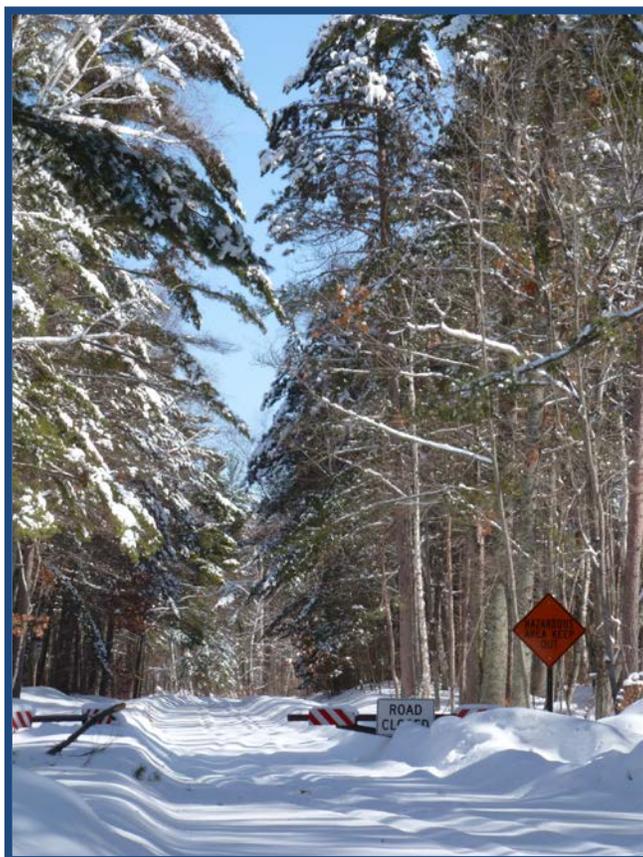


**Community Readiness for Environmental Change:
A Pilot Study in a Minnesota Forest-Associated Community**

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Project Background and Pilot Study Overview

Through a cooperative agreement with the USDA Forest Service Northern Research Station, University of Minnesota researchers are investigating community capacity to adapt to environmental change in northern Minnesota forest-associated communities. The primary goals of the project are to develop, pilot, and refine an adaptive capacity rapid assessment tool for use in forest-associated communities to assess and build community capacity. This report describes the findings of a pilot study conducted in Walker, Minnesota in 2011 and 2012. The pilot study objectives were twofold: (1) to identify community assets and sensitivities and (2) to assess critical capacities and constraints that may affect community readiness for environmental change. Data were gathered through one-on-one interviews and focus group discussions with decision makers, active residents, and natural resource professionals in the Walker area.

Many northern Minnesota communities are particularly connected to and dependent on the health and functioning of surrounding forests, whether for economic, social, cultural, recreation, or other benefits. Within these forest-associated communities, community well-being and forest ecosystem health are inextricably linked (Kusel 2003). Every forest-associated community is unique and has varying conditions, capacities, and constraints that make it particularly vulnerable or resilient to environmental change (Smith, Moore, Anderson, & Siderelis 2012). Moreover, the effects of environmental change and forest impacts are not evenly distributed geographically or socially. Different communities (e.g., indigenous communities with forest-dependent cultural practices, nature-based tourism-dependent communities) and social subgroups within communities (e.g., individuals working in forest products industries, families dependent on forest species for subsistence living) may be more or less sensitive to these impacts and more or less able to adapt.

As resource professionals, community leaders, and organizations help communities prepare for change, community assessment work becomes increasingly important. Knowing a community's vulnerabilities to environmental change is central to building capacity. The adaptive capacity rapid assessment (ACRA) process piloted and tools (Appendix A-C) developed in this study were designed to identify forest-associated communities' assets, sensitivities, capacities and constraints associated with adaptive capacity and to explore past and future community responses to change.

A human community's vulnerability or resilience to changes in its environment is largely a function of its sensitivity to stressors and its ability to adapt (Intergovernmental Panel on Climate Change 2001). Adaptive capacity, or the resources and social processes that can be leveraged by the community to monitor, anticipate, and proactively manage change (Plummer & Armitage 2010), varies community by community. In addition, the intensity, scale, and timing of environmental changes affect a community's vulnerability. Environmental changes can be immediate in the form of catastrophic events such as windstorms, wildland fire, or flooding, or they can be incremental stressors in the form of slow perturbations such as invasive species, shifts in forest types or water quality degradation. While models exist that predict ecosystem responses to change (for forest change example see Minnesota Forest Ecosystem Vulnerability

Assessment and Synthesis (Handler et al, forthcoming), considerably less is known about the social and cultural impacts of environmental change and how human communities might best adapt to change.

We conceptualize adaptive capacity as a function of two elements (1) foundational resources (i.e., capitals) including basic assets and sensitivities within a community and (2) mobilizing psycho-social processes for adapting to ecosystem change. Mobilizing psycho-social processes encompass adaptive capacities and constraints within a community across four levels: individual, relational, organizational, and programmatic capacity (see Davenport & Seekamp 2013, Pradhananga & Davenport 2013). This two-part definition of adaptive capacity is consistent with recent work (see Beckley, Martz, Nadeau, Wall & Reimer 2008, Donoghue & Sturtevant 2007; Mendis-Millard & Reed 2007) that distinguishes between interactional resources (i.e., capacities) and capitals. According to Beckley et al. (2008, p. 59) capitals are transformed into capacities for decision making through “networks, synergy, or social relations.”

Pilot Study Approach

Study area

The study was conducted in the city of Walker, Minnesota and included Walker residents and residents of nearby communities as participants. Walker is the county seat of Cass County. The city is bordered on the north and east by Leech Lake and the Leech Lake Reservation and on the south and west by the Chippewa National Forest. Approximately 55% of the land area in Cass County is forested (USDA Forest Service, 2012). The forestland is largely national forest (31%) or privately owned (28%). The remaining forestland is under county or municipal (24%), state (16%) or tribal (1%) ownership. Walker’s population in 2010 was 941 (Table 1). Compared to Cass County, Walker has a higher proportion of females (56%), a higher median age (49) and a lower median income (\$34,853). The city is predominantly white (86%) with Native Americans making up the largest minority group (11%). The Leech Lake Reservation is governed by the Leech Lake Band of Ojibwe (LLBO). One half of the Chippewa National Forest lies within the Reservation, while 90% of the Reservation is within the National Forest boundaries. The tribal-owned lands are managed by the LLBO Division of Resource Management. The Band maintains basic treaty rights on all lands within Reservation boundaries.

Table 1. Study area sociodemographic profile (2010 US Census)

Sociodemographic characteristics		City of Walker	Cass County
Population	Total	941	28,567
	Density	380/sq. mi.	12/sq. mi.
Gender	Female	55.5%	49.1%
	Male	44.5%	50.9%
Race/ethnicity	White	87.4%	86.1%
	Native American	7.0%	11.0%

	Two or more races	2.8%	2.2%
	Hispanic	1.3%	1.4%
	Asian	1.1%	0.3%
	Black	0%	0.3%
Age	Median	49	32
	Under 18	19.2%	21.1%
	Over 65	30.1%	21.8%
Household income	Median	\$34,853	\$43,042

Adaptive Capacity Rapid Assessment

Community data were gathered through in-depth interviews and focus groups with active community residents, local decision-makers and area resource professionals. An adaptive capacity rapid assessment (ACRA) process was used. Rapid assessments involve a team of researchers to investigate complex social and policy issues (Beebe 2001). James Beebe, a former U.S. Agency for International Development practitioner and leading expert in the field of human organization, defines the rapid assessment process as “intensive, team-based ethnographic inquiry using triangulation, iterative data analysis, and additional data collection to quickly develop a preliminary understanding of a situation from the insider’s perspective” (2001, p. 1). This methodology is well-suited for assessments of adaptive capacity in forest-associated communities because of the diversity of stakeholders and perspectives on forest management involved. Using multiple data collection methods (e.g., interviews and focus groups) enables “ground-truthing” and triangulation or verification of various data sources and narratives on community and environmental change. Interview questions were organized to examine first, foundational community resources including assets and sensitivities and second, mobilizing resources for adapting to ecological change including individual, relational, organizational, and programmatic capacity (see Davenport & Seekamp 2013, Pradhananga & Davenport 2013).

Data collection and analysis

Community data were gathered through face-to-face interviews and focus groups with community residents, local decision-makers, and area resource professionals in the Walker area. Interviews were conducted to examine individual beliefs about community in an in-depth guided conversation. Focus groups enabled group dialogue, reflection and prioritization of issues. Focus groups also served as an appropriate venue to discuss scenarios and contemplate decision making in a naturalistic setting, including how the community has responded to stress in the past and would respond in the future.

A total of 23 in-person interviews were conducted with 25 total participants between October and December 2011. Two interviews were small group interviews with two individuals each. Interviews lasted between 45 minutes and two hours. Three focus groups were conducted with a total of 18 participants in February and March 2012. Three focus group participants had also participated in interviews. Focus groups lasted two hours. A purposive sampling technique was used in which community members with particular knowledge and engagement in decision

making at the community or natural resource level were sought. Participants were recruited by telephone and the “snowball” sampling technique in which study participants and other key informants were asked to recommend potential interviewees who have expertise or are active in community and natural resource issues.

