New York Residents' Awareness of Invasive Species

Emerald Ash Borer

Wild parsnip, L.J. Mehrhoff

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EXECUTIVE SUMMARY

Invasive species have been proliferating in New York State for many years, despite the efforts of many organizations and state agencies. The general public, and also specific user groups, can help prevent the spread of invasive species. Understanding the level of awareness, knowledge, and concern about invasive species among the general public and the behaviors engaged in by specific stakeholder groups can guide educators and outreach coordinators as they develop programs to encourage people to behave in such a way as to prevent the spread of invasive species. This type of information has never been gathered before on a statewide basis and can serve as a baseline against which future outreach efforts can be measured.

We expected many residents of New York to have little awareness of invasive species. Therefore, we conducted a three-part study with part one being an initial screening survey to identify those with some level of awareness of invasive species, and parts two and three being a more in-depth follow-up survey by web/mail and a set of detailed telephone interviews with those who had some level of awareness. The follow-up survey and interviews were designed to identify how New Yorkers' concern about invasive species compares to other concerns, and whether their behaviors influence the spread of invasive species. This report details the results of the initial screening survey, which was conducted by telephone in the fall of 2014.

The specific objectives of this portion of the study were to:

1. Assess New Yorkers' awareness of invasive species statewide and by region;
2. Characterize stakeholder groups that are either particularly affected by invasive species or have the potential to affect the spread of invasive species themselves; and
3. Assess the primary news and information sources used by New York residents.

We found that three-quarters (74%) of New Yorkers were aware of the term "invasive species" or the definition we provided. One-third (34%), by their own assessment, "know something about them." Knowledge levels differ by region with 26% of NYC and Long Island residents knowing at least something about invasive species compared with 49% of Adirondack and SLELO (St. Lawrence – Eastern Lake Ontario) residents knowing something; other regions fell between these extremes.

We asked about awareness of seven invasive species. The most widely known species, by name at least, were water chestnut (59%) and wild pigs (57%). Awareness levels for the other species, which varied by region, can help educators decide where to focus their efforts. For example, zebra mussels have been present and spreading in New York waters for a number of years. Many people (76-79%) in the western, central and northern parts of the state were aware of them. Hydrilla, in contrast, is a relatively new invader still contained to a small portion of the state. Awareness and knowledge about this species is more limited in the same area (29-38% aware). Therefore, educators may have a greater impact on public awareness if they focus their efforts on hydrilla than on zebra mussels.

Information from the initial screening survey can also shed some light on the level of awareness and knowledge of invasive species among stakeholder groups. For example, 44% of gardeners

indicated they knew something about wild parsnip, but only 23% knew something about kudzu. Future outreach efforts with gardeners may not need to focus as much on raising awareness of wild parsnip, instead focusing more on kudzu.

TV and Internet appear to be the primary sources of news and information for New Yorkers. Using both of these outlets has the potential to reach at least three-quarters of residents.

The follow-up survey will provide more detailed information about people's level of concern about invasive species, behaviors they currently engage in that may contribute to the spread or help prevent it, and New Yorker's willingness to do more to prevent the spread and under what conditions.

ACKNOWLEDGMENTS

We wish to thank Chuck O'Neill who had the vision for this study, and reviewed the questionnaire and final report.

We thank Human Dimensions Research Unit (HDRU) staff member, R. Catherine Smith, who helped with table preparation and report formatting. The Survey Research Institute at Cornell University conducted the screening survey telephone interviews.

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INTRODUCTION

Invasive species, both aquatic and terrestrial, have been a concern in New York for a number of years. Following the 2005 report of the NY Invasive Species Task Force to the governor and legislature, a number of important invasive species actions were taken. In 2007, a new Title 17 of the NY Environmental Conservation Law, the NYS Invasive Species Council Act, established the New York Invasive Species Council and an Invasive Species Advisory Committee to assess "the nature, scope and magnitude of the environmental, ecological, agricultural, economic, recreational, and social impacts caused by invasive species in the state" and to identify and coordinate actions to prevent, control, and manage invasive species. In 2008, the New York Invasive Species Clearinghouse was formed to integrate invasive species databases and provide an information clearinghouse. Eight Partnerships for Regional Invasive Species Management (PRISMs) were also formed that divided the state into regions for more targeted invasive species control. The New York Invasive Species Research Institute and the on-line all-taxa invasive species database and mapping tool iMapInvasives New York were established. In late 2010, the Cornell Cooperative Extension Statewide Invasive Species Education Program (CCE ISP) was created. The Program's Mission is "to provide all New York stakeholders affected or potentially affected by (or influencing) invasive species with high quality science-based educational programs and cutting edge research-based information regarding invasive species of major concern to the State of New York" (http://nyis.info/index.php?action=about).

The Advisory Committee and the CCE ISP concluded that gaining an understanding of the public's knowledge and perception of the threat posed by invasive species to New York was integral to both the development and implementation of effective public invasive species prevention, education, and management efforts, as well as for tracking the success of the state's legislative, regulatory and education efforts to protect the state from further invasive species introductions. They perceived the need to collect data statewide on the level of awareness of New Yorkers regarding invasive species, what residents were currently doing that could impact the spread of invasive species, and how best to reach them to encourage them to take action to prevent the spread of invasive species. They believed the information would be valuable as the partners worked to improve their prevention, outreach and management efforts. This type of information had never been gathered before on a statewide basis, and could also serve as a baseline against which to measure future outreach efforts.

The Human Dimensions Research Unit (HDRU) at Cornell University has conducted numerous studies about the relationship between environmental awareness and concern and subsequent associated behavior. Regarding invasive species, the HDRU recently completed a study that examined the awareness of aquatic invasive species among anglers living in the Great Lakes region and their current actions to reduce the spread of aquatic invasive species (e.g., by removing plant material from fishing and boating equipment before moving to another water body) (Connelly et al. 2014).

The study reported herein allows us to apply our knowledge about the relationships between awareness, concern, and behavior to a broader audience of New York State residents and a broader range of invasive species. We expected many residents of New York to have a low level of awareness of invasive species. Therefore, we conducted a three-part study with part one being

an initial screening survey to identify those with some level of awareness of invasive species, and parts two and three being a more in-depth follow-up survey by web/mail and a set of detailed telephone interviews with those who had some level of awareness. The follow-up survey and interviews were designed to identify how New Yorkers' concern about invasive species compares to other concerns, and whether their behaviors influence the spread of invasive species. In addition to the desire to gather data at the statewide level there was also interest in knowing how awareness differed in various regions of the state. We divided the state into six regions using the PRISM regions as a base.

This report details the results of part one, the initial screening survey which was conducted by telephone in the fall of 2014.

The specific objectives of this portion of the study were to:

1. Assess New Yorkers' awareness of invasive species statewide and by region;
2. Characterize stakeholder groups that are either particularly affected by invasive species or have the potential to affect the spread of invasive species themselves; and
3. Assess the primary news and information sources used by New York residents.

METHODS

Sample Selection

New York is divided into eight PRISM regions described above and depicted in Fig. 1. It was not financially feasible to conduct enough telephone interviews to characterize each PRISM region. Accordingly, several regions were grouped together including Finger Lakes and Western NY, SLELO and APIPP (Adirondacks), and Lower Hudson and CRISP (Catskills). Since some counties were not contained wholly within a PRISM region (e.g., Saratoga), the county and those interviewed within it were assigned to the geographic region which contained the majority of the population of that county (e.g., Saratoga respondents were placed in the Capital/Mohawk region).

