

Assessing the Adaptive Capacity of Conservation Organizations to Respond to the Effects of Climate Change: A Pilot Study

A collaborative pilot study by:

Mississippi Valley Conservation Authority (MVCA)

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ABSTRACT

Any conservation organization electing to proactively adapt to climate change needs a realistic strategy that inspires collaboration and progressive action. An organization's adaptive capacity results from a unique combination of values and principles, commitment to public and partner engagement, institutional structure and function, financial and human assets, acquisition and use of information, know-how, and a mandate for adaptive decision-making. And a crucial, initial and ongoing task includes an assessment of these characteristics with the goal of eliminating deficiencies and redundancies, and maintaining inherent strengths.

A pilot study was designed to test a generic procedure to assist Mississippi Valley Conservation Authority (MVCA) staff assess their capacity to adaptively respond to the effects of climate change. The procedure uses an electronic on-line survey and face-to-face workshops to elicit responses to questions about the institutional characteristics that collectively support learning-oriented decision-making. The pilot study provides a self-assessment of the MVCA's adaptive capacity to respond to current and potential climate-related hydrological issues and in-house experience with the assessment tool for future application.

Pilot study results indicate that the MVCA maintains a moderate to high capacity to adaptively manage for the effects of climate change on watershed hydrology. The MVCA's strengths include a long-standing track record in public outreach and knowledge dissemination, and a robust collaborative network of partners. Ongoing challenges include the collection of information on social values, continuity of data collection that relies on seasonal volunteers, and access to financial and human resources. Both internal and external policies were deemed insufficient to address climate change; however, the MVCA is committed to adaptive management and is working to determine how environmental changes affect current operations and how potential future climatic changes may affect policy, planning and decision-making.

The approach used in this pilot study to assess organizational readiness has merit, particularly if it is integrated into programs as an ongoing function. MVCA staff concluded that the process of reviewing on-line survey results during the workshops helped staff and the project team complete a final report designed to inform strategic planning and operational decisions.

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1. INTRODUCTION

Climate change is a pervasive problem that threatens to overwhelm the current capacity of governments and their organizations to adapt. Projections indicate warming temperatures, changing precipitation patterns, and an increase in the frequency and duration of extreme weather events such as heavy rainfall, drought and heat waves. A strategic approach to decision-making that employs knowledge of the effects of climate change on social-ecological systems¹ and their adaptive capacity is a logical and diligent step toward managing for climate change. Given these knowledge requirements, an important initial and ongoing procedure is to assess the organization's adaptive capacity to respond to climate change.

This report describes the results of a pilot study designed to help the Mississippi Valley Conservation Authority (MVCA) assess aspects of its organizational readiness to adapt to the effects of climate change. A goal of this assessment is to help the MVCA maintain socio-ecological system resilience within the watershed.

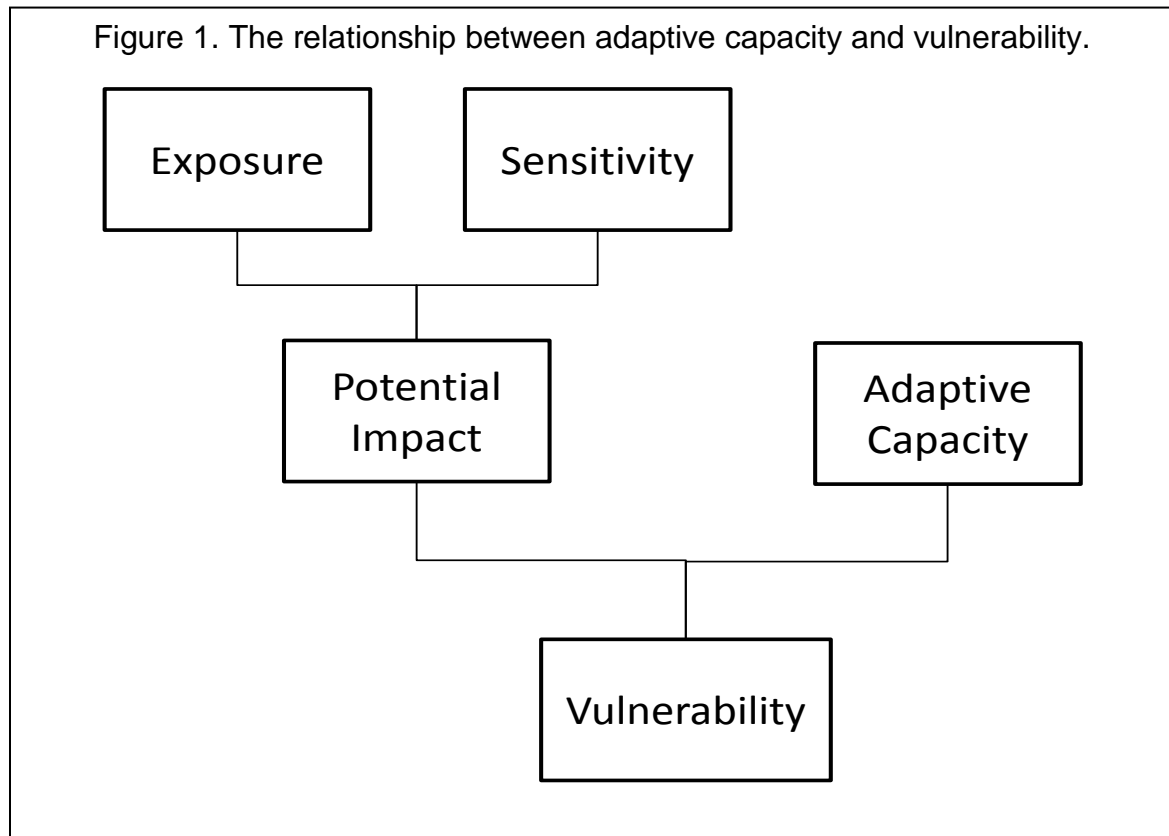
2. THE RELATIONSHIP BETWEEN ADAPTIVE CAPACITY AND VULNERABILITY

Vulnerability to climate change is "...the degree to which a system is susceptible to, and unable to cope with, diverse effects of climate change, including climate variability and extremes" (Parry et al. 2007) (Figure 1). Important factors affecting vulnerability in any social-ecological system include the nature of the climatic changes to which it is exposed, the climate sensitivity of the system, and the system's capacity to adapt. A sector, or town, or ecosystem is considered vulnerable to climatic change when it does not have the capability to employ actions designed to eliminate or reduce the effects of climate change (Lemmen et al. 2007).

