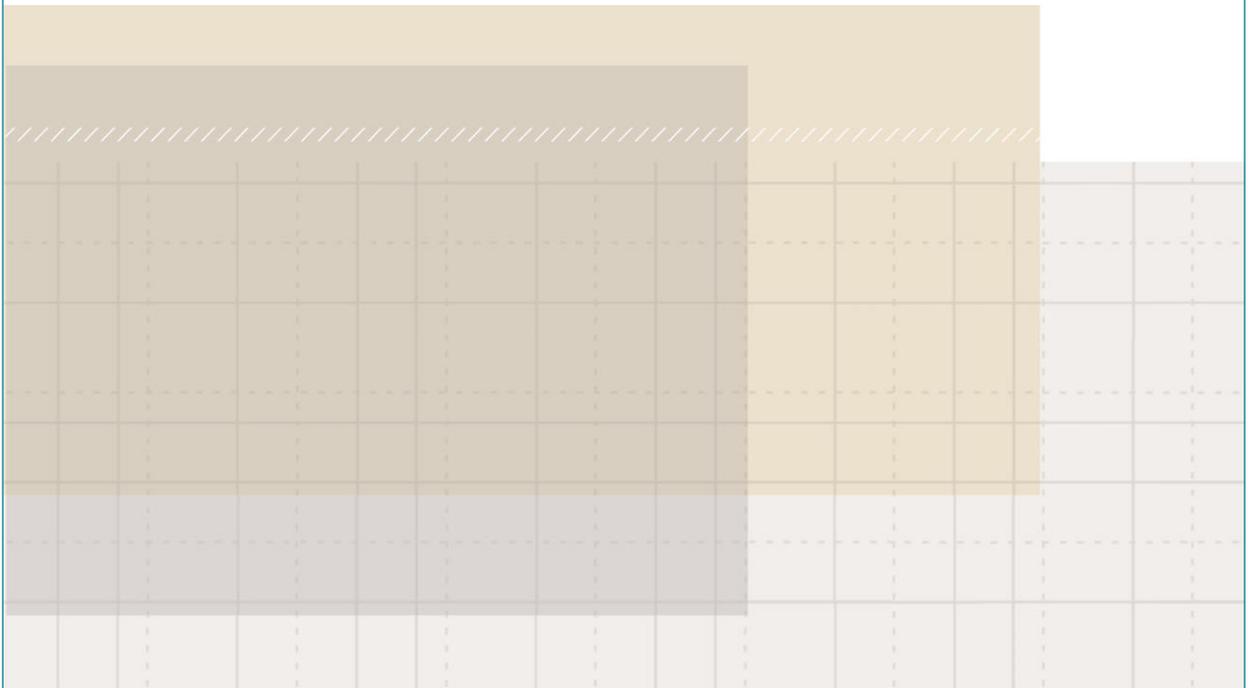


# Minnesota Tourism Industry Perceptions of Invasive Species and Their Control

Presented by Ingrid Schneider, Ph.D., and Xinyi Qian, Ph.D.





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**May 1, 2014**

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## EXECUTIVE SUMMARY

Invasive species include "...an alien (or non-native) species whose introduction does, or is likely to, cause economic or environmental harm or harm to human health" (Executive Order 13112, 1999). Among other impacts, invasive species can change the physical environment upon which many tourism destinations and attractions depend. Subsequently, significant impacts could result from invasive species for the tourism industry. However, little research exists in this area or among industry professionals.

Understanding tourism organizations' perception of invasive species and the efficacy of efforts to control them is important for a variety of reasons, including prevention and mitigation. A 2013 questionnaire of the Minnesota tourism industry, in partnership with Explore Minnesota Tourism (EMT), assessed perceptions about invasive plants and aquatic invasive species and their control.

### Methods

An online questionnaire administered to the Minnesota tourism industry in 2013 included questions on invasive species. The questionnaire was distributed via SurveyMonkey to the database of tourism entities maintained by EMT. Items of interest for this project included questions about aquatic and plant-based invasive species and ways to control them, as well as preferred ways to receive information on sustainable tourism, which, arguably, includes invasive species.

Among the 3,550 surveyed entities, 585 responded and 426 completed the questionnaire — yielding a response rate of 16 percent and a completion rate of 12 percent. Survey responses were downloaded from SurveyMonkey into SPSS (version 21.0) format. Data from completed questionnaires (n=426) were cleaned, checked, and analyzed in SPSS. This report focuses on perceptions of invasive species and their control.

### Results

**Perceptions of harm:** The majority of Minnesota tourism industry respondents agreed both plant-based and aquatic invasive species ("invasives") are harmful to the environment, economy and society, in that order.

**Effective Control:** The majority of respondents agreed that all approaches presented in the questionnaire would help control invasive species. However, cleaning equipment received the highest level of agreement as a helpful measure to control both aquatic and plant-based invasives.

Agreement about effective control methods varied by type of invasives. For invasive plants, the least frequently agreed-with methods were killing invasive plants on one's own property or volunteering to help maintain parks and nature trails. For aquatic invasive species, the least frequently agreed-with control methods were talking to others and not displacing aquatic invasive species.

Respondents' regional origin differentiated a single control method for plant-based invasives only: volunteering to help maintain parks and natural trails was perceived as more effective among Metro respondents than from the Central region of Minnesota.

**Receiving information:** Online reference materials and local workshops were the two most preferred ways of receiving information on sustainable tourism in all five regions. Arguably, controlling invasive species is important for sustainable tourism and, subsequently, these methods would be effective for education and management workshops.

**Respondents:** More respondents came from the lodging/camping sector and the Northeast region than any other industry sector or Minnesota region, respectively. Respondents had both a lengthy

tenure in the tourism industry and with their current employer in that more than 30 percent had worked in the industry and 22.6 percent for their current employer for more than 20 years. More female than male respondents completed the survey (54.9 percent and 44.9 percent, respectively).

## Discussion

**Tourism industry representatives view invasives as harmful:** As of 2013, the majority of respondents to this questionnaire agreed that both plant-based and aquatic invasive species are harmful to Minnesota's environment, economy, and society. For both plant-based and aquatic invasives, respondents agreed most frequently with the environmental harm. Direct impacts to the Minnesota tourism industry remain uncertain, but clearly the tourism industry recognizes the threat of invasive species. In the only other identified study along these lines, Michigan tourism organizations named invasive species as a top concern for the industry (Nicholls, 2014).

**Industry representatives agree that a variety of methods can control invasives:** Given the threat, controlling invasives is important. Although all control approaches presented in the questionnaire appeared to seem effective to respondents, they most strongly agreed that cleaning equipment would prevent the spread of invasive species. Reasons for this are unknown, but long-term, successful campaigns like "stop aquatic hitchhikers" and a newer campaign focused on "play, clean, go" may have influenced these perceptions. Recently enacted state requirements for cleaning watercraft and training personnel dealing with watercraft may also have influenced these responses. Regardless, industry representatives most strongly agreed that cleaning equipment was important to control invasives. Understanding compliance and effective ways to ensure compliance with cleaning are of interest.

Although respondents expressed a lower level of agreement about controlling invasive species through nurseries, plantings, and reporting, respondents agreed these efforts could help control invasives. Presenting information about the effectiveness of these various measures, if known, might encourage action and improve industry perceptions of these measures.

In addition, the opportunities for tourism organizations to influence or participate in any control measures could be more clearly identified by interested organizations. For example, tourism organizations could host or co-sponsor volunteer efforts to remove invasive species or encourage guests to identify invasives through "bio-blitzes". Organizations that own land or have significant influence on visitor behavior may perceive greater control over invasives and subsequently agree with selected control methods. Owners and developers may be particularly important to control efforts as noted by Pickering, Bear and Hill (2007) in a study that associated invasive species with tourism infrastructure development in Australia.