In the Finger Lakes and Western NY region, we drew separate samples from large metropolitan counties (urban) and from areas outside of large metropolitan counties (rural) to ensure that we could characterize residents of both metropolitan counties (which would otherwise dominate the samples) and nonmetropolitan counties.

The telephone sample was provided by the Marketing Systems Group. It was drawn from New York State telephone listings and also contained a cell phone sample. The sample was stratified by the six geographic regions (listed in Table 1), with slightly different quotas for the number of completed interviews desired in each region. The purpose of the larger quotas in some regions was to maximize the potential for interviewing people involved in specific recreational activities that we wanted to ask more about in the follow-up survey (e.g., camping and boating). The quotas for each region are reflected in the number of completed interviews shown in Table 1.

Figure 1. New York State PRISMs.

Screening Survey Interview Design

The interview included sections on awareness of invasive species (generally and for seven specific species), participation in activities that could be impacted by invasive species or contribute to the spread of invasive species (e.g., hiking, camping, boating), and use of news and information sources. At the end of the interview respondents who were aware of invasive species, either by recognizing the term or the definition we provided, were asked to provide their email or mailing address so that a more extensive follow-up survey could be sent to them. The full text of the screening survey interview is available in Appendix A.

Screening Survey Implementation

Screening survey interviews were conducted by telephone between September and November 2014. The first question respondents were asked was what county they lived in, resulting in their placement within a geographic region. Calling ceased when the quota of completed interviews was reached in each geographic region.

Analysis

Data analysis was done using SPSS (IBM SPSS Statistics 20). Pearson's chi-square test was used to test for statistically significant differences between regions at the $P \leq 0.05$ level, and to compare results by gender and residence area (i.e., urban, suburban, rural).

Data reported by region are unweighted and reflect the number of people who were interviewed in that region. However, to make statements about New York State residents as a whole, respondent data was weighted in proportion to the population in each region from which our sample was drawn.

RESULTS AND DISCUSSION

Survey Response

Over 3,000 telephone interviews were completed with New York State residents (Table 1). Three-quarters (79%) of those with working telephone numbers completed interviews. Overall, fewer than 10% refused to be interviewed and fewer than 5% could not be interviewed because no one in the household spoke English. The percentage who could not be interviewed because of a language barrier was higher in the NYC and Long Island region (14%) compared to the rest of the state.

Table 1. Response rate by region and overall.

Regions	# of Households Contacted	# of Interviews Completed	% Completed	% Refused	% Language Problem	% Other Not Completed[1]
NYC & Long Island	529	350	66	9	14	11
Lower Hudson & Catskill	832	651	78	7	3	12
Capital/Mohawk	837	650	78	10	1	11
Adirondack & SLELO	776	654	84	7	<1	8
Finger Lakes & Western NY	1,345	1,101	82	9	1	8
Rural Counties	787	651	83	9	<1	7
Urban Counties	558	450	81	9	2	8
Overall	4,319	3,406	79	8	3	10

[1]Too ill, did not live in New York State, etc.

Preliminary analysis of the data showed very few differences between the rural and urban counties in the Finger Lakes and Western New York regions. We therefore combined the data from the urban and rural counties (weighting appropriately) and divided the sample into a Finger Lakes region and a Western New York region. There were a number of significant differences between the newly created regions. All further analysis will report results for these regions separately. In the few cases where urban versus rural county differences were found, they will be highlighted in the text.

Interviewee Characteristics

Slightly over half (56%) of those interviewed were women and there were no differences in the percentages of women and men interviewed by region (Table 2). As we will see later in the report there were a few differences by gender in terms of awareness of invasive species.

Table 2. Gender, statewide and by region.

	Percent	
Regions	Male	Female
NYC & Long Island	42.9	57.1
Lower Hudson & Catskill	44.9	55.1
Capital/Mohawk	50.3	49.7
Adirondack & SLELO	42.5	57.5
Finger Lakes	44.5	55.5
Western NY	44.1	55.9
Statewide	43.9	56.1

Almost two-fifths (37%) of interviewees reported their primary residence in an urban area; another two-fifths (42%) indicated they lived in a suburban area, with the remainder identifying their residence area as rural (Table 3). These proportions differed by region, as one would expect. Differences in awareness of invasive species by residence area are presented in the next section.

Awareness of Invasive Species

Three-quarters (74.2%) of New York State residents were generally aware of the term "invasive species" or the definition we provided them[1] (Table 4). We assumed that by either knowing the term or the definition they had a basic level of awareness of invasive species. The 95% confidence interval around this estimate was $\pm$ 1.5%. The U.S. Census Bureau (2014) estimated

[1] Invasive species means non-native plants and animals that can cause harm to the environment, the economy, and society.

that there were 15.4 million New Yorkers over age 18 in 2013, so we estimated that there were 11.4 million ± 0.2 million who were aware of invasive species. Awareness differs by region with those living in the NYC and Long Island region less likely to be aware than those living in other regions (Table 4). We asked interviewees first if they were aware of the term "invasive species" and if they were not we followed up by asking if they had ever heard of plants or animals that fit the definition we provided. Most respondents indicated they had heard the term and were not asked about the definition.

Table 3. Self-reported primary residence area, statewide and by region.

	Percent		
Regions*	Urban	Suburban	Rural
NYC & Long Island	54.2	38.4	7.4
Lower Hudson & Catskill	9.2	55.8	35.0
Capital/Mohawk	17.8	41.4	40.8
Adirondack & SLELO	12.1	20.1	67.8
Finger Lakes	15.6	40.8	43.6
Western NY	21.9	41.8	36.3
Statewide	37.3	41.5	21.2

* Statistically significant difference between regions at P=0.05 using chi-square test.

Table 4. Awareness of the term "invasive species" or the definition and overall awareness, statewide and by regions.

	Percent		
Regions	Know term invasive species*	Don't know term, but know description*	Overall awareness of invasive species*
NYC & Long Island	56.3	10.6	66.9
Lower Hudson & Catskill	74.2	7.7	81.9
Capital/Mohawk	79.1	4.6	83.7
Adirondack & SLELO	83.5	3.8	87.3
Finger Lakes	77.1	6.1	83.2
Western NY	75.3	11.6	86.9
Statewide	65.1	9.1	74.2

* Statistically significant difference between regions at P=0.05 using chi-square test.

Interviewees who indicated they were familiar with the term "invasive species" or aware of the definition were asked to assess how much they knew about invasive species. This self-assessment of knowledge reveled that fewer than half (46%) of respondents thought they knew at least "something" about invasive species (Table 5). Only ten percent statewide thought they

knew “a lot” about invasive species. The majority (54%) of those who were aware indicated they knew “very little” about invasive species. Self-reported knowledge differed by region, with those living in NYC and Long Island reporting the least knowledge followed by those living in Western NY. Residents in the other regions had similar levels of knowledge, with a slight majority indicating they knew at least “something” about invasive species.

