The Journal of Extension

Volume 52 | Number 6 Article 18

12-1-2014

Distilling Research into Actionable Knowledge: An Assessment of a Conservation Buffer Guide

Gary Bentrup
USDA National Agroforestry Center, gbentrup@fs.fed.us

Mary Emery
South Dakota State University, mary.emery@sdstate.edu

Nikki D'Adamo-Damery
Virginia Polytechnic Institute and State University, nikkid11@vt.edu

Cornelia Flora
Iowa State University, cflora@iastate.edu

Recommended Citation

Bentrup, G., Emery, M., D'Adamo-Damery, N., & Flora, C. (2014). Distilling Research into Actionable Knowledge: An Assessment of a Conservation Buffer Guide. *The Journal of Extension, 52*(6), Article 18. https://tigerprints.clemson.edu/joe/vol52/iss6/18

This Research in Brief is brought to you for free and open access by the Conferences at TigerPrints. It has been accepted for inclusion in The Journal of Extension by an authorized editor of TigerPrints. For more information, please contact kokeefe@clemson.edu.

Journal of Extension
www.joe.org

December 2014
Volume 52
Number 6
Article # 6RIB2
Research In Brief

Distilling Research into Actionable Knowledge: An Assessment of a Conservation Buffer Guide

Abstract

Agriculture and natural resources Extension professionals face increasing challenges in delivering evidence-based information to clients. Illustrated design guidelines may offer one tool for presenting useful information, particularly when delivering assistance for multifunctional solutions. Using conservation buffers as the technical topic, the study reported here evaluated resource professionals' perception and use of design guidelines to communicate technical information for planning and designing buffers for multiple goals. Overall, the results provide favorable support for design guidelines. The study offers insight into what constitutes effective guidelines, and these lessons learned may be applicable to other topics in Extension programming.

Gary Bentrup
Research Landscape Planner
US Forest Service
USDA National Agroforestry Center
Lincoln, Nebraska
gbentrup@fs.fed.us

Mary Emery
Department Head/Professor
Department of Sociology and Rural Studies
South Dakota State University
Brookings, South Dakota
mary.emery@sdstate.edu

Nikki D'Adamo-Damery
Deputy Director
Appalachian Foodshed Project
Virginia Polytechnic Institute and State University
Blacksburg, Virginia
nikkid11@vt.edu

Cornelia Flora
(retired)
Department of Sociology
Iowa State University
Ames, Iowa
cflora@iastate.edu

Introduction

The Extension system is designed to help people use evidence-based information to improve their lives, use natural resources wisely, and protect the environment. The increasing diversity and quantity of scientific information is making it challenging for Extension to deliver actionable knowledge that is accessible, understandable, and useful for application in agriculture and natural resources management (Argyris, 1996). Some of the challenges are listed below.

- Scientific information is widely dispersed, and practitioners may not have the time to seek out these scattered resources (Hamilton, Chen, Pillemer, & Meador, 2013).
- Unless a synthesis of the science is completed, practitioners are left with the daunting task of reviewing and assembling the numerous studies into a meaningful whole (Cullen et al., 2001).
- With the shift towards managing landscapes for multifunctionality, practitioners need information

that covers a broad range of functions (Selman, 2009).

- To manage for multiple functions, practitioners need to understand, use, and communicate scientific information from many ecological, social, and economic disciplines (Heemskerk, Wilson, & Pavao-Zuckerman, 2003).

At the USDA National Agroforestry Center, we developed and assessed a design tool for Extension and other practitioners that attempted to address the issues identified above. We chose conservation buffers, a best management practice for which Extension provides education and assistance, as our technical topic. Conservation buffers are called by many names, including "wildlife corridors," "shelterbelts," "windbreaks," and "riparian buffer strips," to name a few, and are used in rural and urban landscapes (Lovell & Sullivan, 2006). When these features are suitably designed and located in a landscape, they can provide many ecological, social, and economic services.

The publication entitled *Conservation Buffers: Design Guidelines for Buffers, Corridors, and Greenways* (Guide) (www.bufferguidelines.net) was created to provide practitioners with a tool to aid in planning and designing these features to accomplish multiple functions. This approach is unique because existing buffer resources are generally focused on a single function. A primary goal was to create a user-friendly national guide that distills the science into actionable knowledge, which could be supplemented with state-specific information and local expert opinion.

