

Are Water-Related Leadership Development Programs Designed to be Effective?  
An Exploratory Study

Mark E. Burbach, Ph.D.  
Geoscientist  
School of Natural Resources  
University of Nebraska - Lincoln  
512 Hardin Hall  
Lincoln, NE 68583-0995  
mburbach@unl.edu

Kristin Floress, Ph.D.  
Associate Professor  
College of Natural Resources  
University of Wisconsin – Stevens Point  
800 Reserve Street  
Stevens Point, WI 54481  
Kristin.Floress@uwsp.edu

Eric K. Kaufman, Ph.D.  
Associate Professor  
Department of Agricultural and Extension Education  
266 Litton Reaves  
Virginia Tech  
Blacksburg, VA 24061  
ekaufman@vt.edu

Abstract

Water resource professionals and others involved in managing water resources face increasingly complex challenges. Effective leadership development programs are needed to produce water leaders who can address these challenges. Leadership programs must be designed not simply to increase participants' environmental and leadership knowledge but to develop in participants the requisite abilities and skills. This exploratory study determines the extent to which water-related leadership programs go beyond knowledge only, event-type workshops to determine what proportion are grounded in leadership theory, and employ developmental experiences with assessment, challenge, and support components. Results indicate that most water professionals and others seeking to develop 21<sup>st</sup> century leadership abilities and skills to manage water resources are not getting the developmental experiences they need. Water-related leadership development programs must be grounded in evidence-based theory; provide assessment, challenge, and support; and offer a variety of developmental experiences and the opportunity to learn from experience. There is an urgent need for new or revised leadership development programs for those interested in water resource management.

## Introduction

Managing water resources has always been challenging because of natural variability, uncertainty in weather patterns, and technological demands as well as evolving socioeconomic, policy, and regulatory factors. A host of conditions are emerging that add complexity and risk to traditional water management. Challenges due to climate change and variability, land use changes (e.g. urbanization and intensity of agricultural activity), and the consequences of projected population growth and migration are formidable (Kiang, Olsen, & Waskom, 2011). Furthermore, freshwater biodiversity is decreasing and pollution and conflicts between water users are increasing while communities deal with increased fiscal constraints (Pahl-Wostl, Conca, Kramer, Maestu, & Schmidt, 2013; Pittock, Hansen, & Abell, 2008; USACE, 2010). Additionally, water resources management is “challenged by governance issues as the roles of Federal, state, local and nongovernmental entities are becoming blurred...” (USACE, 2010, p. 17). Sustaining freshwater ecosystem services in the face of emerging threats is one of the greatest challenges facing society (Pittock, Hussey, & McGlennon, 2013; Rockström et al., 2009, Millenium Ecosystem Assessment, 2005).

The challenges facing water resource professionals and others involved in managing water resources require developing leaders with the capacity to understand and address them (Lincklaen Arriëns & When de Montalvo, 2013; Morton & Brown, 2011; Wehn de Montalvo & Alaerts, 2013). Conventional leadership skills will become less important and effective as the diversity of necessary participants and management methods increases in the pursuit of sustainable water resources management (Brown & Farrelly, 2009; Crosby, 2010; Jacobs et al., 2010; Pahl-Wostl et al., 2013). McIntosh and Taylor (2013) assert, “leadership is needed to initiate and drive change, enable innovation (both incremental and radical), build shared visions for a more sustainable water future, and deliver these visions through aligning resources and building commitment to collective success” (p. 46). Greater leadership capacity is required to drive the necessary change (Brasier, Lee, Stedman, & Weigle, 2011; Morton, Selfa, & Becerra, 2011; Pahl-Wostl, Nilsson, Gupta, & Tockner, 2011; Redekop, 2010; Taylor, Cocklin, & Brown, 2012). Given this unprecedented need for water leaders, are leadership development programs designed to meet the need? And, are some leadership development programs wannabes that “... contain little or no purposeful effort to develop leadership skills in participants” (Boyd, 2011, p. vii)?

McCauley, Van Veslor, and Ruderman (2010) identify three distinct outcomes of leader development that water professionals and others involved in managing water resources need: *self-management capabilities* (e.g., self-awareness, balancing conflicting demands, ability to learn, and leadership values), *social capabilities* (e.g., ability to build and maintain relationships, ability to build effective work groups, communication skills, and ability to develop others), and *work facilitation capabilities* (e.g., management skills, ability to think and act strategically, ability to think creatively, ability to initiate and implement change). Researchers who study leadership development programs for natural resources professionals confirm that the programs should enhance participants’ knowledge of topics and develop leadership behaviors and skills in participants (Addor, Cobb, Dukes, Ellerbrock, & Smutko, 2005; Carter & Rudd, 2000; Thompson, Jungst, Colletti, Licklider, & Benna, 2003). There is an expectation that participants experience some permanent behavior change, among other outcomes, as a result of the leadership development program (Black & Earnest, 2009; Hannum, Martineau, & Reinelt, 2007).