Adaptive capacity is the ability or potential of a social-ecological system to successfully respond to climate variability and change, and includes ecological and social resilience, and adjustments in both behaviour and access to resources and technologies (Gunderson 2000, Adger et al. 2007). Ecological resilience is defined as "the ability of a system to absorb impacts before a threshold is reached where the system changes into a different state" (Gunderson 2000). Therefore, a fundamental understanding of social-ecological thresholds and how they could shift under a modified climate regime is important to effective adaptive management. From a social perspective, adaptive capacity denotes the ability of an individual or group to modify their behaviour or engineer a successful response to the effects of climate change. In some cases, such as the rehabilitation or protection of habitat in greenways and blueways, people can also complement or further enhance nature's adaptive responses.

¹ A social-ecological system is a bio-geo-physical unit, such as the Mississippi watershed and its associated social actors and institutions (Glaser et al. 2008).

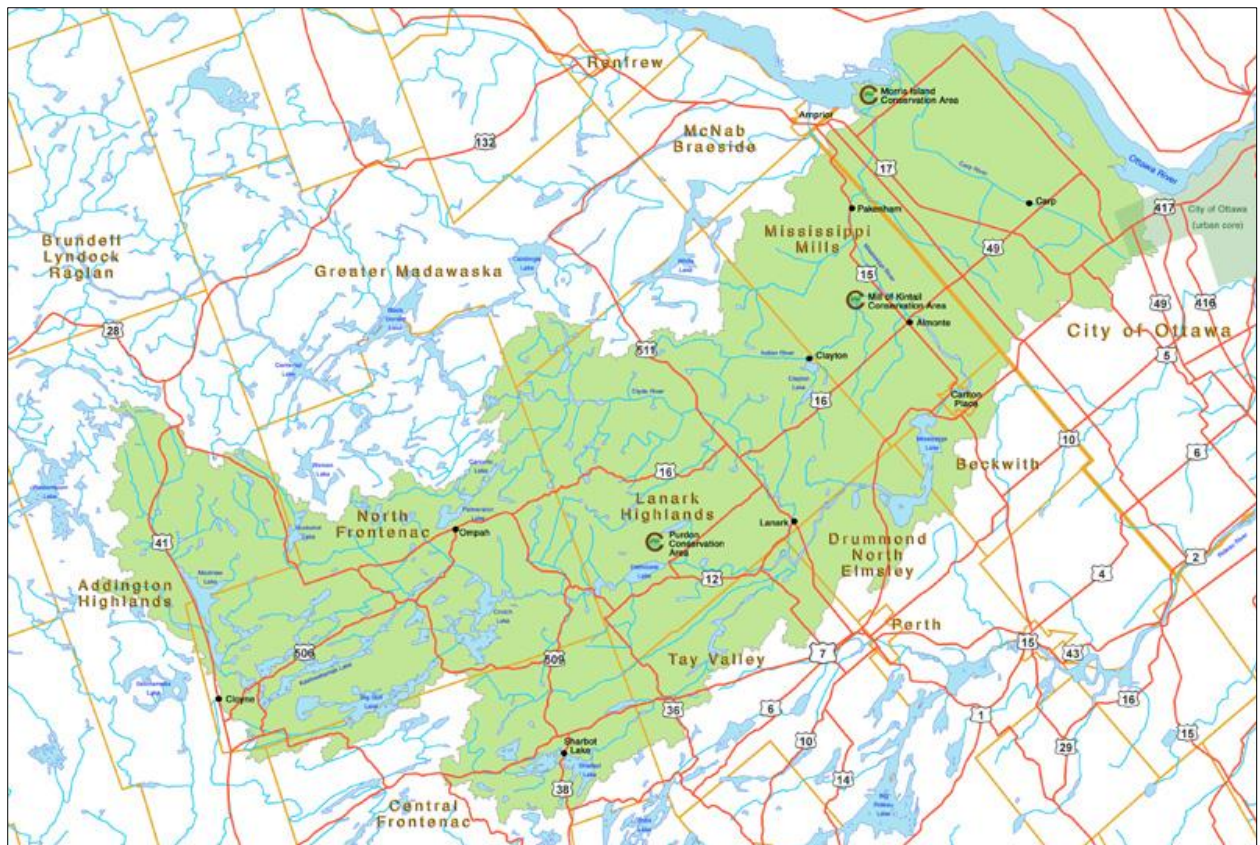
Effective adaptation strategies reduce the likelihood and magnitude of harmful outcomes resulting from the effects of climate change (Brooks et al. 2005). Adaptive capacity also enables organizations to take advantage of opportunities that result from climate change, such as longer summer tourism and growing seasons.



3. STUDY AREA

The Mississippi Valley Conservation Authority (MVCA) is one of 36 Conservation Authorities created by the Ontario Government to care for a number of watersheds in the province. The MVCA is responsible for the management of the Mississippi River Watershed (3,750 km²) and the Carp River Watershed (700 km²) (Figure 2), and works to balance the needs of people living and working in the watersheds with the need to protect drinking water, local ecosystems, property, and a healthy economic framework based on recreational tourism. The MVCA's vision is a watershed in which ecological integrity is maintained and human needs are met, now and in the future, in balance with the needs of the natural environment. Its roles and responsibilities are shaped by its commitment to assume a leadership role in the conservation, enhancement and development of the Mississippi Valley by way of watershed planning, integrated resource management programs, and conservation awareness.

Figure 2. The Mississippi Valley Conservation Authority Watershed.