The interviews and focus groups were conducted by a team of researchers. Research personnel followed a guide or script to ensure that specific topics were addressed in the interviews and focus groups. However, participants were given the freedom to respond to questions based on their own experiences, beliefs, and evaluations. Interviews and focus group questioning addressed community assets and vulnerabilities, perceptions of change, and community capacities for anticipating or responding to change, including individual, relational, organizational and programmatic levels of capacity. In addition, focus group participants were asked a series of questions about past community responses to environmental change (e.g., Leech Lake walleye population decline of the early 2000s¹) and the community’s ability to respond to potential future environmental changes. In each focus group participants were presented with and discussed one of three hypothetical future scenarios related to invasive species and impacts to water quality/sport-fishing, decreased snowfall and impacts to recreation/tourism, and forest health impacts including reduced diversity and increased threats of pests and disease². The scenario was selected a priori by the research team and participant recruitment for each focus group targeted residents, decision-makers, and resource professionals with particular knowledge or involvement in that area (e.g., forest professionals were recruited to discuss forest change).

Data gathered in the interviews and focus groups were documented through team-based note-taking by two to four research personnel. Notes were corroborated and synthesized into one document for each interview and focus group. Interview and focus group transcripts were analyzed in for underlying convergent and divergent themes relevant to the guiding research objectives. Researchers used standard thematic qualitative analysis methods adapted from Corbin and Strauss (2008), Krueger and Casey (2000), and Charmaz (2006) to code and organize the data, identify predominant themes, and explore relationships and patterns among themes. Data sensitivity procedures were used such as theme table development, memoing, and

¹ DNR monitoring revealed walleye gill net catch rates below its management objective rate for seven consecutive years (MN DNR, 2010). As was explained by study participants, the issue became very contentious in the community because of disagreement on the causes of the walleye decline and how the problem should be resolved. Several management interventions have been implemented by the DNR and other agencies including control of the double-crested cormorant, a predator of walleye, by the LLBO Division of Resource Management. The DNR has reported that the fishery has since rebounded.

² Scenario A: Leech Lake is invaded by new non-native species that impact water quality, affect the food web and ultimately, significantly degrade the lake’s sport fishery; Scenario B: For three consecutive years, Walker and the surrounding region experience extremely warm winters with little to no snowfall. Winter weather dependent recreation opportunities in the area are essentially unavailable to local residents or tourists; and Scenario C: Multiple environmental factors cause major shifts in the range of native tree species. As a result, the forests in this region experience significant reductions in the abundance and extent of paper birch, balsam fir, white spruce, red pine, jack pine, white pine, black ash, quaking aspen, and yellow birch. Silver maple and oak replace many of these species. Forest stand diversity declines and threats of pests and diseases increase.

conceptual mapping (Corbin & Strauss 2008, Charmaz 2006). The data analysis process was led by one analyst over three months. Altogether, from participant recruitment through data analysis and the development of theme tables, the process took approximately 6 months.

Study Findings

The study findings are organized to respond to four overarching questions: (1) Who are study participants, (2) What are participants' perceptions of community conditions including key assets and sensitivities, (3) What are perceptions of community capacities and constraints to adapt to environmental change and (4) How can the community learn from the past and plan for the future.

Who are participants?

Interview participants' (n=25) median age was 50 and ranged from 68 to 30 years old (Table 2). Slightly more than half of participants were male (54%). Participants were white (88%) and Native American (13%). Almost two-thirds of participants (61%) had achieved a bachelor's degree or higher levels of formal education, which is a significantly higher proportion than reported in Cass County (20%, 2010 US Census). The majority of participants were full-time residents (91%) and resided in Walker, though a few participants resided in area-communities including Pine River, Hackensack, the Leech Lake Reservation, and unincorporated areas of Cass County. The median years of participants' residency in the community was 16. Participants were representative of various organizations and interest groups including government units such as USDA Forest Service; Minnesota Department of Natural Resources (DNR); LLBO Division of Resource Management; Cass County; City of Walker; local organizations such as the Chamber of Commerce, Tourism Bureau and Rotary Club; as well as business owners, recreationists, and civically active residents.

Focus group participants' (n=18) median age was 54 and ranged from 77 to 36 years old (Table 3). The majority of participants were male (83%). All focus group participants were white and all had attended at least technical or vocational college. The median years of participants' residency in the community was 23. Participants were staff or members of various organizations including the USDA Forest Service, Cass County, Leech Lake Association, Leech Lake Riders Snowmobile Club, Northstar Sportsmen's Club and Walker Area Community Center and represented diverse interests including business, recreation, tourism, community governance and natural resource management. It is important to note that the LLBO Division of Resource Management was not represented in the focus groups, which is a clear limitation of the focus group study results.

Table 2. Interview participant socio-demographic characteristics

Socio-Demographic Characteristics		N	Centrality & Variability	Percent
Gender	Female	11		46%
	Male	13		54%
Age	Maximum		68	
	Minimum		31	
	Median		50	
Race/ethnicity	Native American	3		13%
	White	21		88%
Formal education	High school	3		13%
	Technical/vocational college	6		26%
	4-year college	5		22%
	Graduate school	9		39%
Residency	Full-time resident	21		91%
	Seasonal resident	2		9%
Years lived in community	Maximum		67	
	Minimum		2	
	Median		16	
Professional sector	Government	9		38%
	Business	8		33%
	Retired	2		8%
	Education or research	5		21%

Source: Background information form

Table 3. Focus group participants' socio-demographic characteristics

Socio-Demographic Characteristics		N	Centrality & Variability	Percent*
Gender	Female	3		17%
	Male	15		83%
Age	Maximum		77	
	Minimum		36	
	Median		54	
Race/ethnicity	White	10		100%
Formal education	Technical/vocational college	4		40%
	4-year college	3		30%
	Graduate school	3		30%
Years lived in community	Maximum		70	
	Minimum		6	
	Median		23	
Professional sector	Government	5		42%
	Business	4		33%
	Retired	3		25%

Source: Background information form

*Of 18 total focus group participants, 10 returned fully completed background information forms. Percentages are based on responses received for each question.

What are community assets and sensitivities?

Interview participants were asked to describe critical driving forces that maintain the health of the community and primary threats to the health of the community³. Assets and sensitivities are general evaluations of the community and not necessarily directly tied to adapting to ecological change. Data analysis revealed assets and sensitivities that converged along four primary categories: (1) natural resource and environmental conditions, (2) economic conditions, (3) social conditions, and (4) perceived fairness and trust in institutions (Table 4). These foundational resources within the community were portrayed as sources of strength and stability in the community, as well as areas of vulnerability (Figure 1).

1. *Natural resources and environmental conditions*

Six primary themes emerged in participants' descriptions of natural resource assets:

- Leech Lake

³ Interview questions: (1) What would you say are the three driving forces that you believe have been critical to the health of this community? (2) What are some of the best things about this community? (3) What would you say are three major constraints that you believe have threatened the health of this community? (4) In the last 10 years, have you observed any significant changes or events in this region that may affect quality of life of people living and working here? (5) In the last 10 years, have you observed any significant changes or events in this region that may affect quality of the natural environment? (6) What challenges does this community face in maintaining a healthy natural environment and healthy forests into the future?

- Forests
- Outdoor recreation opportunities
- Nature-based tourism industries
- Forest industries
- Nature-based cultural resources and practices

Leech Lake and the surrounding forestland were the predominating natural resources that study participants described. When asked what they enjoy about living in the area, several participants emphasized natural resources: “The natural resources—the lake and the fishing. The recreation on the lake is a very big thing. It’s great for the kids.” Participants believed the abundance and diversity of natural resources in the region were critical to community health in providing high quality recreation opportunities for area residents and sustaining local tourism industries. One community member explained, “People know that tourism is the lifeblood of Walker.” Participants described several outdoor recreation opportunities as integral to quality of life in the area including fishing, hunting, boating, hiking, snowmobiling, bicycling, and horseback riding. Natural resources were also described as an important source of economic activity especially in supporting tourism and forest industries. Though, participants also noted that the loss of several nearby mills has stressed the community economically and has displaced jobs (see also #4 below for findings associated with tourism dependence). A few participants emphasized the importance of natural resources for traditional cultural uses and traditions of Native Americans including hunting, gathering, and fishing.

Participants identified six primary sensitivities linked to natural resources:

- Lake health
- Forest health
- Invasive species
- Residential and commercial development
- Deer overpopulation
- Climate-related changes

Lake health was a top concern among many study participants. Participants identified invasive species (e.g., zebra mussels, rusty crayfish, Asian carp) and walleye population fluctuations as primary threats to lake health and having a direct impact on recreation opportunities and the local tourism industry. The threat of zebra mussel invasions to Leech Lake weighed heavy on several participants minds: “There’s been a definite scare with invasive species in the past few years; that is something that is very frightening to most of us.” When asked about threats to community health, many other participants recalled the walleye crisis of the early 2000s: “Five years ago there were the fishing concerns, the decline in the walleye population. Now we’re stocking the lake so it has come back.” Forest health concerns also emerged and were centered on the threat of invasive species and pests like the emerald ash borer, as well as deer and predation of sensitive plant species. Some participants expressed concern about increased commercial and residential development and specifically the effects of development on forests (e.g., forest fragmentation) and water quality (e.g., shoreline development). A few participants

identified climate-related changes (e.g., increased temperatures and decreased snow cover as threats to winter recreation and tourism) and unmanaged recreation (e.g., all-terrain vehicles, trails, and campgrounds) as concerns.

