

ASSESSING TREE CARE PROFESSIONALS' AWARENESS AND KNOWLEDGE ABOUT THE ASIAN LONGHORNED BEETLE

Jason M. Hathaway, Cem M. Basman, and Susan C. Barro¹

ABSTRACT.—The level of knowledge and awareness possessed by tree care professionals about the Asian Longhorned Beetle (ALB) is critical for the successful detection and eradication of this pest. A small sample of tree care professionals was surveyed about the ALB (from within the City of Chicago) in the summer of 2001. Results indicate that only 35 percent of survey respondents were “informed” (answered all questions correctly) with respect to the four ALB knowledge questions. Only 35 percent of respondents who reported having “high experience” dealing with pest infestations were “informed” with respect to the four ALB knowledge questions. An increased effort in educating professionals in the green industry may result in swift detection and eradication of the ALB and future pest infestations.

Each year a wide variety of organisms are unintentionally introduced into the United States primarily as a result of the increase in world trade (Haack and others 1997). According to the United States Congress (1993), some 4,500 exotic organisms are established in the United States. Of these organisms, more than 400 are insects that feed on trees and shrubs (Haack and others 1997). Many tree feeding exotics cause little apparent damage each year, while some have caused significant damage to forest ecosystems.

A recent and dangerous exotic insect to arrive in the United States is the Asian Longhorned Beetle (*Anoplophora glabripennis*). The Asian Longhorned Beetle (ALB) was first detected in the United States in New York City in August 1996 (Haack and others 1997). The eradication strategy for the ALB calls for removal of any tree found to be infested. According to a recent report (USDA 2001), 5,324 trees from within the New York City area had been removed because of ALB infestation. The ALB has also caused significant damage to urban trees within the greater Chicago area since its discovery there in the summer of 1998. The City of Chicago, along with state and federal partners, moved quickly

to respond to the infestation. Chicago quarantined the movement of wood materials out of the most heavily infested areas. By the summer of 2001, the quarantined areas included the Chicago neighborhoods of Ravenswood, Addison, Summit, Park Ridge, and O'Hare Airport (fig. 1). As of September 2001, the infestations by the ALB had led to the removal of 1,523 trees from within the quarantined areas of Chicago (USDA 2001).

Without a quick response to the ALB infestation by the City of Chicago in cooperation with State and Federal agencies, the situation would have been much worse. According to estimations made by Nowak and others (2001), up to 2.5 million or 61 percent of all trees within the area would have been at risk, at an estimated cost of \$1.2 billion to the City of Chicago if the infestation had gone unchecked. In a worst-case scenario where no quarantine restrictions exist and a projected spread rate of 3 km per year, the City of Chicago could become totally infested in only 5 years (Nowak and others 2001). The magnitude of this devastating threat has caused the eradication of the ALB to become a very high priority for the City of Chicago.

¹ Graduate Research Assistant (JMH) and Assistant Professor (CMB), Department of Forestry, Southern Illinois University Carbondale, Mailcode 4411, Carbondale, IL 62901-4411 and Research Social Scientist (SCB), North Central Research Station, USDA Forest Service, St. Paul, MN 55108. CMB is corresponding author: to contact, call (812) 855-4711 or e-mail at cmbasman@indiana.edu.

Citation for proceedings: Van Sambeek, J.W.; Dawson, J.O.; Ponder, F., Jr.; Loewenstein, E.F.; Fralish, J.S., eds. 2003. Proceedings, 13th Central Hardwood Forest conference; 2002 April 1-3; Urbana, IL. Gen. Tech. Rep. NC-234. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 565 p. [Peer-reviewed paper from oral presentation].