While most New Yorkers were aware of the term “invasive species” or the definition, far fewer indicated they knew “at least something” about invasive species. We found that one-third (34.1% $\pm$ 1.4%) of New York residents overall knew at least something about invasive species. This equates to 5.2 million $\pm$ 0.2 million New Yorkers. This level of knowledge may be more in line with what some educators would consider to be “awareness.” This measure differs by region, with one-quarter of NYC and Long Island residents knowing at least something about invasive species compared with almost half of Adirondack and SLELO residents knowing something (Fig. 2 and Table 5).

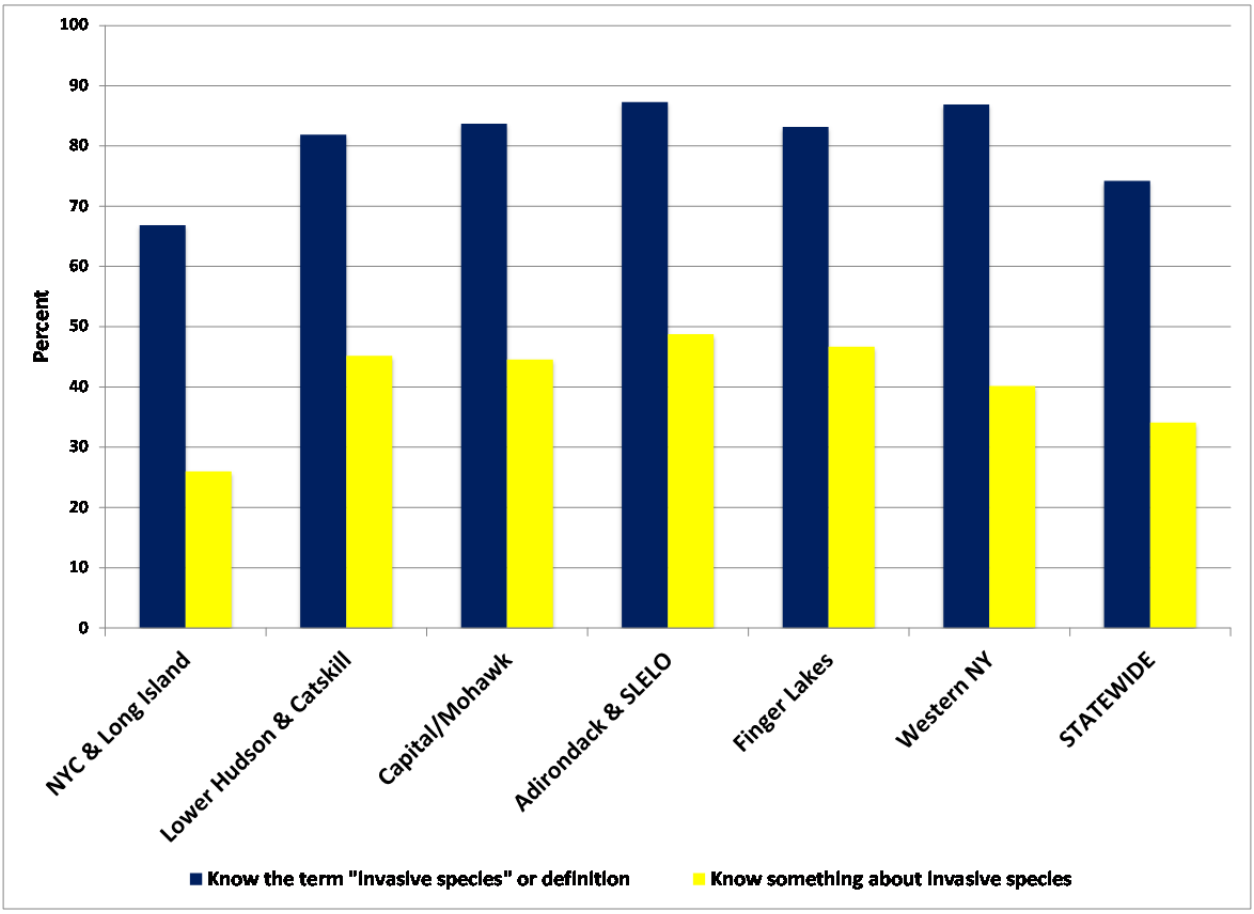

Figure 2. Percent of interviewees who were aware of the term “invasive species” or the definition, or who knew something about invasive species, statewide and by region.

Table 5. Invasive species self-reported knowledge level, statewide and by regions.

	Percent			
	Self-reported knowledge level (*for those aware of invasive species*)*			Proportion who know at least something (*for the entire population*)*
Regions	Very little	Something	A lot	
NYC & Long Island	61.1	31.6	7.3	26.0
Lower Hudson & Catskill	44.8	41.5	13.7	45.2
Capital/Mohawk	46.7	38.4	14.9	44.6
Adirondack & SLELO	44.1	41.9	14.0	48.8
Finger Lakes	43.9	43.3	12.8	46.7
Western NY	53.7	35.9	10.4	40.2
Statewide	54.0	36.0	10.0	34.1

* Statistically significant difference between regions at P=0.05 using chi-square test.

Awareness of the term or definition did not differ by gender, but women were more likely than men to indicate they knew "very little" about invasive species (Table 6). This resulted in a significant difference between men and women in terms of the overall proportion of the total population that knew at least something about invasive species (29% of women versus 40% of men).

Table 6. Awareness of invasive species and self-reported knowledge level by gender.

	Percent	
Awareness measures	Male	Female
Aware of invasive species	75.2	73.4
Self-reported knowledge level (*for those aware of invasive species*)*		
Very little	46.2	60.2
Something	39.9	32.9
A lot	13.9	6.9
Proportion who know at least something (*for the entire population*)*	40.4	29.2

* Statistically significant difference between genders at P=0.05 using chi-square test.

Awareness of invasive species differed by residence area (i.e., urban, suburban, rural) (Table 7). Those respondents living in rural areas were more likely to be aware of the term or definition than those in suburban areas, who in turn were more likely to be aware than urban residents. Rural residents also reported generally higher knowledge levels than suburban or urban residents. This resulted in 45% of rural residents indicating they knew at least something about invasive species compared with just under one-third of suburban and urban residents.

Table 7. Awareness of invasive species and self-reported knowledge level by primary residence area.

	Percent		
Awareness measures	Urban	Suburban	Rural
Aware of invasive species*	69.1	75.3	81.2
Self-reported knowledge level (*for those aware of invasive species*)*			
Very little	55.9	57.3	45.0
Something	36.1	34.8	38.2
A lot	8.0	7.9	16.8
Proportion who know at least something (*for the entire population*)*	30.5	32.1	44.6

* Statistically significant difference between residence types at P=0.05 using chi-square test.

Awareness of invasive species was also measured by asking interviewees if they had ever heard of seven invasive species in New York (Fig. 3 and Table 8). (Questions about these species were asked before the topic of "invasive species" was introduced in the interview so as not to prejudice respondents.) The species familiar to over 50% of New Yorkers were water chestnut and wild pigs. In both cases the description of the species was clarified so as to avoid confusion with the commonly eaten water chestnut or farm-raised pig. However it is still possible even with the clarification, respondents were not thinking about the invasive species. This might be more likely because a greater percentage of respondents indicated they only "recognized the name" compared to "knowing something" about the species. NYC and Long Island residents were less likely to have heard of water chestnut (52%) than residents in other regions of New York (64% - 71%) (Appendix Table B-1). Adirondack and SLELO residents were the most likely to know something about wild pigs (44%) and NYC and Long Island residents the least likely (20%) (Appendix Table B-2).