2. Economic conditions

In discussions about economic conditions in the Walker community five primary assets emerged:

- Strong lake-associated tourism industry
- Community identity and pride
- Main street business vitality
- Strong forest products/mills industry
- County land department well-funded

Lake-associated tourism was identified as an economic driver of community health and a source of community identity and pride. Participants described a cooperative business environment: “Most people have a genuine interest in seeing the community be successful.” A few participants noted that business leaders were very active in community philanthropy. Most participants viewed the main street business district as vibrant and characterized the locally owned restaurants and retailers in the community as fundamental to shaping the community’s identity. Community events such as music festivals and sporting events were credited for serving both as a draw for tourists and as a way to bring the community together to celebrate. Participants also acknowledged strong forest products and milling industries as well as a well-funded county land department as assets.

Six primary sensitivities were identified linked to the community’s economic conditions:

- Tourism dependence
- U.S. recession
- Lack of employment opportunities
- Economic disparities
- Geographic isolation
- Property value and tax increases

A lack of a diversified economy and dependence on tourism were perceived to make the community particularly vulnerable to events such as the national recession, the decline in the walleye fishery in the early 2000s, and the recent closing of major employers. For example, a couple participants explained that after the national recession, fewer tourists were coming to the area and several locally owned resorts were sold as private parcels for residential development. One participant acknowledged, “This community is very tourism-based, second homes and tourism, so it’s susceptible to economic cycles.” Some participants blamed the tourism-based economy for limited employment opportunities, economic disparities among residents, property value and tax increases, and the displacement of young people from the community. Geographic isolation was acknowledged as an additional challenge in that it makes commuting from Walker to other communities for employment difficult. A few participants

suggested that without tourism, the community would struggle to survive. For example, one participant surmised, “We’re a one-horse town.... We farm walleyes and our crop is tourism, and if those things don’t come together, there is no government subsidy for a bad crop.” Some participants expressed concern about annexation and increases in taxes, particularly the notion that residents are paying for city services provided to non-residents (i.e., tourists), who are not paying for those services.

3. Social conditions

Existing social conditions were viewed as an asset and a source of vulnerability. Three primary themes were present in participants’ discussion of assets tied to the community’s social conditions:

- Social connectedness
- Information sharing
- Strong community organizations, groups and leaders

Participants identified existing social networks, community events and meeting places as significant to social connectedness and community health in the Walker area. Several participants characterized the Walker community in terms of its social cohesion and shared values associated with natural resources and the environment. For example, one participant explained, "It's a small, tight-knit community and when something needs to be done, they pull together." The community also was characterized as a small and safe community. A few participants believed their faith, and in particular Christianity, was an important driving force maintaining the community’s health. Several organizations including the local school system, community groups, local businesses, and faith-based organizations were admired for providing forums for community gatherings, supporting local causes, boosting the economy, and keeping members informed on important community issues. One participant noted that there are “strong leaders in this community.” Several participants praised these leaders for promoting the town in the region, securing funding for community projects, taking care of other community members, and generally being committed to the community’s future.

Five primary sensitivities were identified:

- Loss of sense of community
- Vulnerable youth population
- Social tension, isolation, and racism
- Aging population
- Poverty
- Reduced government services for vulnerable groups

Participants also discussed sensitivities within the social structure of the community. Many participants were concerned about the effect of demographic shifts and lifestyle changes on sense of community: “The community has come together, socially. I think they’re more cohesive in some ways, less cohesive in other ways.” Economic pressures were believed to further complicate a sense of community, as younger families move away in search of

employment. A few participants believed volunteerism within the community has declined. Economic conditions were seen as closely linked to community engagement: “When people are satisfied with their economic conditions, they’re more likely to be involved in the community.” Several participants acknowledged an aging population and declining youth populations. A concern expressed was that fewer youth are experiencing nature or engaging in outdoor recreation. One participant said, “I worry about youth not getting into nature.” For some this lifestyle change appeared to detract from a way of life familiar to longtime residents. Some described social tensions and a feeling of isolation or alienation among new residents, “This is a very difficult town for a brand new family to move to.” When asked if diversity of beliefs and values are respected in the community, several participants suggested that diversity is not always respected. One participant responded, “I don’t know how to answer that. It’s a small town and we have the problems that small towns have.” Another participant explained, “Walker itself has not been a very open or receptive community. There is racism there. It has proven difficult to go to work or school in Walker. Perhaps it is easier to hold people at arm’s length, because you don’t have to deal with prejudices.” Finally, a few participants noted that poverty is a major problem in the community and that government services for vulnerable or disadvantaged groups like youth, the elderly, and the poor had declined in recent years.

4. Perceived fairness and trust in institutions

Many participants acknowledged the importance of fairness and trust as both an asset and sensitivity within the community. Assets associated with perceived fairness and trust include

- Natural resource management agency willingness to gather public input
- Trust in individual staff members of natural resource agencies
- Increasing trust in natural resource management agencies
- Increasing trust in environmental and natural resource management programs

Sensitivities linked to perceived fairness and trust include

- Inconsistent enforcement of environmental regulations
- Lack of meaningful public engagement in decision making
- Decision making processes not transparent
- Decision making based on favoritism
- Distrust in natural resource management agencies
- Skepticism of natural resource management agency science and information

Discussions of fairness centered primarily on perceptions of unfairness and inequity in environmental and natural resource management. One participant explained, “It’s a major issue. You treat people equally and reasonably and based on specific circumstances.” Inconsistent enforcement of environmental regulations was a concern among some participants. Though many participants acknowledged city government and resource management agency willingness to gather public input, others questioned whether that input was incorporated into decision making processes and were skeptical about decision making criteria. At the same time, some agency staff interviewed expressed frustration with a lack of public input when they ask for it: “We seek out public opinion. It’s not always easy to get.”

Some participants expressed concern about transparency in decision making and consistency in rule enforcement. One participant described the frustration he and his neighbors felt when some, but not all lakeshore owners were asked to decrease the size of their docks. He explained that the neighbors could not identify any reason why some had to change their docks and others did not. Furthermore, he said lakeshore owners were never provided any justification for how the rule was enforced. Similarly, several participants expressed the belief that enforcement may be influenced by money, personal favors or individual agendas. One participant referenced lakeshore development and said, "I see some of these monster, stupid developments and it seems crazy. You know maybe it's legal, I suppose. It's like stuff on the St. Croix. ...You spend so much on some lawyer you get away with anything. Maybe it's legal, but is it equitable? I don't know." In contrast, a few participants acknowledged that some elected officials may not have the experience needed to properly enforce regulations and that inconsistent enforcement can be attributed to officials not fully understanding the regulations.

Participants expressed varying opinions about the level of trust members have in state, federal, and tribal natural resource management agencies, though several noted trust in agencies and their programs was on the rise. Several participants explained that though they trust agency personnel with whom they've established personal relationships, it's more difficult to trust agencies as a whole. Several participants described trusting the USDA Forest Service, Cass County forest land managers and local city officials. However, other participants acknowledged some level of distrust in each of these government units. For example, while one participant noted, "we all trust the Forest Service people," another participant told us "there's definitely some distrust" in the agency because it's the federal government. Participants described agency responsiveness, fiscal responsibility, and staff skills and abilities as reasons to trust, or not to trust, organizations and staff. It appears as though participants are more skeptical and critical of the Minnesota DNR than the local or federal natural resource management agencies, likely because of their role in managing the state's aquatic resources. Several participants recalled the walleye fishery crisis in the early 2000s as an event in which many community members became distrusting of the agency. According to some participants, during this crisis event three conditions fueled distrust: (1) the DNR's monitoring data did not match local experience, (2) some community leaders perceived that DNR staff disregarded local perspectives, and (3) the DNR's preferred course of action varied significantly from that of a local citizen's group that formed to address the crisis. One participant explained, "[DNR] fisheries department people's problem-solving varied from other local people. Some bridges were burned that won't be repaired. Local people put their heart and soul into the fisheries." A few other participants noted that DNR staff was concerned about local residents spreading misinformation about the crisis. According to one participant, the loss of trust was mutual, with both Walker community members and DNR staff losing trust in each other.

