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Developing Capacity for Local Watershed Management: Essential Leadership Skills and Training Approaches

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Abstract: Management of water resources at a watershed scale often occurs at the local level and relies on the effectiveness of local staff and leaders. Four land-grant universities in Indiana, Michigan, Minnesota and Ohio are delivering training programs that build the capacity of local water resource professionals. Based on experience from these programs, a survey on watershed management core competencies, and two surveys of information and training needs for watershed groups, we examined what core proficiencies are needed by watershed group leaders, how existing programs have approached professional training, and effective methods for delivering the training. Results indicated that successful watershed leaders said they must have skills in leadership, communication, collaboration, technology, policy, and planning along with a solid understanding of natural science disciplines. More importantly, they must be able to integrate these skills to solve problems. The mode of delivery (distance or in-person) depended on the audience and training goals, emphasized networking opportunities with the instructor and other participants, and encouraged participants to apply lessons to their own situations. Features of a successful training program that effectively build watershed leadership capacity are provided.

Keywords: *distance learning, natural resources, education, Extension, training, professional development*

Local watershed organizations can play a leading role in collaborative water resource management in the U.S. by addressing nonpoint sources of water pollution, such as agricultural and urban stormwater runoff, and other management issues (Leach and Pelkey 2001; National Research Council 1999; Sabatier et al. 2005). A diversity of skills and knowledge is essential to being an effective leader of watershed management. Much of the literature on collaborative watershed management emphasizes the critical social skills. In a study of six watersheds, Imperial (2005) found that leadership, staffing and recruitment, personnel management, budgeting, contracting, and grants management were important factors influencing collaborative activities. Leadership and social sciences skills were found to play a key role by Allen and Kilvington (2005) and McGuire (2006), who organized the major collaborative management skills into activation, framing, mobilizing, and synthesizing. Imperial and Hennessey (2000) emphasized the need to understand the "ecology of governance" in addition to understanding how (natural) ecological systems function. They emphasized the need for interpersonal and facilitation skills to resolve disputes and broker agreements, political skills to avoid conflicts, and leadership, argument, and persuasion skills to help leaders engage willing volunteers in collaborative processes such as watershed management.

One reason that social and leadership skills are often emphasized in studies of collaborative watershed management may be that a natural science background and technical skills are presumed to be common for watershed managers, not that technical skills are unimportant. A fundamental understanding of natural sciences such as hydrology, stream and lake ecology, invasive species, and stream dynamics are

important for effective watershed management. A survey of 600 water resource managers by Bourget (2006) found that while respondents emphasized the need for interdisciplinary skills, the top needs selected were watershed hydrology and modeling, followed by geographic information systems. One respondent commented that "There are far too many generalists that are emerging who lack sound scientific skills and experience." Few individuals possess all the natural science and technical skills that are important for effective watershed management.

Building the capacity of water resource leaders requires higher level learning including analysis, synthesis, and evaluation (Bloom et al. 1956), and specifically, the ability to integrate multiple physical and social science disciplines to address complex water resource challenges. No one individual can have a deep understanding of all these areas. Uhlenbrook and Jong (2012) discussed a "T-shaped competency profile" for water professionals that combines deep competency in a specific field (the leg of the T) with a broad suite of interdisciplinary and personal competencies (the crossbar of the T). This forms the basis for higher education of water professionals described by McIntosh and Taylor (2013), which although more in-depth for the post-graduate program they describe, could also be a helpful model for watershed management education.

Several land grant universities in the Great Lakes region have developed educational programs to increase the capacity of watershed groups and their leaders in developing and implementing watershed and lake management plans. This paper takes a critical look at four watershed training programs developed by Purdue University, Michigan State University, University of Minnesota, and The Ohio State University. We first provide an overview of the four programs, including a comparison of content, structure, and delivery methods. To identify educational needs of watershed and lake management leaders, we report on a survey conducted with watershed and lake management program participants to identify knowledge and skill areas associated with effective watershed management leadership. This is followed by a more detailed comparison of the content of the four programs focusing on the balance between social science and natural science topics. We then focus on delivery methods and discuss the relative merits of distance education and in-person approaches. Lastly, we provide conclusions with a focus on providing practical information to watershed management practitioners to inform the development and delivery of similar programs in other states.