**Future research:** Still unknown are the actions tourism organizations would take to prevent, mitigate, and manage invasives. As such, future research could identify and track willingness to act and actions taken either through external observations or self-reporting of actions. Differences among industry sectors may exist based on how much real or perceived impact invasives will have on a sector. Future research also could focus on visitor behavior in response to invasives and modeling of tourist preferences could advance understanding of the economic impacts of invasives. For example, pilot studies in Minnesota indicated one-third of respondents may not return to areas impacted by emerald ash borer (Schneider, Schlueter, & Mater, 2013).

**Limitations:** Readers should consider the results of this study in light of certain limitations, which all studies have. Related to the respondents, the response rate was lower than desired but not unusual for online questionnaires. Still, those completing the questionnaires could be more interested in the primary content of sustainable tourism and subsequently biased. As the Michigan

tourism industry identified invasive species as a significant threat to the industry, however, (Nicholls, 2014), the validity of the perceived harm related invasives seems reasonable and valid.

Regarding limitations to the questions, this was a first attempt to assess the importance to the industry of invasive species and their control, so the questions were purposefully broad. Additional research could focus on perceptions and perceived control of specific species identified as more urgent than others. Future research might include a separate questionnaire focused on invasives, as well as a seven or nine-point scale to further differentiate agreement on the harm caused by invasive species, as well as the effectiveness of control methods.

## INTRODUCTION

Invasive species include "...an alien (or non-native) species whose introduction does, or is likely to cause economic or environmental harm or harm to human health" (Executive Order 13112, 1999). Significant concerns are associated with both plant and aquatic invasive species for communities, businesses, organizations, and society as a whole. As such, legislation, policymaking, and messaging have ensued to address and minimize the harm related to invasive species.

In Minnesota, a variety of actions and organizations address invasive species. For example, in 2001 an invasive species advisory council was initiated, a statewide plan started in 2005, and annual plan published in 2009 (Minnesota Invasive Species Advisory Council, 2009). Since 2010, the Minnesota Department of Natural Resources (DNR) has formed a task force to address aquatic invasive species and the State Legislature has funded an aquatic invasive species center. In 2011, Explore Minnesota Tourism (EMT) partnered with the DNR to create materials and host webinars focused on educating tourists about aquatic invasive species and is considering the same for plant-based species. Regarding plant-based species, a state interagency task force was formed to address effective mitigation efforts and, in 2013, launched an integrative campaign entitled "play, clean, go." "

Published literature pays uneven attention to the impacts of invasive species and few studies exist. While the biophysical effects of invasive species, including biodiversity loss and ecosystem degradation, have been recognized and documented (Pysek & Richardson, 2010), less research exists on other impacts. Since 2008, a handful of studies have explored perceptions and attitudes toward invasive species among local residents (Adams, Bucaram, Lee, & Hodges, 2010; Flint, Qin, & Ganning, 2012, Quick & Bates, 2009), tourists (Arnberger, Eder, Alex, Sterl, & Burns, 2012; Muller & Job, 2009), and environmental agency personnel (Garcia-Llorente, Martin-Lopez, Gonzalez, Alcorlo, & Montes, 2008; Selge, Fischer, & van der Wal, 2011). Despite the significant potential impacts of invasive species on tourism (Pejchar & Mooney, 2009) and their exacerbation by climate change (Walther et al. 2009), only one study appears to identify tourism organizations attitudes to invasive species — a Michigan study that identified invasive species among tourism professionals' top five concerns (Nicholls, 2014).

Given the significant impact that invasive species can have on tourism destinations, as well as the power that tourism organizations and destinations possess to mitigate invasive species, understanding their perceptions about invasive species and their control seems in order. As such, this report documents perceptions of invasive species, both plant-based and aquatic, among Minnesota tourism organizations as of 2013.

## **METHODOLOGY**

### **Questionnaire**

An online questionnaire was developed based on past research (Quick & Bates, 2009) and desired industry information. As part of a larger questionnaire focused on sustainable tourism (Qian, Schneider & Simmons, 2014), respondents identified their level of agreement with several statements related to the importance of invasive species and ways to control them. Statements on both invasive plants and aquatic invasive species were included; examples include “invasive plants are harmful to Minnesota’s environment,” “volunteering to help maintain parks and nature trails will help control invasive plants,” “aquatic invasive species are harmful to Minnesota’s economy,” and “cleaning equipment will help control aquatic invasive species.” (See Appendix A, questions 24 and 25). Respondents were also asked to identify the best ways to receive information on sustainable tourism, such as listserv, in-person workshops, webinars, etc. (See Appendix A, question 29).

For comparison and to assess representativeness, respondents indicated the industry sector with which they were primarily affiliated, the Minnesota tourism region in which their tourism organizations were located, the number of years they had worked in the tourism industry and for the current employer, as well as gender.

### **Data collection**

In March 2013, the questionnaire was electronically deployed via SurveyMonkey to the database of tourism entities maintained by Explore Minnesota Tourism (n=3,550). Questionnaire recipients were located across the state in the sectors of lodging, event/festival, retail, convention and visitor bureaus, and government. Study authors used a modified tailored design method (Dillman, Smyth, & Christian, 2009), with the process including an electronic preview, a personalized invitation to participate in the survey, and a reminder to complete the questionnaire.

### **Response rate**

Among the 3,550 usable contacts in the EMT database, 585 responded and 426 completed the questionnaire— yielding a response rate of 16 percent and a completion rate of 12 percent. The sample size is sufficient for organizational research with categorical data (Bartlett, Kotrlik, & Higgins, 2001) and yielded a 95 percent confidence rate that most responses are accurate within plus or minus 4.46 percent.

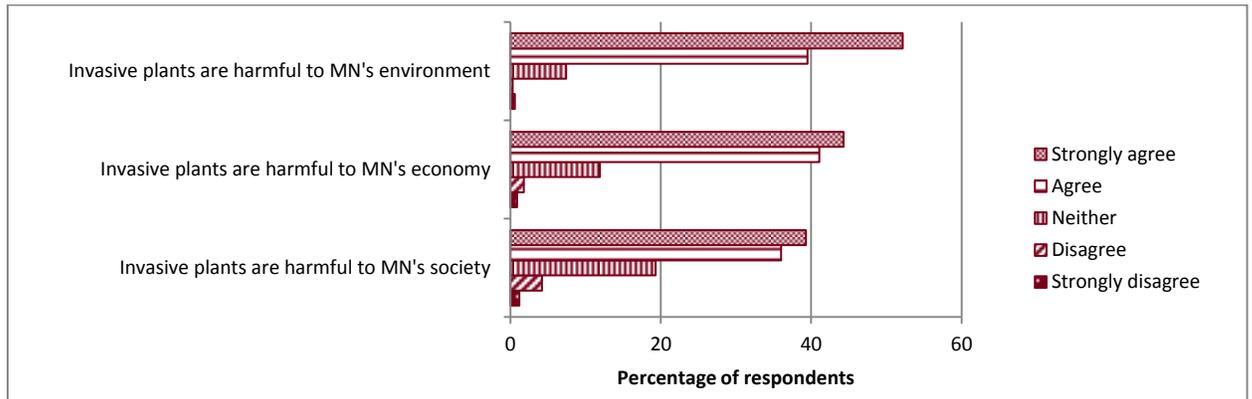
### **Analysis**

The first steps of analysis included downloading survey responses from SurveyMonkey, and checking and cleaning the data in SPSS (version 21.0). Subsequent analysis provided frequencies, means, medians, and standard deviations to describe tourism organizations’ perceptions about the effects of invasive species on the environment, economy, and society, as well as ways to manage these species. Analysis of Variance (ANOVA) examined differences in perceptions by region. For those questions related to controlling invasive species on an organization’s property, only organizations that owned their physical space were included in analysis. Due to small sample sizes, comparisons by sector, number of years working in the industry, or number of years working for the current employer were not feasible. Analysis also provided percentages to describe best ways of receiving information on sustainable tourism for the entire sample and by region.