4. METHODOLOGY

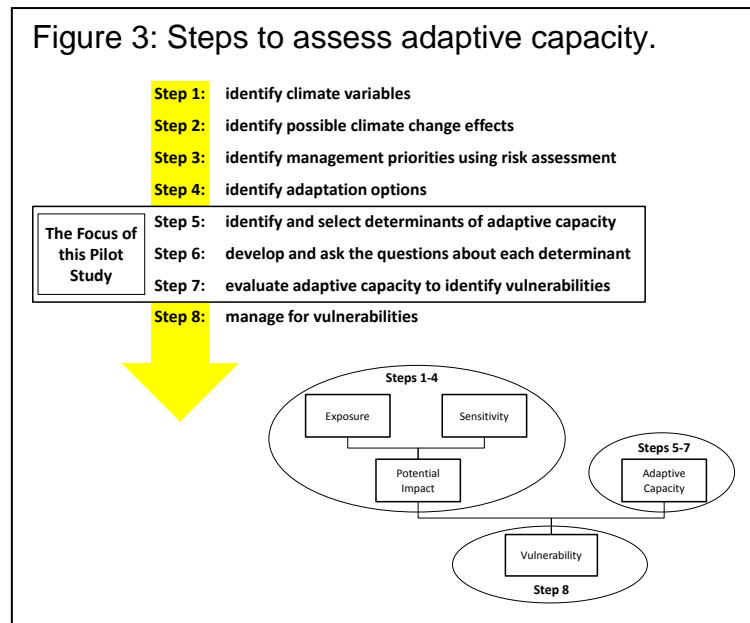
This pilot study was designed to assess the MVCA's capacity to manage for the potential effects of climate change on water levels in the Mississippi River watershed. The MVCA and partners drafted the Mississippi River Water Management Plan in 2006 (Mississippi Valley Conservation et al. 2006) and an initial assessment of the known and potential effects of climate change on social and ecological values in the Mississippi River Watershed was completed in 2007 (Egginton and Lavender 2007, Lehman 2008). In response to these identified effects of climate change, the MVCA elected to evaluate its capacity to adapt using an organizational readiness assessment tool. Even though this report addresses adaptive capacity, it is important to understand the context in which adaptive capacity is assessed. The vulnerability assessment process involves a series of steps to identify and prioritize threats, determine adaptive capacity, and describe vulnerability (Figure 3).

4.1. Steps 1-4: Understanding the Threats

Assessing adaptive capacity requires knowledge about climate and its effects on the important social and ecological values, available adaptation options, a suite of questions designed to explore an organization's readiness to adapt, and an adaptive governance framework in which to implement decisions (Figure 3). Many organizations have yet to

mainstream climate change into programs and policies because they have not assessed climate change threats and their adaptive capacity to manage for vulnerabilities. Fortunately, the MVCA is proactively managing for the effects of climate change and has completed a number of the steps (1-4) required to assess climate change threats (see Egginton and Lavender 2007).

As a result, this pilot study used information previously gathered during steps 1-4 to identify important attributes that characterize the Conservation Authority's (CA's) business, and to develop a suite of questions to help CA staff explore those attributes in the context of climate change. The results in this report were obtained by completing steps 5-7.



Organizational readiness is based on a particular combination of institutional structure and function, financial resources, acquisition and use of information, know-how, and adaptive decision-making. Unfortunately, few comprehensive frameworks comprised of relevant organizational descriptors to assess adaptive capacity are readily available. This study reports on the use of a generic framework created to help conservation organizations assess their adaptive capacity (i.e., strengths, challenges and opportunities) in a rapidly changing climate.

With information generated during the completion of steps 1-4, an issues statement was prepared by the project team to provide a context for pilot study participants and to inform the development of survey questions designed to help participants explore aspects of the CA's adaptive capacity. The issues statement outlines potential ecological and social effects in the watershed and describes some of the management structures and policies that guide CA decisions (Text Box 1).

4.2. Step 5: Select the Determinants of Adaptive Capacity

There are many qualities that help an adaptive organization manage for the effects of climate change. For example, Gupta et al. (2010) suggest that an adaptive organization:

- Encourages the involvement of people with a variety of values and perspectives,
- Enables ongoing institutional learning,
- Motivates and provides opportunities for decision-makers to adjust behaviour,
- Promotes appropriate leadership,

- Mobilizes resources for implementing adaptation measures, and
- Supports principles of fair governance.

To this list we can add many more attributes that have been variously described in thousands of articles, books and reports released in the last 50 years on ecosystem-based approaches to management and sustainable living. To help refine the list with characteristics important for this pilot project, the study team used a 14-theme generic

TEXT BOX 1

ISSUES STATEMENT FOR THE MVCA

The Mississippi River supports a broad range of interests throughout the watershed, which must share a limited supply of fresh water. The goal of the Mississippi River Water Management Plan (MRWMP) is to define a water level and flow management regime that accounts for an optimal mix of important socio-economic and ecological values to maximize the net benefit to the system and its users. However, the plan does not consider the known and potential effects of climate change on the quantity of available water.

Projected climatic changes for eastern Ontario will result in significantly lower stream flow volumes, a shift in the seasonal distribution of stream flow, and greater variability and uncertainty in stream flow conditions. Within the Mississippi River watershed these effects will potentially exceed the ability of existing water management structures and reservoirs to satisfy current socio-ecological system management objectives.

The first step to adapting to these changes will require understanding both the risk to the socio-economic and environmental values of concern and the capacity of existing infrastructure to control water levels and flows to achieve the maximum net benefit to the system and its users in a different climate.

framework to guide the creation of a suite of questions to assess adaptive capacity (Figure 4).

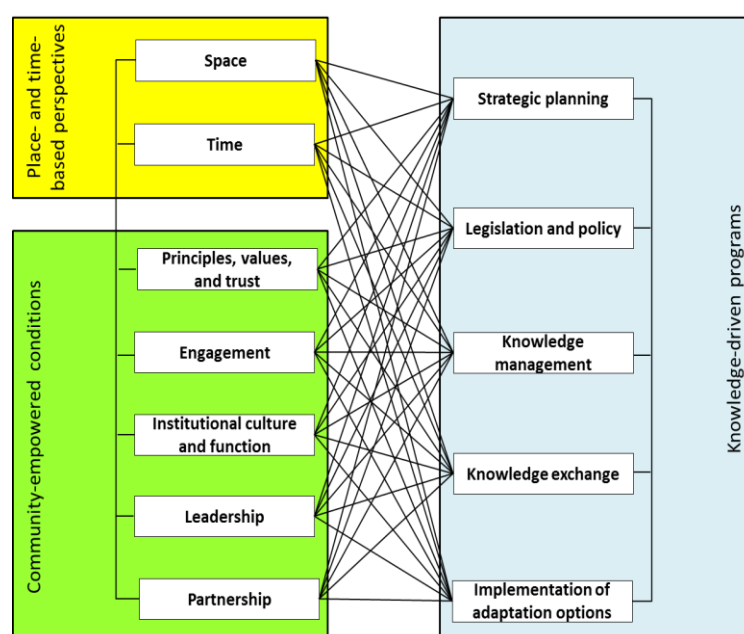
4.3. **Step 6: Develop the Questions**

The study team reviewed the roles and responsibilities of the MVCA and developed the survey questions. Ten questions addressed respondent background, experience and general perceptions about climate change. Thirty questions explored institutional structure and function to help assess adaptive capacity and are organized according to the 14 categories identified by Gray (2012, see Figure 4).