Most environment-related leadership development programs, explicitly or not, follow the knowledge or information deficit model (Bak 2001; Sturgis & Allum, 2004). That is, they are based on the frame that increasing participant environmental and leadership knowledge will cause behavior change and development of new abilities and skills. Behaviors typically associated with leadership development programs include acting as a catalyst for social change, managing conflict, and serving one's community, among others (Day, 2000). Other behaviors associated with environment-related leadership include influencing individuals and mobilizing organizations (Egri & Herman, 2000), influencing environmental policy (Addor et al., 2005) or being a policy entrepreneur (Brouwer & Biermann, 2011; Meijerink & Huitema, 2010), championing natural resource issues (Andersson & Bateman, 2000), and being an agent for change (Benn, Dunphy, & Griffiths, 2006; Dunphy, Griffiths, & Benn, 2007; Taylor, 2009). Gordon and Berry (2006) identify the ability to solve problems as a central component of environmental leadership; McCauley et al. (2010) identify a suite of capabilities categorized as leading oneself, leading others, and leading the organization as leadership behaviors.

Knowledge is important to leadership programs as it forms the foundation upon which to form change. Knowledge is a necessary although insufficient condition for environmental and leadership behavior change (Kaiser & Fuhrer, 2003; Kollmus & Agyeman, 2002), or developing the ability to effect change in others, communities, or policy (Gordan & Berry, 2006). The lack of knowledge may also be a barrier to someone motivated to change behavior (Monroe, 2003; Schultz, 2002). While knowledge is often correlated to behavior, increasing knowledge alone will typically not result in lasting behavior change (Abrahamse, Steg, Vlek, & Rothengatter, 2005; Barling, Weber, & Kelloway, 1996; Schultz, 2002; Steg & Vlek, 2009; Yukl, 2012). Likewise, leadership effectiveness and the ability to influence others require a set of competencies more than a body of knowledge alone (Arthur, Bennett, Edens, & Bell, 2003; Bandura, 1986; Boyatzis, 1982). At best knowledge-only programs result in small, short-term change or minimal ability to influence others. Further, leadership development must account for social and cultural factors and may involve changing values, beliefs, and attitudes which require long term educational programming and reinforcement (e.g. Clayton & Opatow, 2003; Dietz, Fitzgerald, & Shwom, 2005; McKenzie-Mohr, 2000).

Many leadership development initiatives are short one-time workshops (DeVenney, 2009; Petrie, 2013). Attendees may collect information and may even be motivated to implement change. Or, if long-term, participants meet periodically where environmental and/or leadership knowledge is shared at a series of stand-alone workshops, or in more advanced cases, where earlier knowledge is built upon. However, in neither case do they often get... "the ongoing follow-up to solidify new thinking and behaviors into new habits" (Petrie, 2013, p. 4).

In order to cause a lasting change in behavior or leadership abilities, however, leadership development programs must embrace a process-based curriculum. The philosophical underpinning of any leadership development program should be that leader development is a process, not an event (e.g. Geller, 1992; McCauley et al., 2010; Whitney & D'Andrea, 2007), and requires a systematic approach that considers the unique contextual needs of the program and the individual (Byrne & Rees, 2006; Ritch & Mengel, 2009). There are two key points to remember about the behavioral change process. For leader development to occur there must be both a variety of developmental experiences, and the ability and opportunity to learn from these

experiences (Barbuto & Etling, 2002; McCauley et al., 2010; Newman, Bruyere, & Beh, 2007; Popper & Mayselless, 2007).

Individuals can have abundant experiences but not necessarily develop the skill set required to implement the new behavior. Likewise, individuals can learn the concepts and the ideas behind how to do a behavior without necessarily developing the skill set required to implement the new behavior. In either case, active engagement with the concepts in the context of their own lives, critical reflection, and reinforcement is crucial to “set” the new behavior (Argyris & Schon 1978; Bandura, 1977; Mezirow, 1997). The leader development process will succeed in instances where individuals have solid developmental experiences, while being given robust opportunities to learn. This integration is most likely to produce the leader expected from participating in a leadership development program (Hughes, Ginnett, & Curphy, 2012).

The leader development process relies heavily on developmental experiences (Barbuto & Etling, 2002; Hughes et al., 2012; McCall, 2004). Researchers estimate nearly 70% of all leader development occurs through developmental experiences, while 20% occurs through working with and learning from other people and 10% occurs from formal programs like classroom instruction (McCall, Lombardo, & Morrison, 1988; Robinson & Wick, 1992; Wick, 1989). What separates developmental experiences from practical, “in-the-trenches” experiences is that developmental experiences include three key components: assessment, challenge, and support. A developmental experience lacking in any of the three will not provide a developmental experience (Addor et al., 2005; McCauley et al., 2010). Leader development is contingent upon tailored intervention (e.g. Argyris & Schon 1978; Azjen 1985; Bandura, 1977; Freire, 1973; Gardner & Stern, 1996; Shapiro, 2006).

Assessment consists of empirically or qualitatively collected information (data) that provides sound feedback to individuals about their skills, values, and/or traits. Assessment works to motivate individuals to improve or find better ways to do things. Without good assessments in developmental experiences, individuals lack a sound gauge to work from. Additionally, assessment is a useful method to determine if participants are learning what is intended for them to learn and if programs are meeting objectives (Goertzen, 2009).