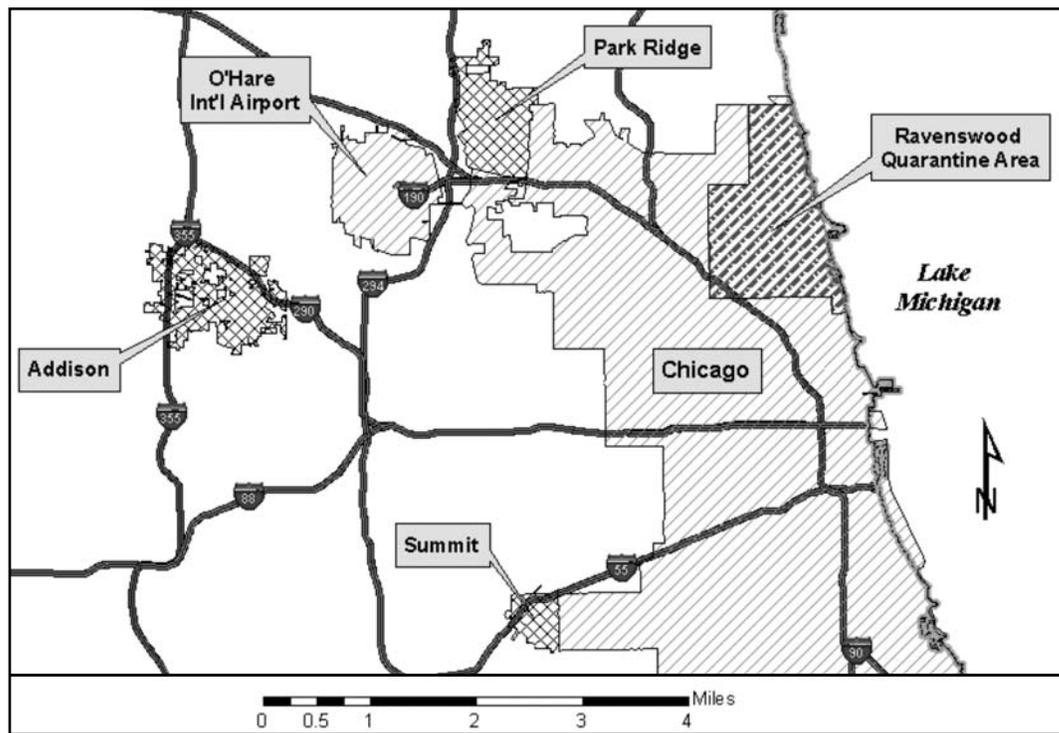


Figure 1.—Quarantined areas for the Asian Longhorned Beetle in the Chicago-land area through the summer of 2001 (USDA 2001).

Preventing the spread of ALB infestation to other major cities remains a concern for governmental agencies dealing with pest infestations. The ALB needs to be eradicated quickly from wherever it is detected. Tree care professionals, having day-to-day contact with a city's trees, can play an important role in the first line of defense against the beetle. Their effectiveness in this role is dependent on their knowledge and understanding of the biology and life history of the ALB, the signs of ALB infestation, and how to handle infested trees and woody material.

BIOLOGY AND INFESTATION

There are many host tree species to which the ALB is attracted. For example, in Chicago the ALB has been found feeding on the tree species: maple (*Acer*), horse chestnut (*Aesculus*), apple (*Malus*), chinaberry (*Melia*), mulberry (*Morus*), poplar (*Populus*), cherry (*Prunus*), pear (*Pyrus*), locust (*Robinia*), willow (*Salix*), elm (*Ulmus*), birch (*Betula*), rose of sharon (*Hibiscus*), ash (*Fraxinus*), and citrus (USDA 2001). As the beetle egg hatches in the bark, the larvae moves into the tree wood where it overwinters and feeds, and then emerges the following spring, signs of the ALB are left behind.

Detecting the evidence of an ALB infestation is critical for eventual eradication of the pest. Inspectors must examine individual trees for

unique exit and entry holes of the insect. This can be cumbersome because the beetle typically chooses the top of the tree canopy as it begins its assault on the tree. Inspectors also look for piles of frass (sawdust) at the base of infested trees and in branch crotches, as well as sap leaking from wounds in the trees. Another sign of ALB activity is unseasonable yellowing or drooping of leaves when the weather has not been especially dry (Benson 1998).

While examining potential host trees for signs of ALB activity, inspectors may come across adult beetles working on limbs or trunks of infested trees. Being able to confirm sightings of adult beetles is another crucial method of detection. Adult ALB are 1.25 inches long with antennae that are as long as their bodies (Benson 1998). Each antenna is checkered black and white, and the body is shiny black with white spots. Larvae are cream-colored with distinct mandibles and mature to the same length as adult beetles (Ellis 1998).

After a tree has been found to be infested with an ALB, infested plant material must be removed and disposed of properly. Because of the lengthy egg-laying period, deep feeding habits within the tree by the larvae, and lack of any significant biological control agents, complete tree removal has been chosen as the best

strategy for eradication (Haack and others 1997). Trees that are removed are cut, chipped, and incinerated. This method of tree removal has proven to be very effective within the greater Chicago-land area.