## RESULTS

### Invasive plant species

**Harm to Minnesota’s environment, economy, and society.** The majority of respondents agreed that invasive plants are harmful to Minnesota’s environment, economy, and society, in that order (Figure 1, Table 1). Fewer than six percent disagreed at any level that invasive plants were harmful in these ways. Regional comparisons did not show significant differences in perceptions of harm by invasive plant species (Table 2).



**FIG. 1:** Respondents’ perceptions of invasive plant species’ harm to Minnesota’s environment, economy, and society (n=335)

	Mean <sup>1</sup>	Median <sup>1</sup>	Standard Deviation
Invasive plants are harmful to Minnesota’s environment	4.42	5.00	0.69
Invasive plants are harmful to Minnesota’s economy	4.26	4.00	0.80
Invasive plants are harmful to Minnesota’s society	4.08	4.00	0.92

**TABLE 1:** Descriptive statistics of respondents’ perceptions of invasive plant species’ harm to Minnesota’s environment, economy, and society (n=335)

<sup>1</sup>Rated on a scale where 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly Agree.

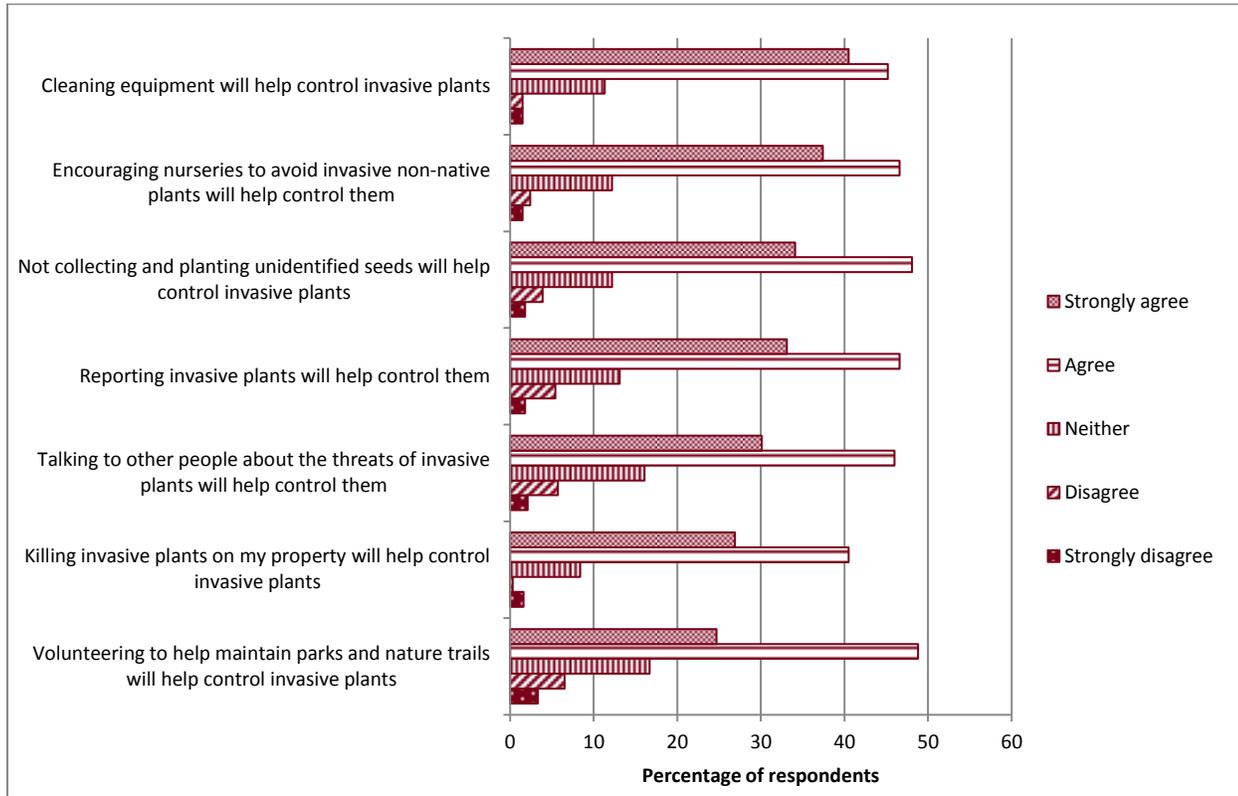
	Mean (Standard Deviation)					F
	Northeast (n=82)	Central (n=70)	Northwest (n=59)	Southern (n=68)	Metro (n=58)	
Invasive plants are harmful to MN’s environment	4.47 (0.71)	4.40 (0.65)	4.42 (0.67)	4.38 (0.75)	4.43 (0.70)	0.19
Invasive plants are harmful to MN’s economy	4.29 (0.85)	4.31 (0.69)	4.34 (0.68)	4.19 (0.95)	4.16 (0.80)	0.61
Invasive plants are harmful to MN’s society	4.13 (0.94)	4.10 (0.82)	4.03 (0.96)	4.07 (1.00)	4.03 (0.92)	0.15

**TABLE 2:** Regional comparison of respondents’ perceptions of invasive plant species’ harm to Minnesota’s environment, economy and society (n=335)

Note: Rated on a scale where 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly Agree.

**Controlling invasive plants:** Using a mean score of 3.5 as the threshold for “agree,” respondents agreed that all seven ideas presented to control invasive plants would help (Table 3). Respondents most frequently agreed that cleaning equipment would help control invasive plants, followed by

killing invasive plants on their own property (where applicable). Although respondents agreed that all seven items would help control invasive plants, they least frequently agreed that talking to others and volunteering to maintain trails and parks would help control invasive plants.



**FIG. 2:** Perceived efficacy of methods to control invasive plants (n=335)

Note: For the item “killing invasive plants on my property will help control invasive plants,” only responding tourism organizations that own the physical space were included in analysis (n=309).

	Mean <sup>1</sup>	Median <sup>1</sup>	Standard Deviation
Cleaning equipment will help control invasive plants	4.22	4.00	0.82
Killing invasive plants on my property will help control invasive plants <sup>2</sup>	4.17	4.00	0.79
Encouraging nurseries to avoid invasive non-native plants will help control invasive plants	4.16	4.00	0.84
Not collecting and planting unidentified seeds will help control invasive plants	4.09	4.00	0.88
Reporting invasive plants will help control invasive plants	4.04	4.00	0.92
Talking to other people about the threats of invasive plants in Minnesota will help control invasive plants	3.96	4.00	0.94
Volunteering to help maintain parks and nature trails will help control invasive plants	3.85	4.00	0.97

**TABLE 3:** Descriptive statistics of perceived efficacy of methods to control invasive plants (n=335)

<sup>1</sup>Rated on a scale where 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly Agree.

<sup>2</sup>Only responding tourism organizations that own the physical space were included in analysis (n=309).

Of the seven ways to control invasive plants assessed in the survey, respondents’ regional location showed significantly different results for one method: volunteering to help maintain parks and nature trails. Metro-area respondents agreed more strongly this was effective than respondents in the Central region (F=3.18,  $p < 0.05$ ) (Table 4).

