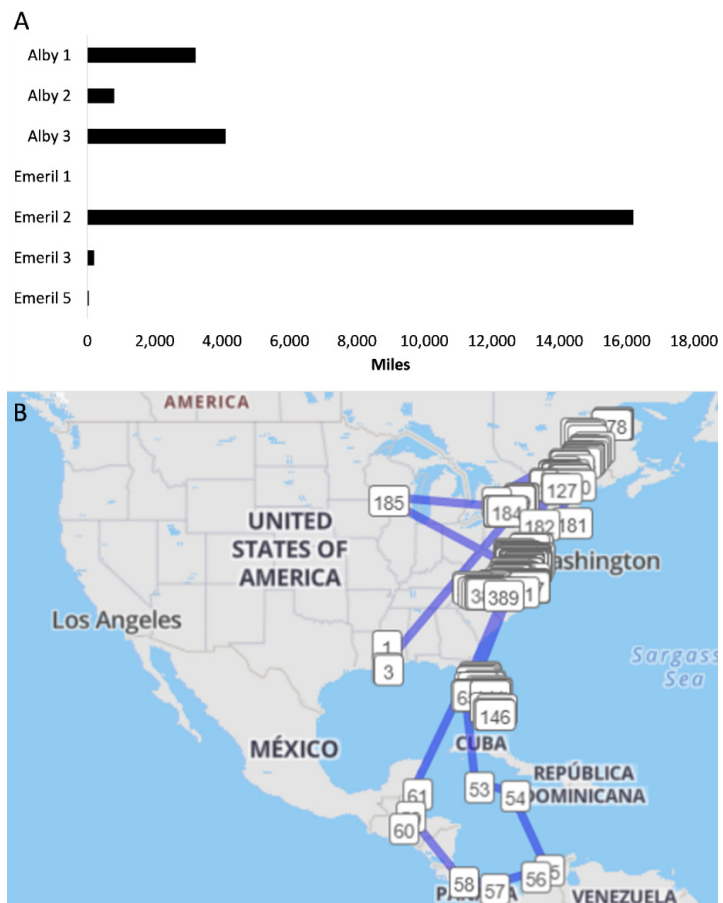


Figure 3. (A) Miles traveled by travel bugs. (B) Example travel-bug tracking map showing “Emeril 2” movements.

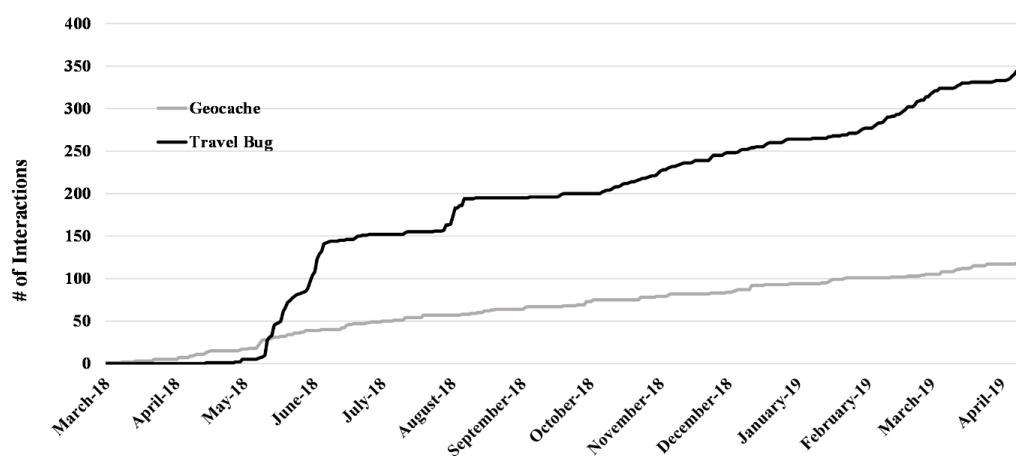


Figure 4. Cumulative interactions over time for geocaches and travel bugs during an evaluation of the efficacy of geocaching as an education/outreach tool.

RESULTS AND DISCUSSION

Over the deployment period (see Table 1), 468 users interacted with caches and travel bugs. There were more than three times more interactions per day with travel bugs ($0.14 \pm 0.01 SE$) than with geocaches ($0.04 \pm 0.01 SE$). The average cost per interaction was nearly three times greater for caches than for travel bugs (\$4.04 and \$1.34, respectively). In comparison, estimated costs for face-to-face Extension workshops are greater than for instructional geocaching, at \$35 per interaction, while webinars cost about \$2 per interaction (Coyle, unpublished data, 2018), and are on par with instructional geocaching.