Each question asks the respondent to rate the MVCA's capacity along a continuum of no capacity (a rating of 0) to good capacity (a rating of 3) and provides a comment box should the respondent elect to expand on his/her answer. The ratings for each question were tabulated and summarized in a histogram (Appendix 1). In addition, ratings were arrayed in web-like diagram generated in MSEXcel™ to provide an overall picture of adaptive capacity and to enhance comparative analyses of responses to the 30 questions. Averages and modes (the most common rating for each question) were tabulated and arrayed in the web diagram. The histograms and web diagram were used as the basis for discussion at the face-to-face workshops.

The survey was distributed to nine MVCA staff selected by the General Manager to participate in the pilot study.

Figure 4: A generic framework of determinants of adaptive capacity (Source: Gray 2012).



4.4. Step 7: Evaluate Adaptive Capacity to Identify Vulnerabilities

Given their knowledge of CA operations and associated management issues, selected MVCA staff completed an on-line survey and participated in follow-up face-to-face discussions organized to explore the results (Appendix 2).

The first face-to-face workshop (see Appendix 3 for the Agenda) with MVCA staff members was convened on 21 February 2014 with objectives to:

- Review the utility, strengths and weaknesses of each question, and
- Review the rating assigned to each question and develop a statement about the MVCA's adaptive capacity.

Survey respondents (nine MVCA staff members), the project team, and an observer from the Rideau Valley Conservation Authority attended the workshop. The project team summarized the results of the on-line survey and facilitated the workshop.

Following the first workshop, survey responses and related observations collected during the workshop were assessed and used to create guiding statements for the CA. The draft report was reviewed by the project team, including the MVCA General Manager, to verify the accuracy of statements and was subsequently shared with survey respondents as background information for the second face-to-face workshop convened on 28 March 2014. The goal of the second workshop was to identify strengths and challenges, discuss relationships between different facets of adaptive capacity, and provide a list of short-, medium- and long-term priority actions required to improve adaptive capacity (see Appendix 4 for the agenda).

5. RESULTS

5.1. Respondent Characteristics

Survey respondents manage a range of portfolios and comprise a representative cross-section of MVCA staff and programs (Figure 5). MVCA staff are experienced in their disciplines (an average of 15 years of experience) and provide a range of professional services that will be useful as the CA works to manage for the effects of climate change. Concern about climate change varies among respondents, a function of their portfolio and level of knowledge (Figure 6).

Figure 5: MVCA respondent's area of expertise.

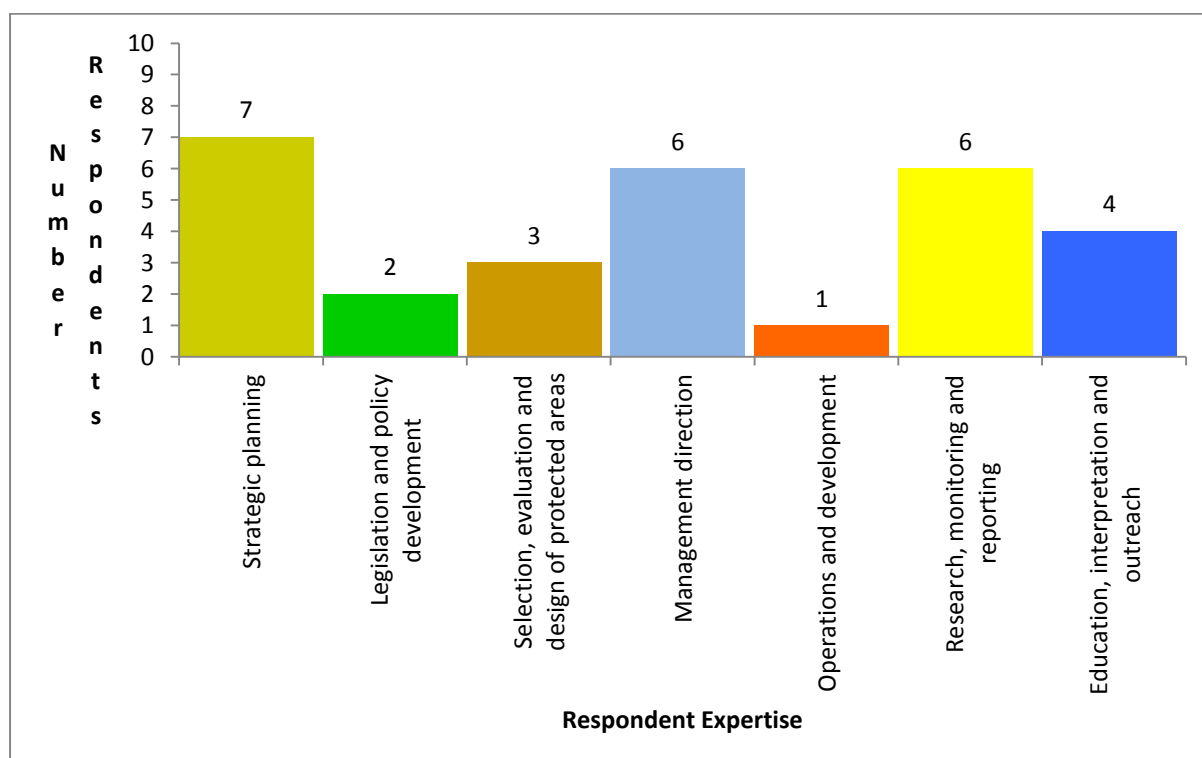
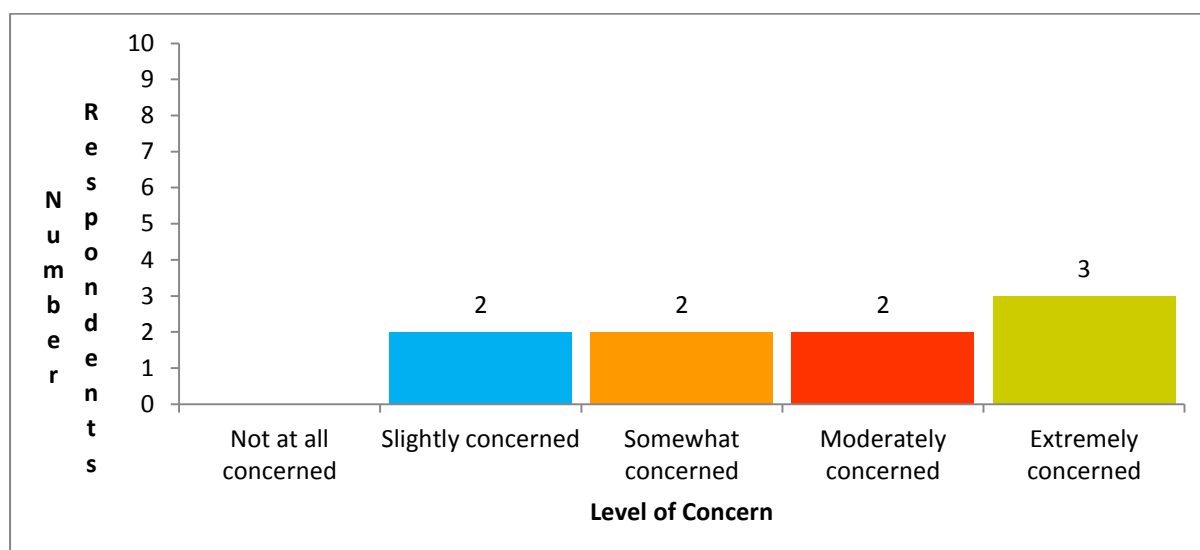