Overview of Four Watershed Leadership Programs

Four watershed leadership training programs were compared to evaluate diverse delivery methods, types of participants, motivation for participation, content of the programs, participant activities, program evaluation, and funding mechanisms. The four programs (and year of initiation) are the Indiana Watershed Leadership Academy (2006), the Michigan Lake and Stream Leaders Institute (2002), the Minnesota Watershed Specialist Training (2013), and the Ohio Watershed Academy (2001). Each program was designed to meet the needs of their targeted audiences within each state.

Both the Ohio and the Minnesota programs are online only. The Ohio program is a 10-week program while Minnesota's lasts 14 weeks with optional weekly web/phone meetings. Indiana's Academy is a blended training program, consisting of three face-to-face class sessions and a series of web-based distance learning modules offered over a five month period. The Michigan program is delivered entirely face-to-face, with five all day sessions offered over the course of six months. In alternate years, a one day face-to-face advanced class is offered for alumni.

Target audiences vary somewhat within each state but all include water resource professionals and volunteers, especially those who are directly involved in developing and implementing local watershed action plans. Other targeted groups include community leaders, people representing watershed and non-profit organizations, local and state government officials, teachers, students, and retirees. The number of attendees per class ranges from 15 to 30 participants. A challenge faced by all programs is the vast difference in background, knowledge, and interests of attendees

on the various topics covered including watershed management, hydrology, biology, policy, planning, communications, and social science.

Based on mail surveys and direct evaluations by program attendees, many participants indicated that they are primarily motivated by a desire for professional or personal development. People who complete any of the programs earn either a Professional Certificate in Watershed Management or a Certificate of Completion. Minnesota and Ohio also offer the option of university credit. Other motivating factors cited by participants in evaluations include interest in lake and stream ecosystems, leadership, institutions and legal frameworks, identifying and involving partners, negotiation skills, or building the broad package of skills. In Ohio, the state Department of Natural Resources (ODNR) required the training for ODNR-funded watershed coordinators.

Each program incorporates homework assignments, required readings, and discussion with peers (online or face-to-face). Two of the programs also require an independent group or individual project. Examples of assignments include writing a strategic communication plan, designing a gap exercise to identify information needs, planning a stakeholder analysis or community assessment, preparing a photo essay of a community watershed issue, and calculating pollutant loads using monitoring data. Both the online and face-to-face approaches promote networking and introduce participants to water management practices.

Each program includes an evaluation component that includes a participant self-assessment of learning. Evaluation responses also provide feedback to instructors about participants' confidence in watershed planning, implementation and leadership, and their opinions on the relevance of presented topics. Participants provide their assessment of the entire program including their likes and dislikes. These evaluations help the instructors shape their programs for the future and determine if they are meeting their goals.

Participant fees range from $125 to $825 per person, or more if students are paying university tuition. However, the real cost of delivering training is estimated to be $850 per person in Minnesota and $2200 per person in Indiana, where expenses include overnight accommodations and meals. Expenses not covered by fees are paid by a variety of sources, including private donations, state funding, federal grants, and in-kind contributions of time from instructors.

These four programs cover some of the same topics as the Environmental Protection Agency's Watershed Academy Web (EPA 2015), an online self-administered certificate program. Unlike EPA's academy, these programs provide substantial time for networking and interaction among participants, either online or in-person, and provide a local and state-specific perspective.

Skills and Knowledge of an Effective Watershed Leader

In 2013, our team conducted an online survey of individuals who had previously participated in any one of three watershed leadership training programs offered by The Ohio State University, Michigan State University or Purdue University (Bonnell and Baird 2013). At the time, Minnesota's program was in its first year. The purpose of the survey was to gather input on the value of these training programs; to identify core competencies required by leaders of watershed, lake, and stream management efforts; and to evaluate the extent to which the programs were addressing the identified core competencies. Invitations were sent to 445 program participants, and 117 responded to the survey. Respondents were asked to rate the degree to which each knowledge/skill "item" was critical to their work (Table 1). Respondents were also given the option to write in "other" items under each category. Of the 26 items listed, 19 were rated as being critical or very critical. The ten highest rated items, with number 1 being highest, were: 1) Partnerships and collaboration; 2) Outreach and communication; 3) Project management; 4) Landowner interactions and interpersonal skills; 5) Best management practices; 6) Building professional networks; 7) Strategic planning; 8) Water quality criteria; 9) Working with boards and volunteers; and 10) State regulations.

Survey respondents were also asked to list up to five competencies (knowledge, skills, abilities, or behaviors) that have proven to be most beneficial or made the biggest difference for them in their role in water resources management. Their open-ended

Table 1. Knowledge/Skill Areas Included in Survey of Watershed Academy Participants.

