Extension Education Methods

Adoption of Landscape Management Practices by Florida Residents

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SUMMARY. The Florida Cooperative Extension Service (FCES) teaches residents the importance of proper landscaping practices. FCES offers several educational programs that teach residents how to integrate energy and water conservation, pest management, and waste recycling practices into their home landscapes. In 1997, extension staff and volunteers planned and conducted environmental landscape management (ELM) programs resulting in >800,000 customer contacts. A survey was conducted to measure the adoption of recommended best management practices by program participants and nonparticipants. Results show that, of 39 practices examined, Master Gardener trainees increased the number of practices used by an average of 7.3, while educational seminar and publications-only participants increased by an average of 4.5 and 2.8 practices, respectively. Nonparticipants showed essentially no change. When practices are examined one at a time, the Master Gardeners made statistically significant increases in 28 of the 39 recommended practices. Educational seminar and publications-only participants made similar gains in 31 and 6 practices, respectively, and the nonparticipant comparison group made significant increases in 2 practices and decreases in 8. The results suggest that the publications-only strategy for delivering information to homeowners is less effective than strategies combining educational seminars or intensive training with relevant publications.

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Though concern for the environment continues to resonate with the public, homeowners are often slow to recognize the impact of their landscape design and maintenance practices on surrounding ecosystems. Environmental degradation can occur to our water, land, and biotic resources from the cumulative impacts of individual homeowners' fertilization, irrigation, pest management, and other landscaping practices (Beverly et al., 1997). For example, using recommended irrigation practices can save ≈30% of outdoor water use, while redesigning the home landscape and irrigation system and using proper irrigation practices can save 75% to 80% (Gilman and Park Brown, 1991; Karlik, 1992; Nelson, 1987). Florida Cooperative Extension Service (FCES) is teaching residents the importance of proper landscaping practices to address these environmental concerns. It offers several educational programs that promote the adoption of environmentally sound practices in the design and management of residential landscapes. These programs teach homeowners how to integrate energy and water conservation, pest management, waste recycling, and other practices into their landscapes. Although delivery methods vary among counties, program content and environmental landscaping principles are consistent.

In 1997, FCES staff and volunteers planned and conducted environmental landscape management (ELM) programs resulting in >800,000 customer contacts. Consumers learned about ELM through >500 programs in 46 of Florida's 67 counties. Personnel and operating expenses for the ELM programs in fiscal year 1997 was ≈2 million dollars. Given FCES's investment of resources in the ELM program, a team of county and state Extension faculty wanted to assess program impact and compare the effectiveness of delivery methods. Information about the impact of different delivery methods is critical to improving the program's efficiency. If one delivery method is ineffective, then efforts can be modified or redirected to other strategies. Impact information is also used to meet increasing accountability requirements of state and federal legislative bodies, county officials, and the public at large. This paper addresses these issues by comparing the adoption of recommended landscaping practices by participants in three versions of the ELM program with a nonparticipant comparison group.

Environmental landscape management programs

County extension faculty often customize the delivery of ELM programs to fit the educational interests and needs of the local audience. These programs fit into three categories: Master Gardener (MG) training, educational seminars, and publications only. Florida's MG program provides residents with an intensive education of horticultural practices. The program requires that participants attend 50 h of training on topics relating to landscape management. After satisfactorily completing the training and meeting program requirements, MGs are expected to volunteer 50 h of in-kind services within 1 year of their training. Trainees also receive the MG handbook and other relevant resource materials.

Educational seminars and workshops lasting from 1 to 6

Table 1. Distribution of environmental landscape management survey respondents' property attributes by type of program.

	Program type							
	Master Gardener (n = 134)		Seminar (n = 320)		Publications only (n = 72)		Nonparticipant group (n = 186)	
	n	%	n	%	n	%	n	%
Property type								
Home	102	77	287	90	65	90	152	83
Mobile home	7	5	16	5	3	4	17	9
Other (e.g., condos)	24	18	17	5	4	6	14	8
Maintained by								
Respondent	122	92	272	85	61	85	121	66
Lawn service	6	4	28	9	6	8	41	22
Other	5	4	19	6	5	7	21	12
Area								
1/8 acre (0.05 ha)	20	15	80	26	21	30	63	35
1/4 acre (0.10 ha)	25	19	94	30	24	34	53	29
1/3 to 1/2 acre (0.13 to 0.20 ha)	33	25	75	24	15	21	33	18
1 acre (0.40 ha)	18	14	31	10	4	6	17	9
>1 acre (0.40 ha)	36	27	29	9	7	9	14	8
Irrigation system								
Permanent	42	31	144	45	41	57	75	40
Nonpermanent	92	69	176	55	31	43	110	60

h are offered to residents on topics relating to environmental landscape management. Workshops such as the "Eco-Gardening Conference," "Lawn and Landscape Improvement," and "Florida Yards & Neighborhoods" offer information on composting, backyard habitats, landscape design, and conservation. In some counties, trained volunteers provide direct assistance to individual homeowners. Participants also receive a copy of relevant publications, including the Florida Yards and Neighborhoods (FYN) handbook.