EFFECTIVE COMMUNICATION NEEDS

The level of knowledge and awareness of ALB by tree care professionals may affect their ability to swiftly and successfully detect this pest. Informational and educational materials available to tree care professionals can play an important role in raising awareness and in turn detecting the beetle. Governmental agencies and organizations charged with eradicating the ALB need to provide useful and understandable information and educational materials about ALB to tree care professionals. Tree care professionals deal directly with the resource. They may be the first to be consulted by homeowners who suspect something is wrong with their tree. Ultimately a more informed cadre of tree care professionals may lead to more efficient detection and eventual eradication of the ALB.

Attempts to provide an effective education and information effort to a specific group about a natural resource issue can be challenging according to research by Bright (1994), as the success levels of the communication efforts are highly variable. The effectiveness of a communication effort can improve with carefully focusing communication strategies to the specific needs of a particular target group (Basman 1998).

Targeting educational efforts may begin by determining what a specific group currently knows about an issue (Slater 1992). For example, by understanding the extent and scope of knowledge held by tree care professionals about the ALB within the greater Chicago-land area, more effective educational materials could be developed by government agencies and organizations charged with disseminating information. There have been many endeavors by government agencies and organizations to disseminate information to the green industry, however, to date, no assessment of the tree care professionals' knowledge or beliefs about the ALB has been conducted.

The purpose of the current study was to assess tree care professionals' awareness and knowledge levels about the Asian Longhorned Beetle (ALB) within the greater Chicago-land area, and to determine the sources from which tree care professionals received information regarding the ALB, and the perceived credibility of these sources. Specifically, the study objectives were to:

- 1) Determine the various sources of ALB information utilized by tree care professionals and assess their perceived credibility and utility of the information sources.
- 2) Determine the various sources of ALB training made available to tree care professionals and assess their perceived credibility of these sources.
- 3) Assess tree care professionals' knowledge levels regarding four diagnostic signs of ALB infestations and develop a proficiency profile of their knowledge levels.
- 4) Assess the self-perceived experience levels of tree care professionals regarding pest infestations and compare to their proficiency levels about the ALB.
- 5) Develop suggestions for improving communication and education efforts by governmental agencies and organizations to tree care professionals regarding the detection and eradication of the ALB.

METHODS AND PROCEDURES

The study subjects were selected from tree care companies located in or adjacent to the ALB quarantined areas within the greater Chicago area by a non-random convenience method. A list of 118 tree care companies within or adjacent to these quarantined areas was compiled from telephone directory listings and an Internet search. In June 2001, each of the 118 tree care companies were contacted by phone. The researcher provided a brief explanation of the study and asked if the company would be willing to participate.

If the company agreed to take part in the study, they were mailed a survey. This occurred during the peak summer business time for tree care professionals when ALB issues would be most salient. A self-addressed pre-paid envelope was provided with the survey for the return of surveys upon completion.

Survey Instrument

The survey instrument for the current study evaluated respondents' knowledge about ALB and its life history, their beliefs and belief strengths about the status of the ALB infestation, the types of educational and training materials available from government sources, and the type of information and education delivery methods best suited for the tree care profession. Basic sociodemographic information was also collected.

Tree care professionals were asked four multiple choice questions to assess their knowledge regarding the ALB: "where sawdust created by

the ALB would most likely be located;" "the shape of ALB exit holes;" "the size of ALB exit holes;" and "what is the current most effective method of eradicating the ALB." To assess beliefs about the status of the ALB infestation in Chicago, respondents were asked four questions about their beliefs about the status of the ALB infestation in Chicago. A 7-point Likert-type scale was utilized to assess the belief scores of respondents that ranged from "strongly disagree or very detrimental" to "strongly agree or very beneficial," with "neither" as the midpoint of the scale.

To assess the certainty scores for the belief questions, a 7-point Likert-type scale was utilized that ranged from "very uncertain" to "very certain," with "neither" as the midpoint of the scale. According to Bright (1994) and Basman (1998), certainty about a belief is an indication of the strength by which these beliefs are held by individuals.

Self-perceived experience levels of respondents were assessed using a five-point scale that ranged from "no experience" to "much experience", with "average experience" measure as the midpoint of the scale. General sociodemographic information regarding individual and business backgrounds was also collected. Open-ended questions were also asked allowing respondents to make additional comments regarding the ALB infestation in the greater Chicago area. Respondents were provided a list of information sources and delivery systems (including those methods currently used by USDA-APHIS, USDA Forest Service, and City of Chicago) and asked to identify the "most useful" method in which they would like to receive information regarding the ALB.