Figure 6: Level of concern about climate change among MVCA survey respondents (note that a respondent may have expertise in more than one discipline).



5.2. An Overview of Adaptive Capacity in the Mississippi Valley Conservation Authority

Overall, the results suggest that the MVCA has developed a moderate to high level of adaptive capacity to manage for the effects of climate change on watershed hydrology in a number of programs.

Due to the small sample size of survey respondents ($n = 9$), the mode² (red line) is considered the more revealing of the two statistics; however, both the average (blue line) and the mode ratings are presented in the web diagram (Figure 7). When the lines show similar ratings, there is agreement among survey respondents. A difference between the red and blue lines indicates that staff provided a range of ratings. Workshop participants indicated that in many cases the variability in responses likely reflected the fact that staff have some knowledge gaps about programs outside their area of expertise, rather than program limitations.

Based on the results of this pilot study, MVCA staff perceived their organization to have a high adaptive capacity in outreach, partnership and public engagement (participation) (Figure 7). This is an impressive accomplishment given the small size of the organization and the many pressures that conspire to limit or inhibit operations, including diversion of resources to other priorities such as urban growth in Ottawa. Survey results and workshop discussions confirmed the CA's commitment to adaptation in a number of important functions (determinants) that collectively enable the CA to marshal staff and resources to meet its mandate (Table 1).

² Mode is the most frequently selected rating for a given question.

The survey questions and follow-up discussions also helped the CA identify some of the interconnected internal and external challenges facing program managers. For example, with respect to the question about organizational principles and the inclusion of climate change in those principles (Q14), the MVCA was assigned a moderate to high rating. In contrast, the low ratings assigned to questions about climate-related policies (Q25, Q28, Q29 and Q31) suggest that a lack of coordinated inter-agency management of climate change limits the ability of the MVCA to apply the principles to which it subscribes. Going forward, clear direction from the MVCA leadership (Q25) and a strong commitment to partnership (Q23 and Q24) will provide a basis for ‘climate ready’ policy and legislation.

Given historical limitations of data collection and monitoring programs resulting from insufficient financial and human resources, the MVCA leadership plans to revise the 2002 Strategic Plan in order to make provisions to enhance the information management capability, including volunteer programs. And while financial resources (Q21) and human resources (Q22) remain an issue, the MVCA has also demonstrated the strength of its information management system, public outreach (Q19) and partnerships (Q26).

Table 1. A summary of observations about MVCA program strengths and suggestions for improvement assembled from on-line survey results and workshop discussions.

Determinant	Question	Strength	Suggestions for Improvement
Spatial Boundaries	Question 11 Have all of the important social and ecological values (e.g., wetlands, wildlife habitat, forests, recreational areas, parks, etc.) in the Mississippi watershed been mapped and described?	Spatial data are available for a number of values. Recognized as an important and ongoing process.	Increased attention to describing and mapping social values.
Timeframe	Question 12 Is the MVCA committed to short- to long-term monitoring programs needed to assess the condition of important social and ecological values as the climate changes?	The MVCA is committed to short- to long-term monitoring.	Identify opportunities for new programs designed to meet management needs in a changing climate.
	Question 13 Are ongoing outreach programs timed to address emerging issues and decision needs?	MVCA capacity to deliver outreach programs and address public concerns.	
Principles	Question 14 Do the over-arching organizational principles	Ongoing monitoring programs inform iterative decision-making.	

	embraced by the MVCA enable an ongoing, iterative response to the effects of climate change?	The Strategic Plan is under review and there is a desire to use this as an opportunity to include climate change in principles and programs.	
	<p>Question 15</p> <p>Is there an organizational principle(s) (or standard decision-making process) which informs conflict resolution?</p>	<p>Overall, the MVCA works to mitigate conflict while maintaining ecological integrity and balancing the interests of stakeholders</p> <p>Conflict resolution is addressed under the auspices of the Water Management Plan where there is a defined process.</p>	Integrate conflict resolution processes into the range of the MVCA operations.
Values	<p>Question 16</p> <p>Do any CA programs evaluate and report on the important social and ecological values in the Mississippi watershed?</p>	MVCA sponsors a watershed report card focused on ecological values.	Include social values in the reporting programs.
	<p>Question 17</p> <p>Do the CA (Conservation Authority) programs assess how climate change affects important social and ecological values?</p>	The MVCA has begun to use climate model outputs to inform decision-making.	
Trust	<p>Question 18</p> <p>Given the possible need for rapid responses to the effects of climatic changes, and given the associated trade-offs often associated with decisions, do communities in the watershed trust the CA to make the necessary decisions?</p>	MVCA staff believe that communities in the watershed trust in the CA's ability to make the necessary decisions.	
Community Engagement	<p>Question 19</p> <p>Does the CA provide an ongoing forum to ensure effective outreach and consultation?</p>	<p>Overall capacity to consult with stakeholders and conduct outreach is high.</p> <p>The MVCA hosts regular meetings.</p>	<p>Concise outreach messaging that matches MVCA output.</p> <p>Sponsor additional risk assessment work on some values in support of outreach or consultation activities on climate change.</p> <p>Engagement of volunteers</p>