Table 4. Community assets and sensitivities identified by interview participants

Natural Resources and Environmental Conditions	Assets	Sensitivities
Economic Conditions	<ul style="list-style-type: none"> ▪ Leech Lake ▪ Forests ▪ Outdoor recreation opportunities ▪ Nature-based tourism industries ▪ Forest industries ▪ Nature-based cultural resources and practices 	<ul style="list-style-type: none"> ▪ Lake health ▪ Forest health ▪ Invasive species ▪ Residential and commercial development ▪ Increased deer population ▪ Deer overpopulation ▪ Climate-related changes ▪ Impacts of unmanaged recreation
Social Conditions	<ul style="list-style-type: none"> ▪ Main street business vitality ▪ Community identity and pride ▪ Strong lake-associated tourism industry ▪ Strong forest products/mills industry ▪ County land department well-funded 	<ul style="list-style-type: none"> ▪ Social connectedness <ul style="list-style-type: none"> ▪ Social networks
		<ul style="list-style-type: none"> ▪ Tourism dependence <ul style="list-style-type: none"> ▪ Lake/fishing dependence (uncertainty) ▪ Seasonal population fluctuations (second homeowners) ▪ Seasonal jobs ▪ Lack of diversified economy, little manufacturing ▪ Outside business owners ▪ Climate-related impacts, snow cover decline ▪ U.S. recession ▪ Lack of employment opportunities <ul style="list-style-type: none"> ▪ Loss of some local mills ▪ Lack of access to small business loans ▪ Economic disparities ▪ Property value and tax increases <ul style="list-style-type: none"> ▪ Walker residents paying for services others use (annexed residents, tourists). ▪ High rent on downtown businesses ▪ Geographic isolation
		<ul style="list-style-type: none"> ▪ Loss of sense of community <ul style="list-style-type: none"> ▪ Decline of local, independent businesses

	<ul style="list-style-type: none"> ▪ Community events, sporting events ▪ Community meeting places (e.g., coffee shops, restaurants) ▪ Shared values ▪ Small community ▪ Safe community ▪ Information sharing <ul style="list-style-type: none"> ▪ Local newspaper ▪ Organization/business websites ▪ Word of mouth ▪ Strong community organizations, groups and leaders <ul style="list-style-type: none"> ▪ Education (e.g., public school system) ▪ Service (e.g., Rotary Club, Lions Club, Eagles Club) ▪ Environmental/recreation (e.g., Lake Associations, bike trails group) ▪ Economic (e.g., local businesses, Chamber of Commerce) ▪ Social (e.g., “Coffee Club,” “Old Coots”) ▪ Faith-based 	<ul style="list-style-type: none"> ▪ Struggling community center ▪ Limited employment opportunities ▪ Decline in community engagement and volunteerism ▪ Vulnerable youth population <ul style="list-style-type: none"> ▪ Decreasing youth population ▪ Limited sense of community ▪ Youth isolated from nature, nature-based experiences ▪ Aging population ▪ Poverty ▪ Social tension and isolation <ul style="list-style-type: none"> ▪ Ethnic/racial (e.g., racism and bigotry) ▪ Economic (e.g., classism) ▪ Religious (e.g., religious intolerance) ▪ New resident isolation ▪ Reduced government services for vulnerable groups
<p>Perceived Fairness and Trust in Institutions</p>	<p>Assets</p> <ul style="list-style-type: none"> ▪ Natural resource management agency willingness to gather public input ▪ Trust in individual staff members of natural resource agencies ▪ Increasing trust in natural resource management agencies ▪ Increasing trust in environmental and natural resource management programs 	<p>Sensitivities</p> <ul style="list-style-type: none"> ▪ Inconsistent enforcement of environmental regulations ▪ Lack of meaningful public engagement in decision making ▪ Decision making processes not transparent ▪ Decision making based on favoritism ▪ Distrust in natural resource management agencies ▪ Skepticism of natural resource management agency science and information

Focus group participants were asked about the community’s biggest strengths and weaknesses⁴. Strengths (Table 5) and weaknesses (Table 6) identified by the focus groups closely mirrored those provided by interview participants, converging along the broad themes of natural resources and the environment, economics, and social conditions.

Table 5. Focus group participants’ identification and ranking of community strengths across three sessions

Category	Theme	N*
Natural Resources	Leech Lake	10
	Fishing	5
	Chippewa National Forest	4
	Public lands	3
	Natural resources	2
	Good land management	2
	Trees and water	1
Total		27
Economics	Bike and snowmobile trail systems	7
	Unique shops	4
	Tourism	3
	Area marketing	1
	Healthy downtown business district	1
Total		16
Social Conditions	Engaged citizenry	4
	Public demand to protect resources	2
	Efficient use of tax dollars	2
Total		8

*N is the total number of votes for each theme/category identified by participants. Categories and themes are listed by number of votes in descending order. Each participant voted for the three biggest community strengths.

⁴ What do you see as Walker’s biggest strengths as a community? What do you see as Walker’s greatest weaknesses as a community?

Table 6. Focus group participants' identification and ranking of community weaknesses across three sessions

Category	Theme	N*
Institutional Deficiencies	Lack of industry	7
	Lack of educational funding	3
	Lack of a hospital	3
	Lack of value addition to timber	2
Total		15
Social Limitations	Lack of living wage jobs	7
	High socioeconomic disparity	5
	Seasonal population	2
Total		14
Natural Resources	Threats from endangered species	3
	Economically inefficient use of natural resources	1
	Dependence on fisheries	1
Total		5

*N is the total number of votes for each theme/category identified by participants. Categories and themes are listed by number of votes in descending order. Each participant voted for the three biggest community weaknesses.

What are community capacities and constraints to adapt to ecological change?

Participants were asked about the Walker community's capacity to respond to community problems. Questions focused on each of the four levels of community adaptive capacity: (1) individual⁵, (2) relational⁶, (3) organizational,⁷ and (4) programmatic⁸ (Figure 1). Responses varied, but indicated both capacities and constraints at each level. Responses for each level of capacity are described below.

1. Individual capacity

⁵ Are individuals living and working in this community committed to responding to the changes or challenges you described earlier? Do individuals in this community have the resources they need to respond effectively? Do individuals in this community work together to resolve problems?

⁶ Does this community have strong social networks? How do people in the community get and share information about the changes or challenges you described earlier? Are these methods of information sharing effective? Is there conflict in this community? What would you say are some of the more controversial issues? 15. Is diversity of beliefs and values respected in the community?

⁷ Are local government and non-governmental entities committed to responding to these changes or challenges? Do local government and non-governmental entities have the resources they need to respond effectively? Do local government and non-governmental entities work together to address these challenges?

⁸ Do you think the roles and responsibilities of different organizations are clearly established in environmental management programs? Does it seem like there are adequate resources available for environmental management programs? Does it seem like environmental management programs are coordinated across existing ownership and jurisdictional boundaries?

Many community members are informed and engaged in community issues (Table 7). Several participants observed that members are knowledgeable about environmental issues and that the community as a whole is united in a “love of the outdoors.” One participant appreciated living in an engaged community: “We are blessed to have active, engaged people. The bike trails, applying for grants, the trail systems...they all took individuals with time and motivation.” However, some participants noted that a lack of broad member engagement may limit collective action on certain issues. For example, one participant acknowledged that civic engagement is limited to a few active members: “You go to civic events and you generally see the same people.” Another participant blamed a lack of community engagement on member apathy: “Some don’t care or want to get involved until it affects them.” A few participants believed that accessing information about environmental issues can be difficult and that many community members are uncertain about how to get involved in decision making processes. Similarly, a few participants found overlapping jurisdictions confusing. When asked if roles and responsibilities among natural resource managers are clear, one participant explained: “I’m not sure I can give you a very well-educated answer. I sometimes get confused, because there are so many groups.” According to several participants, diverse beliefs exist in the community, but they are not always accepted or valued. One participant acknowledged a communication problem constrained by non-tribal members’ “ignorance” and assumptions about tribal members: “It’s the same as anywhere else. Native Americans are the minority and there is a line of ignorance. The majority doesn’t want to learn, the minority doesn’t want to tell. [The majority thinks] that Native Americans don’t like us.”

Table 7. Individual capacities and constraints

Individual	Capacities identified	Constraints identified
	<ul style="list-style-type: none"> ▪ Existing historical environmental knowledge ▪ Shared environmental values and a “love of the outdoors” ▪ High awareness of environmental problems ▪ Shared concern about the environment problems ▪ Willingness among members to volunteer for community events ▪ Many engaged, informed and influential members and leaders 	<ul style="list-style-type: none"> ▪ Accessing information about environmental issues/planning processes may be difficult for some ▪ Concern about self-interested members ▪ Uncertainty and confusion among some members associated with environmental decision making processes and jurisdictions/authority ▪ Concern that broad member engagement is limited; often only those directly affected or with decision making power are involved ▪ Some members are resistant to change and avoid conflict ▪ Concern about intolerance of diversity and diverse values

2. Relational capacity

Many participants described strong social networks in the community in which members exchange information and share resources (Table 8). At the same time, others maintained that existing social networks with real influence (i.e., political networks) in the community are not inclusive of the broader community and can be isolating especially for newcomers, low income individuals and Native Americans. Several types of overlapping social networks exist in the community including informal networks, formal networks, and political networks. Members have multiple pathways for communication and information exchange such as the media (e.g., newspaper and radio) and several informal social engagements or groups. Participants described meeting places like coffee shops and restaurants where members interact and listed several community events that bring people together. Participants noted that certain community members have an established history of working together around certain issues. These participants characterized the community as “small” and “tight-knit.” As a result, participants suggested, people know one another and “pull together” when faced with challenges. One participant suggested these social networks lead to friendships and trust: “Because it’s a small town, you know the people, run into them and have friendships. You can pick up the phone and call anyone.”