Challenge consists of pushing individuals to be better at what they do. This involves challenging them to hold themselves to a higher standard and to commit to the desired behavior, while creating optimism that the desired behavior is within their reach. Water-related leadership development programs, for instance, cannot simply deliver discrete packages of information but need to challenge existing paradigms on environmental issues (e.g. Dryzek, 2000). DeRue and Wellman (2009) confirmed that challenging experiences, combined with individual feedback, are positively related to leadership skill development.

Support consists of on-going personal and professional intervention. This intervention is geared to create a safe and supportive environment for individuals to practice their skills and behaviors. This model is supported by the research of Abrahamse et al. (2005, 2007) who have shown that a combination of tailored information, commitment, goal setting, tailored feedback, and modeling are necessary for behavior change and development of the intended abilities.

The McCauley et al. (2010) model reflects the research-based ingredients of leader development discussed above. First, there needs to be developmental experiences combined with assessment, challenge, and support. Secondly, leader development is a process which requires opportunities to learn from the developmental experiences.

### Purpose and Objectives

The purpose of this exploratory study was to determine the extent to which water-related leadership programs go beyond knowledge-only, event-type workshop programs to affect leader development. Specifically, we examined what proportion of water-related leadership programs are grounded in leadership theory, and follow the McCauley et al. (2010) model of leader development employing developmental experiences with assessment, challenge, and support components. This information can be used to plan future professional development programs for water-related leaders.

### Research Questions

1. To what extent are water-related leadership development programs designed to change behavior and develop new abilities and skills?
2. Are water-related leadership development programs theory based?
3. To what extent do leadership development programs conduct assessment and evaluate leader development?
4. How do programs vary in terms of target audience?
5. How do programs vary in terms of duration?

### Methodology

An internet search for water-related environmental leadership programs was conducted with selected key search terms. Search terms were leadership, environment(al), water, natural resources, development, training, programs, academy, and institute. We contacted the resultant programs and reviewed for adherence to the McCauley et al. (2010) model of leadership development. We excluded college leadership degree programs from analysis.

We developed lists of leadership theories, assessment, evaluation, and target audiences based upon a review of information provided by the programs (e.g. webpages, curricula, and registration information) and interviews with program directors. We also noted the length of each program in months and whether the program utilized challenge or support mechanisms. We entered each of these variables into an excel file, and theories, assessment, evaluation type, target audience, challenge, or support were noted by coding 1 as present or 0 as absent, and each variable was summed. Finally, we recorded the length of the programs.

The 20 variables associated with Leadership Theory were combined into four categories: programs using leadership theories, programs using non-theory book (based on a popular/bestselling book in a topic area of interest), programs using personality types, and programs using neither theory nor book.

Four variables were used for assessment and evaluation: individual pre- and post-assessment, program evaluation, post program feedback, and no evaluation. Individual assessment consists of empirical or observational data that provides feedback to participants about their skills and abilities before or during the program and again after the program. This data includes a combination of more than one questionnaire during the programs, 360-degree feedback, and tests of knowledge, skills, and behaviors. Program evaluation is evaluating learning outcomes of participants at the end of the program in order to evaluate the effectiveness of the program. Post program feedback is evaluating the experience people had in the program. This is typically feedback from participants about what they thought about their leadership training experience or what the program could do to improve. No evaluation is when no individual assessment, program evaluation, or program feedback methods are conducted by the program.

There were 22 target audiences identified through the review, which were grouped into 9 audiences: water resources professionals, all with interest in water issues, all with interest in environmental issues, natural resources professionals, students, private sector, NGOs, water residents and users, and community or environmental leaders.

Cross tabulations were run on target audience and theoretical foundation and target audience and program length. Cross tabulations provided a means to compare categories of interest from this small number of leadership programs.

## Results

### Overview

A total of 30 programs were identified as water-related leadership development programs. The intended participants for programs range from all of those with interest in the topic to specialized programs for specific audiences such as those in executive leadership roles in the water management sector. Only four programs are both leadership theory-based and follow the components of the McCauley et al. (2010) model of leader development. Most programs claim to be theoretically grounded with references to theory in brochures, advertisements, websites, other promotional material, or in pronouncements by program directors; however, inspection of curricula revealed otherwise. Furthermore, many program directors do not know what it means for a leadership development program to be theoretically grounded.

### Theories in Leadership Programs

Of the eight programs (Table 1) utilizing a theoretical leadership foundation, the following were identified as part of the program: transformational leadership, transformative leadership, theory of change, appreciative inquiry, social change, complexity leadership, conflict resolution, boundary spanning leadership, and champions of innovation. Some programs use one of these approaches, while others use several. Four programs include the Myers-Briggs theory of personality type and one includes ecological resilience theory. Some programs claim to be theory-based but were determined not to be based on credible theories; rather they are based on appealing ideas or popular leadership books (e.g. Johnson, 1998) related to leadership. The vast

majority of programs (n=18) use neither theory nor popular leadership books to ground their programs.