A majority of New York residents (58%) had never heard of zebra mussels (Table 8). However, residents in western, central, and northern New York (where zebra mussels are present) were three times more likely to have heard of zebra mussels than residents in NYC and Long Island (Appendix Table B-3). About half of the residents in the Western and Finger Lakes regions indicated they knew something about zebra mussels; an even greater percentage (56%) in the Adirondack and SLELO region indicated they knew something about them. Urban county residents within the Finger Lakes and Western regions were more likely to know something about zebra mussels (57%) than rural county residents in these two regions (46%).

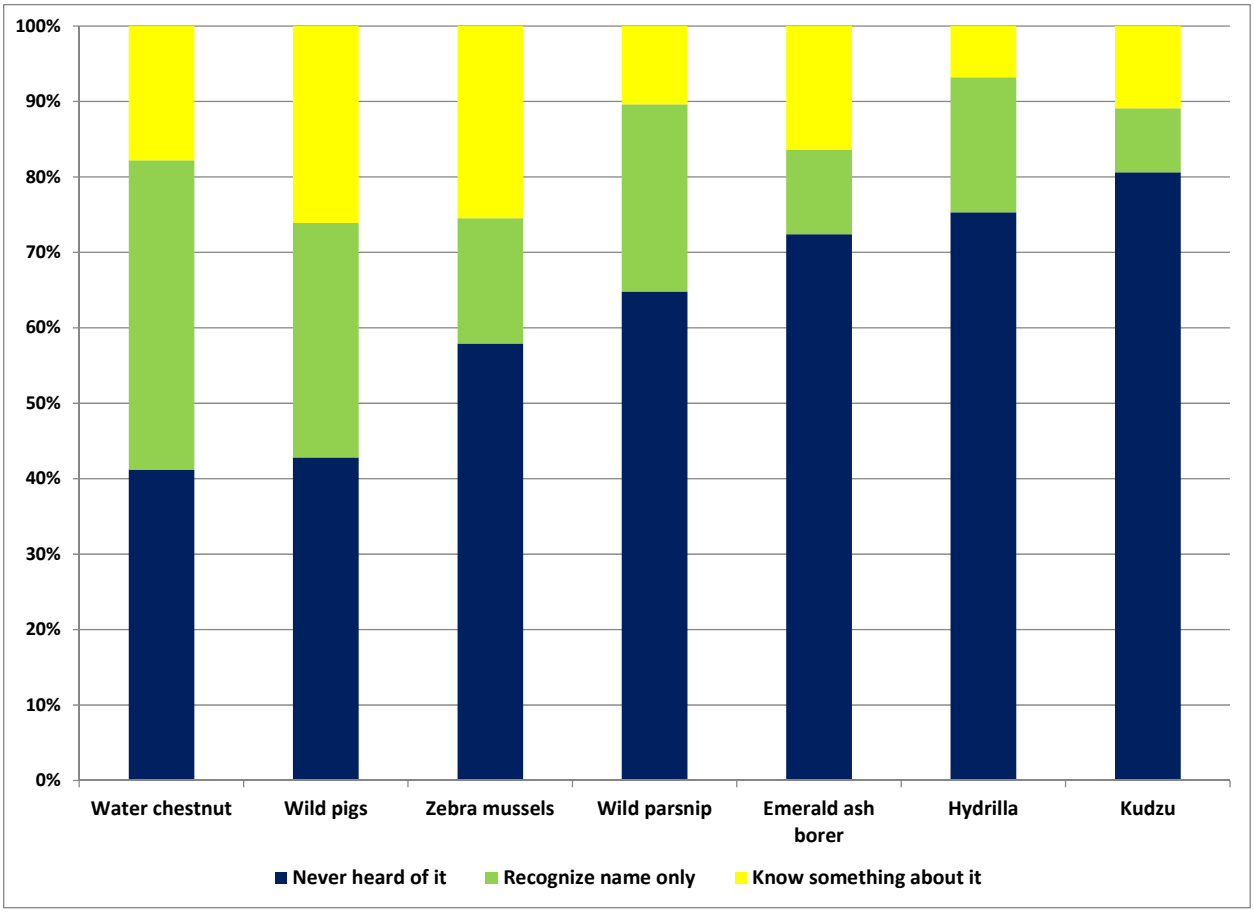

Figure 3. Awareness of select invasive species.

Table 8. Awareness of select invasive species.

	Percent		
Select invasive species	Never heard of it	Recognize name only	Know something about it
Water chestnut	41.2	41.0	17.8
Wild pigs	42.8	31.1	26.1
Zebra mussels	57.9	16.6	25.5
Wild parsnip	64.8	24.8	10.4
Emerald ash borer	72.4	11.2	16.4
Hydrilla	75.3	17.9	6.8
Kudzu	80.6	8.5	10.9

A similar pattern was found for hydrilla: most New Yorkers (75%) had never heard of hydrilla, but awareness was much higher in the area where it is currently found (Table 8 and Appendix Table B-6). Almost 40% of Finger Lakes residents were aware of hydrilla, with 22% recognizing the name only and 16% knowing something about it. Rural county residents within

the Finger Lakes and Western regions were more likely to have at least heard of hydrilla (40%) compared to urban county residents in these two regions (29%).

Three-quarters of New York residents (72%) had never heard of emerald ash borer (Table 8). Again, awareness was higher in the regions where emerald ash borer is located or expanding into (Appendix Table B-5). Two to three times as many residents in the Western, Finger Lakes, and Adirondack/SLELO regions had heard of emerald ash borer than in the NYC & Long Island region. About one-third of the residents in the Western and Adirondack/SLELO regions indicated they knew something about emerald ash borer; an even greater percentage (39%) in the Finger Lakes region indicated they knew something about them.

Two-thirds of New Yorkers (65%) had never heard of wild parsnip (Table 8). Awareness was generally low across the state, with one exception. Just over half of the Adirondack and SLELO residents recognized the name or knew something about it (Appendix Table B-4).

Fewer than 20% of residents statewide had ever heard of kudzu (Table 8). Kudzu was not well known anywhere in the state (Appendix Table B-7). Residents in the Lower Hudson and Catskill region were the most likely to know something about it (19%).

Characterization of Stakeholder Groups

Interviewees were asked if they participated in a variety of activities that could influence the spread of invasive species (Table 9). The primary purpose for asking these questions was to identify stakeholder groups that could be asked follow-up questions during the second and third phase of this study (web/mail survey and detailed telephone interviews). However, information from the initial screening survey can shed some light on the level of awareness and knowledge of invasive species for each stakeholder group.

Table 9. Percent of New York residents who were members of various stakeholder groups and proportion of each group who know at least something about invasive species.