Survey data were entered into SPSS Version 10 for analysis. Descriptive type data were collected as well as Chronbach's Alpha tests were run to determine reliability coefficients.

RESULTS

Of the 118 total companies contacted via telephone calls, 22 companies agreed to participate and 69 companies were left messages but did not respond, 13 did not wish to participate, and 14 were out of business at the time the survey was conducted. A total of 91 surveys (22 who agreed to participate and 69 left messages) were mailed to tree care companies. Thirty-four surveys were returned resulting in a 37 percent response rate.

Demographic Information

Tree care professionals located from within the Chicago-land area were used as respondents for the current study. Eighty-two percent of respondents were male and 15 percent of respondents were female. Ages of respondents ranged from 29 years old to 69 years old with the mean age being 48 years. Position titles listed by surveyed respondents were mainly owner/president at 53 percent of respondents. The remainder of job titles listed by survey respondents was: manager (18 percent), supervisor (9 percent), office manager (9 percent), sales (3 percent), climber (3 percent), and consulting arborist (3 percent). Seventy-seven percent of survey respondents reported they were fulltime employees.

Respondents reported they have worked in the tree care industry from 1 year to 44 years with 21 years as the mean number of years. More than half (55 percent) reported they were certified within the tree care industry. Of those who reported being certified, 27 percent were certified from the International Society of Arboriculture and 21 percent being certified from the Illinois Arborist Association. Additionally, the majority of survey respondents (70 percent) reported their highest level of education completed as either "some college" or as a "college graduate." The remainder of survey respondents reported their highest level of education completed as: "high school graduate" (10 percent), "trade or technical school" (10 percent) and "graduate or professional school" (10 percent).

ALB Information Sources

Survey respondents were asked to indicate whether or not they had received ALB information from seven different sources. They were also asked to report how credible they believed these sources to be. Eighty-eight percent of respondents indicated that they received information from "home television" and 65 percent of respondents received ALB information from the "USDA-APHIS" (table 1). The information received from the "USDA-APHIS" was reported as being the most credible ($m = 4.57$) The "Internet" was reported as the least utilized source of ALB information by tree care professionals, being used by less than 1 percent of respondents.

To assess source credibility, an index was created by summing respondents' scores for quality and value of the score. Reliability tests yielded Chronbach's Alpha scores of 0.83 to 0.99 for credibility index scores.

Table 1.—Sources of information about the Asian Longhorned Beetle utilized by tree care professionals and their perceived credibility scores. (n=34)

Information Source	Utilized by respondents		Credibility index		SD
	Percentage		n	Mean*	
	Alpha**				
Home television	88 %	30	3.79	0.94	0.83
Home newspaper	70 %	24	3.76	0.98	0.91
USDA-APHIS	65 %	22	4.57	0.48	0.96
Work newsletters	50 %	17	4.41	0.67	0.88
Home radio	50 %	17	3.56	1.25	0.95
Chicago/Dept. of Forestry	32 %	11	4.15	0.41	0.99
Work training	27 %	9	4.44	0.39	0.97
USDA Forest Service	12 %	4	4.38	0.47	0.99
Internet	—	1	3.00	—	—

* Mean scores based on 5 point credibility scale: 1 = very poor, 2 = poor, 3 = neutral, 4 = good, and 5 = excellent.
 ** Chronbach's Alpha reliability coefficient for credibility index (mean of "quality" and "value" scores).

Respondents were asked to report the preferred methods for receiving ALB information in the future from a provided list of methods or by selecting "other" and writing in a method (table 2). Nearly 60 percent of respondents would prefer to receive their ALB information in the future from "bulletins." Only 14 percent of survey respondents reported that they would prefer to receive ALB information in the future from the "Internet."

Survey respondents were asked to indicate whether or not they had received ALB training from four different organizations (USDA-APHIS, City of Chicago, USDA Forest Service, and place of employment) and to report on the perceived quality of this training. Nearly 30 percent of the respondents received ALB training from their "place of employment;" while 17 percent indicated they had received training from "USDA-APHIS." Only 2 respondents indicated receiving ALB training from the "City of Chicago" (table 3). ALB training provided by the "USDA-APHIS" was considered of greatest value with a mean score of 4.57. An index was created by summing respondents' scores for quality and value of the source. Reliability tests yielded high Chronbach's Alpha scores of 0.96 or above for credibility index scores.