Using a questionnaire focused on respondents' perceptions, we wanted to explore the following questions:

1. Did the Guide provide actionable knowledge for communicating and designing multifunctional buffers?

2. What features appear to contribute to the use of the Guide?

3. Are there lessons learned that may be applicable to other Extension topics?

Methods

Conservation Buffers Guide

A review of 1,436 research publications on buffers was conducted using standard procedures (Light & Pillemer, 1984). From this review, 35 functions were identified and were grouped into seven categories: water quality, biodiversity, productive soils, economic opportunities, protection and safety, aesthetics and visual quality, and outdoor recreation. These functions are presented in a table available at: http://nac.unl.edu/buffers/using/planning.html.

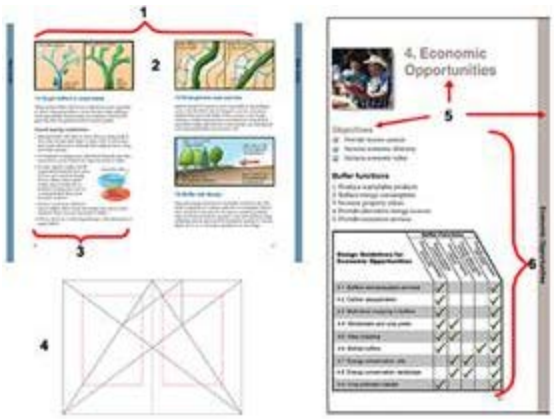
Information from the review was synthesized and distilled into illustrated design guidelines that are applicable at the practice level. Guidelines have been suggested as a viable approach for delivering evidence-based information in Extension and may offer a tool that is highly useful for the purpose while being as simple as possible to encourage practitioner use (Dunifon, Duttweiler, Pillemer, Tobias, & Trochim, 2004). Because understanding and use of information is often negatively related to the

perceived complexity of the information (Plumlee, 2003; Tornatzky & Klein, 1982), we used a variety of science delivery strategies to manage and present the information in a clear and concise format (Figure 1).

Figure 1.

Some of the Science Delivery Strategies Used in the Guide

(Duncan, 1984; Levie & Lentz, 1982; Tschichold, 1997; Wright, 1977)



The Guide was peer-reviewed and field-tested by 32 scientists and practitioners during its development, and responses were used to refine the final publication. The manual was advertised through practitioner networks and was distributed by request. The Guide was also available online.

Assessment

An online questionnaire was developed based on the study's objectives and 20 in-depth interviews with a random sample of users who had requested the Guide (Dillman, Smyth, & Christian, 2009). It was pre-tested with five practitioners in the presence of a researcher, and questions considered confusing were revised. In addition to the quantitative data gathered via the questionnaire, respondents were invited to provide narrative feedback.

The URL for the questionnaire was sent to 2,751 individuals who had requested the Guide during a 12-month period. Eight hundred and eight were undeliverable due to invalid email accounts. Two reminders were sent out. A total of 300 people completed the questionnaire, with a response rate of 15.4 %. While this is low response rate, it is comparable to other rates ranging from 8 to 16% (Harms, Presely, Hettiarachchi, & Thien, 2013; Hensely, Place, Jordan, & Israel, 2007; Westa, Tyson, Broderick, & Stahl, 2007).

Non-response error was evaluated by comparing early and late respondents as recommended by Lindner and Wingenbach (2002). No differences were identified, suggesting the results can be

generalized (Radhakrishna & Doamekpor, 2008).

Results

Respondents came from many occupational groups (e.g., Extension, conservation districts, USDA Natural Resources Conservation Service, agriculture and environmental consulting firms) and had a range of professional experience in natural resources management: 3.6% had less than 1 year, 16.2% had 1 to 5 years, 12.5% had 6 to 10 years, 24.6% had 11 to 20 years, and 43.1% had over 20 years of experience.

When asked to evaluate the usefulness of the Guide, the majority (79.1%) of respondents indicated that they found the Guide to be useful. Four percent of the respondents did not find the Guide to be useful, with four respondents commenting that they felt it was lacking in region-specific details they were looking for to implement a buffer project.

Number of years employed in a position related to natural resources appears to influence the perception of the Guide's usefulness. Just under half of the respondents (43.1%) were practitioners who have worked in natural resource management for over 20 years. Of those veteran employees, 7% did not find the Guide useful. In contrast, those employed from 1 to 10 years, all found the Guide to be useful or very useful.