At the same time, others maintained that existing social networks with real influence (i.e., political networks) in the community are not inclusive of the broader community and can isolate certain subpopulations like newcomers or lower income individuals. A few people described the social and political structure of Walker as “cliquey.” One participant explained, “This community is cliquey. It can be pretty challenging if you’re new. It takes time to get used to the power structures.” Some participants perceived that the community’s existing social networks lead to power networks that disproportionately affect member access to information and leadership opportunities. A few believed this form of social capital impeded consistent enforcement of land use regulations. Two participants described how difficult it can be for government officials to enforce regulations on long-time residents: “You’re too close to make rational decisions,” and “You could be completely opposed to something, but you are in it.”

Relational constraints participants discussed appear to challenge community well-being. Constraints included exclusive social networks and communication channels, power imbalances, interpersonal conflict, and racial discrimination. Though one participant characterized “a core group of people... that make this place work,” as a real asset to the community, another participant characterized Walker as “cliquey at times” and said “wealthier people from the cities form their own networks; it works for those folks.” When asked who has influence in the community in environmental decision making, one participant responded succinctly, “Who has power here? ...Those that speak the loudest!” Conflict in the community seemed to emerge most commonly around highly contentious environmental issues such as walleye fishery management and timber harvesting. One participant noted tension linked to tribal hunting and fishing rights: “Legally you have two sets of hunting and fishing rules for tribal and non-tribal members. You get differences of opinion on that.” Some participants acknowledged tension between non-tribal and tribal members and described instances of racial, religious, and class discrimination and bigotry in the community. One participant recalled an example of a values conflict and intolerance in the public school system: “You’ve got to be

Christian. It's a Christian-oriented school and you better not say anything against it. They have church release days at Walker school and have church groups come in on Wednesdays. But, we tried to have a pow wow on a school day so kids could participate. Parents pulled non-native kids out so they wouldn't participate in a pagan ritual."

Table 8. Relational capacities and constraints

Relational	Capacities identified	Constraints identified
	<ul style="list-style-type: none"> ▪ Several formal (e.g., newspaper, radio, Internet) and informal (e.g., word of mouth, coffee groups) pathways exist for information exchange ▪ Some community members interact frequently at businesses meeting places (e.g., coffee shops and restaurants) and at public community events which are frequently held. ▪ Some community members have an established history of working together around certain issues 	<ul style="list-style-type: none"> ▪ Concern that some existing social networks are exclusive and privilege longtime community members over newcomers ▪ Concern around power imbalances that disproportionately affect opportunities for leadership and information exchange for some ▪ Some environmental issues are highly contentious within the community sparking instances of interpersonal and intergroup conflict ▪ Instances of racial and class discrimination and bigotry were reported

3. Organizational capacity

Community-based service, business, and environmental organizations play a strong role in supporting the community and its members (Table 9). Participants listed several service and business organizations that are active and influential in the community and described them as well-informed, committed to the community, and able to secure funding for programs and projects. Many participants described the public school system as strong and unifying. Though as described earlier, instances of parents' religious intolerance have played out within the school system. Natural resource management organizations including the Cass County Land and Environmental Services Departments, the Minnesota DNR, USDA Forest Service, and LLBO Division of Resource Management were described as active and influential, especially as sources of scientific and management expertise. These organizations were also credited for creating opportunities for community input on environmental issues.

Opinions diverged as to how well organizations work together on community and environmental issues. Many participants observed that the city and county "work very well together." One participant acknowledged, "Usually when something is important, we all work together." A few participants noted past interpersonal conflict between business owners and city government officials. One participant recalled a dispute about the walleye crisis: "I was at a meeting at a restaurant three years ago and member of the Leech Lake Association was

advocating the DNR position on walleye stocking, and [a local public official] disagreed and they got into a personal verbal attack on each other.” Some participants believed that natural resource organizations have competing interests in environmental management which can lead to conflict. For example, a few participants described discord between the LLBO and the USDA Forest Service around forest management issues, and especially timber sales.

The Cass County Land Department, and its timber sale program, was described as a strong source of revenue for the county. However, several participants acknowledged that resources for natural resource management organizations are scarce: "There’s never enough [funding]; it's only semi-adequate. You see some things happening that wouldn’t happen if there were other resources." Some participants acknowledged that organizations must rely on partnerships and outside grants to manage the forest. Time was described as a major constraint to environmental planning: “People are overloaded with day-to-day work. Planning gets put off until we have ‘time,’ but then we never have it.” Another participant described jurisdictional boundaries as a major constraint to effective environmental management: “They say ‘we can’t touch that because it’s city,’ ‘we can’t touch that because it’s county.’ We don’t want to step out of jurisdictions, so nothing gets done."

Table 9. Organizational capacities and constraints

Organizational	Capacities	Constraints
	<ul style="list-style-type: none"> ▪ Several well-established, informed and influential community-based service and business organizations are active in the community (e.g., Walker Area Foundation, Chamber of Commerce, Rotary Club, faith-based organizations) ▪ Local environmental organizations are active in the community around certain issues (e.g., Leech Lake Association, Bike Trails) ▪ Community-based service and business organization leaders are influential, especially in securing/accessing funding ▪ Businesses sponsor/support events and programs that benefit the community ▪ The public school system is strong and unifying ▪ Natural resource management organizations (e.g., Cass County , MN DNR, USDA Forest Service, LLBO Division of Resource Management) 	<ul style="list-style-type: none"> ▪ Instances of intergroup and interpersonal conflict within local government and between leaders and business owners have been reported ▪ Concern around lack of funding and staffing for natural resource management programs ▪ Instances of intergroup conflict between organizations around environmental issues (e.g., timber sales, tribal hunting/fishing rights, fishery management, business development) have been reported

	<p>are active in the community as sources of scientific and management expertise and create opportunities for community input on environmental issues</p> <ul style="list-style-type: none"> ▪ Organizations have demonstrated ability to cooperate on issues (e.g., walleye crisis) 	
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4. Programmatic capacity

Participants listed several community programs and events that support community health in the area (Table 10). Events like the Moondance Jam, International Eelpout Festival and Bay Days in particular were described as bringing members together to celebrate the community. A few participants also mentioned social services programs that assist disadvantaged and vulnerable populations in the community (e.g., youth and older populations). However, other participants expressed concern that the programs’ benefits are not reaching certain populations within the community like tribal members. Participants also acknowledged increasing trust in natural resource management agencies and expressed optimism that natural resource management programs have improved.

In the interviews much discussion ensued about the challenge of competing natural resource values, goals, and management preferences of community members. These discussions centered on lake use and management and forest use and management. Discussions of lake use and management focused on five primary themes:

- Invasive species management
- Walleye stocking
- Predator control
- Recreation use
- Lakeshore development

Several participants credited resource management agencies including the USDA Forest Service, Leech Lake Division of Resource Management, Minnesota DNR, as well as local governments Cass County and the City of Walker for protecting natural resources, managing natural resources for multiple uses, and maintaining their accessibility to the public. At the same time, participants also expressed varying attitudes overall toward the use and management of lakes and forestland.

The sport fishery on Leech Lake was a predominating topic of conversation. Beliefs and attitudes around the management of the walleye fishery in particular were wide-ranging and an obvious source of disagreement among community members. According to participants, the decline of the walleye fishery spurred citizen action and community organizing and ultimately resulted in DNR intervention. DNR intervention was not well-received by some community members. Several participants described conflict between the community and the agency

around this issue. One participant explained, “The fisheries department people’s problem-solving varied from the local people. Some bridges burned that won’t be repaired. Local people put their heart and soul into [saving the walleye fishery].” Participants generally agreed that protecting the walleye fishery is critical to the community, but opinions diverged as to what the source of the problem is (e.g., invasive species, cormorant predation, overfishing) or how the problem should be resolved (e.g., stocking, predator control, boater regulations, boater education). The issue strained relationships and was described as an issue that “divided the community.” Study participants were also divided in how they viewed the DNR’s action. Some were critical and others praised the agency for its response.

Several participants described lakeshore development as a threat to water quality in the area and similarly, attitudes toward the city and county’s role in managing lakeshore development varied. Some held very positive views of the local government’s handling of permitting and control of lakeshore development, while others were much more critical of these efforts. For instance one participant recalled, “We’d cruise around the lake wanting to see the natural lake. Well, there’s one huge town home complex.... You know it’s a beautiful point, but then they plant lots of grass and put in a huge retaining wall, so they could put in a boat harbor. It’s crazy.”