Knowledge and Experience

Survey respondents were asked four multiple choice knowledge questions regarding ALB diagnostic signs to determine knowledge levels. The majority of tree care professionals answered the ALB diagnostic knowledge questions correctly (table 4). Sixty-one percent of respondents answered correctly to "sawdust location," 94

Table 2.—Use of ALB and other pest related information. (n=34)

Method	Frequency	Percentage
Bulletins	20	58 %
Brochure	12	35 %
Video tape	10	29 %
Reports	6	17 %
Internet/ Websites	5	14 %
Training sessions/ workshops	4	11 %
Seminars	3	<10 %
Email	3	<10 %
Company newsletter	2	<10 %
Magnets (refrigerator)	1	<10 %
Other ¹	5	14 %

¹Included: mailed items; seminars from Illinois Arborist Association.

percent of respondents answered correctly to the "shape of ALB exit holes," 73 percent of respondents answered correctly to the "size of ALB exit holes," and 87 percent of respondents answered correctly to the "most effective eradication methods of the ALB."

A proficiency profile of tree care professionals' knowledge levels was created based on the total number of correct answers each respondent had to the knowledge questions. Survey respondents answers to the ALB knowledge questions were grouped into three new categories. Survey respondents who answered all four questions correctly were considered "informed." Survey respondents who answered two or three questions correctly were labeled "inconclusive" with respect to their proficiency. Although getting

Table 3.—Asian Longhorned Beetle training sources utilized by tree care professionals and their perceived quality scores. (n=34)

Training source	Utilized by respondents		Perceived quality index		
	Percentage	Alpha**	n	Mean*	SD
Work training	27 %	9	4.44	0.39	0.97
USDA-APHIS	17 %	6	4.57	0.48	0.96
Chicago Forestry	—	2	4.44	—	—
USDA Forest Service	—	1	5.00	—	—

* Mean scores based on 5 point quality scale: 1 = poor, 2 = fair, 3 = average, 4 = good, and 5 = excellent.
 ** Chronbach's Alpha reliability coefficient for perceived quality index (mean of "quality" and "value" scores).

Table 4.—Assessment of tree care professionals' answers to knowledge questions about the Asian Longhorned Beetle. (n=34)

Knowledge question	Answer correctly	
	Frequency	Percent
Sawdust (frass) location	20	61 %
ALB exit hole shapes	31	94 %
ALB exit hole size	24	73 %
Effective eradication method	28	87 %

three or four questions correct may seem to indicate substantial knowledge, any sign of ALB not detected could lead to breaking quarantines. Those who answered zero questions correctly were considered "uninformed." Respondents for this study were 35 percent (n = 12) "informed", 59 percent (n = 20) "inconclusive", and only one respondent was "uninformed" about the ALB (fig 2).

Survey respondents were asked to report their self-perceived experience levels regarding pest infestations with response choices of: no experience, little experience, average experience, a fair amount of experience, and much experience. Respondents' proficiency levels (as assessed through response to ALB knowledge questions) were then compared to experience levels. The larger majority (77 percent) of respondents who reported having a low level of experience regarding pest infestations fell into the "inconclusive" knowledge category (fig. 2). Respondents indicating an average amount of experience regarding pest infestations were either "informed" (50 percent) or "inconclusive" (50 percent). Respondents who reported having a high level of experience regarding pest infestations had a proficiency level of "inconclusive" to ALB knowledge questions making up 58 percent of survey respondents within that group.