When asked to identify the ways in which they used the Guide, the majority of respondents (67.3%) indicated that they used it as a resource for planning and designing buffers, although respondents also used it as an educational tool for training (45%). All sections were used fairly consistently, although the water quality, biodiversity, and aesthetics and visual quality sections were used with greater frequency.

A majority of respondents felt comfortable in identifying opportunities for multifunctional buffers (62.7%) and discussing multifunctional options with clients as a result of using the Guide (68.1%), while 69.9% felt comfortable in planning and designing buffers that address more than one function (Table 1).

Table 1.

Respondents' Comfort Level for Specified Tasks as a Result of Using the Guide

Question: As a result of using the Guide, how comfortable are you:						
		Very Uncomfortable	Uncomfortable	Neutral	Comfortable	Very Comfortable
Statement:	N	%	%	%	%	%
Identifying opportunities for multifunctional buffers	241	1.2	5.0	31.1	40.2	22.5

Discussing multifunctional options with clients	245	0.5	5.3	26.1	39.1	29.0
Designing buffers to address more than one function	243	0.5	4.1	25.5	43.6	26.3

When asked to evaluate the content of the Guide, the majority of respondents agreed that the Guide presented research in a practical manner (78.5%); is applicable to a wide range of scenarios (77.5%); and is useful for designing buffers to meet a variety of goals (79%)(Table 2). The Guide rated slightly lower in providing the type of information needed to make decisions on implementing buffers (65.3%).

Table 2.

Responses to Statements Related to the Content of the Guide

Question: To what extent do you agree with the following statements:						
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Statement:	N	%	%	%	%	%
The Guide presents research in a practical manner	283	0.0	2.8	18.7	44.9	33.6
The Guide is applicable to a wide range of scenarios	285	0.4	3.2	18.9	43.5	34.0
The Guide provides useful guidelines for meeting a variety of goals	276	0.4	4.7	15.9	44.9	34.1
The Guide provides the type of information I need to make decisions	262	1.5	8.0	25.2	41.2	24.1

A majority of the respondents agreed that the Guide was concise (81.7%), well organized (88.1%), the illustrations were clear and effective (88.3%), the tabs were useful (89.8%), and it was the right size (83.9%) (Table 3).

Table 3.

Responses to Statements Related to the Delivery of the Guide

Question: To what extent do you agree with the following statements:						
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Statement:	N	%	%	%	%	%
The Guide is concise	285	1.8	2.5	14.0	32.6	49.1
The Guide is well organized	287	2.1	2.1	7.7	34.1	54.0
Illustrations are clear and effective	288	1.7	1.7	8.3	35.2	53.1
The tabs are useful	282	2.1	2.8	5.3	27.3	62.5
It's the right size	287	1.1	4.2	10.8	36.9	47.0

Discussion

Usability

The results suggest the Guide provided actionable knowledge for many of the respondents, especially for those with less than 20 years of experience. Some experienced practitioners felt the Guide lacked regional or state-level information, although our intent was that users would supplement the Guide with more detailed information from their local area as necessary. To address this concern, one option might be to provide links in the Guide to more specific information, such as recommended plant material lists. In cases where detailed information is not available, it may be advantageous to develop a series of ecoregion-based guides that could augment the Guide by offering more in-depth recommendations based on biophysical and socioeconomic factors found in the ecoregions.

Guidelines appear to be a worthwhile strategy for creating actionable knowledge, with more than three-quarters of the respondents agreeing that the guidelines presented research in a practical manner, were useful for designing buffers to meet a variety of goals, and were suitable in a wide range of applications. Based on narrative feedback, respondents appreciated the adaptability that guidelines offered. Practitioners and clients can select the guidelines corresponding to their desired issues, and this flexibility appears valuable because clients' situations and objectives are often unique. Guidelines may offer a benefit over more rigid tools such as buffer assessments with predetermined functions that may or may not align with their interests (Groot, Jellema, & Rossing, 2010).

Content

Information in the Guide was purposely distilled into design criteria that could be applied at the practice level. Results indicate respondents value criteria at the local scale where they practice, such as recommendations on targeting buffer placement based on landscape and site-scale considerations to achieve desired functions. Practitioners also appreciated a resource that provided guidance for a

comprehensive range of buffer functions and were interested in a diversity of functions, including visual quality, energy conservation, and odor mitigation, in addition to water quality and biodiversity functions. Frequently, evidence-based guidance for buffers is concentrated on a single issue and, therefore, may not be satisfying the needs of practitioners (e.g., Correll, 2005). The study reported here supports other research results that indicate practitioners see little value in information that is narrowly focused, lacks concrete detail, ignores what they see as key variables in a system, or is at a scale over which they have no control (Dilling & Lemos, 2011; McNie, 2007; Stewart, Coles, & Pullin, 2005).