Organizational	Strategic planning Facilitation Fundraising Partnerships/Collaboration Working with boards and volunteers
Interpersonal	Negotiation Conflict management Building professional networks Project management
Ecological assessment	Water quality criteria Monitoring Hydrology/stream processes Designing scientific studies
Implementation	Restoration design Best management practices Landowner interaction/interpersonal skills Load reduction modeling
Policy	Water policy Conservation programs Storm water regulations Land use policies Local ordinances State regulations
Education and outreach	Target audience analysis Program design and implementation Outreach and communication

comments were grouped into the following five thematic areas based on standard content analysis techniques and a qualitative analysis by a team of evaluation experts:

1. Effective communication (e.g., "speaking to the people you are meeting with at the time and tailoring the message")
2. Organizational and project management skills (e.g., "keeping meetings meaningful and people involved")
3. Facilitative leadership (e.g., "being able to let others have the idea and then support them")
4. Vision (e.g., "an ability to set attainable and measurable goals for which continued progress can be shown to stakeholders, partners, the public, board members")
5. Collaboration (e.g., "maintaining and keeping open strong/trusting relationships with key organizations [such as the] drain commissioner, conservation district, and local interest groups")

These competencies closely matched the top five critical knowledge/skill areas, providing confirmation of the importance of these categories

of knowledge and skills to effective watershed leadership.

This research effort allowed for the identification of core competencies that watershed and lake management leaders considered fundamental to their success and identified some of the benefits and areas for improvement in our respective watershed leadership programs. The most beneficial aspects of the existing watershed and lake management programs for participants are fostering a broader understanding of watershed management and expanding professional networks. In terms of weaknesses, respondents mentioned the need for more applied learning experiences (e.g., case studies and field scale problem solving) and inclusion of additional technical topics, such as calculating load reductions, inventorying streams or identifying aquatic organisms.

Determining the Curriculum for the Watershed Academies

The selection of a manageable number of topics to address in each of the four programs was challenging because so many skills are needed. To guide development of the curriculum, each watershed program convened an advisory committee made up of University staff and faculty, Extension educators, state agency representatives, and in some cases, nonprofit organizations. In Indiana, a needs assessment and survey were developed with a group of advisors (Broussard et al. 2006), and many ideas were adopted from the Ohio Watershed Academy.

The curriculum development processes in all four states identified a need for both social skills such as leadership and communication, and technical skills such as understanding of hydrology and modeling. However, the balance between these types of skills in each state was based on the following assessments:

1. The Indiana needs assessment survey (Broussard et al. 2006) found that the top four skills identified by watershed management leaders were technical or natural science based: 1) calculating load reductions for possible treatment alternatives, 2) using watershed models to estimate runoff, 3) using GIS to map and analyze watersheds, and 4) identifying restoration alternatives to address watershed problems.
2. In Michigan, the key training skills identified by the advisory team included a basic understanding of aquatic ecology; familiarity with management options, legal frameworks, and resources for partnership, funding, and support; and strong leadership, facilitation and communication skills.
3. In Minnesota, the advisory committee considered the characteristics of effective watershed leaders and then selected training topics based on two criteria: gaps in existing training, and topics of broad need. Several important technical topics (e.g., specific watershed models) were not included in the training because individual needs would vary too much and other training opportunities were available.
4. In Ohio, instructional module topics were determined in part through input from the advisory committee and, over time, feedback from participants. The resulting balance of topics is weighted more heavily on social science knowledge/skills than technical knowledge/skills. A recent study conducted by OSU which included interviewing 20 watershed leaders found that the essential skills most frequently mentioned were communication and interpersonal skills, followed by the ability to recognize and understand community dynamics, confirming the importance of social skills.

The results of each state's program development process are shown in Table 2, listing the major categories of program content along with topics offered by each.

Integrating Disciplines

Whether a particular module or assignment is primarily grounded in the natural or social sciences, instructors should strive to integrate natural and social science knowledge and skills. For example, a lesson on hydrology and stream function should include linkages to watershed management, which might focus on the identification of critical areas and how stream functions relate to the critical areas.

Table 2. Major Content Categories and Topics for the Four Watershed Training Programs.