In addition to benefits from gamification, instructional geocaching also benefits from strengths associated with being a virtual form of facilitated learning. Virtual education and facilitated learning are efficient teaching strategies with situational advantages and trade-offs and have rightfully earned a place in the Extension education toolkit alongside traditional face-to-face education (Anderson et al., 2021; Wise, 2017).

Table 1. Deployment Dates for Instructional Geocaches and Travel Bugs Included in an Examination of Geocaching as an Effective Education and Outreach Tool in Natural Resources Conservation

Type	Name	Deployed (2018)	Duration (days) ^a
Cache	Wood Wasp	March 20	406
	Knocked Out of the Park	April 10	385
	Ashes to Ashes	May 17	348
	Birch Please!!	May 18	347
	JP Coleman	May 18	347
	Greenville Cypress Preserve	May 23	342
	Laurel Lullaby	May 27	338
	Don't Carya Firewood	August 7	266
Travel bug	Alby 1	March 27	399
	Emeril 2	April 10	385
	Emeril 3	May 17	348
	Alby 2	May 18	347
	Emeril 1	May 23	342
	Alby 3	May 27	338
	Emeril 5	July 3	301

^aSummed through April 30, 2019.

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Table 2. Geocache and Travel Bug User Comment Examples

Outreach source	User comments
Geocaches	“Beautiful here!!! Traded TBs and on our way. A perfect example of why I love geocaching!”
	“TFTC! Very informative and fun find while camping.”
Travel bugs	“We recently did a construction project near Mississippi State and enjoyed our stay there very much! Such friendly folks. This TB surely does tell a sobering tale. I will make an effort to be careful. Thanks for sharing.”
	“Grabbed alby from the TB hotel and will assist in spreading awareness.”
	“I hate you ash borer.”

Note. TB = Travel Bug; TFTC = Thanks For The Cache.

Instructional geocaches and travel bugs are low-maintenance and cost-effective options for engaging a target audience. Caches and travel bugs can stay active for years with minimal maintenance and be accessible year-round to the target demographic.

We relied on user comments to provide insights on information retention and how users reacted to the material (see Table 2). The ability of travel bugs to move (see Figures 3B and 4) among caches further supports the potential of this method as an outreach option. We recommend that future investigations of instructional geocaching use external questionnaires and/or external links with tracking capabilities to gain more detailed insights into learning outcomes, as the geocaching platform does not inherently support these capabilities.

USE IN FUTURE OUTREACH PROGRAMS

One potential hurdle for using geocaching as an educational tool is that geocache rules prohibit caches that “support a cause”; therefore, cache write-ups must be carefully written to not trigger problems with volunteer cache reviewers who approve new caches. Travel bugs have no such restrictions.

ACKNOWLEDGMENTS

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APPENDIX A. LINKS TO INSTRUCTIONAL GEOCACHE DESCRIPTIONS THAT WERE PART OF A “DON’T MOVE FIREWOOD” EDUCATION CAMPAIGN IN MISSISSIPPI

Geocache	Link
Ashes to Ashes	https://www.geocaching.com/geocache/GC7PTJV_ashes-to-ashes
Birch, Please!!	https://www.geocaching.com/geocache/GC7PTX5_birch-please
Don’t Carya Firewood	https://www.geocaching.com/geocache/GC7R6BB_dont-carya-firewood
Greenville Cypress Reserve	https://www.geocaching.com/geocache/GC7NQCH_greenville-cypress-preserve
JP Coleman	https://www.geocaching.com/geocache/GC7P2KH_jp-coleman
Knocked Out of the Park	https://www.geocaching.com/geocache/GC7MV3V_knocked-out-of-the-park
Laurel Lullaby	https://www.geocaching.com/geocache/GC7Q63H_laurel-lullaby

APPENDIX B. LINKS TO INSTRUCTIONAL TRAVEL BUG DESCRIPTIONS THAT WERE PART OF A “DON’T MOVE FIREWOOD” EDUCATION CAMPAIGN IN MISSISSIPPI

Travel bug	Link
Alby 1	https://www.geocaching.com/track/details.aspx?id=6967773
Alby 2	https://www.geocaching.com/track/details.aspx?id=6967786
Alby 3	https://www.geocaching.com/track/details.aspx?id=6967755
Emeril 1	https://www.geocaching.com/track/details.aspx?id=6967768
Emeril 2	https://www.geocaching.com/track/details.aspx?id=6967784
Emeril 3	https://www.geocaching.com/track/details.aspx?id=6967745
Emeril 4	https://www.geocaching.com/track/details.aspx?id=6967780
Emeril 5	https://www.geocaching.com/track/details.aspx?id=6967762