	Percent	
Stakeholder Groups	Participated in past year	Proportion of all participants who know at least something about invasive species
Gardeners	55.8	41.8
Hikers	30.6	56.8
Anglers	19.7	53.7
Campers	17.1	50.7
Boaters	11.4	53.8
Aquarium Owners	9.2	39.1
Water Gardeners	4.9	46.4
Farmers or Nursery Stock Growers	2.4	59.9

Of the activities we asked about, gardening held the most participants in New York (56%, Table 9). About one-third of New Yorkers went hiking in the past year; fewer went fishing (20%), camping (17%) or boating (11%). Fewer than 10% owned an aquarium, water garden, or worked as a farmer or nursery stock grower. Each of these stakeholder groups had a higher level of knowledge compared to the statewide average (34%) (Fig. 4 and Table 9). For most groups, over half of the participants indicated they knew something about invasive species. Farmers or nursery stock growers were the most likely to know something (60%); aquarium owners and gardeners were the least likely to know something (39% and 42%, respectively).

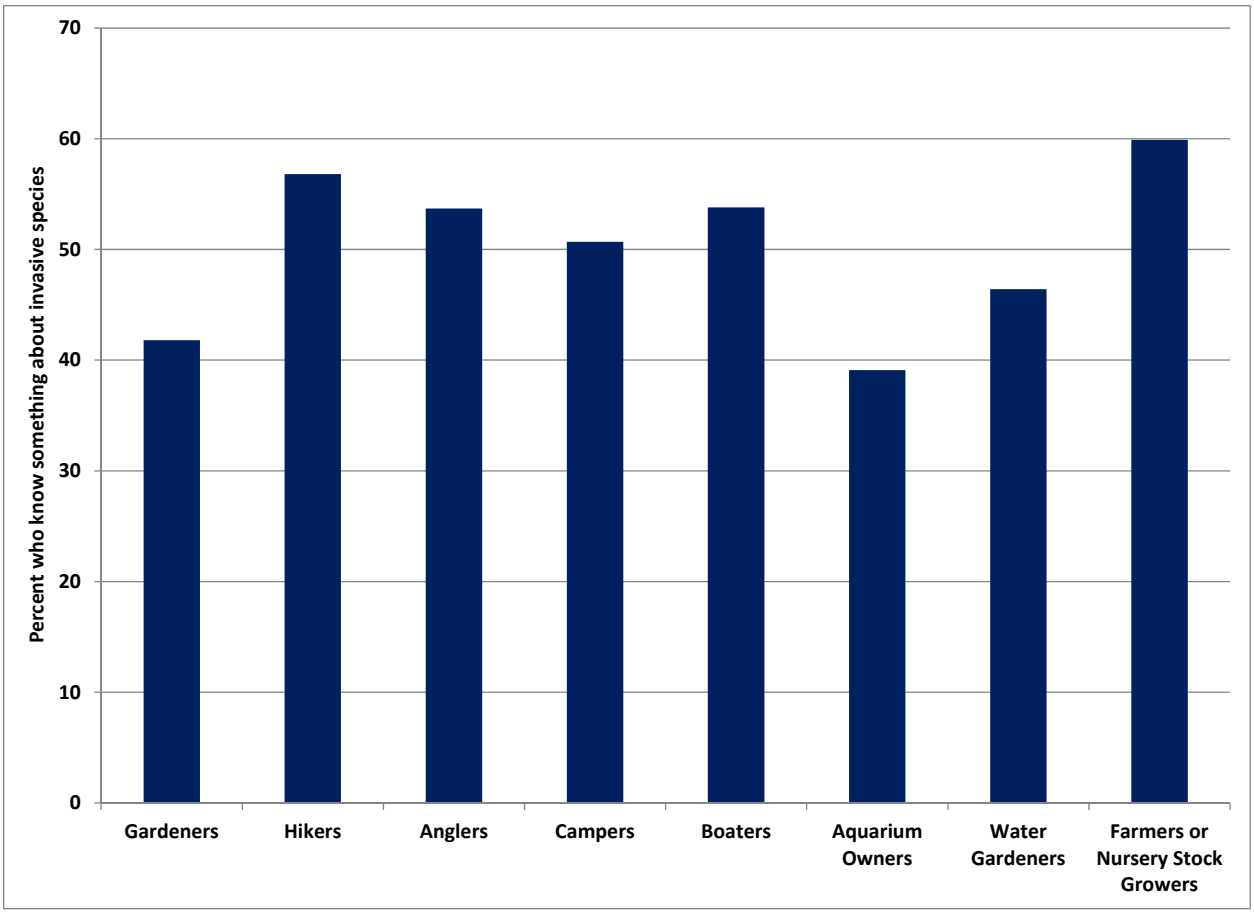

Figure 4. Percent of participants in each stakeholder group who know something about invasive species.

Appendix Tables B-8 through B-23 detail the participation rate and level of awareness of each stakeholder group by region, and the level of awareness of specific species by stakeholder group. This detailed information can be used by PRISM members as they consider outreach efforts targeting certain stakeholder groups in their region. For example, when working with anglers in the Adirondack and SLELO region focusing on basic awareness of invasive species might not be necessary because two-thirds of them indicated they knew something about invasive species (Appendix Table B-12), and among all anglers 43% indicated they knew something about zebra mussels (Appendix B-13).

Primary News and Information Sources

Interviewees were asked what sources they used for news and information and what their primary source was. Over 80% used the TV as a source of information; three-quarters used the Internet (Table 10). Fewer respondents, but still over half, used newspapers or other print media, the radio, or friends and family. While there were statistical differences in the proportion using some of the sources by region, it is likely that the differences were small enough as to not alter the choices of media for outreach efforts by region. One possible exception would be that 75% of urban county residents in the Finger Lakes and Western regions used the Internet compared with 66% of rural county residents.

Table 10. Source of news and information, statewide and by region.

	Percent				
Regions	TV*	Internet*	Newspapers	Radio	Friends and family*
NYC & Long Island	80.3	76.0	74.0	59.4	68.6
Lower Hudson & Catskill	81.4	78.3	71.6	66.2	72.7
Capital/Mohawk	83.4	75.7	67.4	63.1	76.5
Adirondack & SLELO	85.6	73.1	70.6	60.7	77.2
Finger Lakes	82.5	71.0	68.4	65.2	76.4
Western NY	88.1	67.5	72.4	62.9	78.4
Statewide	81.8	75.1	72.3	61.5	71.6

* Statistically significant difference between regions at P=0.05 using chi-square test.

TV and Internet were the primary sources of news and information for over two-thirds (71%) of New Yorkers (Table 11). The Internet might have the greatest potential for reaching hikers, anglers, campers, boaters and aquarium owners as 40% or more of the members of these groups indicated the Internet was their primary source of information (Appendix Table B-24).

Table 11. Primary source of news and information, statewide and by region.

	Percent				
Regions	TV	Internet	Newspapers	Radio	Friends and family
NYC & Long Island	35.1	35.2	17.0	7.5	5.2
Lower Hudson & Catskill	36.3	32.9	17.9	8.3	4.6
Capital/Mohawk	40.4	33.7	15.9	6.0	4.0
Adirondack & SLELO	42.1	31.3	14.1	6.7	5.8
Finger Lakes	37.9	31.4	15.1	9.4	6.2
Western NY	44.4	26.9	16.0	6.5	6.2
Statewide	36.8	33.8	16.5	7.6	5.3

CONCLUSIONS AND RECOMMENDATIONS

Three-quarters (74%) of New York residents have at least a passing awareness of invasive species; they either recognize the term or the definition we provided. One-third (34%), by their own assessment, "know something about them." This type of information forms a valuable baseline from which future outreach efforts can be compared.