Table 1

*Theoretical foundation for leadership development programs. (Two use both leadership and personality type theory and another uses both leadership and resilience theory)*

Theory/Book	Number of programs
Using Leadership Theories	8
Using Non-theory Books	2
Using Personality Type	4
Using Ecological Resilience	1
Using Neither Theory nor Book	18

### Assessment and Evaluation

Only nine programs use individual level assessment to provide feedback to participants about their own leadership development before or during the program as well as after the program (Table 2). Four programs only assess participant learning outcomes at the end of the program. Seven programs only acquire post program feedback from participants to evaluate participants experience with the training program. For example, participants are asked if the program was a good experience, or would they recommend the program to a friend or colleague. Fourteen programs do not conduct any type of individual assessment, post-program assessment, or feedback to the program. In some instances participants provide feedback to presenters but not to the program and this information is not tracked by program directors.

Table 2

*Individual participant assessment and/or program evaluation*

Evaluation/Assessment	Number of Programs
Individual Pre- & Post-program Assessment	9
Program Evaluation	4
Post-program Feedback	7
No Program Evaluation	14

### Target Audience

The majority of programs are open to all natural resources professionals (Table 3). Two programs offer participants credits toward a college degree or continuing education credits for natural resource professionals, and four are open to water residents and users. Some programs have more specific audiences – for example, there are seven that target water resources

professionals. Many programs target several audiences, which is why the total number of programs investigated is less than the total number of programs found in table 3. Programs that include college students are most likely to be grounded in theory (2 of 2). Programs targeting all with interest in water (0 of 4), NGOs (0 of 2), and water residents and users (0 of 4) are not grounded in theory. While programs targeting natural resources professionals are most numerous (11), only two are grounded in theory.

Table 3  
*Target audience*

Target Audience	Total Number of Programs	Theoretical Leadership Foundation
Water Resources Professionals	7	2
All with Interest in Water	4	0
All with Interest in Environment	5	1
Natural Resources Professionals	11	2
Students	2	2
Private Sector	4	2
NGOs	2	0
Water Residents and Users	4	0
Community or Environmental Leaders	6	3

### Program Duration

Program length varies dramatically (Table 4). The programs targeting natural resources professionals have the greatest variation in length, ranging from one-half month to 22 months. They also have the widest range of contact hours between instructors and participants, 24 to 288. The programs targeting water resources professionals range from 1.5 days with an option to participate in additional sessions to 12 months. Programs targeting all with an interest in the environment have the highest proportion lasting 7-9 months or more (4 of 5). None of the programs targeting water residents and users is longer than 6 months. Programs targeting the private sector have the highest mean number of contact hours (98.3).

The average program length is 6.6 months (Table 4). The mean number of contact hours between instructors and participants is 67.8. The shortest program is 1.5 days (12 contact hours) and the longest 22 months (288 contact hours). Caution must be used when interpreting the length of program and contact hour variables, as some programs meet for intensive several day workshops with months in between for a total of a 12 month commitment, while others only require attendance at one day events interspersed throughout a 12 month period. The work required between face-to-face sessions varies considerably. Ten programs have individual assignments or group projects between sessions while others require no work between sessions. In some cases the amount of work varies from one leadership class to another in which case the

most recent year was used. Thus, recognition that leader development is a process which requires opportunities to learn from developmental experiences varies greatly across programs.

Table 4

*Duration of leadership programs*

	1 day-3 mos.	4-6 mos.	7-9 mos.	10-12 mos.	>12 mos.	Mean mos.	Range mos.	Mean cont. hrs.	Range cont. hrs.
All Programs	12	5	7	4	2	6.6	.1-22	67.8	12-288
By target audience*									
Water Resources Prof.	3		3	1		6.4	.1-12	46.6	12-90
All with Interest in Water	1	3				5.0	3-6	53.5	38-96
All with Interest in Envir.		1	3	1		7.8	4-10	81.6	24-160
Natural Resources Prof.	4	2	1	2	2	8.3	.5-22	41.2	24-288
Students	2					1.8	.5-3	52.5	40-65
Private Sector	1		2		1	8.8	3-18	98.3	65-152
NGOs	1		1			5.0	3-7	76.0	72-80
Water Residents and Users	1	3				4.1	.3-6	42.0	40-96
Comm. or Envir. Leaders	2		2	1	1	8.0	.1-18	76.8	16-152

\* Some programs target multiple audiences

## Discussion

Developing water leaders is more important than ever. Communities across the country face increasing challenges due to increasing demand and climate variability, depletion and contamination of groundwater, aging infrastructure, increased regulation, and dependence on single sources of supply. “Managing water resources as a collaborative endeavor is becoming increasingly crucial as society faces demographic, economic, institutional and climate changes manifesting across the U.S. and around the globe” (Stockton, 2010, p. v). These challenges require adaptive and innovative leaders for sustainable water management (Taylor, Cocklin, & Brown, 2012). This exploratory study examined what proportion of water-related environmental leadership programs are grounded in leadership theory, and follow the McCauley et al. (2010) model of leadership development employing developmental experiences with assessment, challenge, and support components.