			to collect data for baseline monitoring programs.
Institutional Culture and Function	<p>Question 20</p> <p>Does the CA practice adaptive governance that includes adaptive management?</p>	The MVCA does practice adaptive governance.	Work with external partners to eliminate barriers (e.g., modify current practices) that inhibit adaptive governance.
	<p>Question 21</p> <p>Does the CA have sufficient financial resources to manage for the effects of climate change?</p>	The MVCA has enhanced its internal capacity to manage for climate change.	<p>Fund MVCA staff to address the effects of climate change.</p> <p>Acquire financial resources to support adaptive governance.</p> <p>Acquire funding for new or upgraded technology (e.g., Web-enable ¹WISKI SODA).</p> <p>Funding to purchase equipment to support a volunteer-based data collection program.</p>
	<p>Question 22</p> <p>Does the CA have sufficient human resources (staff) to manage for the effects of climate change?</p>	Where feasible, and given existing resources, MVCA staff work to integrate climate change into daily programs.	<p>Provide sufficient human resources to manage for the broad range effects of climate change.</p> <p>Increased skills and training to complete vulnerability assessments.</p> <p>Staff training to transfer knowledge about climate change and IT/data programs to clients, municipalities and the Board.</p> <p>Establish a volunteers program to assist with baseline data collection and monitoring programs.</p>
	<p>Question 23</p> <p>Does the CA's institutional structure and function provide for collaboration at multiple scales of decision making?</p>	The MVCA has a moderate to high capacity for collaboration, particularly in monitoring and planning programs.	Improve internal communication across program areas.
	<p>Question 24</p> <p>Do the CA's collaborative arrangements optimize its capacity to manage for</p>	The MVCA has a moderate to high capacity for collaboration, particularly in monitoring	The CA requires new agreements with local, provincial and federal partners with greater

	the effects of climate change?	and planning programs.	flexibility for collaborative decision-making.
Leadership	<p>Question 25</p> <p>Does the CA's leadership support the need to mainstream climate change into its programs?</p>	Mainstreaming is being implemented, characterized by efforts to integrate climate change into monitoring and reporting programs, and decision-making, as well as a commitment to adaptive management.	
Partnership	<p>Question 26</p> <p>Can current partnerships be used to enhance the CA's capacity to adapt to the effects of climate change?</p>	<p>The MVCA capacity for partnering is high.</p> <p>The MVCA employs collaboration and partnership to enhance its capacity to respond to climate change.</p>	Increased collaboration at various levels of government to share data and information (e.g., the Eastern Region approach – MVCA/RVCA/South Nation).
Strategic Planning	<p>Question 27</p> <p>Does the CA subscribe to a strategic plan that recognizes the importance of adaptive governance, including adaptive management, to manage for the effects of climate change?</p>	<p>Adaptive management is part of the MVCA's daily operations.</p> <p>The 2002 Strategic Plan identifies priorities needed for adaptive management and to address climate change.</p> <p>The Strategic Plan is under review and there is a desire to use this as an opportunity to include climate change in principles and programs.</p> <p>Monitoring strategy.</p>	The monitoring Strategy should address data interpretation needs (e.g., linking project data to WISKI SODA) and reporting through a climate lens.
	<p>Question 28</p> <p>If climate change is addressed in the strategic plan, does the language used match practices/activities within the CA?</p>	Initiated a monitoring strategy to achieve consistency of reporting (i.e., address data gaps: water quality, weather data, and quantity and quality of local groundwater data).	<p>Some 'disconnects' between the strategic plan and operational budgets and work plans require attention.</p> <p>Iteratively review the status of strategic planning commitments.</p>
Policy and Legislation	<p>Question 29</p> <p>Does the current suite of policies and legislation for which the CA has direct responsibility enable the mainstreaming of climate change issues into decision making?</p>	The MVCA recognizes the importance of 'climate ready policies' and has begun to mainstream climate change issues into decision-making.	Some 'disconnects' between operations and policy/legislation require attention.

	<p>Question 30</p> <p>Does the current suite of policies and legislation for which the CAs partners and collaborators have direct responsibility enable the mainstreaming of climate change issues into decision making?</p>	<p>Mainstreaming has begun at federal and provincial levels.</p> <p>Municipalities regularly consult with the MVCA on a variety of issues affecting policies and programs.</p>	<p>Encourage provincial and federal partners to mainstream climate change and address policy gaps.</p> <p>Encourage provincial and federal partners to develop and apply efficient and collaborative methods to adapt policies that have been difficult to modify in the past.</p> <p>Coordinate the timing of provincial data collection/reporting with decision-making at the provincial level.</p>
	<p>Question 31</p> <p>Do other policies and legislation which the CA is subject to enable mainstreaming of climate change?</p>	<p>Some mainstreaming has begun.</p>	<p>Encourage federal and provincial partners to mainstream policies.</p>
Knowledge Management	<p>Question 32</p> <p>Are there enough baseline data to support a sound decision making process to manage for the effects of climate change impacts?</p>	<p>The MVCA has assigned staff and developed the IT/Software capacity (WISKI SODA) to enhance data management.</p>	<p>Enhance baseline data programs because data for a number of important ecological and social values do not exist.</p> <p>Address other issues, including:</p> <ul style="list-style-type: none"> • Cost and access to data maintained by other agencies. • Challenges of integrating data into decision-making.
	<p>Question 33</p> <p>Does the CA monitor how all the water needs of people living and working in the watershed are changing?</p>		<p>Integrate water needs assessment into monitoring programs.</p>
	<p>Question 34</p> <p>Does the CA provide clients and partners access to its information management system?</p>	<p>Information sharing.</p> <p>Data management programs.</p>	
	<p>Question 35</p> <p>Does the CA's information management system meet client and</p>	<p>Information sharing.</p> <p>Data management programs.</p>	