The most widely known species that we asked about were water chestnut and wild pigs. However it is possible, even with the clarification that we were not referring to the commonly eaten water chestnut or farm-raised pigs, respondents were not thinking about the invasive species. Further investigation will be needed to clarify the level of awareness for these two species.

Awareness levels for other species, which varied by region, can provide guidance to outreach educators in the PRISMs as they decide where to focus their efforts. For example, zebra mussels have been present and spreading in New York waters for a number of years. Many people in the western, central and northern parts of the state are aware of them. Hydrilla, in contrast, is a relatively new invader still contained to a small portion of the state. Awareness and knowledge about this species seems more limited. Therefore, educators may have a greater impact on public awareness if they focus their efforts on hydrilla than on zebra mussels.

Information from the initial screening survey can also shed some light on the level of awareness and knowledge of invasive species among stakeholder groups. For example, 44% of gardeners indicated they knew something about wild parsnip, but only 23% knew something about kudzu. Future outreach efforts with gardeners may not need to focus as much on raising awareness of wild parsnip, instead focusing more on kudzu.

TV and Internet appear to be the primary sources of news and information for New Yorkers. Using both of these outlets has the potential to reach at least three-quarters of residents.

The follow-up survey and interviews will provide much more detailed information about level of concern about invasive species, behaviors currently engaged in that may contribute to the spread or help prevent it, and New York residents' willingness to do more to prevent the spread and under what conditions.

LITERATURE CITED

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APPENDIX A: TELEPHONE SCREENING SURVEY QUESTIONS

1. First, what county in New York do you currently live in?

_____ Answer will be linked to stratum

____Don't live in NYS (END INTERVIEW - That's the only question I have today. Thank you very much for taking the time to talk with me.)

2. Have you participated in any of the following activities in the past year:

a. Hiking

____ No
____ Yes

b. Camping

____ No
____ Yes

c. Fishing

____ No
____ Yes

d. Gardening with flowers or vegetables

____ No
____ Yes -> Do you have a water garden?
____ No
____ Yes

3. Now I'm going to ask you about some plants and animals that live in New York or might move to New York. I'd like to know if you recognize the name, know something about it, or never heard of it before.

a. The first one is: An insect called Emerald Ash Borer

____ Recognize the name, but that's it
____ Know something about it
____ Never heard of it

b. A water plant called Hydrilla

____ Recognize the name, but that's it
____ Know something about it
____ Never heard of it

c. A water plant called Water Chestnut

____ Recognize the name, but that's it
____ Know something about it
____ Never heard of it

d. A plant called Wild Parsnip

____ Recognize the name, but that's it
____ Know something about it
____ Never heard of it

e. A plant called Kudzu

____ Recognize the name, but that's it
____ Know something about it
____ Never heard of it

f. How about zebra mussels or quagga mussels that live in the water

____ Recognize the name, but that's it
____ Know something about it
____ Never heard of it

g. And lastly wild pigs, not pigs that live on a farm, but wild pigs or feral swine

____ Recognize the name, but that's it
____ Know something about it
____ Never heard of it

4. Before I called today, had you ever heard the term "invasive species?"

____ No -> It means non-native plants and animals that can cause harm to the environment, the economy, and society. Have you ever heard of plants or animals like that?

____ No
____ Yes -> Would you say you know very little, something, or a lot about these types of plants and animals?
____ Very little
____ Something
____ A lot

____Yes -> Would you say you know very little, something, or a lot about invasive species?
____ Very little
____ Something
____ A lot

5. Do you own a boat that you have used in the past year?

____ No
____ Yes

6. Do you have an aquarium in your house?

____ No
____ Yes

7. Do you work as a farmer or nursery stock grower?

____ No
____ Yes

8. Is your primary residence in an urban area, suburban area, or rural area?

____ Urban
____ Suburban
____ Rural

9. Which of the following sources do you use regularly for news and information:

a. TV

____ No
____ Yes

b. Internet

____ No
____ Yes

c. Radio

____ No
____ Yes

d. Newspapers or other print materials

____ No
____ Yes

e. Friends and family

____ No
____ Yes

f. Which of those would you say is your primary source of information?

____ TV
____ Internet
____ Radio
____ Newspapers or other print materials
____ Friends and family

If respondent said "No" that they were not aware of the term "invasive species" AND "No" they were not aware of non-native plants and animals, end interview (Thank you very much for taking the time to talk with me).

Record Gender: ____ Male ____ Female

10. We'll be contacting you again in January to ask you more about invasive species, those non-native plants and animals that that can cause harm to the environment, the economy, and society. And about any concerns you might have about them, and about your specific interests and activities that might be affected by invasive species. We'd prefer to survey you by email because it doesn't cost as much and saves us all money. Would you please provide me with your email address?

_____Email address (Confirm email address _____)

If no email, may I confirm your mailing address so we can send you our survey? Is it?
_____ (Information from sample file)

____Refuse to participate in survey

That's all the questions I have for you. Thank you for taking the time to speak with me today. END INTERVIEW.

Record Gender: ____ Male ____ Female

APPENDIX B: ADDITIONAL TABLES

Appendix Table B-1. Awareness of water chestnut, statewide and by region.

	Percent		
Regions*	Never heard of it	Recognize name only	Know something about it
NYC & Long Island	48.0	38.3	13.7
Lower Hudson & Catskill	32.7	43.5	23.8
Capital/Mohawk	28.8	44.6	26.6
Adirondack & SLELO	29.2	46.5	24.3
Finger Lakes	36.3	42.9	20.8
Western NY	29.3	48.5	22.2
Statewide	41.2	41.0	17.8

* Statistically significant difference between regions at P=0.05 using chi-square test.

Appendix Table B-2. Awareness of wild pigs, statewide and by region.

	Percent		
Regions*	Never heard of it	Recognize name only	Know something about it
NYC & Long Island	49.4	30.9	19.7
Lower Hudson & Catskill	35.5	32.7	31.8
Capital/Mohawk	36.3	27.7	36.0
Adirondack & SLELO	26.6	29.8	43.6
Finger Lakes	32.3	30.3	37.4
Western NY	34.0	36.6	29.4
Statewide	42.8	31.1	26.1

* Statistically significant difference between regions at P=0.05 using chi-square test.

Appendix Table B-3. Awareness of zebra mussels, statewide and by region.

	Percent		
Regions*	Never heard of it	Recognize name only	Know something about it
NYC & Long Island	76.8	12.9	10.3
Lower Hudson & Catskill	52.7	14.3	33.0
Capital/Mohawk	36.0	18.3	45.7
Adirondack & SLELO	20.6	23.4	56.0
Finger Lakes	22.2	26.9	50.9
Western NY	23.5	27.8	48.7
Statewide	57.9	16.6	25.5

* Statistically significant difference between regions at P=0.05 using chi-square test.

Appendix Table B-4. Awareness of wild parsnip, statewide and by region.