Only eight of the 30 water-related leadership development programs reviewed in this study utilize a theoretical leadership foundation. Thus, most are not grounded in an evidence-based curriculum. Only nine programs use individual level assessment to provide feedback to participants about their own leadership development during and after the program. Most programs are not collecting information regarding participant learning during the program and

providing participants feedback to gauge their skill development. Only four programs are both leadership theory-based and provide feedback to participants about their own leadership development. The vast majority of programs do not conduct program evaluation that can provide feedback to program directors to determine if their programs are meeting course objectives.

The majority of programs target natural resource professionals, water professionals, and community or environmental leaders. Four programs target water residents and users, and two are open to both college students and natural resource professionals for non-college credit.

Quality developmental experiences require time for practice and feedback (DeRue & Wellman, 2009). Seventeen programs last less than 7 months. The average program length is 6.6 months and 67.8 contact hours. Eight programs require fewer than 40 contact hours. Two programs are longer than one year with the longest 22 months with 288 contact hours. In contrast, Kaufman, Rateau, Carter, and Strickland (2012) found that 19 agricultural leadership development programs have a mean length of 21 months with an average of 12 seminars per class. However, the survey of Virginia agriculture leaders identified a preference for a program of one year or less.

The evidence from this study indicates that most water professionals and others seeking to develop 21<sup>st</sup> century leadership abilities and skills to manage water resources are not getting the kind of leadership development opportunities they need. Results of this study call into question whether current leadership development programs are meeting their objectives, and producing leaders capable of addressing current and future water management issues.

## Recommendations

The challenges facing water resource management require a multitude of technical and social disciplines. Furthermore, professionals in these disciplines, in addition to working with each other, need to work closely with communities and diverse stakeholders. These conditions require water professionals and others to develop leadership abilities and skills beyond their formal training. Thus, it is critical that leadership development programs be grounded in evidence-based theory; offer a variety of developmental experiences and the opportunity to learn from experience; and provide assessment, challenge, and support. Simply focusing on increasing participant environmental and leadership knowledge will not develop in participants the abilities and skills that 21<sup>st</sup> century water professionals require. There is an urgent need for new or revised leadership development programs for those interested in water resources management.

Water-related leadership development programs will need long-term program evaluation to determine if the programs are meeting objectives and to determine if adjustments are necessary. Furthermore, to truly assess whether programs are developing leaders with necessary abilities and skills, they should assess alumni impact on water resources management.

## Acknowledgements

This study was supported in part by a Multistate Research Fund to enable research on high-priority topics among the State Agricultural Experiment Stations in partnership with the National Institute of Food and Agriculture of the U.S. Department of Agriculture. We thank the

North Central Regional Association of Agricultural Experiment Station Directors NC1190 team for feedback and encouragement in developing this area of research. We also thank JoLeisa Cramer for assistance in contacting leadership programs.

## References

- Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2005). A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology, 25*, 273-291. <http://dx.doi.org/10.1016/j.jenvp.2005.08.002>
- Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, J. A. (2007). The effect of tailored information, goal setting and feedback on household energy use, energy related behaviors and behavioral determinants. *Journal of Environmental Psychology, 27*, 265-276. <http://dx.doi.org/10.1016/j.jenvp.2007.08.002>
- Addor, M., Cobb, T., Dukes, E., Ellerbrock, M., & Smutko, L. (2005). Linking theory to practice: A theory of change model of the Natural Resources Leadership Institute. *Conflict Resolution Quarterly, 23*(2), 203-223. <http://dx.doi.org/10.1002/crq.133>
- Andersson, L., & Bateman, T. (2000). Individual environmental initiative: Championing natural environmental issues in US business organizations. *Academy of Management Journal, 43*, 548-570. <http://dx.doi.org/10.2307/1556355>
- Argyris, C., & Schon, D. (1978). *Organisational Learning*. London: Addison-Wesley.
- Arthur, W., Jr., Bennett, W., Jr., Edens, P. S., & Bell, S. T. (2003). Effectiveness of training in organizations: A meta-analysis of design and evaluation features. *Journal of Applied Psychology, 88*, 234-245. <http://dx.doi.org/10.1037/0021-9010.88.2.234>
- Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action control: From cognition to behavior* (pp. 11-39). Heidelberg: Springer-Verlag. [http://dx.doi.org/10.1007/978-3-642-69746-3\\_2](http://dx.doi.org/10.1007/978-3-642-69746-3_2)
- Bak, H.-J. (2001). Education and public attitudes toward science: Implications for the "Deficit Model" of education and support for science and technology. *Social Science Quarterly, 82*(4), 779-795. <http://dx.doi.org/10.1111/0038-4941.00059>
- Bandura, A. (1977). *Social Learning Theory*. Englewood Cliffs, NJ: Prentice Hall.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall, Englewood Cliffs, New Jersey.
- Barbuto, J. E., Jr., & Etling, A. W. (2002). Leadership development training in extension: A research-based curriculum design. *Proceedings of the 18th Annual Conference of the*

*Association for International Agricultural and Extension Education*, Durban, South Africa, pp. 21-28.