Delivery

Based on the results and narrative comments, users seem to value the annotated illustrations, bulleted statements, and an easy-to-comprehend layout. Comments include the following.

"Easy to read, well designed for practitioners" and "Excellent descriptive graphics."

This indicates that principles of visual attention and cognition we used in developing the guide may be important considerations in information delivery (Figure 1). Even relatively minor elements that aid use such as publication size and tabs are worth considering. As a result of using the Guide, respondents felt more comfortable in discussing multifunctional options with clients and commented on the value of using the Guide to communicate.

"This little Guide, I can take it with me and answer the questions right off the bat. The way the Guide is organized helped out" and "The Guide was most useful as a way to communicate with landowners."

This feedback suggests actionable knowledge is not just about effective science-based communication with practitioners, but that the participatory process they use to discuss and explore options with decision-makers is also important (Welsh & Rivers, 2011). Practitioners need tools to help initiate conversations with clients, to expand alternatives, and to clarify choices (McNie, 2007). The format of the Guide seems to facilitate practitioners working with clients to identify recommendations for their specific combination of goals. If productive dialogue cannot be fostered, the impact and usefulness of scientific information will be diminished (Robinson, 2013).

Application

The following list provides a summary of the lessons learned from our evaluation. While these lessons are based on the results from our study, they may be applicable to other Extension efforts.

1. Focusing content on design criteria that users' can affect is essential.

2. Practitioners value a resource that covers a comprehensive range of issues and functions.

3. Illustrated guidelines can be an effective method to transfer knowledge.

4. Guidelines offer practitioners flexibility in addressing clients' objectives.

5. Guidelines allow knowledge from other sources to be used cooperatively.

6. The science delivery strategies used to develop the Guide may aid in the assimilation, understanding, and adoption of the tool (see Figure 1).

7. The format of the tool encouraged dialogue with clients and facilitated participatory planning.

Evidence-based guidelines can provide actionable knowledge from research, offering another option in the Extension toolbox. As Extension struggles to meet demands under dwindling resources, multi-state collaboration has been suggested to leverage resources (Bowen-Elizey, Romich, Civittolo, & Davis, 2013). National or multi-state guidelines could be created through collaboration between research and Extension and then augmented at the state level with more detailed information, ultimately saving individual Extension practitioners their most valuable resource: their time.

Acknowledgements

Financial assistance for this project was provided in part by the U.S. Department of Agriculture, Forest Service, Southern Research Station, National Agroforestry Center (grant number 09-JV-11330152-098).

References

Argyris, C. (1996). Actionable knowledge: Design causality in the service of consequential theory. *The Journal of Applied Behavioral Science*, 32(4), 390-406.

Bowen-Elizey, N., Romich, E., Civittolo, D., & Davis, G. (2013). Change is inevitable: How field specialists positions can help meet the challenge. *Journal of Extension* [On-line], 51(3) Article 3COM1. Available at: http://www.joe.org/joe/2013june/comm1.php

Correll, D. L. (2005). Principles of planning and establishment of buffer zones. *Ecological Engineering*, 24(5), 433-439.

Cullen, P., Cottingham, P., Doolan, J., Edgar, B., Ellis, C., Fisher, M., Flett, D., Johnson, D., Sealie, L., Stocklmayer, S., Vanclay, F., & Whittington, J. (2001). *Knowledge seeking strategies of natural resource professionals. Synthesis of a workshop held in Bungendore, New South Wales, 5–7 June 2000*. Technical Report 2/2001. Canberra, Australia: Cooperative Research Centre for Freshwater Ecology.

Dilling, L., & Lemos, M. C. (2011). Creating usable science: Opportunities and constraints for climate knowledge use and their implications for science policy. *Global Environmental Change*, 21(2), 680-689.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2009). *Internet, mail, and mixed-mode surveys: The tailored design method (3rd ed.).* Hoboken, NJ: John Wiley & Sons.

Duncan, J. (1984). Selective attention and the organization of visual information. *Journal of Experimental Psychology: General*, 113(4), 501-517.