	Percent		
Regions*	Never heard of it	Recognize name only	Know something about it
NYC & Long Island	68.6	23.1	8.3
Lower Hudson & Catskill	59.8	28.1	12.1
Capital/Mohawk	58.8	25.4	15.8
Adirondack & SLELO	46.8	32.1	21.1
Finger Lakes	62.5	25.0	12.5
Western NY	62.1	27.3	10.6
Statewide	64.8	24.8	10.4

* Statistically significant difference between regions at P=0.05 using chi-square test.

Appendix Table B-5. Awareness of emerald ash borer, statewide and by region.

	Percent		
Regions*	Never heard of it	Recognize name only	Know something about it
NYC & Long Island	91.1	4.3	4.6
Lower Hudson & Catskill	61.9	12.6	25.5
Capital/Mohawk	53.2	18.5	28.3
Adirondack & SLELO	43.9	22.2	33.9
Finger Lakes	36.3	25.0	38.7
Western NY	38.9	26.3	34.8
Statewide	72.4	11.2	16.4

* Statistically significant difference between regions at P=0.05 using chi-square test.

Appendix Table B-6. Awareness of hydrilla, statewide and by region.

Regions*	Never heard of it	Recognize name only	Know something about it
NYC & Long Island	79.1	16.9	4.0
Lower Hudson & Catskill	74.7	16.7	8.6
Capital/Mohawk	74.0	17.5	8.5
Adirondack & SLELO	68.9	19.3	11.8
Finger Lakes	61.5	22.4	16.1
Western NY	70.9	21.9	7.2
Statewide	75.3	17.9	6.8

* Statistically significant difference between regions at P=0.05 using chi-square test.

Appendix Table B-7. Awareness of kudzu, statewide and by region.

Regions*	Never heard of it	Recognize name only	Know something about it
NYC & Long Island	86.0	6.3	7.7
Lower Hudson & Catskill	68.4	12.7	18.9
Capital/Mohawk	74.5	10.3	15.2
Adirondack & SLELO	75.7	8.7	15.6
Finger Lakes	74.2	12.5	13.3
Western NY	76.3	11.1	12.6
Statewide	80.6	8.5	10.9

* Statistically significant difference between regions at P=0.05 using chi-square test.

Appendix Table B-8. Percent who gardened in past year and their awareness of invasive species and self-reported knowledge level, statewide and by region.

	Percent					
	Participated in past year*	Aware of invasive species*	Self-reported knowledge level (*for those aware of invasive species*)*			Proportion who know at least something (*for all participants*)*
Regions			Very little	Something	A lot*	
NYC & Long Island	46.0	78.3	60.4	31.7	7.9	31.1
Lower Hudson & Catskill	66.8	89.7	41.0	42.8	16.2	52.9
Capital/Mohawk	69.4	87.1	42.5	41.7	15.8	50.1
Adirondack & SLELO	69.6	92.1	40.1	43.7	16.2	55.2
Finger Lakes	69.1	88.6	40.5	45.1	14.4	52.7
Western NY	71.1	90.6	48.8	40.0	11.2	46.4
Statewide	55.8	84.2	50.4	38.0	11.6	41.8

* Statistically significant difference between regions at P=0.05 using chi-square test.

Appendix Table B-9. Gardeners' awareness of select invasive species.

	Percent		
Select invasive species	Never heard of it	Recognize name only	Know something about it
Water chestnut	35.8	41.4	22.8
Wild pigs	36.6	30.6	32.8
Zebra mussels	48.2	18.5	33.3
Wild parsnip	56.5	29.2	14.3
Emerald ash borer	61.3	15.2	23.5
Hydrilla	71.0	19.8	9.2
Kudzu	76.9	9.4	13.7

Appendix Table B-10. Percent who went hiking in the past year and their awareness of invasive species and self-reported knowledge level, statewide and by region.

	Percent					
	Participated in past year*	Aware of invasive species*	Self-reported knowledge level (*for those aware of invasive species*)			Proportion who know at least something (*for all participants*)*
Regions			Very little	Something	A lot	
NYC & Long Island	20.6	87.5	42.9	46.0	11.1	50.0
Lower Hudson & Catskill	49.8	91.7	37.7	43.8	18.5	57.1
Capital/Mohawk	46.3	94.4	37.3	43.0	19.7	59.1
Adirondack & SLELO	41.7	97.1	28.7	50.5	20.8	69.2
Finger Lakes	43.9	93.3	31.8	50.4	17.8	63.6
Western NY	34.5	95.5	35.9	46.9	17.2	61.2
Statewide	30.6	91.3	37.8	46.6	15.6	56.8

* Statistically significant difference between regions at P=0.05 using chi-square test.

Appendix Table B-11. Hikers' awareness of select invasive species.

	Percent		
Select invasive species	Never heard of it	Recognize name only	Know something about it
Water chestnut	30.5	43.2	26.3
Wild pigs	30.8	30.1	39.1
Zebra mussels	36.8	20.3	42.9
Wild parsnip	55.2	29.3	15.5
Emerald ash borer	54.3	16.6	29.1
Hydrilla	69.0	20.5	10.5
Kudzu	66.6	13.7	19.7

Appendix Table B-12. Percent who went fishing in the past year and their awareness of invasive species and self-reported knowledge level, statewide and by region.

	Percent					
	Participated in past year*	Aware of invasive species*	Self-reported knowledge level (*for those aware of invasive species*)			Proportion who know at least something (*for all participants*)*
Regions			Very little	Something	A lot	
NYC & Long Island	15.1	73.6	35.9	48.7	15.4	47.2
Lower Hudson & Catskill	22.6	84.4	34.7	42.7	22.6	55.1
Capital/Mohawk	28.6	89.2	33.1	45.2	21.7	59.7
Adirondack & SLELO	31.0	94.6	30.2	46.9	22.9	66.0
Finger Lakes	27.6	92.4	35.2	47.8	17.0	59.9
Western NY	22.7	90.9	41.2	42.5	16.3	53.4
Statewide	19.7	82.8	35.2	47.0	17.8	53.7

* Statistically significant difference between regions at P=0.05 using chi-square test.

Appendix Table B-13. Anglers' awareness of select invasive species.

	Percent		
Select invasive species	Never heard of it	Recognize name only	Know something about it
Water chestnut	33.7	43.0	23.3
Wild pigs	30.4	34.0	35.6
Zebra mussels	39.9	17.5	42.6
Wild parsnip	60.3	28.0	11.7
Emerald ash borer	58.5	14.8	26.7
Hydrilla	64.0	23.1	12.9
Kudzu	76.9	11.0	12.1

Appendix Table B-14. Percent who went camping in the past year and their awareness of invasive species and self-reported knowledge level, statewide and by region.

	Percent					
	Participated in past year*	Aware of invasive species*	Self-reported knowledge level (*for those aware of invasive species*)			Proportion who know at least something (*for all participants*)
Regions			Very little	Something	A lot	
NYC & Long Island	11.7	75.6	45.2	41.9	12.9	41.5
Lower Hudson & Catskill	19.0	90.3	34.8	42.9	22.3	58.9
Capital/Mohawk	28.9	89.9	44.4	38.5	17.1	50.0
Adirondack & SLELO	30.0	94.4	33.5	47.6	18.9	62.8
Finger Lakes	26.6	87.9	37.1	45.5	17.4	55.3
Western NY	22.9	94.4	39.3	44.0	16.7	57.3
Statewide	17.1	84.9	40.3	43.3	16.4	50.7

* Statistically significant difference between regions at P=0.05 using chi-square test.