- Barling, J., Weber, T., & Kelloway, E. (1996). Effects of transformational leadership training on attitudinal and financial outcomes: A field experiment. *Journal of Applied Psychology*, *81*, 827-832. <http://dx.doi.org/10.1037/0021-9010.81.6.827>
- Benn, S., Dunphy, D., & Griffiths, A. (2006). Enabling change for corporate sustainability: An integrated perspective. *Australasian Journal of Environmental Management*, *13*, 156-165. <http://dx.doi.org/10.1080/14486563.2006.10648683>
- Black, A. M., & Earnest, G. W. (2009). Measuring the outcomes of leadership development programs. *Journal of Leadership and Organizational Studies*, *16*(2), 184-196. <http://dx.doi.org/10.1177/1548051809339193>
- Boyatzis, R. E. (1982). *The competent manager: A model for effective performance*. New York: Wiley.
- Boyd, B. (2011). From the editor's clipboard: All leadership programs are not created equal. *Journal of Leadership Education*, *10*(1), p. vii-viii. <http://dx.doi.org/10.12806/V10/I1/C3>
- Brasier, K. J., Lee, B., Stedman, R., & Weigle, J. (2011). Local champions speak out: Pennsylvania's community watershed organizations. In L. W. Morton & S. S. Brown (Eds.), *Pathways for getting to better water quality: The citizen effect* (pp. 133-144). New York: Springer. [http://dx.doi.org/10.1007/978-1-4419-7282-8\\_11](http://dx.doi.org/10.1007/978-1-4419-7282-8_11)
- Brouwer, S., & Biermann, F. (2011). Towards adaptive management: Examining the strategies of policy entrepreneurs in Dutch water management. *Ecology and Society*, *16*(4), 5. <http://dx.doi.org/10.5751/ES-04315-160405>
- Byrne, J. C., & Rees, R. T. (2006). *The successful leadership development program: How to build it and how to keep it going*. San Francisco, CA: Pfeiffer.
- Carter, H. S., & Rudd, R. D. (2000). Evaluation of the Florida leadership program for agriculture and natural resources. *Journal of Southern Agricultural Education Research*, *50*(1), 193-199.
- Clayton, S. & Opatow, S. (Eds.). (2003). *Identity and the natural environment: The psychological significance of nature*. Cambridge, MA: MIT Press.
- Crosby, B. (2010). Leading in a shared-power world of 2010. *Public Administration Review*, *70*, s69-s77. <http://dx.doi.org/10.1111/j.1540-6210.2010.02248.x>
- Day, D. V. (2000). Leadership development: A review in context. *Leadership Quarterly*, *11*(4), 581-613. [http://dx.doi.org/10.1016/S1048-9843\(00\)00061-8](http://dx.doi.org/10.1016/S1048-9843(00)00061-8)

- DeRue, D. S., & Wellman, N. (2009). Developing leaders via experience: The role of developmental challenge, learning orientation, and feedback. *Journal of Applied Psychology, 94*, 859-875. <http://dx.doi.org/10.1037/a0015317>
- DeVenney, M. (2009). *Leadership: Making the critical investment*. Halifax, Nova Scotia: Bluteau DeVenney & Company.
- Dietz, T., Fitzgerald, A., & Shwom, R. (2005). Environmental values. *Annual Review of Environmental Resources, 30*, 335-72. <http://dx.doi.org/10.1146/annurev.energy.30.050504.144444>
- Dryzek, J. (2000). *Deliberative democracy and beyond: Liberals, critics, contestations*. Oxford: Oxford University Press.
- Dunphy, D., Griffiths, A., & Benn, S. (2007). *Organizational change for corporate sustainability: A guide for leaders and change agents of the future* (2<sup>nd</sup> Ed). Routledge: London.
- Egri, C., & Herman, S. (2000). Leadership in the North American environmental sector: Values, leadership styles and contexts of environmental leaders and their organizations. *Academy of Management Journal, 43*, 571-604. <http://dx.doi.org/10.2307/1556356>
- Freire, P. (1973). *Education for critical consciousness*. New York: Continuum.
- Gardner, G. T., & Stern, P. C. (1996). *Environmental problems and human behavior*. Boston: Allyn and Bacon.
- Geller, E. S. (1992). Solving environmental problems: A behavior change perspective. In S. Staub & P. Green (Eds.), *In our hands: Psychology, peace, and social responsibility* (pp. 248-268). New York: New York University Press.
- Goertzen, B. J. (2009). Assessment in academic based leadership education programs. *Journal of Leadership Education, 8*(1), 148-162. <http://dx.doi.org/10.12806/V8/I1/IB3>
- Gordon, J. C., & Berry, J. K. (2006). *Environmental leadership equals essential leadership: Redefining who leads and how*. New Haven, CT: Yale University Press.
- Hannum, K. M., Martineau, J. W., & Reinelt, C. (Eds.). (2007). *Handbook of leadership development evaluation*. San Francisco: Jossey Bass.
- Hughes, R. L., Ginnett, R. C., & Curphy, G. J. (2009). *Leadership: Enhancing the lessons of experience* (5th ed.). New York, NY: McGraw-Hill.
- Jacobs, K., Lebel, L., Buizer, J., Addams, L., Matson, P., McCullough, E., Finan, T. (2010). Linking knowledge with action in the pursuit of sustainable water resource management.