Participants’ perspectives on forest use and management focused on five primary themes:

- Resource protection
- Cultural uses and traditions
- Timber harvesting
- Residential and commercial development
- Recreation development

Participants generally recognized a need for multiple-use forest management in the region, but opinions varied on how to balance resource protection and resource use. Some participants expressed concerns about resource protection, characterizing existing land use regulations and incentives programs as “inadequate.” Some believed that residential and commercial development has negatively impacted forest health. One participant described the difficulty in balancing economic pressures with forest management: “I’d say those market forces are the biggest challenge for maintaining healthy forests. The mills we still have here are doing well.” In contrast, others criticized local governments for failing to take advantage of opportunities to further develop or use natural resources for energy, economic growth, and recreation. Some participants expressed concern that tribal members’ traditional cultural practices have been abrogated in favor of timber harvesting or other economically driven uses. In contrast, other participants commended Cass County for maintaining forest productivity and supporting timber industries.

While most participants viewed recreation development including new bike trails as a benefit to the community, a few were concerned about trails fragmenting the forest. Some participants expressed frustration about increases in off-highway vehicle use. A few participants lamented

these impacts but also acknowledged the challenges of maintaining and staffing recreation facilities such as campgrounds with stagnant or shrinking budgets.

The roles and responsibilities of organizations active in community and natural resource management are not always clear and thus may not be coordinated. Some participants attributed role confusion to overlapping agency jurisdictions and a “patchwork” pattern of land ownership in the area. However, several participants expressed optimism that environmental protection and management programs were improving and will lead to enhanced ecosystem health. Yet, scarce program resources present a constraint to continued expansion of environmental protection programs. It also appeared that many community members and resource managers worked diligently to provide quality programs despite shrinking budgets.

A lack of coordination among natural resource and environmental agencies and organizations was identified as a major constraint to programming. Instances of conflicting values, goals and competing jurisdictions and authority between agencies and organizations (e.g., USDA Forest Service, MN DNR, LLBO DRM, County, City) were reported. Participants believed that this lack of coordination affects communication and cooperation in natural resource management and land use planning (e.g., forest, lake and fishery management, regulation enforcement).

A few participants characterized environmental protection programs as reactionary and lacking long-term vision and consistency. Inconsistent enforcement of environmental regulations was a major programmatic constraint according to some participants and also included concern around inequity and favoritism toward the powerful elite within the community. One participant referred to the natural environment and said succinctly, “if it’s protected, it’s by accident.”

Some participants were concerned that natural resource management programs did not take into account the knowledge, needs, and interests of diverse community groups. One participant was concerned about the impacts of timber harvesting on traditional cultural practices: "There is not a lot of opportunity for engagement between the tribe and government. For instance, the [USFS] didn’t listen when the tribe wanted to prevent any cutting in an area to save the medicines that grew in the forests.”

Table 10. Programmatic capacities and constraints

Programmatic	Capacities	Constraints
	<ul style="list-style-type: none"> ▪ Community events (e.g., Moondance, International Eelpout Festival, Bay Days, Habitat for Humanity) bring people together ▪ Programs are supported by partnerships between multiple organizations across public, private and community sectors 	<ul style="list-style-type: none"> ▪ Competing natural resource values, goals and management preferences among community members (e.g., lake use and management and forest use and management) ▪ Natural resource and environmental coordination lacking among agencies and organizations. ▪ Concern that environmental

	<p>(e.g., shared visitor center, bike trails)</p> <ul style="list-style-type: none"> ▪ Some social service programs exist to serve disadvantaged and vulnerable populations (e.g., youth, elderly) ▪ Optimism that environmental protection programs have improved 	<p>planning programs are reactionary rather than visionary</p> <ul style="list-style-type: none"> ▪ Concern around a lack of consistent enforcement of environmental regulations ▪ Lack of funding and staffing for natural resource management programs ▪ Natural resource management programs challenged in integrating diverse community member values and preferences <ul style="list-style-type: none"> ▪ Limited community engagement in programs and planning ▪ Inequities in access to and benefits attained from programs particularly within the tribal community
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How can the community learn from the past and plan for the future?

Focus group participants were asked to reflect on the ways the community has learned from the past⁹ and to anticipate how well it might prepare for the future¹⁰. Responses to questions about past community responses and future preparedness revealed important elements of a crisis event including catalysts, responses, and outcomes.

- Catalysts

⁹ What recent major event, crisis, or opportunity has your community experienced related to [fish populations, recreation opportunities and quality of life, or forest health]? How would you describe this issue (when it began and what was involved)? Who emerged to address this issue? Did existing groups, organizations or social networks help people to work together to address this issue? Did the people working together treat each other fairly and show respect for others? Did the community have access to the resources it needed to address the issue? What were the outcomes? Will the community be in better or worse shape to address other issues in the future as a result of this experience? How would the community be affected by this issue? Are there existing leaders, groups, or organizations to work together to address this issue? How well will these individuals and groups work together to address this issue? Does the community have access to the resources it needs to address the issue? Considering everything we have just discussed, is the community ready to address this issue?

¹⁰ Scenario 1: Leech Lake is invaded by non-native species that impact water quality, affect the food web and ultimately, significantly degrade the lake’s sport fishery. The Minnesota Department of Natural Resources is considering prohibiting boating and fishing on the lake to contain the invasion and reduce stress on native species. Scenario 2: For three consecutive years, Walker and the surrounding region experience extremely warm winters with little to no snowfall. Winter weather dependent recreation opportunities in the area are essentially unavailable to local residents or tourists.

Scenario 3: Multiple environmental factors cause major declines in habitat suitability for native tree species. As a result the forests in this region experience significant reductions in the abundance and extent of paper birch, balsam fir, white spruce, red pine, jack pine, white pine, black ash, quaking aspen, and yellow birch. Forest stand diversity declines and threats of pests and diseases increase.

- Responses
- Outcomes

To frame conversations about responses to a past crisis, participants in each focus group were asked to select a past community crisis. The lake health and recreation groups chose to discuss the walleye fishery decline and the forest health group chose to discuss a forest blowdown event. Participants noted a few catalysts for community responses to these natural resource crises including the severity of the problem's consequences and intergroup conflict over the causes of the problem. According to one participant, the direct impacts of the walleye crisis on the community spurred action: "Things got so damn bad we had to do something about it."

Participants described a variety of community responses to past natural resource related crises. Responses identified included cooperation, adaptation, and reactionary responses. Cooperation between organizations was described as critical to responses, because natural resource problems cross jurisdictional boundaries and because the problems often require resources and action from multiple organizations and individuals. For example, in the fishery decline discussions one participant recalled the crisis and noted the community's dependence on Minnesota DNR's support, "There was no direction we could move unless we had the support of our government." Adaptation was described by participants in the blowdown discussion as "business as usual." Participants explained that the blowdown was not a crisis, because forest managers had the capacity to respond and adapt to the problem as it happened. A few participants in the fishery decline discussion criticized responses to this crisis for being reactionary and slow. According to one participant, when the fishery decline was initially reported by the community to the Minnesota DNR, fisheries managers said, "You've got to learn to fish better."

Two outcomes were described from community responses to past crisis events: learning and distrust. Learning was described as a clear benefit of responding to natural resource crises. One participant referred to the community response to the walleye fishery decline and said, "If anybody was paying attention, they learned a lot." However, the lessons learned from the experience were not always positive. In some cases, participants said they were left distrusting state government. A participant in the fishery decline discussion said two lessons learned from the crisis were "don't trust the DNR" and "question the information you're given." These responses reflect the emergence of conflict between the DNR and many local community members who disagreed with the agency's response to the crisis.

Responses to questions about preparedness for future scenarios of environmental crises (i.e., invasive species in Leech Lake affecting lake health, warmer temperatures and reduced snowfall affecting winter recreation and tourism, and decline in forest health affecting native species) were divergent. Perspectives appeared to be split between the belief that the community was well-prepared for future environmental crises and the belief that the community still had work to do to be for such events.

Those who didn't believe the community needed to become better prepared for future crises were generally optimistic that "this community could respond," and community members would find ways to overcome the forest or climate crisis. Some appeared to be confident that local businesses would step up to address changes, "If you let free enterprise take over, someone will step in; as long as the government doesn't get in the way." Other participants championed the adaptability of local residents themselves, "There are a fair number of doers up here. You may not have the opportunities that you do in the cities, but that means you have to learn to adapt." The threat of invasive species, however, was not met with the same degree of optimism. Participants in the lake health focus group explained that the local economy is so heavily dependent on fishing and fishing-related tourism that if the fishery collapsed once again, it could spell disaster for the community: "There's no fall back to go to." Participants also expressed concerns that there is not enough information and resources available to help them effectively prepare for aquatic invasive species. Participants identified several needs including stronger partnerships especially among local merchants and federal, state, and tribal agencies; public education programs; consistent enforcement of lake uses; lake-focused volunteer programs; and intensified lake health monitoring. Some participants lamented the lack of a single, trusted source for information on aquatic invasive species: "We're lacking a singular place to go for information; one place that people trust." Other participants seemed more concerned about the community's inability to enforce prevention measures on boaters: "Legally, we can't stop people from spreading invasives."

Conclusions and Recommendations

The Walker community pilot study revealed important assets, sensitivities, capacities and constraints that we believe are critical to community readiness for environmental change. These conditions and capacities should be acknowledged and addressed in community and natural resource planning and crisis management. In several instances assets are also areas of sensitivity (e.g., walleye population) or capacities can become constraints (e.g., social networks).