Appendix Table B-15. Campers' awareness of selected invasive species.

	Percent		
Select invasive species	Never heard of it	Recognize name only	Know something about it
Water chestnut	32.2	45.7	22.1
Wild pigs	30.8	34.6	34.6
Zebra mussels	40.7	18.9	40.4
Wild parsnip	49.6	37.0	13.4
Emerald ash borer	58.0	13.9	28.1
Hydrilla	64.9	24.4	10.7
Kudzu	79.9	9.1	11.0

Appendix Table B-16. Percent who went boating in past year and their awareness of invasive species and self-reported knowledge level, statewide and by region.

	Percent					
	Participated in past year*	Aware of invasive species*	Self-reported knowledge level (*for those aware of invasive species*)			Proportion who know at least something (*for all participants*)*
Regions			Very little	Something	A lot	
NYC & Long Island	6.9	66.7	43.8	43.8	12.4	37.5
Lower Hudson & Catskill	14.6	93.7	29.2	38.2	32.6	66.3
Capital/Mohawk	21.2	95.7	37.1	37.9	25.0	60.1
Adirondack & SLELO	24.8	95.1	29.2	48.1	22.7	67.3
Finger Lakes	18.8	92.5	29.8	49.2	21.0	64.9
Western NY	12.4	100.0	52.1	29.2	18.7	47.9
Statewide	11.4	85.0	36.7	42.8	20.5	53.8

* Statistically significant difference between region at P=0.05 using chi-square test.

Appendix Table B-17. Boaters' awareness of select invasive species.

	Percent		
Select invasive species	Never heard of it	Recognize name only	Know something about it
Water chestnut	33.0	37.9	29.1
Wild pigs	29.7	32.0	38.3
Zebra mussels	27.6	17.3	55.1
Wild parsnip	58.6	29.5	11.9
Emerald ash borer	47.3	15.0	37.7
Hydrilla	58.4	27.9	13.7
Kudzu	70.0	12.7	17.3

Appendix Table B-18. Percent who had an aquarium in their house and their awareness of invasive species and self-reported knowledge level, statewide and by region.

	Percent					
			Self-reported knowledge level (*for those aware of invasive species*)			
Regions	Aquarium in house	Aware of invasive species*	Very little	Something	A lot	Proportion who know at least something (*for all participants*)*
NYC & Long Island	8.0	ins	ins	ins	ins	ins
Lower Hudson & Catskill	10.8	85.7	31.7	41.7	26.6	58.6
Capital/Mohawk	11.1	87.5	36.5	46.0	17.5	55.6
Adirondack & SLELO	10.6	95.7	34.8	44.0	21.2	62.3
Finger Lakes	10.7	89.5	32.4	48.5	19.1	60.5
Western NY	10.8	95.2	35.0	50.0	15.0	61.9
Statewide	9.2	77.2	49.4	36.4	14.3	39.1

* Statistically significant difference between regions at P=0.05 using chi-square test.
ins - Insufficient sample size.

Appendix Table B-19. Aquarium owners' awareness of select invasive species.

	Percent		
Select invasive species	Never heard of it	Recognize name only	Know something about it
Water chestnut	34.1	41.7	24.2
Wild pigs	35.7	24.5	39.8
Zebra mussels	51.1	12.1	36.8
Wild parsnip	51.9	28.0	20.1
Emerald ash borer	65.0	11.8	23.2
Hydrilla	60.3	28.6	11.1
Kudzu	82.5	7.6	9.9

Appendix Table B-20. Percent who had a water garden and their awareness of invasive species and self-reported knowledge level, statewide and by region.

	Percent					
	Had water garden	Aware of invasive species	Self-reported knowledge (*for those aware of invasive species*)			Proportion who know at least something (*for all participants*)
Regions			Very little	Something	A lot	
NYC & Long Island	4.0	ins	ins	ins	ins	ins
Lower Hudson & Catskill	6.6	88.4	26.3	55.3	18.4	65.1
Capital/Mohawk	6.6	88.4	39.5	31.6	28.9	53.5
Adirondack & SLELO	5.2	88.2	30.0	56.7	13.3	61.8
Finger Lakes	6.6	91.5	27.9	53.5	18.6	66.0
Western NY	5.4	ins	ins	ins	ins	ins
Statewide	4.9	84.5	45.1	41.9	13.0	46.4

ins - Insufficient sample size.

Appendix Table B-21. Water gardeners' awareness of select invasive species.

	Percent		
Select invasive species	Never heard of it	Recognize name only	Know something about it
Water chestnut	26.8	47.0	26.2
Wild pigs	38.9	25.7	35.4
Zebra mussels	50.3	16.8	32.9
Wild parsnip	46.1	35.9	18.0
Emerald ash borer	61.3	12.5	26.2
Hydrilla	67.9	19.6	12.5
Kudzu	80.8	7.2	12.0

Appendix Table B-22. Percent who work as a farmer or nursery stock grower and their awareness of invasive species and self-reported knowledge level, statewide and by region.

	Percent					
	Work as a farmer or nursery stock grower*	Aware of invasive species	Self-reported knowledge level (*for those aware of invasive species*)			Proportion who know at least something (*for all participants*)
Regions			Very little	Something	A lot	
NYC & Long Island	0.6	ins	ins	ins	ins	ins
Lower Hudson & Catskill	3.7	ins	ins	ins	ins	ins
Capital/Mohawk	5.4	94.3	27.3	45.5	27.2	68.6
Adirondack & SLELO	6.0	97.4	39.5	50.0	10.5	59.0
Finger Lakes	7.0	88.0	31.8	40.9	27.3	60.0
Western NY	4.1	ins	ins	ins	ins	ins
Statewide	2.4	93.6	36.0	34.3	29.7	59.9

* Statistically significant difference between region at P=0.05 using chi-square test.
ins - Insufficient sample size.

Appendix Table B-23. Farmers' or nursery stock growers' awareness of select invasive species.

	Percent		
Select invasive species	Never heard of it	Recognize name only	Know something about it
Water chestnut	22.2	39.5	38.3
Wild pigs	19.8	24.7	55.5
Zebra mussels	22.0	22.0	56.0
Wild parsnip	46.3	24.4	29.3
Emerald ash borer	19.5	31.7	48.8
Hydrilla	57.3	31.7	11.0
Kudzu	58.0	17.3	24.7

Appendix Table B-24. Primary source of news and information by stakeholder groups.

	Percent				
Stakeholder groups	TV	Internet	Newspapers	Radio	Friends and family
Gardeners	37.1	32.5	19.1	7.3	4.0
Hikers	25.9	44.0	14.6	8.4	7.1
Anglers	32.5	40.0	16.7	5.1	5.7
Campers	28.9	46.0	11.7	6.0	7.4
Boaters	28.3	42.3	17.1	8.1	4.2
Aquarium owners	31.4	41.4	13.6	7.1	6.5
Water gardeners	47.0	28.6	13.7	3.0	7.7
Farmers or nursery stock growers	32.1	37.1	16.0	8.6	6.2