- Proceedings of the National Academy of Sciences (PNAS)*, January, 1-6.  
<http://dx.doi.org/10.1073/pnas.0813125107>
- Johnson, S. (2002). *Who moved my cheese? An amazing way to deal with change in your work and in your life*. New York: Putnam.
- Kaiser, F., & Fuhrer, U. (2003). Ecological behavior's dependency on different forms of knowledge. *Applied Psychology: An International Review*, 52, 598-613.  
<http://dx.doi.org/10.1111/1464-0597.00153>
- Kaufman, E. K., Rateau, R. J., Carter, H. S., & Strickland, L. R. (2012). What's context got to do with it? An exploration of leadership development programs for the agricultural community. *Journal of Leadership Education*, 11(1), 121-139.  
<http://dx.doi.org/10.12806/V11/I1/RF7>
- Kiang, J. E., Olsen, J. R., & Waskom, R. M. (2011). Introduction to the featured collection on nonstationarity, hydrologic frequency analysis, and water management. *Journal of the American Water Resources Association*, 47, 433-435. <http://dx.doi.org/10.1111/j.1752-1688.2011.00551.x>
- Lincklaen Arriëns, W., & Wehn de Montalvo, U. (2013). Exploring water leadership. *Water Policy*, 15(Suppl.2), 15-41. <http://dx.doi.org/10.2166/wp.2013.010>
- McCall, M. W. (2004). Leadership development through experience. *Academy of Management Executive*, 18, 127-130. <http://dx.doi.org/10.5465/AME.2004.14776183>
- McCall, M. W., Lombardo, M. M., & Morrison, A. M. (1988). *The lessons of experience: How successful executives develop on the job*. Lexington, MA: Lexington Books.
- McCauley, C. D., Van Velsor, E., & Ruderman, M. N. (2010). Introduction: Our viewpoint of leadership development. In E. Van Velsor, C. D. McCauley, & M. N. Ruderman (Eds.), *The Center for Creative Leadership handbook of leadership development* (pp. 1-26). San Francisco: Wiley.
- Meijerink, S., & Huitema, D. (2010). Policy entrepreneurs and change strategies: Lessons from sixteen case studies of water transitions around the globe. *Ecology and Society*, 15(2), 1-21.
- Millennium Ecosystem Assessment. (2005). *Ecosystems and human well-being: Synthesis*. Washington, DC: Island Press and World Resources Institute.
- Mezirow, J. (1997). Transformative learning: Theory to practice. *New Directions for Adult and Continuing Education*, 74, 5-12. <http://dx.doi.org/10.1002/ace.7401>
- Monroe, M. (2003). Two avenues of encouraging conservation behaviors. *Human and Ecology Review, Society for Human Ecology*, 10(2), 113-125.

- Morton, L. W., & Brown, S. S. (2011). *Pathways for getting to better water quality: The citizen effect*. New York: Springer. <http://dx.doi.org/10.1007/978-1-4419-7282-8>
- Morton, L. W., Selfa, T., & Becerra, T. A. (2011). Shared leadership for watershed management. In L. Wright Morton & S. S. Brown (Eds.), *Pathways for getting to better water quality: The citizen effect* (pp. 29-39). New York: Springer. [http://dx.doi.org/10.1007/978-1-4419-7282-8\\_3](http://dx.doi.org/10.1007/978-1-4419-7282-8_3)
- Newman, P., Bruyere, B. L., & Beh, A. (2007). Service-learning and natural resource leadership. *Journal of Experiential Education*, 30(1), 54-69. <http://dx.doi.org/10.5193/JEE.30.1.54>
- Pahl-Wostl, C., Conca, K., Kramer, A., Maestu, J., & Schmidt, F. (2013). Missing links in global water governance: a processes-oriented analysis. *Ecology and Society*, 18(2), 33. <http://dx.doi.org/10.5751/ES-05554-180233>
- Pahl-Wostl, C., Nilsson, C., Gupta, J., & Tockner, K. (2011). Societal learning needed to face the water challenge. *Ambio*, 40, 549-553. <http://dx.doi.org/10.1007/s13280-011-0149-1>
- Petrie, N. (2013). *Vertical leadership development – part 1: Developing leaders for a complex world*. Greensboro, NC: Center for Creative Leadership. Retrieved from [www.ccl.org](http://www.ccl.org)
- Pittock, J., Hanson, L., & Abell, R. (2008). Running dry: Freshwater biodiversity, protected areas and climate change. *Biodiversity*, 9(3 & 4), 30-38. <http://dx.doi.org/10.1080/14888386.2008.9712905>
- Pittock, J., Hussey, K., McGlennon, S. (2013). Australian climate, energy and water policies: Conflicts and synergies. *Australian Geographer*, 44(1), 3-22. <http://dx.doi.org/10.1080/00049182.2013.765345>
- Popper, M., & Mayseless, O. (2007). The building blocks of leadership development: A psychological conceptual framework. *Leadership & Organizational Development*, 28, 664-668. <http://dx.doi.org/10.1108/01437730710823905>
- Redekop, B. W. (Ed.). (2010). *Leadership for environmental sustainability*. New York: Routledge.
- Ritch, S., & Mengel, T. (2009). Guiding questions: Guidelines for leadership education programs. *Journal of Leadership Education*, 8(1), 216-227. <http://dx.doi.org/10.12806/V8/I1/C2>
- Robinson, G. S., & Wick, C. W. (1992). Executive development that makes a business difference. *Human Resource Planning*, 15, 63-76.
- Rockström J., Steffen, W., Noone, K., Persson, A., Chapin, F. S., Lambin, E. F. Foley, J. A. (2009). A safe operating space for humanity. *Nature*, 461, 472-475. <http://dx.doi.org/10.1038/461472a>