Topics	Michigan State University Lake and Stream Leaders Institute	Purdue University Indiana Watershed Leadership Program	The Ohio State University Ohio Watershed Academy	University of Minnesota Watershed Specialist Training
People, Leadership, Communication	Communicating scientific information, conflict resolution, collaborating and guiding groups to consensus, building powerful partnerships, engaging public participation in natural resources management	Stakeholder involvement, developing effective messages, sustaining watershed groups financially, effective outreach using social marketing strategies, running effective meetings, group facilitation skills	Facilitating group decision making, running effective meetings, stakeholder involvement using social indicators to effectively target watershed education programs, basic negotiation skills	Communication (writing a strategic communication plan), civic engagement, project management (writing a work plan), professional development plans
Technology and Tools	Water quality assessments, monitoring, wetland identification	Online tools for watershed inventory, gathering social information about your watershed, GIS, calculating loads	Tools to determine how healthy a watershed is, data collection with a purpose, streams dynamic equilibrium, calculating sediment load	Watershed science assessment, monitoring and evaluation
Natural Science	Ecology of plants, invertebrates, and fish, stream and lake ecology, invasive species, wetlands, bio-engineered and natural shorelines and stream banks	Understanding stream processes, macroinvertebrate monitoring, watershed inventory and analysis	Streams dynamic equilibrium	Watershed science, basic hydrology and limnology, identifying critical source areas
Policy and Regulations	Michigan inland water law - key concepts and current issues, understanding water withdrawal and use regulations	Understanding the land use planning process, The Clean Water Act: overview, permits, WQ standards and TMDLs, understanding drainage policy and practice	Using Ohio EPA reports to understand water quality and causes of impairment in a watershed	Policy and institutions (who are the players and what are their roles and authority)
Planning	Developing a watershed management plan, developing a basic/"first order" lake management plan	Gathering social information about your watershed, setting goals to achieve outcomes	Watershed planning and implementation, defining watershed problems, developing goals and objectives, implementing a watershed plan	Project and program implementation, evaluating implementation alternatives (including cost-benefit analysis)

Tools such as geographic information systems have particular relevance when participants see how maps can be used as an educational tool to aid decision-making.

Both the literature and our program evaluations suggest that strong watershed management coordinators have an ability to integrate natural science tools and information with social skills to inform water resource management. The most effective coordinators are able to act as a bridge between technical experts and people who can get things done in the watershed. They are able to determine what information is needed and translate natural science into terminology that decision makers understand. Macleod et al. (2007) suggested that the set of qualities required to achieve integration include curiosity, confidence, credibility, capacity, communication, collaboration and connections. These qualities are not easily taught, but are a desired outcome of the integrated watershed programs described in this paper. The integrated watershed training program, consisting of both natural sciences and social and leadership skills, mirrors integrated watershed management, focusing on understanding the complexities of water resources and how the pieces fit together.

Distance vs. In-Person Modes of Program Delivery

Numerous studies have demonstrated that online and face-to-face teaching modes can be equally effective in achieving learning objectives (McCann 2007; Means et al. 2009; Tallent-Runnels et al. 2006, Neuhauser 2002). In both cases, results depend on fundamental principles of teaching and learning. As with face-to-face delivery, effectiveness of distance modes depends on incorporating opportunities for learners to interact with the content, the instructor, and other learners (Mandernach et al. 2009; McCann 2007; Neuhauser 2002). Success with distance learning depends to a large extent on attributes of the learner, emphasizing the importance of selecting and preparing the right learners. Successful distance learners tend to have an internal locus of control (Stone 1992), to be more abstract learners (Ouzts 2006) and to have distinctive learning style preferences (Aragon et al. 2002). Social skills are less essential in determining learning success in an online environment (Pugliese 1994). Little research exists specific to distance training modes for adult professionals studying natural resource topics and for higher order learning objectives.

Each learning mode has different strengths. Distance approaches have the advantage of flexibility and lower travel costs for participants, making them accessible to more participants. Face-to-face modes have the advantage of interpersonal interaction with both instructors and colleagues. Therefore, the choice of mode depends on which of these strengths is most important for the particular audience and training goals.

Generally, in-person learning methods may include field and classroom activities such as lectures, discussions, small group work, hands-on data collection, independent (outside of class) projects, and student presentations. Distance learning methods are predominantly online, including readings and multimedia learning resources, webinars and teleconferences, online discussion forums, and independent projects. Distance methods may be either synchronous (e.g., live webinars) or asynchronous (e.g., discussion boards), and learners may participate either independently or interactively with other participants. All three distance programs discussed here are delivered interactively. Learners go through the programs as a cohort on a set schedule and interact with one another.