Five community narratives

Five predominating narratives of community conditions from the perspectives of local decision makers, natural resource managers, and active residents are relevant to the Walker community's readiness for environmental change:

1. *Natural resources are a key asset and a driving force in the health of the community.*

This portrayal of Walker will not come as a surprise to community and natural resource managers. Participants agreed that the community's health and vitality is inextricably linked to the health and vitality of its natural resources. The lake, the forest, and associated natural resources are seen as primary assets and hold multiple tangible and intangible meanings, as well as use and non-use or inherent values to community members.

2. *Multiple threats to natural resources persist in the area.*

Participants also recognized current and potential stressors to area natural resources. Past events including the walleye fishery decline and the threat of future events including aquatic invasive species appear to be ongoing sources of concern among community members. Economic dependence on a few key resources, like walleye, makes the community particularly vulnerable to ecosystem threats.

3. *Diverse and sometimes conflicting perspectives exist on the use and management of natural resources, especially the lake and the forest.*

Though community members share a "love for the outdoors," the study revealed divergent, competing and in some instances, conflicting natural resource values, beliefs about environmental problems and attitudes toward natural resource management.

4. *Nature-based recreation and tourism are primary drivers of the local economy, but tourism dependence makes the community vulnerable.*

Community sensitivity to environmental change was a predominating theme among the interviews and focus groups. Participants emphasized the structure of local economy and its dependence on recreation and tourism industries. Most participants believed that this dependence made the community vulnerable to environmental stressors, especially those that affect lake health, and economic stressors that directly and indirectly affect tourism and forest products markets.

5. The community is simultaneously socially cohesive, isolating, and divided

We believe this finding is particularly significant to understanding the community's sensitivity to change. One-on-one interviews with diverse community members suggested distinct images of Walker. On the one hand, some residents experience it as tight-knit, nurturing, and civically engaged. On the other hand, some experience it and one which is cliquish, isolating, and unengaged. Still other residents have experienced it as hostile.

The latter may be particularly true for Native American residents. Only three of the interview participants in this study are Native American. Thus, we gained only a very limited understanding of Native American or tribal narratives of Walker community assets, sensitivities, capacities, and constraints. From this limited understanding, it is clear that significant intercultural differences exist and that culture and cultural experiences shape perceptions of community resources and responses to environmental change. More research is needed to better understand and represent tribal perspectives on community readiness and environmental change.

A community readiness framework

The Environmental Change Readiness Framework (Figure 1) highlights the relationship between community conditions (i.e., assets and sensitivities), mechanisms for problem solving (i.e., capacities and constraints, adaptive capacity, and responses to environmental change). Community assets and sensitivities are foundational resources and include social, economic, and natural resource conditions, as well as perceived fairness and trust in institutions. These foundational resources undergird individual, relational, organizational and programmatic capacities for and constraints to adaptation. Altogether these assets, sensitivities, capacities and constraints drive community readiness and its capacity to adapt to environmental change. Community responses are catalyzed by the timing, scale, and intensity of environmental change. Community responses, in turn, have outcomes that affect community conditions and capacities. For example, a forest-associated community may have multiple social, economic, natural resource and trust-based assets that make it a high capacity community for responding to problems at the individual, relational, organizational, and programmatic levels. This combination of assets and capacities means the community is able to monitor its environment, anticipate environmental crisis events like fire or pest invasions and prepare by protecting cultural resources from wildfire or realigning forest product industries for pest-resilient species.

Environmental Change Readiness Framework

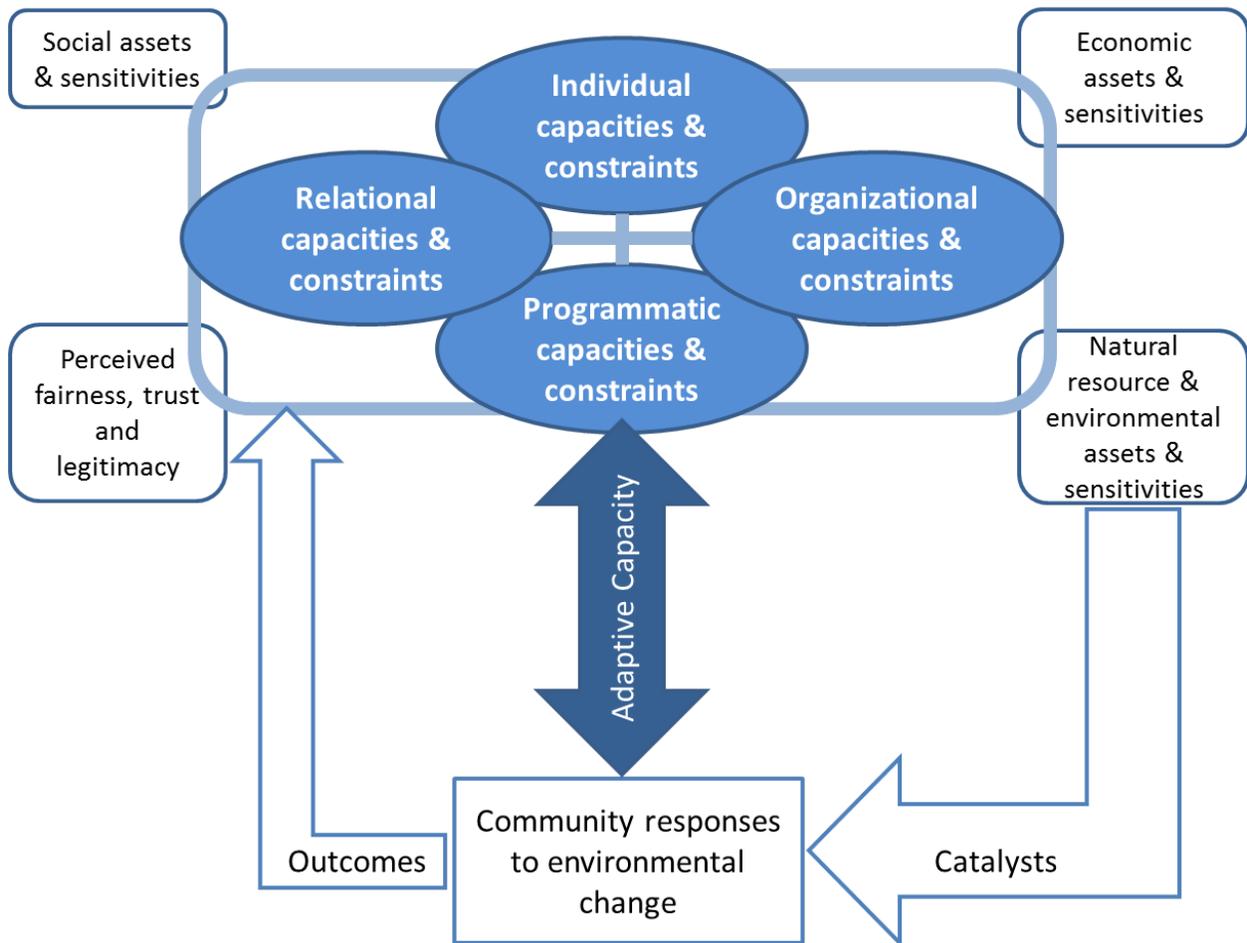


Figure 1. Environmental change readiness framework

Recommendations for building readiness for environmental change

The recommendations presented below are intended as strategy-level guidance to community leaders and natural resource managers in building readiness for environmental change. Specific tactics should be developed by local decision makers, experts in the community in collaboration with diverse community stakeholders. An important message from this work is that building community readiness for environmental change does not hinge on any specific ecosystem management practice or even set of practices, instead it is a community-building process that has multiple and broader implications for community-wellbeing. Moreover, this study underscores the notion that any one community asset or capacity may also be a sensitivity or constraint. For example, community assets and capacities associated with leadership and social connectedness may be inaccessible for some or may exclude diverse social groups. These conditions and mechanisms and their tradeoffs need careful and thoughtful critique by planners and decision makers involved in adaptive ecosystem management.

1. Acknowledge and address social sensitivities and relational constraints in planning

Socio-economic disparities, social isolation, and racial tension and their impacts on the social structure and social processes within the community may make the community particularly vulnerable to environmental change. Further, if community planning for change does not address the knowledge, needs, and interests of particularly affected groups, efforts to prepare and adapt may further isolate or alienate these groups. Failure to address social sensitivities and relational constraints in decision making can amplify social tensions or increase stress and other mental health problems among community members, especially in times of crisis. On one hand, the community has strong social networks for sharing information and mobilizing resources; on the other hand, existing networks may not be inclusive of diverse stakeholder groups including vulnerable or traditionally underrepresented populations. These populations may not have access to information, resources or opportunities for leadership in natural resource planning and management. The social sensitivities and relational constraints identified in this pilot study should be considered when developing communication, education, and outreach programs and evaluating their success.