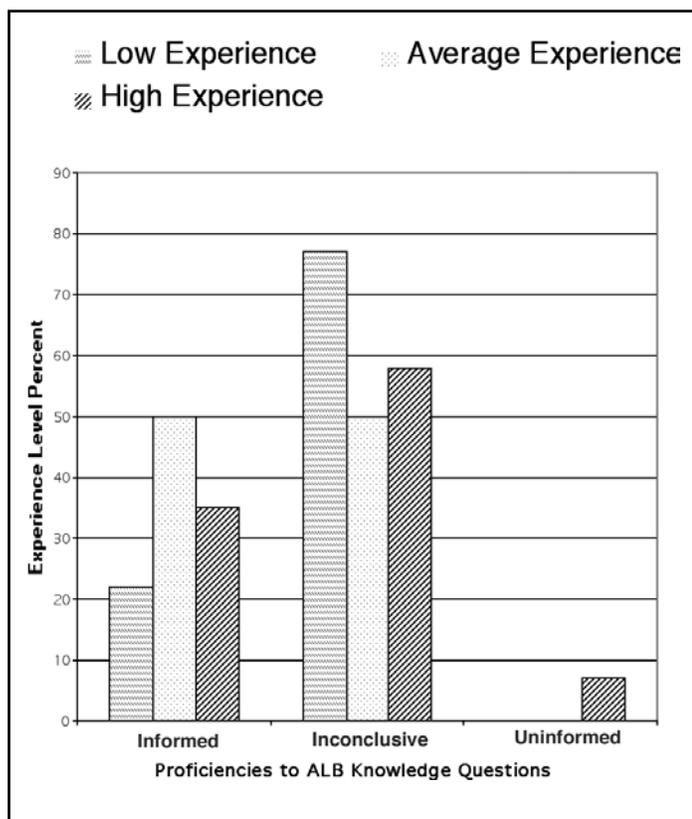


Figure 2.—Percent of self-perceived experience levels regarding pest infestations by tree care professionals knowledge proficiency levels about the Asian Longhorned Beetle.

CONCLUSIONS

Our study was a preliminary study looking at tree care professionals' knowledge and awareness levels regarding the ALB or other pest infestations. Although our study had a relatively low response rate, it can still serve as an initial step in learning more about this important group of people in the battle against the ALB. The study focus on awareness, knowledge, and information sources was targeted at identifying places where the communication process breaks down. With this knowledge we can take steps to overcome these communication barriers. The

current study indicates the largest amount of information tree care professionals receive about the ALB comes from local media sources (television and newspaper).

While the volume of information received by tree care professionals from the USDA-APHIS was not as great as that received from media sources, it was considered the most credible source. The tree care professionals we heard from are not currently utilizing the Internet to obtain ALB or other pest related information. This may indicate that tree care professionals do not have access or are unaware of information available from the Internet. Rather, respondents to this survey reported that they would prefer to receive ALB and other pest related information in the future mainly from brochures and bulletins. This has important implications for agencies such as APHIS, since more and more organizations are moving information to web based access and reducing or eliminating more traditional information venues.

Survey respondents reported their training was most frequently obtained from their place of employment. The number of tree care companies who received training from the City of Chicago (which is only available upon request) was very minimal. This may indicate that professionals from within the green industry are not aware of the training services offered by the city or do not have the interest or time to receive such training.

Slightly more than a third of respondents answered all four knowledge questions correctly. An increased effort from agencies in charge of dealing with the ALB and other pest infestations in training professionals in the green industry may increase the overall knowledge and awareness of tree care professionals insuring that the ALB and other pest outbreaks are swiftly contained and properly exposed of in the future.

Tree care professionals are challenging groups to communicate with because of the change-over of tree care companies (as shown by 13 percent out of business) and the diversity of tree care companies (small companies versus large companies) evidenced by the survey respondents. Tree care professionals are in a key position to make a difference in the war on the ALB and state and federal agencies charged with handling the ALB need to know how to best communicate with the green industry to 'win the war'.

ACKNOWLEDGMENTS

This study was funded by the North Central Research Station, United States Department of Agriculture, Forest Service, Evanston, Illinois, 60202-2357.

LITERATURE CITED

- Basman, C.** 1998. The effect of salience on natural resource recreation knowledge and behavior. Fort Collins, CO: Colorado State University. Ph.D. dissertation.
- Benson, D.** 1998. Asian longhorned beetle infests Chicago. *American Nurseryman*. 188(6): 10.
- Bright, A.** 1994. Information campaigns that enlighten and influence the public. *Parks and Recreation*. 49-54.
- Ellis, J.** 1998. Asian beetles bore trees to death. *American Gardener*. 77(4): 20-21.
- Haack, R.; Law, K.; Mastro, V.; Ossenbruggen, S.; Raimo, B.** 1997. New York's battle with the Asian long-horned beetle. *Journal of Forestry*. 95: 11-15.
- Nowak, D.; Pasek, J.; Sequeira, R.; Crane, D.; Mastro, V.** 2001. Potential effect of *Anoplophora glabripennis* (Coleoptera: Cerambycidae) on urban trees in the United States. *Journal of Economic Entomology*. 94: 116-122.
- Slater, M.** 1992. Mass communication research: lessons for persuasive communication. In: Manfredo, M., ed. *Influencing human behavior*. Champaign, IL: Sagamore Publishing, Inc.
- United States Congress.** 1993. Harmful non-indigenous species in the United States. [On-line]. Available: http://www.wws.princeton.edu/~ota/ns20/alpha_f.html [June 2001].
- United States Department of Agriculture.** 2001. Asian Longhorned Beetle [On-line]. Available: <http://www.na.fs.fed.us/spfo/alb/data/ilinfest.htm> [September 2001].