Blended education modes that combine distance and in-person modes are increasingly common (Porter et al. 2014). The Indiana Watershed Leadership Academy uses a blended approach, requiring participants to complete online modules and attend in-person workshops. All four programs provide online resources and require independent work including readings, field practice activities, or writing assignments.

The choice of learning mode is based on how well the mode matches the audience and the learning objectives. Computer-based learning is only appropriate if the target audience is technologically savvy and has access to adequate technology. Watershed professionals generally meet these criteria. Volunteers and others learning from home – especially in rural areas – may not have adequate hardware or internet connections for convenient

access to online resources. The learning objectives, rather than the topic, determine which teaching mode is appropriate. For example, the topic of an Index of Biotic Integrity (IBI) can be learned using distance modes if the objective is for students to be able to define an IBI and its components. However, in-person modes are needed if the objective is for students to be able to correctly collect the data to calculate an IBI.

Table 3 lists learning objectives and teaching activities that are suited to distance or in-person methods. Regarding one-way presentations, basic concepts can be delivered effectively at a distance through readings, recorded lectures, field videos, and so on. However, delivery of complex concepts can benefit from an in-person demonstration or an involved Q&A session with instructors.

This difference between basic and complex concepts was revealed during a group evaluation discussion for the Indiana Watershed Leadership Academy. During the evaluation session, participants were asked to identify Academy activities that helped them learn, note whether these were in-person or distance activities, and then discuss whether the lesson could have been learned using the alternate (distance or in-person) type of activity. The outcome of the evaluation session was a group consensus arising from the discussion. Regarding learning web-based tools such as GIS and soils databases, participants saw a need to practice and spend time on their own, but they saw how a brief in-person introduction could be useful for less experienced users. Participants thought in-person contact with instructors would have helped them with difficult concepts such as load reductions; conversely, they liked web meetings because participants could ask more questions. They valued the group problem solving involved with in-person activities such as role playing a planning meeting, identifying stakeholders, and determining Best Management Practices (BMPs) for an example watershed. Finally, participants appreciated the convenience of not traveling for distance learning activities; while conversely, they appreciated the convenience of in-person communication for facilitating group projects.

Networking is an especially critical skill in a complicated and dynamic field like water resource management. Ohio Watershed Academy evaluations documented the value of in-person contact for networking. In the initial course design, participants were required to complete both online and face-to-face components, but the in-person requirement was gradually reduced and then eliminated in 2011. During years when face-to-face workshops were part of the curriculum, participants gave very positive feedback about networking opportunities and noted them in the summative evaluations as one of the most valuable aspects of the program. After the workshops were eliminated, participants gave the course lower ratings on "helping them develop new professional relationships." In the Michigan program, which is delivered entirely in-person, networking with

Table 3. Strengths of In-person and Distance Modes of Teaching.

In-person	Distance
• Delivering complex concepts • Role play (e.g., Watershed Game, facilitation skills, Land Use Planning Commission meeting) • Interactive reflection on application of principles (e.g., discussions following case study presentations or role play) • Co-learning (e.g., brainstorming or group problem solving) • Hands-on training and practice of field activities • Networking and interpersonal contact	• Delivering straight-forward concepts • Independent learning pace • Extended discussions with more contributors • Independent selection of learning topics and assignments • Independently applying lessons to a local watershed • Using online tools and resources • Interacting with participants from a wide geographic area

peers and topic experts, and group interaction, were noted as important components in the comment section of course evaluations. In the Minnesota program, surveys of alumni have been designed to learn whether online activities promote networking. The assumption is that learners who establish professional connections through distance interactions will then build on them at field days, conferences, trainings or other in-person events that occur regularly in the water resource community.

Effective Delivery Methods

Regardless of the teaching mode, an overriding consideration for effectively training watershed leaders is to address the diverse needs of participants who have educational backgrounds ranging from the natural sciences to the social sciences, work in small rural offices or large urban offices, draw from years of experience or have recently graduated, and face varied priorities in their workplace. In addition, an effective training program will address the constraints inherent to the selected in-person or distance mode. Above all, effective training begins with fundamental principles of pedagogy, or andragogy, in the case of adults (Knowles 1998). Kelly (2013) identified five practices to improve online courses that are equally appropriate to in-person modes of watershed professional training: flexibility, relevance, presence, feedback, and early alerts. All of these practices address the issue of diversity of learners by giving them some control over how and what they learn.