Some residents only obtain copies of environmental landscape management publications (e.g., the FYN handbook) and do not attend educational seminars or the intensive MG training.

Methods

Surveys collected information on landscape design and maintenance practices, as well as homeowner attributes, sources of landscaping information, and attitudes concerning landscape management. Data was first collected from a nonparticipant comparison group in 1993 to establish a baseline. Data was collected from program participants immediately before and ≈6 months after the educational programs during the FY97 program year. A nonequivalent control group design was used for the evaluation (Campbell and Stanley, 1963). Although this design assesses program impacts, it is subject to coverage and nonresponse bias. Coverage refers to the extent to which participation by the target population achieves the levels specified in the program design (Rossi and Freeman, 1993). Nonresponse bias occurs when nonrespondents differ from respondents, which is usually problematic when response rates are low.

Survey data was collected from 134 Clay, Baker, Duval, Leon, Monroe, Nassau, Putnam, St. Johns, and St. Lucie county residents who were enrolled in 1996–97 MG programs. MGs yielded a higher response rate (63%) than any other group. In 1996 and 1997, Brevard, Broward, Hillsborough, Manatee, Monroe, and St. Lucie counties collected preprogram and followup data on 320 participants who attended educational seminars (a response rate of 45%). Data was collected from 72 residents of Manatee and Hillsborough counties who received publications only (a response rate of 54%). A nonequivalent comparison group was selected from 23 counties having proactive environmental landscape extension programs. A sample of licensed drivers (18 years of age or older) yielded a response rate of 57% or 186 usable instruments during the 1993 baseline survey.

Since the development of the ELM program, the survey instrument has been revised several times. Questions that have remained the same for each survey version are included in this paper. Specifically, the analysis focused on the use of 39 best management practices—practices FCES recommends to homeowners that relate to landscape design, irrigation, fertilization, pest management, mowing and pruning, and mulching. An analysis of variance was calculated to determine whether program type impacted net adoption across the set of practices. McNemar's test was used to assess whether the change in adoption of specific practices between the pre- and followup surveys was significant (Sokal and Rohlf, 1995).

Attributes of respondents

More than 75% of the respondents from each group indicated that they lived in single-family homes. A somewhat higher percentage of MG trainees reported living in condos, apartments and other types of housing than did other groups' members (Table 1). More MGs also maintained their own landscapes and were likely to own more acreage than members of any other group. Nonparticipants from the comparison group were less likely to maintain the landscape. Less than half of those in the MG, seminar, and nonparticipant groups indicated that they owned a permanent irrigation system, while 57% of the publications-only group already had a system.

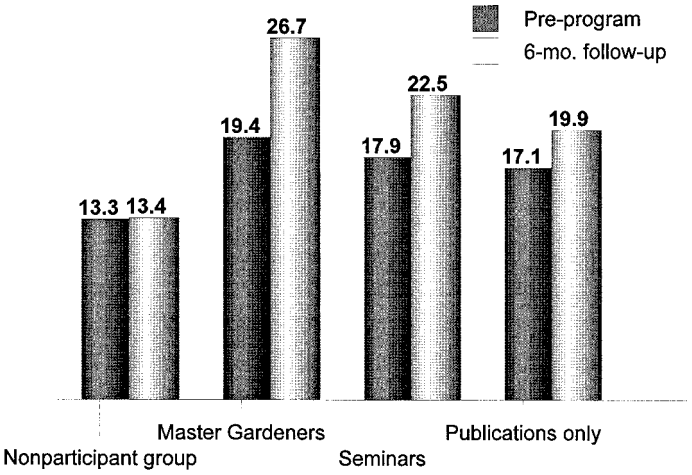

Fig. 1. Mean number of environmental landscape management practices used by program type.

Assessing program impacts

Preprogram surveys indicated that respondents in the groups were using an average of between 13 and 19 of 39 practices before the programs (Fig. 1). Six months after the programs, the average number of practices used by participants showed an increase, while that for nonparticipants remained unchanged. MGs had the largest net increase in practice adoption, followed by seminar and publications-only participants, respectively.