	Mean (Standard Deviation)					F
	Northeast (n=82)	Central (n=70)	Northwest (n=59)	Southern (n=68)	Metro (n=58)	
Cleaning equipment will help control invasive plants	4.19 (0.88)	4.24 (0.82)	4.34 (0.64)	4.09 (0.88)	4.24 (0.82)	0.82
Encouraging nurseries to avoid invasive non-native plants will help control invasive plants	4.18 (0.93)	4.18 (0.73)	4.03 (0.93)	4.16 (0.80)	4.22 (0.77)	0.45
Not collecting and planting unidentified seeds will help control invasive plants	4.17 (0.91)	3.98 (0.86)	4.25 (0.66)	3.91 (0.99)	4.14 (0.89)	1.69
Killing invasive plants on my property will help control invasive plants <sup>1</sup>	4.10 (0.94)	4.19 (0.64)	4.19 (0.82)	4.20 (0.79)	4.19 (0.69)	0.14
Reporting invasive plants will help control invasive plants	4.05 (0.97)	4.01 (0.91)	4.10 (0.91)	4.01 (0.88)	4.02 (0.93)	0.10
Talking to other people about the threats of invasive plants in Minnesota will help control invasive plants	3.95 (0.98)	3.93 (0.87)	3.86 (1.12)	4.10 (0.84)	3.96 (0.86)	0.57
Volunteering to help maintain parks and nature trails will help control invasive plants	3.73 (1.13)	3.64 (1.02) <sub>a</sub>	3.76 (0.97)	4.06 (0.79)	4.12 (0.78) <sub>a</sub>	3.18*

**TABLE 4:** Regional comparison of perceived efficacy of methods to control invasive plants (n=335)

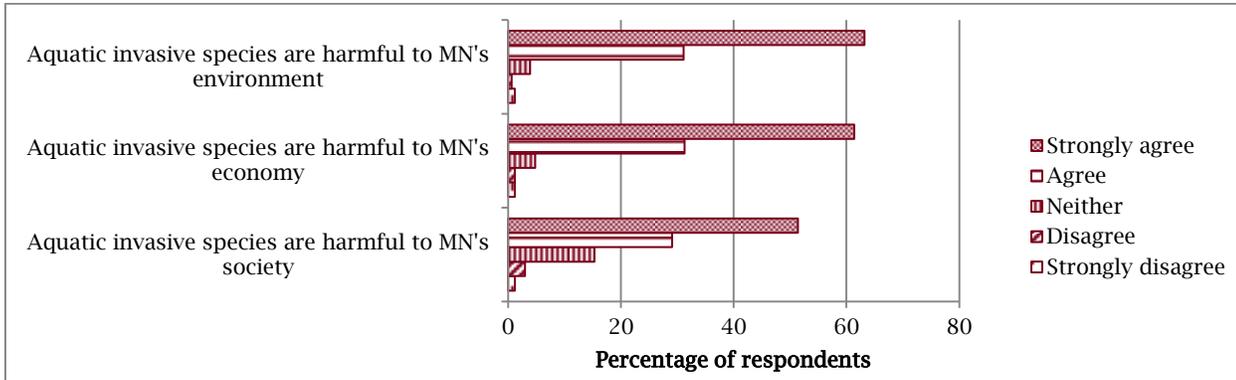
Note: Rated on a scale where 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly Agree. Means with pairing subscripts within rows are significantly different at the  $p < 0.05$  based on Bonferroni post hoc paired comparisons.

<sup>1</sup>Only responding tourism organizations that own the physical space were included in analysis. The sample size for Northeast, Central, Northwest, Southern, and Metro areas were 67, 48, 48, 45, 32, respectively.

\* $p < 0.05$ .

### Aquatic invasive species

**Harm to Minnesota's environment, economy, and society:** The majority of respondents agreed that aquatic invasive species are harmful to Minnesota's environment, economy, and society, in that order (Figure 3, Table 5). Fewer than two percent disagreed at any level that aquatic invasive species were harmful in these ways. Regional comparisons did not reveal any significant differences in the perceived harm of aquatic invasive species on Minnesota's environment, economy, and society (Table 6).



**FIG. 3:** Respondents' perceptions of aquatic invasive species' harm to Minnesota's environment, economy and society (n=335)

	Mean <sup>1</sup>	Median <sup>1</sup>	Standard Deviation
Aquatic invasive species are harmful to Minnesota's environment	4.54	5.00	0.71
Aquatic invasive species are harmful to Minnesota's economy	4.51	5.00	0.75
Aquatic invasive species are harmful to Minnesota's society	4.26	5.00	0.91

**TABLE 5:** Descriptive statistics of respondents' perceptions of aquatic invasive species' harm to Minnesota's environment, economy, and society (n=335)

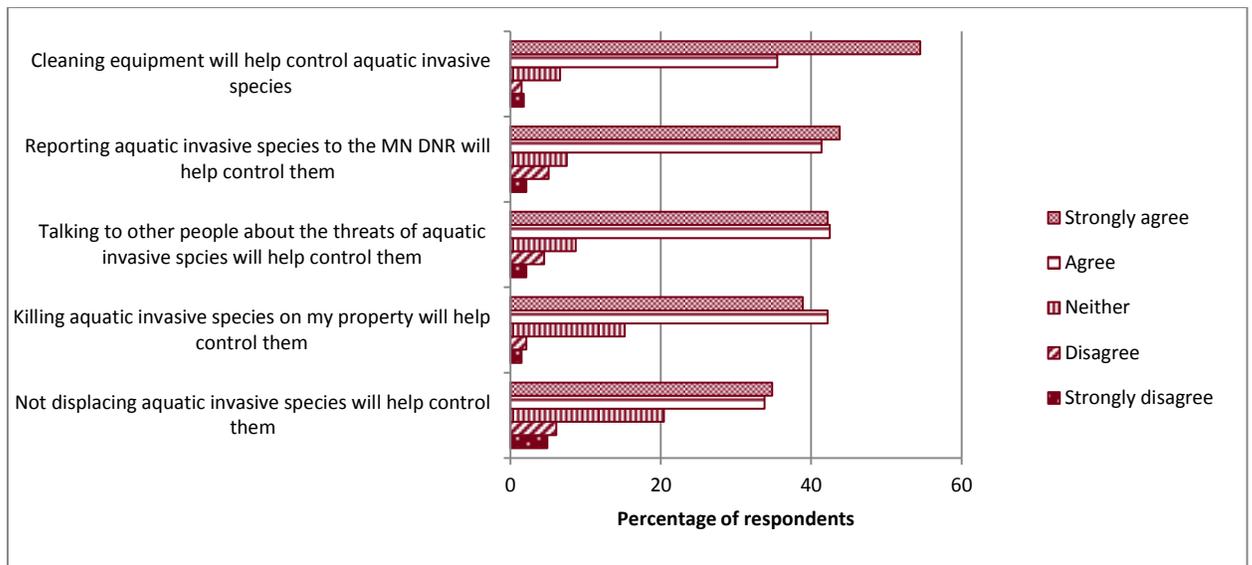
<sup>1</sup>Rated on a scale where 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly Agree.

	Mean (Standard Deviation)					F
	Northeast (n=82)	Central (n=70)	Northwest (n=59)	Southern (n=68)	Metro (n=58)	
Aquatic invasive species are harmful to Minnesota's environment	4.59 (0.72)	4.61 (0.55)	4.51 (0.60)	4.36 (0.96)	4.65 (0.61)	1.78
Aquatic invasive species are harmful to Minnesota's economy	4.54 (0.74)	4.59 (0.60)	4.54 (0.57)	4.35 (0.98)	4.50 (0.78)	1.01
Aquatic invasive species are harmful to Minnesota's society	4.34 (0.90)	4.29 (0.75)	4.20 (0.90)	4.14 (1.06)	4.33 (0.92)	0.64

**TABLE 6:** Regional comparison of respondents' perceptions of aquatic invasive species' harm to Minnesota's environment, economy, and society (n=335)

<sup>1</sup>Rated on a scale where 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly Agree.

**Controlling aquatic invasive species:** Using a mean score of 3.5 as the threshold for “agree,” respondents agreed that all five ideas presented to control aquatic invasive species would help (Figure 4, Table 7). Respondents most frequently agreed that cleaning equipment would help control aquatic invasive species, followed by reporting aquatic invasive species and killing aquatic invasive species on one's own property. Although respondents agreed that all five items would help control aquatic invasive species, they least frequently agreed that not displacing aquatic invasive species would help. Responses did not significantly differ by region (Table 8).