Flexibility

To meet individual needs, the Ohio, Indiana and Minnesota programs allow learners to either select electives from a menu of optional modules, or select subtopics within a module. Assignments are designed to be flexible to match the learner's level of expertise on the topic. Distance learning is conducive to a flexible time schedule. Ohio and Minnesota have no required synchronous activities; webinars are recorded so participants can listen to them later. Postings to online discussion forums can be made any time within a specified period. All the programs provide some leniency on assignment deadlines acknowledging that participants are juggling other priorities.

Relevancy and Hands-on Learning

Keeping material relevant to participants is an important characteristic of effective adult learning. Relevancy is enhanced by designing flexible assignments that give students a choice of focus, and by building the course content around practical lessons and concerns of the target audience. Assignments in all four programs encourage participants to apply lessons to examples from their own situation and interests. Relevancy is also enhanced by using active, experiential learning approaches to maintain interest and help participants internalize concepts. Michigan and Indiana provide in-field lessons and role playing activities. Other programs require independent hands-on practice such as completing a watershed assessment.

Presence and Feedback

Frequent interaction between a learner, the instructors, classmates, and colleagues has three benefits: learners build professional networks, they get feedback from others in the field, and it creates accountability. Interaction among classmates takes advantage of the diverse backgrounds of the learners, turning the challenge of diversity into a learning tool. The Indiana program engages alumni to provide feedback on assignments. The Minnesota program requires participants to provide feedback to other participants. In end-of-session evaluations, participants value the practical feedback from real practitioners in the field of water resource management – both instructors and fellow classmates. Michigan participants valued the in-person interaction with the experts who presented or participated in panel discussions. All four programs encourage interaction with colleagues and community members outside of the course to complete assignments.

Early Alerts and Learning Guidance

Online learning is challenging not only because of the distance, but because it is asynchronous, which can leave participants feeling isolated and unmotivated. Several strategies can be used to counter this, including explicitly talking about the

challenges of online learning, suggesting strategies for learning, and providing practice interacting in the online environment. Assignments for both online and in person learning can be designed with clear sub-tasks and frequent due dates to help participants manage their time. Students can be made accountable to others by requiring them to share their work and provide feedback on others' work. Monitoring participant activity helps identify and check in with those who are lagging.

Conclusions

To be an effective watershed, lake or stream leader, an individual must possess a variety of attributes that incorporate technical and social skills. Many leaders seek out continuing education and training programs to increase their capacity to lead water resource management efforts. This report offers a critical review of educational programs developed at four land-grant universities aimed at addressing the diverse educational needs of watershed and lake management leaders in Indiana, Ohio, Michigan, and Minnesota. Each included a common set of themes and topics that integrated both social and natural sciences. Additionally, networking and interactions either in-person, through online discussions, or through phone calls were regarded as highly valuable by participants and instructors in all four programs. Each of the programs included Extension educators in developing and presenting the programs. Extension appears to be well-suited to develop and run this type of program, with their expertise in adult education, knowledge of other experts in natural and social sciences, and connections from the local to state level.

Although most of our evaluations were not designed to compare delivery methods, we observed that no one method of delivery was overall more effective than another. Each delivery method offers different opportunities and impacts, as shown previously in adult learning literature and confirmed by reactions from program participants. An understanding of these differences combined with an understanding of the audience and desired education outcomes are the basis for an ideal program design. With online distance learning, courses can be self-paced, interactive, and archived for use by students at their convenience. No travel is involved, but participants must be computer literate. Face-to-face courses can include a diverse set of presenters, experiential outdoor learning opportunities, and interactive group exercises. Travel time can be a challenge for both participants and presenters. Whether the program is online or in-person, both modes provide participants with the capability to increase their knowledge for a broad set of topics, network with a diversity of people with varying expertise, connect with stakeholders and decision makers within their community, and sharpen their skills to become effective watershed, lake, and stream leaders.

These four programs exemplify the elements needed to develop a successful training program that fosters watershed, lake and stream leadership capacity: natural science knowledge, effective leadership and communication skills, networking, capacity building, effective tools and techniques, and community engagement. Building watershed leadership capacity parallels the features of good watershed management in that it 1) engages multiple stakeholders (e.g., through the use of advisory boards) in the development and delivery of the program, 2) integrates diverse biophysical and social science disciplines to address water resource issues, 3) recognizes and takes advantage of the diverse backgrounds and needs of participants, 4) gives learners plenty of individual (local) control over what to study and how to approach assignments to meet their needs, and 5) builds networks and networking capacity to support ongoing learning. These features characterize the strategies that watershed groups use to effectively manage water resources.

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