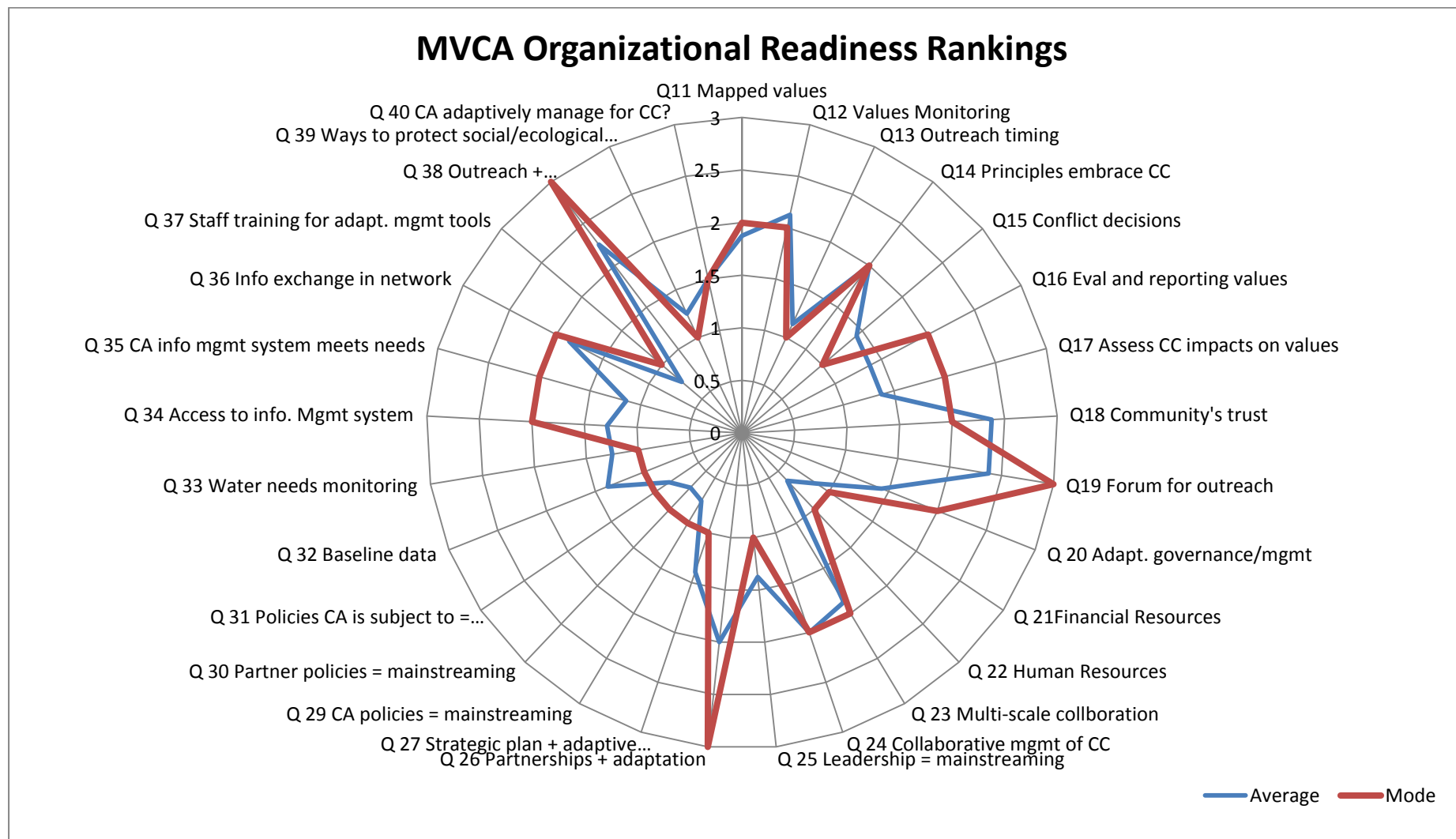
	partner needs?	Where possible the MVCA accommodates requests to convert data into more readily accessible formats.	
	<p>Question 36</p> <p>Are collaborative monitoring networks in place to facilitate the exchange of data and information at multiple scales?</p>	<p>The MVCA participates in collaborative monitoring networks and data/information exchange, particularly with other CAs.</p> <p>The MVCA has collaborative relationships with lower levels of government.</p>	Beyond the CAs and lower levels of government, work with provincial agencies to improve data sharing in support of decision-making.
Knowledge Dissemination	<p>Question 37</p> <p>Are staff training opportunities, which focus on adaptive management tools/techniques to help with decision-making under great uncertainty, available?</p>	<p>MVCA staff work to understand the effects of climate change through independent study.</p>	<p>Formal training courses on climate change.</p> <p>Staff training on how to communicate the effects of climate change on the quality (e.g., health and economics) of everyday life.</p>
	<p>Question 38</p> <p>Does the CA provide outreach programs that help people understand the ethical, social, economic and ecological aspects of climate change to increase awareness and participation in decision making?</p>	<p>The MVCA provides high quality outreach programs that address a range of issues.</p> <p>Standardized monitoring/watershed report card with external driver (²SMARTER/bio-criteria monitoring program).</p>	Outreach programs focused on climate change and social values.
Operations (Implementation)	<p>Question 39</p> <p>Does the CA have appropriate mechanisms in place to protect important social and ecological values in the event of a significant change in precipitation patterns?</p>	<p>Some protection mechanisms for social and ecological values have been implemented.</p> <p>MVCA staff recognize the importance of flexibility and adaptation to manage for varying seasonal and annual conditions that emerge.</p> <p>MVCA staff are comfortable with the decision-making tools available to them and the organization's commitment to develop short- to long-term responses as needed.</p>	Continually assess the status of the MVCA's capacity to protect important watershed values.

	<p>Question 40</p> <p>Does the CA know if it can meet the objectives of the Mississippi River Water Management Plan by adaptively responding to extreme weather events and significant changes in climatic trends?</p>	<p>The MVCA supports a medium to high capacity to respond to extreme weather events and significant changes in climate trends.</p>	<p>There is need for more computer simulation capacity to inform discussions about management actions.</p>

¹WISKI-SODA – A platform for sharing data that describe hydrological conditions in Ontario.