**FIG. 4:** Perceived efficacy of methods to control aquatic invasive species (n=335)

*Note:* For the item “killing invasive plants on my property will help control invasive plants,” only responding tourism organizations that own the physical space were included in analysis (n=309).

	Mean <sup>1</sup>	Median <sup>1</sup>	Standard Deviation
Cleaning equipment will help control aquatic invasive species	4.39	5.00	0.82
Reporting aquatic invasive species to the Minnesota Department of Natural Resources will help control the population	4.20	4.00	0.93
Killing aquatic invasive species on my property will help control the invasive population <sup>2</sup>	4.20	4.00	0.85
Talking to other people about the threats of aquatic invasive species in Minnesota will help control the population from spreading	4.18	4.00	0.92
Not displacing aquatic invasive species will help control the population	3.87	4.00	1.10

**TABLE 7:** Descriptive statistics of perceived efficacy of methods to control aquatic invasive species (n=335)

<sup>1</sup>Rated on a scale where 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly Agree.

<sup>2</sup>Only responding tourism organizations that own the physical space were included in analysis (n=309).

	Mean (Standard Deviation)					F
	Northeast (n=82)	Central (n=70)	Northwest (n=59)	Southern (n=68)	Metro (n=58)	
Cleaning equipment will help control aquatic invasive species	4.43 (0.88)	4.47 (0.66)	4.47 (0.68)	4.15 (1.04)	4.45 (0.75)	1.84
Reporting aquatic invasive species to the Minnesota Department of Natural Resources will help control the population	4.23 (0.96)	4.17 (0.86)	4.15 (1.03)	4.14 (1.00)	4.29 (0.79)	0.30
Talking to other people about the threats of aquatic invasive species in Minnesota will help control the population from spreading	4.18 (0.96)	4.15 (0.83)	4.22 (1.02)	4.06 (0.97)	4.31 (0.80)	0.61
Killing aquatic invasive species on my property will help control the invasive population <sup>1</sup>	4.18 (0.97)	4.11 (0.79)	4.25 (0.82)	4.24 (0.85)	4.25 (0.76)	0.23
Not displacing aquatic invasive species will help control the population	3.75 (1.19)	3.86 (1.12)	3.98 (1.06)	3.70 (1.19)	4.15 (0.85)	1.77

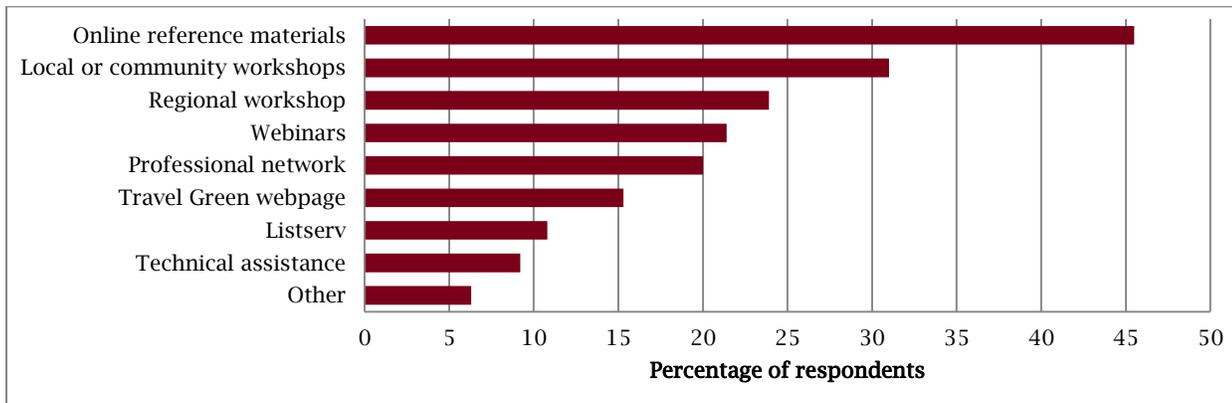
**TABLE 8:** Regional comparison of perceived efficacy of methods to control aquatic invasive species (n=335)

Note: Rated on a scale where 1=Strongly disagree, 2=Disagree, 3=Neither, 4=Agree, 5=Strongly Agree.

<sup>1</sup>Only responding tourism organizations that own the physical space were included in analysis. The sample size for Northeast, Central, Northwest, Southern, and Metro areas were 67, 48, 48, 45, 32 respectively.

**Best ways to receive information on sustainable tourism**

Respondents identified online reference materials and local or regional workshops as the top two best ways to get information on sustainable tourism, including information on invasive species (Figure 5). Respondents most frequently chose online reference materials as one of the best ways to receive information on sustainable tourism. Between 20 and 30 percent of respondents endorsed workshops as preferred ways to learn about sustainable tourism. About 20 percent of respondents selected webinars or professional networks to obtain information on sustainable tourism. On the other end of the scale, fewer respondents indicated that they preferred technical assistance, the Travel Green website or a listserv as one of the best ways to receive information on sustainable tourism.



**FIG. 5:** Respondents' choices of best ways to receive information on sustainable tourism (n=335)

## Respondents

The most frequently represented sector of respondents was lodging/camping (38.3 percent, Table 10). About 13 percent of the respondents came from the event/festival sector, about 10 percent from convention and visitors bureaus, and slightly more than five percent each from government and retail. Almost 30 percent of respondents indicated that they were from an industry sector that was not listed.

The distribution of survey respondents was fairly equal across the five Minnesota tourism regions, with the Northeast representing the largest share (22.1 percent) and the Northwest representing the smallest share (16.7 percent) (Table 10).

More than 30 percent of the respondents indicated they had worked in the tourism industry for more than 20 years, followed by over 20 percent employed in the industry for 10-14 years (Table 10). In terms of the number of years working for the current employer, 23 percent of the respondents had stayed with the current employer for over 20 years, followed by about 18 percent for 10-14 years and 17 percent for 1-3 years. Lastly, more females (about 55 percent) than males completed the survey (Table 10).

	Frequency	Percentage ( percent)
Industry sector		
Lodging/Camping	163	38.3
Event/Festival	55	12.9
Convention & Visitor Bureau/similar Tourism Organization	44	10.3
Government	23	5.4
Retail	22	5.2
Other	119	27.9
Minnesota tourism region		
Northeast <sup>1</sup>	94	22.1
Southern <sup>2</sup>	89	20.9
Central <sup>3</sup>	86	20.2
Metro <sup>4</sup>	86	20.2
Northwest <sup>5</sup>	71	16.7
Number of years working in the tourism industry		
1-3	38	11.1
4-6	47	13.7
7-9	49	14.3
10-14	72	21.0
15-19	33	9.6
20+	104	30.3
Number of year working for the current employer		
1-3	59	17.4
4-6	55	16.2
7-9	55	16.2
10-14	61	17.9
15-19	33	9.7
20+	77	22.6
Gender		
Female	187	54.9
Male	158	44.9

**TABLE 9:** Professional characteristics and gender of 2013 survey respondents.

<sup>1</sup>Northeast includes Carlton, Cook, Itasca, Kanabec, Koochiching, Lake, Pine, St. Louis Counties.

<sup>2</sup>Southern includes Big Stone, Blue Earth, Brown, Chippewa, Cottonwood, Dodge, Faribault, Fillmore, Freeborn, Goodhue, Houston, Jackson, Lac qui Parle, Le Sueur, Lincoln, Lyon, Martin, Mower, Murray, Nicollet, Nobles, Olmsted, Pipestone, Redwood, Renville, Rice, Rock, Sibley, Steele, Swift, Traverse, Wabasha, Waseca, Watonwan, Winona, Yellow Medicine Counties.