The type of program significantly influenced the change in the number of practices used by respondents ($F = 31.7$; $p = 0.001$). However, the type of property, person maintaining the property, presence of a permanent irrigation system, and parcel size did not significantly affect practice adoption (data not shown). Based on the ANOVA model, comparison of adjusted means for net adoption indicated that each type of program differed significantly from other groups in the number of practices adopted (Table 2). MGs adopted significantly more practices (6.9 practices) than those attending seminars (4.3 practices) and, in turn, persons attending seminars adopted more practices than participants who received publications only (2.6 practices).

On a practice-by-practice basis (Table 3), the number of MGs using a practice significantly increased between the program's start and six months later for 28 of 39 practices studied. The number of seminar and publications-only participants using a practice increased for 31 and 6 practices, respectively. The nonparticipant group made a significant decrease in 8 of the practices, which suggests a tendency to overreport on the pretest by this group.

Site analysis, planting, and landscape design

MG and educational seminar participants made significant increases in the number who adopted recommended landscape design practices, while the nonparticipant group significantly decreased (Table 3). For MG and seminar participants, the number of those grouping plants by water needs and maintenance needs, selecting plants adapted to site conditions, incorporating low-maintenance areas into their landscapes, and identifying sun and shade patterns increased 6 months after the programs. The publications-only group showed a significant increase for just one practice, planting in the proper size hole, while nonparticipants either decreased or showed no change in using recommended landscape design features and practices.

Irrigation practices

As with landscape design, MG trainees and seminar participants showed higher rates of adoption of irrigation practices. Each of these groups showed a significant increase for four of five practices. Preprogram surveys showed that one-third or less of the participants watered their lawns when 30% to 40% of the grass blades fold (a sign of stress). Followup surveys showed that MGs substantially increased (25%) watering when the blades fold, followed by seminar (13%) and comparison nonparticipants (8%). All three types of program participants, MG, seminar and publications-only, increased the number who applied an appropriate amount of water per irrigation, (20%, 13%, and 18%, respectively). The nonparticipant group decreased the number watering early in the morning or in the evening, a decrease that probably represents overreporting on the pretest survey.

Fertilization

Before the program delivery, participants reported varying rates of adoption for practices relating to recommended fertilizer practices. Preprogram surveys showed that less than two-thirds of respondents from each group were using slow release fertilizers, <40% were fertilizing sparingly to reduce excessive growth, <20% applied 1 lb of nitrogen per 1000 ft^2 (4.9 kg / 1000 m^2) of turf, and <15% were using iron sulfate to green-up lawns. Followup surveys showed MG, seminar and publications-only participants made significant increases in the use of slow release fertilizers (13%, 15%, and 13%, respectively), while nonparticipants made no change. Six months after the programs, the largest percent change in fertilizer practices exhibited by each group was in applying the appropriate amount of nitrogen; MGs showed the largest increase (38%) in adoption, followed by seminar participants (18%). One practice that was not readily utilized before or after the

Table 2. Mean number of environmental landscape management practices adopted by type of program.

Program type	Practice used before program (mean no.)	Practices adopted (net no.)	Practices adopted (adj. net no.[z])
Master Gardener	19.4	7.3	6.9
Seminar	17.9	4.5	4.3
Publications only	17.1	2.8	2.6
Nonparticipant group	13.3	0.1	0.0

[z]Adjusted means (least square means) were generated by the analysis of variance (model F value = 8.78, $p = 0.0001$). Each mean is significantly different from the others ($p = 0.001$).

Table 3. Percentage point change between pretest and followup surveys for 39 environmental landscape management practices by type of program.