Dunifon, R., Duttweiler, M., Pillemer, K., Tobias, D., & Trochim, W. M. (2004). Evidence-based Extension. *Journal of Extension* [On-line], 42(2) Article 2FEA2. Available at: http://www.joe.org/joe/2004april/a2.php

Groot, J. C., Jellema, A., & Rossing, W. A. (2010). Designing a hedgerow network in a multifunctional agricultural landscape: balancing trade-offs among ecological quality, landscape character and implementation costs. *European Journal of Agronomy*, 32(1), 112-119.

Hamilton, S. F., Chen, E. K., Pillemer, K., & Meador, R. H. (2013). Research use by Cooperative Extension Educators in New York State. *Journal of Extension* [On-line], 51(3) Article 3FEA2. Available at: http://www.joe.org/joe/2013june/a2.php

Harms, A. M. R., Presley, D. R., Hettiarachchi, G. M., & Thien, S. J. (2013). Assessing the educational needs of urban gardeners and farmers on the subject of soil contamination. *Journal of Extension* [On-line], 51(1) Article 1FEA10. Available at: http://www.joe.org/joe/2013february/a10.php

Heemskerk, M., Wilson, K., & Pavao-Zuckerman, M. (2003). Conceptual models as tools for communication across disciplines. *Conservation Ecology* [On-line], 7(3) 8. Retrieved from: http://www.ecologyandsociety.org/vol7/iss3/art8/

Hensley, S. T., Place, N. T., Jordan, J. C., & Israel, G. D. (2007). Quality 4-H youth development program: Belonging. *Journal of Extension* [On-line], 45(5) Article 5FEA8. Available at: http://www.joe.org/joe/2007october/a8.php

Levie, W. H., & Lentz, R. (1982). Effects of text illustrations: a review of research. *Educational Communication and Technology*, 30(4), 195-232.

Light, R. J., & Pillemer, D. B. (1984). *Summing up. The science of reviewing research.* Cambridge, MA: Harvard University Press.

Lindner, J. R., & Wingenbach, G. J. (2002). Communicating the handling of nonresponse error. *Journal of Extension* [On-line], 40(6) Article 6RIB1. Available at: http://www.joe.org/joe/2002december/rb1.php

Lovell, S. T., & Sullivan, W. C. (2006). Environmental benefits of conservation buffers in the United States: Evidence, promise, and open questions. *Agriculture, Ecosystems & Environment*, 112(4), 249-260.

McNie, E. C. (2007). Reconciling the supply of scientific information with user demands: An analysis of the problem and review of the literature. *Environmental Science & Policy*, 10(1), 17-38.

Plumlee, M. A. (2003). The effect of information complexity on analysts' use of that information. *The Accounting Review*, 78(1), 275-296.

Radhakrishna, R. B., & Doamekpor, P. (2008). Strategies for generalizing findings in survey research. *Journal of Extension* [On-line], 46(2) Article 2TOT1. Available at: http://www.joe.org/joe/2008april/tt1.php

Robinson, P. (2013). Effectively communicating science to Extension audiences. *Journal of Extension*

[On-line], 51(2) Article 2IAW1. Available at: http://www.joe.org/joe/2013april/iw1.php

Selman, P. (2009). Planning for landscape multifunctionality. *Sustainability: Science, Practice, & Policy*, 5(2), 45-52.

Stewart, G. B., Coles, C. F., & Pullin, A. S. (2005). Applying evidence-based practice in conservation management: Lessons from the first systematic review and dissemination projects. *Biological Conservation*, 126(2), 270-278.

Tornatzky, L. G., & Klein, K. J. (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *Engineering Management, IEEE Transactions on Engineering Management*, 29(1), 28-45.

Tschichold, J. (1997). *The form of the book: Essays on the morality of good design*. Vancouver: Hartley & Marks.

Welsh, R., & Rivers, R.Y. (2011). Environmental management strategies in agriculture. *Agriculture and Human Values*, 28(3), 297-302.

Westa, S., Tyson, B., Broderick, S., & Stahl, P. (2007). Continuing education needs in the Last Green Valley: A natural resource, land use, & community design needs assessment. *Journal of Extension* [On-Line], 45(5) Article 5FEA9. Available at: http://www.joe.org/joe/2007october/a9.php

Wright, P. (1977). Presenting technical information: a survey of research findings. *Instructional Science*, 6(2), 93-134.