2. Increase community engagement in planning across diverse social groups

Decision makers and managers should explore opportunities to increase community engagement and make it more inclusive. Readiness planning should not be conducted *for* diverse social groups but *with* them to ensure the planning process and outcomes are fair, meaningful, and legitimate. Community and natural resource managers and planners must go beyond conventional public involvement strategies to engage diverse groups in planning early and frequently. Special efforts are required to include groups that are not commonly present at public meetings or may feel their concerns are not heard when they are. Our results suggest this may be especially true for Native Americans. Strategies may include holding public meetings in locations and at times that are comfortable for under-represented populations and engaging through trusted organizations that may not have a primary natural resource mission. Waiting until a crisis even happens likely would hinder responses and their inclusivity.

Like many communities, diverse social groups in Walker need better access to information and opportunities for civic engagement and leadership. Readiness plans will be more effective and more widely accepted and implemented if diverse groups are engaged in plan development. Furthermore, responding to and being ready for environmental change require multiple sources and forms of ecological and civic knowledge (e.g., scientific, traditional, and experiential), creative problem solving, and diverse resources/skillsets. Diverse social and cultural groups have important experiences and insight to contribute to planning processes.

3. Tap into existing capacities

Existing social networks and community organizations in Walker are strong, resourceful, and influential. Community members have many events, places, and media by which they can get to know one another, share information, make decisions, and organize action. Many community members are active, influential and committed to community health and vitality. Community decision makers and natural resource managers should continue to tap into these individual, relational and organizational capacities and explore ways to facilitate information sharing,

decision making and action taking around community readiness for environmental change. Community members in Walker have experience organizing around crisis events; the challenge will be to organize community readiness proactively, for slow-acting and incremental environmental stressors (e.g., invasive species, drought, increasing temperatures, land use change) that often precipitate crisis events (e.g., native species decline or extirpation, fire, low snowfall/early ice out, flooding). Information and resource pooling across networks will be critical for adaptation of economic, social, and environmental systems within the community. While social ties and trust within networks are strong, ties and trust between networks and cross-scale linkages to external natural resource management organizations (e.g., county, state, and federal agencies) will need continued development.

4. Invest in conflict management and resolution

In forest-associated communities, impacts to ecosystem structure and functioning have the potential for cascading direct and indirect effects on community economies, social conditions, and members' quality of life. The study revealed some evidence of factionalism and "shadow networks" (i.e., informal networks operating outside formal systems of influence, Schultz, Plummer & Purdy 2011) within the community that may complicate community responses to and hinder readiness for environmental change. Shadow networks form typically because of discontent with formal systems of decision making but they also run the risk of being exclusive networks or not being representative of diverse social groups. Findings suggest that investments in conflict management and resolution at interpersonal, intergroup, and organizational levels would enhance community readiness for environmental change. These investments might include additional training of community government and natural resource management personnel in conflict assessment, management and resolution, as well as expanding community-building projects and programs that bridge existing social divides (e.g., newcomers and long-time residents, tribal and non-tribal members, residents of diverse age and income levels) and day-light shadow networks for more transparency and accountability. Additionally, natural resource managers should work closely with local experts to identify, share and integrate traditional, experiential, and scientific ecological knowledge in long-term planning, as well as in more immediate crisis management.

Adaptive Capacity Rapid Assessment Tools

The adaptive capacity rapid assessment (ACRA) process was piloted in one forest-associated community. Based on the pilot study findings, a set of ACRA tools were developed to help inform future assessments. The tools consist of a series of worksheets (Appendix A-C) that highlight important indicators for assessment of adaptive capacity in forest-associated communities. The tools are intended to provide local practitioners (i.e., community planners, natural resource managers, non-profit organizations representatives, economic and tourism development specialists, educators, and extension agents) with a reliable yet flexible set of indicators to quickly develop a preliminary understanding of their community from the perspectives of local experts. The tools do not provide procedural guidance in community assessment data collection techniques (e.g., interview and focus group methods). Practitioners should consult additional resources for insight on survey, interviewing or focus group design and administration. The tools enable practitioners to consider more comprehensively

community assets, sensitivities, constraints, and capacities that affect a community's readiness for environmental change. The tools will help local leaders identify and build resources that are critical to emergency responses, ecological planning and management, and community visioning and goal setting. They could inform policy decisions and raise awareness and understanding of the diverse community resources that better prepare communities for environmental change.

Given the broad applicability of these tools, the ACRA process as described in the report may be a valuable model for future community assessments across a range of social-ecological situations and community characteristics.

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Appendices

Appendix A. Adaptive Capacity Rapid Assessment Tool: Assets Identification

1. What are some of the best things about this community?
2. What makes this community unique from other communities in the area?
3. Are individuals living and working in this community committed to addressing community/environmental problems? Please explain.
4. Does this community have strong social ties? Please explain.
5. Are local government organizations committed to addressing community/environmental problems? Please explain.
6. Are local non-government organizations committed to addressing community/environmental problems? Please explain.
7. Does it seem like there are adequate financial resources available for community/environmental management? Please explain.
8. Does it seem like there are adequate physical resources available for community/environmental management? Please explain.
9. Does it seem like there is adequate information for community/environmental management? Please explain.
10. Does it seem like there is adequate technology for community/environmental management? Please explain.
11. Does it seem like there is adequate leadership for community/environmental management? Please explain.
12. What would you say are three driving forces that you believe have been critical to the health of this community?

Appendix B. Adaptive Capacity Rapid Assessment Tool: Sensitivities Worksheet

<p>Natural Resources and the Environment</p>	<p>Sensitivity indicators</p> <ul style="list-style-type: none"> ▪ Are natural resources at risk? ▪ Is there ongoing or future potential for chronic impacts to species, ecosystem structure and functioning? ▪ Is there a possibility of cataclysmic environmental events or disasters?
	<p>Sensitivities</p>
<p>Economics</p>	<p>Sensitivity indicators</p> <ul style="list-style-type: none"> ▪ Is natural resource productivity at risk? ▪ Are natural resource-based livelihoods at risk? ▪ Are natural resource-based industries at risk? ▪ Are local and regional economies at risk?
	<p>Sensitivities</p>

Social Conditions	Sensitivity indicators <ul style="list-style-type: none"> ▪ Is access to healthy ecosystems at risk? Is there potential for resource scarcity? ▪ Are nature-based recreation opportunities at risk ▪ Are nature-based cultural practices at risk? ▪ Is there ongoing or future potential for human physical and mental health problems including stress, anxiety, despair, sense of powerlessness? (related problems associated with increased drug/alcohol abuse) ▪ Is there potential for a loss of sense of community impacting shared identity social cohesion, and trust? ▪ Is there ongoing or future potential for social/cultural conflict (e.g., discrimination or violence)? ▪ Is there potential for disproportionate impacts to vulnerable, disadvantaged, or underrepresented populations (i.e., across race/ethnicity, age and socioeconomic class)?
	Sensitivities

Appendix C. Adaptive Capacity Rapid Assessment Tool: Capacities and Constraints Worksheet

Individual capacity	Adaptive capacity Indicators <ul style="list-style-type: none"> ▪ Do community members value the natural environment? ▪ Are they aware of environmental problems/threats? ▪ Are they concerned about problems/threats? ▪ Do they feel a sense of personal and civic responsibility to respond to/prepare for problems/threats? ▪ Do they have the knowledge, skills and resources needed to respond to/prepare for problems/threats? ▪ Do they perceive their actions will be effective in responding to problems/threats? ▪ Are they personally and civically engaged in community/environmental issues? 	
	Capacities identified	Constraints identified
Relational capacity	Adaptive capacity Indicators <ul style="list-style-type: none"> ▪ What social networks exist in the community? ▪ Are social networks influential in the community? ▪ ▪ Are there opportunities to exchange information? Is there sharing of information? ▪ Are community leaders effective at bringing people together on environmental issues? ▪ Are community member interactions positive and meaningful member interaction? ▪ Is diversity of values and beliefs respected in the community? ▪ Is there a strong sense of community based on shared identity and trust? ▪ Do community members work together to respond to community and environmental problems/threats? 	
	Capacities identified	Constraints identified

Organizational capacity	Adaptive capacity Indicators	
	<ul style="list-style-type: none"> ▪ What organizations exist in the community to address community and environmental issues? ▪ Do they have the resources needed to respond? ▪ Are they influential in the community? ▪ Are they effective in responding to community and environmental problems/threats? ▪ Do organizations engage community members in a fair and meaningful way? ▪ Is there conflict? Is conflict managed effectively? ▪ Are organizational leaders effective at bringing organizations together on environmental issues? ▪ Do organizations work together to address community and environmental problems/threats? 	
	Capacities	Constraints
Programmatic capacity	Adaptive capacity Indicators	
	<ul style="list-style-type: none"> ▪ Do programs exist to address problems/threats ▪ Do programs have the resources needed to address problems/threats? ▪ Are programs influential in the community? Do they promote collective action? ▪ Are programs effective in addressing community and environmental problems/threats? ▪ Are the roles and responsibilities of different organizations clearly established in community/environmental management? ▪ Are programs coordinated? ▪ Are programs monitored for success and adapted if needed? 	
	Capacities	Constraints