Practice	Program type[z]			
	Master Gardener	Seminar	Publications only	Nonparticipant group
Site analysis, planting and landscape design				
Group plants by water needs	26.1	15.0	---	–7.0
Group plants by maintenance needs	23.9	14.4	---	---
Select plants adapted to conditions	16.4	9.4	---	–10.8
Design low maintenance areas into landscape	14.5	6.3	---	–8.6
Identify sun and shade patterns	12.7	10.3	---	---
Test the pH of the soil	11.9	---	---	---
Group plants into beds	10.4	---	---	–11.8
Select plants with moderate growth rates	---	19.1	---	---
Test soil for drainage	---	10.3	---	–5.9
Plant in holes twice as wide as the root ball	---	---	15.3	---
Plant root ball at proper depth	---	---	---	---
Shade western & eastern walls of home	---	---	---	–9.1
Irrigation				
Water the lawn when the blades fold	24.6	13.1	---	8.0
Apply 1/2 to 3/4 inch (1.3 to 1.9 cm) of water/irrigation	20.2	12.8	18.1	---
Water plant bed separately from lawn	19.4	---	---	---
Irrigate according to season	14.2	11.9	---	---
Water early in the morning or in the evening	---	9.1	---	–10.0
Fertilization				
Apply 1 lb. of nitrogen/1000 ft^2 (4.9 kg/1000 m^2)	38.1	17.5	---	---
Fertilize sparingly to reduce the need to prune	32.8	17.5	---	---
Fertilize with slow release components	13.4	15.3	12.5	---
Use iron sulfate to green up the lawn in summer	---	6.3	---	7.0
Pest management				
Routinely check landscape for pest problems	29.9	12.5	15.3	---
Choose pesticide least harmful to environment	23.1	6.6	---	–9.7
Tolerate slight plant damage	21.6	13.4	---	---
Change cultural practices affecting the problem	21.6	6.3	---	---
Identify the problem before using chemicals	20.9	11.3	---	---
Spot-treat only the infested area and buffer zone	20.9	---	---	---
Follow pesticide label instructions and warnings	11.2	9.1	---	---
Mowing and pruning				
Prune branches in front of the branch collar	31.3	10.9	---	---
Mow no more than 1/3 of the grass blade	17.0	6.3	---	---
Set mower blade at the appropriate height	15.7	10.9	---	---
Sharpen mower blade when grass has ragged cut	---	13.1	---	---
Mulching				
Pull much away from shrub stem and tree trunk	32.1	10.6	16.7	---
Increase the size of mulched areas around trees	19.4	9.1	---	---
Use self-mulching areas under trees	18.7	10.6	---	---
Use a compost pile	12.7	5.9	---	---
Leave grass clippings to recycle nutrients	---	12.8	---	---
Add mulch to maintain 2 to 3 inch (5.1 to 7.6 cm) depth	---	9.7	16.7	---
Apply mulch in beds around trees and shrubs	---	---	---	---

[z]Nonsignificant changes are denoted by a dashed line.

programs by any group was use of iron sulfate for greening-up the lawn.

Pest management

Exception for spot-treating infested areas and changing cultural practices affecting a problem, a majority of participants were using recommended pest management practices before the program. Even so, a significant percentage of MG trainees adopted each of the recommended practices. Though the change was smaller than for MGs, a significant percentage of seminar participants also adopted six of seven pest management practices. In contrast, more publications-only participants routinely checked their landscape for pest problems after receiving educational materials but made no other significant changes. The nonparticipant group showed a decline in choosing the least harmful pesticide and no change on other pest management practices.

Mowing and pruning

More participants in educational seminars used each of the mowing and pruning practices at the time of the follow up than before the program. Similarly, a significant number of MG trainees adopted three of four practices. Neither the publications-only participants nor nonparticipants adopted any practices at a significant level.

Mulching

For six of seven mulching practices, the percentage of participants in educational seminars using the practice increased at the time of the follow up survey. Similarly, a significant number of MG trainees adopted four of seven practices. Publications-only participants had significant increases for maintaining mulch depth and pulling mulch from stems and trunks. Because ≈75% of participants used mulch in beds around trees and shrubs before the program, this practice showed little change by any group. Again, the nonparticipant group showed no change for each mulching practice.

Conclusions

The evaluation demonstrated that each delivery method significantly increased use of recommended landscape maintenance practices by program participants in comparison to nonparticipants. MG trainees made the largest average increase in net adoption, probably reflecting the program's more intensive educational experience. Similarly, participants who attended an educational seminar showed significant increases in use of many environmental landscaping practices. On the other hand, persons receiving publications only generally showed limited adoption of individual practices, though this was significant in the aggregate.

One reason that the MG training and educational seminars are more effective may be that an extension faculty member has the opportunity to lay the groundwork for printed information that participants receive, to explain the information in terms that are more meaningful to participants, and to motivate people to take action. A recent qualitative study found that people are motivated to adopt environmental landscape practices when they are likely to reduce their workload, incur no extra cost, conform to neighborhood norms and prevent environmental damage (Salazar, 1997). When faculty members are present, as in MG training and educational seminars, they can address these customer concerns. In contrast, printed materials often focus on the techniques of environmental landscaping and omit discussion of how work is reduced, money saved and so on. For these reasons, program efforts should be redirected from the publications-only approach toward seminars that are complemented by publications. An alternative strategy, whose impact would need to be evaluated, would be to revise ELM publications to explicitly address issues that facilitate or inhibit homeowners making changes in how they manage the landscape.

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