<sup>3</sup>Central includes Aitkin, Benton, Crow Wing, Douglas, Grant, Kandiyohi, McLeod, Meeker, Mille Lacs, Morrison, Otter Tail, Sherburne, Stearns, Stevens, Todd, Wadena Counties.

<sup>4</sup>Metro includes Anoka, Carver, Chisago, Dakota, Hennepin, Isanti, Ramsey, Scott, Washington, Wright Counties.

<sup>5</sup>Northwest includes Becker, Beltrami, Cass, Clay, Clearwater, Hubbard, Kittson, Lake of the Woods, Mahnommen, Marshall, Norman, Pennington, Polk, Pope, Red Lake, Roseau, Wilkin Counties.

## DISCUSSION

A questionnaire distributed to Minnesota tourism organizations in 2013 indicated the majority of tourism industry representatives agree invasive species are harmful to the environment, economy, and society. A majority of respondents also agreed that all methods presented could help control invasive species. As this was a first effort to document perceptions of invasives, considerable opportunity exists to further understanding of these findings and effectively use them to prevent and mitigate impacts of invasives. Still, the results provide a baseline for future assessments and reveal the importance respondents attribute to invasives and their control.

The majority of respondents to this questionnaire agreed both plant-based and aquatic invasive species are harmful to Minnesota's environment, economy, and society. For both plant-based and aquatic invasives, the respondents cited environmental harm most frequently. Direct impacts to the Minnesota tourism industry remain uncertain, but clearly the tourism industry recognizes the threat of invasive species. In the only other identified study along these lines, Michigan tourism organizations identified invasive species as a top concern for the industry (Nicholls, 2014).

Given the threat, controlling invasives is important. Although all control approaches appeared to seem effective to respondents, they most strongly agreed that cleaning equipment would prevent the spread of invasive species. Reasons for this are unknown, but long-term, successful campaigns like "stop aquatic hitchhikers" and the newer "play, clean, go," campaign may have influenced these perceptions. Minnesota's recent state requirements for cleaning watercraft and training personnel dealing with watercraft may also have influenced these responses. Regardless, industry representatives identify cleaning as important. Understanding compliance and effective ways to ensure compliance with cleaning are of interest.

Respondents agreed that nursery selection, plantings, and reporting can help control the spread of plant-based invasive species. Presenting information about the actual effectiveness of these various measures, if known, could encourage action where applicable and improve industry perceptions of these actions.

Also, the opportunities for tourism organizations to influence any of these practices or participate in them could be more clearly identified. For example, tourism organizations could host or co-sponsor volunteer efforts to remove invasive species or encourage guests to participate in "bio-blitz" communication campaigns to identify invasives. Certainly some organizations already participate, but it's likely that more organizations could be involved or involved to a greater degree. Organizations that own land or have significant influence on visitor behavior may have greater perceived control over, and subsequently greater agreement with, select control methods. Owners and developers may be particularly important as a study by Pickering et al. (2007) associated invasive species with tourism infrastructure development in Australia.

### Future research

A variety of future research areas exist related to tourism and invasive species. Still unknown are the needs and actual actions tourism organizations would take to prevent, mitigate, and manage invasives. As such, future research could identify and track willingness to act and actions taken either through observations or self-reporting of actions. Differences among industry sectors may exist due to how much real or perceived impact invasives will have on a sector.

Further research on visitor behavior in response to invasives and modeling of tourist preferences could advance understanding of the economic impacts of invasives and effective education techniques. For example, initial interviews with park visitors in Minnesota indicated one-third of

respondents may not return to areas impacted by emerald ash borer (Schneider, Schleuter, Arnberger, Vennette, Snyder & Cottrell, 2014).

Readers should consider the results of this survey in light of certain limitations. Related to the respondents, the response rate was lower than desired but not unusual for online questionnaires. Still, those completing the questionnaires could be more interested in the primary content of sustainable tourism and subsequently biased. The importance of invasive species to the Michigan tourism industry (Nicholls, 2014) however, provides validity for the perceived harm of invasives.

Related to the questions, this was a first attempt to assess the importance among the industry and the questions were purposefully broad. Additional research could focus on perceptions and perceived control of specific species identified as more urgent than others. Future research may want to have a separate questionnaire focused on invasives, as well as include a seven or nine point scale to further differentiate agreement on the harm and effectiveness of control methods.

### **Conclusion**

As climate change can exacerbate invasive species expansion (Walther et al. 2009), the urgency to effectively prevent or mitigate the spread of invasive species rises. Efforts to understand a variety of stakeholder perceptions and interests in acting on invasive species is important and future work is imperative (Dunens, Haase, Kuzma, & Quick, 2013).

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## APPENDIX

Below is the questionnaire that was distributed to tourism entities throughout Minnesota in 2013 to gauge implementation of sustainable practices.

The University of Minnesota's Tourism Center and Explore Minnesota Tourism have partnered to assess the 'state of sustainable tourism in Minnesota.' Our goal is to understand the attitudes about and practices of sustainable tourism in Minnesota. By understanding your attitudes and behaviors, we can plan for future educational offerings and product development. In this questionnaire, we define sustainable tourism as: that which meets the needs of present tourists and host regions while protecting and enhancing opportunities for the future." We ask you to complete this short online questionnaire that will take about 15 minutes. All the information you provide is completely voluntary, confidential, and anonymous. If you have any questions or concerns about the survey, please feel free to phone me at 612.624.2250 or email me at [ingridss@umn.edu](mailto:ingridss@umn.edu).

Ingrid Schneider, Director, UMN Tourism Center

John Edman, Director, Explore MN Tourism

**First, tell us a bit about your organization and its location. (Section 1 of 4).**

**1.\*What industry sector are you PRIMARILY affiliated with (click on one sector)?**

- Lodging/Camping
- Convention & Visitor Bureau/similar Tourism Organization
- Event/Festival
- Retail
- Government
- Other (explain, please)

**2. \*In what Minnesota tourism region is your tourism organization/event located?**

- Northeast (includes Carlton, Cook, Itasca, Kanabec, Koochiching, Lake, Pine, St. Louis Counties)
- Central (includes Aitkin, Benton, Crow Wing, Douglas, Grant, Kandiyohi, McLeod, Meeker, Mille Lacs, Morrison, Otter Tail, Sherburne, Stearns, Stevens, Todd, Wadena Counties)
- Northwest (includes Becker, Beltrami, Cass, Clay, Clearwater, Hubbard, Kittson, Lake of the Woods, Mahnomen, Marshall, Norman, Pennington, Polk, Pope, Red Lake, Roseau, Wilkin Counties)
- Southern (includes Big Stone, Blue Earth, Brown, Chippewa, Cottonwood, Dodge, Faribault, Fillmore, Freeborn, Goodhue, Houston, Jackson, Lac qui Parle, Le Sueur, Lincoln, Lyon, Martin, Mower, Murray, Nicollet, Nobles, Olmsted, Pipestone, Redwood, Renville, Rice, Rock, Sibley, Steele, Swift, Traverse, Wabasha, Waseca, Watonwan, Winona, Yellow Medicine Counties)
- Metro (includes Anoka, Carver, Chisago, Dakota, Hennepin, Isanti, Ramsey, Scott, Washington, Wright Counties)

### 3. Does your organization own its physical space (office, etc.)?

- Yes
- No

### Your attitudes about sustainable tourism. (Section 2 of 4).

Sustainable tourism is defined as "that which meets the needs of present tourists and host regions while protecting and enhancing opportunities for the future. Management of all resources in such a way that economic, social and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity, and life support systems." - World Tourism Organization.

In this section, we are interested in your attitudes about sustainable tourism.

### 4. Click on one response below to indicate your agreement with each of the statements about the benefits and challenges of sustainable tourism.

