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Landowner Characteristics Associated with Receiving Information About Invasive Plants and Implications for Outreach Providers

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Abstract: Based on a survey of woodland owners in West Virginia, we examined the possibility of differences in the characteristics of those who had and had not received information about local invasive plants and implications for outreach providers. Findings suggest that landowners who farmed on their property, held recreation objectives, and lived in the local area were significantly more likely than their counterparts to have received information. A majority of landowners with these characteristics, however, had not heard or read such information. Implications for expanding awareness through both traditional and non-traditional information channels are presented.

Introduction

Non-native invasive plants have been recognized as a serious and increasing threat to the ecological and economic values of forests and other natural and managed lands (cf., National Invasive Species Council, 2001; USDA Forest Service, 2004). The fact that private forest landowners account for a full 42% of the nation's forestland (Butler & Leatherberry, 2004) underscores the need to engage them in detecting and managing these plants.

Based on a mail survey of West Virginia woodland owners, Steele, Chandran, Grafton, Huebner, and McGill (2006) identified a need to heighten awareness of invasive plants. Two-thirds of landowners had not heard or read information about invasive plants in their area. While 62% were aware of "undesirable" plants on their woodland, these landowners identified a limited range of species. Most common were multiflora rose (*Rosa multiflora*), tree-of-heaven (*Ailanthus altissima*), and autumn olive (*Elaeagnus umbellata*).

In the study reported here we extended Steele et al. (2006) by examining the possibility of differences in the characteristics of landowners who had and had not received information about invasive plants and identifying implications for outreach providers. Objectives were:

1. To determine whether information receipt was associated with landowners' ownership objectives, uses of the property, and local or non-local residence,

2. To determine the sources of the information received and whether source type was associated with landowner characteristics, and

3. To determine the implications of these findings for targeting information dissemination strategies

Methods

Data Collection

We collected data as part of a larger study of woodland owners' awareness and management of invasive plants (Steele et al., 2006). We selected three study sites from different ecological regions of West Virginia. Within each site, we mailed questionnaires to 500 randomly-chosen landowners with 10 or more acres of woodland as indicated on property tax records. In the initial mailing we included a personalized cover letter, a questionnaire, fact sheets describing tree-of-heaven, Japanese stilt grass, and multiflora rose, and a stamped return envelope. Two follow-up mailings were sent: a postcard thank-you/reminder to all respondents and a final replacement questionnaire to non-respondents. Response rates ranged from 42% in Site 1 to 46% in Site 3, for an overall value of 44%.

To assess the possibility of non-response error, we constructed variables measuring place of residence (in-site, county adjacent to site, elsewhere in West Virginia or adjacent state, and non-adjacent state) and woodland acreage (10-25, 26-50, 51-100, 101-200, and greater than 200 acres). We compared the observed and expected proportions using chi-square tests and found no significant differences.

We measured information receipt as a yes/no response to the question: "Have you heard or read information about invasive plants in your area?" While it was not possible to determine from this question whether or not the landowner actively sought the information received, that does not alter its validity for linking information receipt to landowner characteristics.

Those who answered yes were then asked to identify whether or not they had received information from each of the following sources: 1) family members; 2) friends or personal acquaintances; 3) forester; 4) West Virginia Department of Agriculture (WVDA); 5) Extension agent; 6) local newspaper; 7) other publication; 8) the Internet; 9) television; 10) radio; or 11) other. Because landowners identified multiple sources, we constructed a new variable to measure general source type. Categories included: 1) Personal networks only (family and/or friends); 2) agencies/media only; or 3) combination of personal and agency/media sources.

Landowner characteristics included whether or not the owner: 1) used the property for farming; 2) used it for timber production; 3) cited recreation as an ownership objective; 4) cited wildlife as an objective; and 5) lived within the local study area (not necessarily on their woodland). We measured the first four characteristics on the questionnaire, and the fifth based on the zip code of the landowners' mailing address.

- Landowners who farm on their property, use it for timber production, or hold recreation or wildlife objectives may perceive invasive plants as tangible threats to those activities/ objectives. They may therefore seek out relevant information.

- Many of those who farm have long-standing connections to traditional information sources that have sought to increase awareness of invasive plants (such as the WVDA and Extension Service). Similarly, landowners who manage for timber, recreation, and/or wildlife may be connected to interest-based information networks.

Data Analysis

We first compared the proportions of landowners who had received invasive plant information across the study sites using a one-way analysis of variance test. Because there were no significant differences, we pooled the data from the three sites for subsequent analyses.

Next, we cross-tabulated each of the landowner characteristics with whether or not the landowner received information. To account for relationships among the characteristics, we introduced them in a logistic regression model (treating information receipt as a yes/no response variable).

Finally, we limited our attention to those landowners who had received information. We produced a frequency distribution of information sources and cross-tabulated general source type with landowner characteristics. We separately analyzed relationships with whether or not the landowner received information from an Extension agent.

Results

Relationships Between Information Receipt and Landowner Characteristics

Among all respondents, 34% had heard or read information about invasive plants in their area. Two-thirds cited wildlife as an objective, 48% farmed on the property, 47% indicated recreation was an objective, and 35% used the property for timber production. Ninety percent of landowners cited at least one of these four uses or objectives. Sixty-five percent of respondents lived in the local area, and average age was 59.7 years.

In the bivariate context, landowners who held each of these objectives/uses were significantly more likely than their counterparts to have received information about invasive plants (Table 1). The strongest relationship by far was with farming status. Nearly half (48%) of all those who used their property for farming received information, compared to 22% of their counterparts, and over two-thirds (68%) of those who received information farmed on their property.