- Schultz, P. W. (2002). Knowledge, education, and household recycling: Examining the knowledge-deficit model of behavior change. In T. Dietz & P. Stern (Eds.), *Education, information, and voluntary measures in environmental protection* (pp. 67-82). Washington, DC: National Academy of Sciences.
- Shapiro, I. (2006). Theories of practice and change in ethnic conflict interventions. In M. Fitzduff, & C. Stout. (Eds.) *The Psychology of Resolving Global Conflicts* (pp. 1-31). New York: Praeger.
- Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, 29, 309-317.  
<http://dx.doi.org/10.1016/j.jenvp.2008.10.004>
- Stockton, S. L. (2010). Foreward. In U.S. Army Corps of Engineers, *Building strong collaborative relationships for a sustainable water resources future, National report: Responding to national water resources challenges*, (pp.v-vi). Washington, DC: U.S. Army Corps of Engineers.
- Sturgis, P., & Allum, N. (2004). Science in society: Re-evaluating the deficit model of public attitudes. *Public Understanding of Science*, 13(1), 55-74.  
<http://dx.doi.org/10.1177/0963662504042690>
- Taylor, A., Cocklin, C., & Brown, R. (2012). *Fostering environmental champions: A process to build their capacity to drive change*. *Journal of Environmental Management*, 98, 84-97.  
<http://dx.doi.org/10.1016/j.jenvman.2011.12.001>
- Thompson, J., Jungst, S., Colletti, J., Licklider, B., & Benna, J. (2003). Experiences in developing a learning-centered natural resources curriculum. *Journal of Natural Resources and Life Sciences Education*, 32, 23-31.
- U.S. Army Corps of Engineers (USACE). (2010). *Building strong collaborative relationships for a sustainable water resources future, National report: Responding to national water resources challenges*. Washington, DC: U.S. Army Corps of Engineers.
- Whitney, R., & D'Andrea, L. M. (2007). The process of becoming a leader: An individual identity model. *Vistas*. Retrieved from  
<http://counselingoutfitters.com/vistas/vistas07/Whitney.htm>
- Wehn de Montalvo, U., & Alaerts, G. (2013). Leadership in knowledge and capacity development in the water sector: A status review. *Water Policy*, 15(Suppl.2), 1-14.  
<http://dx.doi.org/10.2166/wp.2013.109>
- Wick, C. W. (1989). How people develop: An in-depth look. *HR Report*, 6, 1-3.
- Yukl, G. (2012). *Leadership in organizations* (8<sup>th</sup> ed.). Englewood Cliffs, NJ: Prentice-Hall.

### Author Biographies

Mark E. Burbach is a Geoscientist in the School of Natural Resources at the University of Nebraska-Lincoln where he teaches courses in environmental leadership and human dimensions of natural resource management. He has a PhD in Leadership Studies from UNL. He is the human dimensions of natural resources faculty area leader and teaching coordinator in the School of Natural Resources. Mark has published peer-reviewed research articles related to natural resource management, leadership, teamwork, critical thinking, and emotional intelligence. He has designed more than 25 leadership development programs. Dr. Burbach has received teaching awards from the North American Colleges and Teachers of Agriculture and the UNL Parents Association; and a Bessey Award for best article in the journal *Great Plains Research*.

Kristin Floress is an Associate Professor of human dimensions of natural resources at the University of Wisconsin – Stevens Point, where she teaches courses in social science methods, policy, and integrated resource management. She coordinates the Applied Master of Science in Natural Resources Leadership and Administration through her Extension work in the Center for Land Use Education. Her research focuses on public participation in resource management, collaborative watershed management, and natural resources attitudes and behavior. Kristin received her PhD from Purdue University in 2008.

Eric K. Kaufman is an Associate Professor in the Department of Agricultural and Extension Education at Virginia Tech, where he teaches leadership courses for students in all disciplines at the graduate and undergraduate levels. He coordinates Virginia Tech's graduate certificate program in Collaborative Community Leadership and assists in coordination of the undergraduate Leadership and Social Change minor. Eric's research interests include collegiate leadership education and leadership development with adults in community and volunteer settings. Eric holds a Bachelor of Science degree from The Ohio State University (2000); both his Master's and his Doctor of Philosophy degrees are from the University of Florida (2004 and 2007). Prior to joining the faculty at Virginia Tech, Eric was a high school Agriscience teacher in Florida (2000-2003) and then program coordinator for Florida's Wedgworth Leadership Institute for Agriculture and Natural Resources (2004 – 2007).