#### The BENEFITS in the adoption of sustainable tourism practices are...

	Strongly disagree	Disagree	Neither	Agree	Strongly agree
improved consumer prospects.	<input type="checkbox"/>				
remaining competitive.	<input type="checkbox"/>				
economic savings.	<input type="checkbox"/>				
improved organizational image.	<input type="checkbox"/>				
attracting new clientele.	<input type="checkbox"/>				
improved customer perceptions.	<input type="checkbox"/>				
meeting customer expectations.	<input type="checkbox"/>				
increased environment protection.	<input type="checkbox"/>				

#### 5. The DIFFICULTIES in the adoption of sustainable tourism practices are...

	Strongly disagree	Disagree	Neither	Agree	Strongly agree
initial financial costs.	<input type="checkbox"/>				
time and energy.	<input type="checkbox"/>				
customer opposition.	<input type="checkbox"/>				
lack of control over customer behavior.	<input type="checkbox"/>				
staff opposition.	<input type="checkbox"/>				
external restrictions on operations.	<input type="checkbox"/>				
lack of information.	<input type="checkbox"/>				
lack of professional network.	<input type="checkbox"/>				
lack of interest in the concept of sustainability within the organization.	<input type="checkbox"/>				
lack of interest in the concept of sustainability within the consumer base.	<input type="checkbox"/>				

**6. How likely are you to participate in the following, if available?**

	Very unlikely	Unlikely	Likely	Very likely
A self certification for tourism organizations (e.g., property, organization, event, etc.) related to green travel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A 3rd party certification for tourism organizations related to green travel (an independent and neutral party does the evaluation).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Sustainable tourism practices. (Section 3 of 4).**

To understand the current state of sustainable tourism practices, we ask you to identify your organization's current efforts in six areas: a) energy, b) waste, c) air, d) water, e) landscaping, and f) purchasing. If a practice doesn't apply, simply click 'na' for not applicable.

**7. Energy Efficiency. Please check one response in each line below to identify your organization's efforts in this area.**

	No attempt	Under consideration	Just beginning	Completed/ongoing	N/A
Our organization uses compact fluorescent light bulbs.	<input type="checkbox"/>				
Our organization uses light emitting diode (LED) bulbs.	<input type="checkbox"/>				
Exit signs have been replaced with light emitting diode (LED) exit signs.	<input type="checkbox"/>				
Renewable energy sources are used (e. g. solar, wind, biomass, geothermal).	<input type="checkbox"/>				
Window film is installed to lower heating and cooling loads and reduce glare.	<input type="checkbox"/>				
Daylight is used to the greatest possible extent.	<input type="checkbox"/>				
Equipment (e. g. window, light fixtures, appliances) is installed with or replaced by the Energy Star qualified equipments.	<input type="checkbox"/>				
An energy management system (EMS) is used to prevent circulating air, heating, cooling, and lighting while not necessary ( e.g., when not in use ).	<input type="checkbox"/>				
Electric package terminal air conditioner (PTAC) units have been replaced with more efficient heat pump technologies.	<input type="checkbox"/>				
Customers are provided with ideas about energy conservation practices.	<input type="checkbox"/>				

Operation schedules include an energy audit/assessment of the facility by a qualified professional.	<input type="checkbox"/>				
Occupancy sensors or timers are used to control lighting and vending machines in intermittent-use areas.	<input type="checkbox"/>				
Our organization includes periodic HVAC tune-up in our preventative maintenance schedule.	<input type="checkbox"/>				

**8. Waste Minimization. Please check one response in each line below to identify your organization's efforts in this area.**

	No attempt	Under consideration	Just beginning	Completed/ongoing	N/A
We have a recycling program for waste management.	<input type="checkbox"/>				
We provide recycling receptacles for staff and customer use.	<input type="checkbox"/>				
We buy products that contain recycled materials.	<input type="checkbox"/>				
Chemical products are stored safely in a well-ventilated area.	<input type="checkbox"/>				
We require vendors to take back pallets and crates or other packaging.	<input type="checkbox"/>				
Renewable building materials are used in facility construction.	<input type="checkbox"/>				
We donate leftover guest amenities, old furniture and appliances, and other forms of donations to charities and environmental conservation organizations.	<input type="checkbox"/>				
We consult the U. S. Green Building Council ( <a href="http://www.usgbc.org">www.usgbc.org</a> ) when constructing or remodeling in order to learn and to be certified for standards of green buildings.	<input type="checkbox"/>				
We compost food waste and other compostable items, e.g., dishware, napkins, etc., with an onsite composting system or we send materials to an offsite composting facility.	<input type="checkbox"/>				

**9. Environmental Purchasing. Please check one response in each line below to identify your organization's efforts in this area.**

	No attempt	Under consideration	Just beginning	Completed/ ongoing	N/A
We use recycled paper products with high post-consumer recycled content that are either unbleached or bleached without chlorine.	<input type="checkbox"/>				
We minimize the amount and size of paper used.	<input type="checkbox"/>				
We give preference to products that are no or low toxicity, and organic.	<input type="checkbox"/>				
We buy products locally when possible.	<input type="checkbox"/>				
We purchase reusable and durable products.	<input type="checkbox"/>				
We purchase fair trade products. The list of wholesalers can be found at: <a href="http://www.fairtradefederation.org/memwhl.html">www.fairtradefederation.org/memwhl.html</a> ).	<input type="checkbox"/>				
We give preference to the selection of environmentally responsible service providers (e.g. renewable energy, pest management, alternative fuel vehicles).	<input type="checkbox"/>				
We are in favor of equipment that has a long life and that can be repaired.	<input type="checkbox"/>				
We practice social responsibility without discrimination based on race, sex, religion, or political affiliation.	<input type="checkbox"/>				
We employ local residents.	<input type="checkbox"/>				
We pay a fair wage.	<input type="checkbox"/>				
We provide literature that promotes local businesses.	<input type="checkbox"/>				
We avoid burning campfires on poor air quality days.	<input type="checkbox"/>				

**10. Air Quality. Please check one response in each line below to identify your organization's efforts in this area.**

	No attempt	Under consideration	Just beginning	Completed/ ongoing	N/A
Air filtration is in place/available.	<input type="checkbox"/>				
We use environmentally responsible cleaners (MSDS Health Hazard Rating 1 or less).	<input type="checkbox"/>				

Low VOC (Volatile Organic Compound) materials such as paint, adhesives, carpeting, air freshener, etc. have been used.	<input type="checkbox"/>				
The HVAC system is checked at least annually for mold and bacteria as well as obstructions to air flow.	<input type="checkbox"/>				
High moisture areas are well ventilated.	<input type="checkbox"/>				
All air and odor emission are controlled to meet the standard requirements.	<input type="checkbox"/>				
We have periodical tests to ensure healthy air quality (such as carbon monoxide and radon, lead paint and asbestos).	<input type="checkbox"/>				
We use the environmental High Efficiency Particulate Air (HEPA) filters.	<input type="checkbox"/>				
All air handler units and coils are cleaned following a regular preventive maintenance schedule (at least annually).	<input type="checkbox"/>				
We do not leave vehicles running when idle.	<input type="checkbox"/>				
We encourage public or group transportation.	<input type="checkbox"/>				

**11. Water Conservation. Please check one response in each line below to identify your organization's efforts in this area.**

	No attempt	Under consideration	Just beginning	Completed/ongoing	N/A
Our water plan monitors, records, and posts rates of water use, and makes repairs or replaces equipment when rate changes indicate problems.	<input type="checkbox"/>				
Our operations collect rainwater/storm water to use whenever possible.	<input type="checkbox"/>				