Table 1.
Bivariate Relationships between Information Receipt and Landowner Characteristics (N = 585)

	Received Information?				
	Yes	**No**			
	(N = 201)	**(N = 384)**			
	% in column category		**% in row category who received info**	**^{2}**	
Use for farming					
Yes (N = 283)	68%	38%	48%	44.0	***
No (N = 302)			22%		
Live within study area					
Yes (N = 382)	73%	61%	38%	7.8	**
No (N = 203)			27%		
Use for timber production					
Yes (N = 203)	42%	31%	42%	7.3	**
No (N = 382)			30%		
Recreation objective					
Yes (N = 282)	55%	44%	39%	5.6	*
No (N = 303)			30%		
Wildlife objective					
	74%	65%	38%	5.1	*

Yes (N = 397)					
No (N = 188)			28%		
Based on cases with non-missing data on all these variables * p < 0.05; ** p < 0.01; *** p < 0.001					

Three of these variables remained significant in the multivariate model (Table 2). The odds of receiving information were 3.4 times higher for landowners who farmed on their property, 2.0 times higher for those with a recreation objective, and 1.5 times higher for those who lived within the study area, compared to their counterparts.

Table 2.
Logistic Regression on Information Receipt (N = 585)

	Logit Coefficient	**Odds Ratio**	
Farm on property	1.23	3.4	***
Recreation objective	0.67	2.0	***
Live within study area	0.42	1.5	*
Constant	-1.91		
-2 log likelihood	691.5		
Percent correctly classified	67%		
* p < 0.05; *** p < 0.001			

Using the property for timber production dropped from significance in the multivariate model because of its association with recreation and farming. Forty-one percent of landowners who cited recreational objectives produced timber ($^2 = 8.4$, $p < 0.05$), and 40% of farming landowners did so ($^2 = 5.3$, $p < 0.05$). Citing wildlife as an objective was strongly associated with recreation. A full 89% of those with recreation objectives also cited wildlife ($^2 = 113.5$, $p < 0.001$).

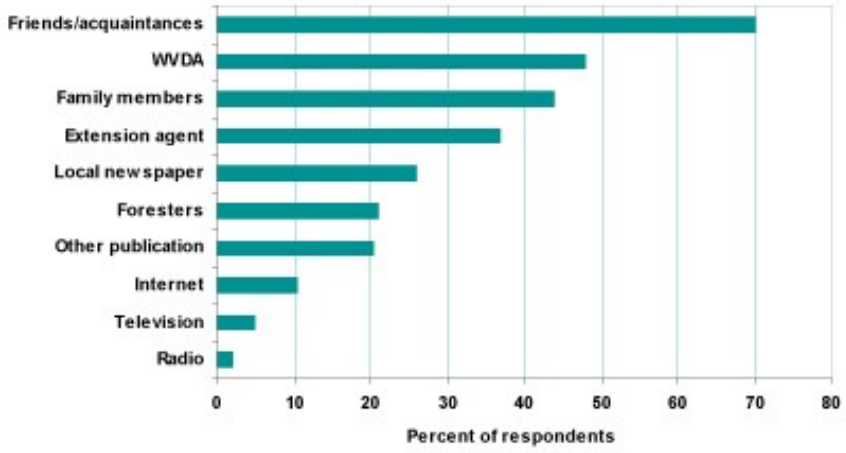
Information Sources and Relationships with Landowner Characteristics

Among landowners who received information (N = 201):

- The most frequently cited source was friends or personal acquaintances (70%; Figure 1). Next most common were the WVDA (48%), family members (44%), Extension agents (37%), local newspapers (26%), foresters (21%), other publications (20%), Internet (10%), television (5%), and radio (2%).

- Twenty percent received information from personal sources only, 27% from agencies/media only, and 53% from a combination of personal and agency/media sources.

Figure 1.
Sources of Information about Invasive Plants (Respondents IdentifiedMultiple Sources)



Landowner characteristics were unassociated with general source type. Landowners who used their property for farming, however, were more likely than their counterparts to indicate that they received information from an Extension agent (43% compared to 25%, $^2 = 5.6$, $p < 0.01$).

Discussion

Although landowners' information networks may vary somewhat in different states or regions, these results suggest an important role for Extension and other information providers. Even though friends, acquaintances, and family members were major sources of information, only 20% of landowners received information exclusively from such sources. Results also suggest that both broad-based and targeted information channels may be used to reach more landowners.

- The fact that landowners were heterogeneous in relation to their objectives/uses, combined with the fact that even a majority of local landowners had not heard or read information about invasive plants in the area, suggests a need for cost-effective means to reach a broad base of landowners.

- Disseminating information through recreation and wildlife-based interest networks merits attention. Although landowners who cited recreation as an objective were more likely than their counterparts to hear or read information about invasive plants, 61% of them did not. Because recreation was associated with wildlife and timber production objectives, there are a number of possible channels for reaching these landowners. Extension educators and others who offer forest landowner workshops, for example, may capitalize on popular interest in wildlife management programming (Downing & Finley, 2005; Magill, McGill, & Fraser, 2004; Measells et al., 2006) to expand awareness of invasive plants and their impacts.

- Traditional assistance providers could play important roles in continuing to reach out to landowners who farm (because about half of these landowners had not received information about invasive plants) and in heightening awareness of lesser known and/or recently introduced species.

Any efforts to increase awareness of invasive plants must be considered as part of a larger outreach strategy that goes beyond information dissemination to ultimately improving landowners' ability to control invasive plants on the ground (Steele et al., 2006). This includes direct control using mechanical and chemical treatments as well as methods for working across property boundaries to reduce chances for re-infestation and enhance long-term control.

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