We install automatic run-off water taps.	<input type="checkbox"/>				
We have a reclaimed water system that is used for things such as irrigation, laundry, toilets, and/or cooling towers.	<input type="checkbox"/>				
The large areas such as sidewalks and driveways are swept or vacuumed instead of washed down.	<input type="checkbox"/>				
We properly dispose of hazardous chemicals and avoid disposing them into the sink and toilet.	<input type="checkbox"/>				
Our preventative maintenance program includes regularly testing for and repairing leaks on toilets, sink faucets, irrigation systems, and other equipment.	<input type="checkbox"/>				
We install new or replace equipment with U.S. Environmental Protection Agency's WaterSense labeled products.	<input type="checkbox"/>				
We install low-flow faucet aerators, pre-rinse dish sprayers if there is a commercial kitchen, and showerheads; water efficient, dual flush, or water-free composting toilets; and other water-saving fixtures/devices.	<input type="checkbox"/>				
Customers are provided with ideas for water conservation practices.	<input type="checkbox"/>				

**12. Landscaping/Wildlife. Please check one response in each line below to identify your organization's efforts in this area.**

	No attempt	Under consideration	Just beginning	Completed/ongoing	N/A
Residual pesticides or herbicides are used in landscaping.	<input type="checkbox"/>				
The design and construction of our facility reflects the natural surroundings and culture of the area.	<input type="checkbox"/>				
The native vegetation has been retained or included in landscaping.	<input type="checkbox"/>				
We ensure that usual noise levels from all activities at the site are not significantly more than the background noise in nearby natural areas or adjacent residences.	<input type="checkbox"/>				
Irrigation watering, when necessary, takes place in the early morning or at night to minimize evaporation and/or is done so using timers to avoid overwatering.	<input type="checkbox"/>				
Wildlife observation is done from a remote distance and avoided during sensitive times of the year such as during mating season.	<input type="checkbox"/>				
We use an integrated pest management system to reduce or eliminate the need for toxic insecticides and pesticides.	<input type="checkbox"/>				
We promote the Leave No Trace principles to customers and employees.	<input type="checkbox"/>				
Publications are provided to offer information on native plants and wildlife.	<input type="checkbox"/>				
We use interpretative signs on nature to instruct customers.	<input type="checkbox"/>				
In the garden areas, we switch to drought resistant native plants, and/or replace mowed landscaping with native ground cover.	<input type="checkbox"/>				
We compost landscaping wastes, e.g., grass clippings, woods/plants, on site or we send these materials to an offsite compositing facility.	<input type="checkbox"/>				

A bit about you and your organization. (Section 4 of 4).

**\*13. Please identify what industry sector you are PRIMARILY affiliated with.**

- Lodging
- Event/Festival
- Convention & Visitor Bureau or similar Tourism Organization
- Retail
- Government
- Other

Property Profile.

**14. What type of property are you associated with?**

- Resort
- Resort with campground
- Hotel/Motel/Historic inn
- Bed & Breakfast
- Campground
- Other (Specify, please)

**15. How many rooms/campsites does the property have?**

Rooms/Campsites

**16. How many acres is your property?**

- Less than 1 acre
- 1 to 5 acres
- 6 to 10 acres
- 11 to 15
- 16 to 20
- 21 to 25
- 25+

**17. When is the property open?**

- Year round (if checked, skip next question, please)
- Seasonally

**18. We do property laundry on site.**

- Yes
- No

**19. There are several sustainable practices specific to lodging properties. Please check one response to indicate if and how your organization has considered the practices listed below.**

	No attempt	Under consideration	Just beginning	Completed/ ongoing	N/A
Our property offers a linen reuse option to multiple guest rooms.	<input type="checkbox"/>				
We install water conserving fixtures such as low-flow showerheads/toilets, toilet-tank fill diverters, and sink aerators.	<input type="checkbox"/>				
Our housekeeping and engineering departments have an active system to detect and repair leaking toilets, faucets and showerheads.	<input type="checkbox"/>				
Refillable amenity dispensers are used rather than individual bottles for bathroom amenities.	<input type="checkbox"/>				
Whenever possible, we buy guest amenities in bulk.	<input type="checkbox"/>				
Bicycles are available for use or for rental.	<input type="checkbox"/>				
The water-using appliances and equipment, such as ice machines, washing machines, etc., are on a preventative maintenance schedule to ensure maximum efficiency.	<input type="checkbox"/>				

We use guest room energy management systems that allow a guest to easily turnoff all unnecessary electronics when leaving the room (e.g., single-point key card systems).

Event/Festival Profile.

20. How many days is your event/festival (Choose one, please)?

21. Approximately how many people attend your event/festival?

- Fewer than 1,000 people
- 1,000 - 4,999 people
- 5,000 - 9,999 people
- 10,000 - 49,999 people
- 50,000 or more
- Unsure

22. What is your event/festival's budget?

- Less than \$1,000
- \$1,000 - \$9,999
- \$10,000 - \$49,999
- \$50,000 or more
- Unsure

23. In your opinion, what are the most important indicators of a 'sustainable' event or festival?

24. This question focuses on plant species that are invasive to Minnesota. Please indicate your response regarding the following options concerning invasive plant species in Minnesota.

	Strongly Disagree	Disagree	Neither	Agree	Strongly agree
Invasive plants are harmful to Minnesota's environment.	<input type="checkbox"/>				
Invasive plants are harmful to Minnesota's economy.	<input type="checkbox"/>				

Invasive plants are harmful to Minnesota's society.	<input type="checkbox"/>				
Talking to other people about the threats of invasive plants in Minnesota will help control invasive plants.	<input type="checkbox"/>				
Reporting invasive plants will help control invasive plants.	<input type="checkbox"/>				
Cleaning equipment will help control invasive plants.	<input type="checkbox"/>				
Not collecting and planting unidentified seeds will help control invasive plants.	<input type="checkbox"/>				
Volunteering to help maintain parks and nature trails will help control invasive plants.	<input type="checkbox"/>				
Planting and maintaining native plants in my yard and garden will help control invasive plants.	<input type="checkbox"/>				
Killing invasive plants on my property will help control invasive plants.	<input type="checkbox"/>				
Encouraging nurseries to avoid invasive non-native plants will help control invasive plants.	<input type="checkbox"/>				

**25. This question focuses on aquatic species that are invasive. Please indicate your response regarding aquatic invasive species in Minnesota.**

	Strongly Disagree	Disagree	Neither	Agree	Strongly agree
Aquatic invasive species are harmful to Minnesota's environment.	<input type="checkbox"/>				
Aquatic invasive species are harmful to Minnesota's economy.	<input type="checkbox"/>				
Aquatic invasive species are harmful to Minnesota's society.	<input type="checkbox"/>				
Talking to other people about the threats of aquatic invasive species in Minnesota will help control the population from spreading.	<input type="checkbox"/>				
Reporting aquatic invasive species to the Minnesota Department of Natural Resources will help control the population.	<input type="checkbox"/>				
Cleaning equipment will help control aquatic invasive	<input type="checkbox"/>				

species.

Not displacing aquatic invasive species will help control the population.	<input type="checkbox"/>				
Killing aquatic invasive species on my property will help control the invasive population.	<input type="checkbox"/>				

**\*26. How many years have you worked in the tourism industry (this drop down box will allow you to enter in number of years; if less than 1, enter 0)?**

**27. How many years have you worked in this organization (this drop down box will allow you to enter in number of years; if less than 1, enter 0)?**

**28. You are (choose one):**

**29. What are the best ways to receive information on sustainable tourism?**

- Listserv.
- Travel Green webpage.
- Local or community workshops.
- Online reference materials.
- Regional workshops.
- Technical assistance (onsite visits).
- Webinars.
- Professional network.
- Other, please specify

**30. What, in your opinion, are the next best steps for sustainable tourism in Minnesota (please type in your ideas)?**

**31. If you would like to be kept informed on developments in Minnesota's sustainable tourism, please include your email below.**