²SMARTER – The Stream Monitoring Assessment and Research Team, Eastern Region: Combines Ontario's Benthos Biomonitoring Network and the Ontario Stream Assessment Protocol with water chemistry sampling in a five year study to assess waterways and impacted sites across landforms.

Figure 7: Overall adaptive capacity ratings of organizational readiness for the Mississippi Valley Conservation Authority
(The red line represents the most frequent response [mode] and the blue line represents the average rating).



6. DISCUSSION

The adaptive capacity for the MVCA to manage for hydrological issues in a rapidly changing climate is perceived to be moderate to high for a number of program determinants. For example, the MVCA maintains a strong capacity for community engagement, knowledge dissemination and partnership (see Figure 7, Table 1). The consistently high ratings for outreach programs results from the MVCA's history of strong support for public awareness and its reputation as a sound source of information for water resource management issues, including flooding. Partnership is a key activity that the MVCA uses to meet its mandate and participate in decision-making at a variety of scales in and around the watershed. Given the importance of collaboration, the MVCA currently works with a number of partners to explore opportunities to mainstream climate change into programs and policies, such as optimizing data and information exchange.

Despite the many program strengths, there are a number of perceived challenges facing the MVCA, including commitments and actions by partners, implementation of, or access to, programs to monitor social values, access to financial and human resources and the provision of climate change-oriented extension and education programs for staff (see Table 1). Results from the survey and face-to-face workshops point to significant external factors, such as provincial and federal policies, that limit the MVCA's capacity to strategically respond to the effects of climate change. Mitigation of these barriers will depend on the strength of commitments by external partners to manage for climate change at a variety of spatial scales and organizational levels, and how they involve agencies like the MVCA. For example, effective knowledge dissemination, partnership and knowledge management is contingent upon the collective commitments and programs sponsored by a number of CAs, municipalities, and provincial and federal agencies.

On a promising note, some provincial ministries have begun to mainstream climate change into policy and programs. For example, the government of Ontario subscribes to a climate change adaptation strategy ('Climate Ready', MOE 2011) and the OMNRF employs a strategic plan (MNR 2011) in response to the government's commitments in *Climate Ready*. Ontario Parks has incorporated an adaptive management process into the parks planning process and requires that climate change vulnerability assessments be completed as part of management planning (MNR 2009, 2012). In addition, the *Provincial Policy Statement* (MMAH 2014) recognizes the need to integrate climate change into land use planning. For their part, MVCA staff are collaborating with partners to increase organizational readiness by leveraging individual skills and competencies.

As a next step, pilot study participants suggested that the MVCA integrate climate change into the *Mississippi River Water Management Plan*. The MVCA could further enhance its adaptive capacity by continuing to integrate climate change into internal policies, encouraging partners to mainstream climate change into their policies and programs, and

enhancing baseline data collection and knowledge about water quantity trends and demands for access to water.

MVCA staff recognize the importance of measuring key ecological and social values to inform decision-making. While there is capacity to monitor and report on the status of some ecological values, monitoring and reporting on social values requires enhancement. To date, climate change-related work has been focused on reservoir management stemming from the effects of climate change on the hydrologic regime. However, other values are important as well, and expertise and tools are needed to understand water quality, nutrient budgets, and other aspects of ecosystem function. Likewise, pilot study participants recommended that the measurement of social values and vulnerability assessments should consider public attitudes and perceptions, and the implications of those perceptions on adaptive capacity, knowledge dissemination and participation.

Internal training opportunities will improve the capacity of staff to respond to changing conditions and decision-making under increasing uncertainty. Furthermore, these findings suggest that enhanced knowledge exchange between programs could improve the overall adaptive capacity of the MVCA.

Results from this pilot study and the literature suggest the need for adaptive, collaborative and flexible co-management approaches if organizations hope to effectively cope with the multi-scalar, cross-jurisdictional effects of climate change (Lemieux in press). Clearly, managing for climate change requires strategic use of the adaptive management cycle. Dovers and Hezri (2010) and others suggest that the nature of an organization's adaptive response is a function of how it uses three well known management philosophies, variously described as maintaining the status quo (resistance and maintenance), making minor changes (change at the margins), and adaptive approaches to manage for uncertainty (Text Box 2). In reality, every organization has a unique ensemble of decision-making processes based on some combination of the three philosophies that result in success or failure, depending on the spatial, temporal and socio-political context in which it is used and the nature of the adaptive governance system employed.

Given the complexity of how an organization uses these philosophies, an organizational readiness evaluation can help staff dissect management tools and techniques, explore application of the philosophies, evaluate their utility in the context of a rapidly changing climate and modify decision-making processes as required. Usually, an organization demonstrates several degrees of readiness. For example, the MVCA's outreach program signifies a commitment to an open and adaptive approach because it proactively provides information to the public about changes to operations, plans and policies. MVCA staff believe that the community recognizes the MVCA as a source of sound information that strives to work effectively and transparently to address public issues. In the absence of major provincial-level policy change, MVCA staff provide strategic advice to partners when requested and modify internal programs where possible in response to climate-related events.

TEXT BOX 2

THE PHILOSOPHIES OF DECISION-MAKING

I. Resistance and maintenance: Positively, this strategy is characterized by purpose and stability, optimization of resource use, and a low risk of ill-considered change. Negatively, by denial of or resistance to change, appeals to ignorance, and awaiting crisis before revising assumptions and practices.

II. Change at the margins: Positively, this admits the need for change and utilizes well considered reactions to new understanding and pressures—manageable, incremental responses. Negatively, may not cope with major shifts in operating environment or understanding, address symptoms rather than causes, poor at long-term strategy, and risks masking the continuation of problem through a veneer of change.

III. Openness and adaptability: Positively characterized by recognition of uncertainty and imperatives for change (including addressing underlying causes), and preparedness to adapt quickly to changed circumstances. Negatively characterized by inefficiencies, of frequent change and possible maladaptation through poorly considered change.

The pilot study allowed participants and the organizing team to assess the steps used to complete the organizational readiness evaluation. It highlighted the importance of working with the client to develop and ask the right questions. The face-to-face workshop format allowed participants to expand on survey results and/or modify the ratings as a result of round table discussions. In a number of cases, participants commented on the merit of the question, clarified and modified where necessary (see Appendix 5) and rated the MVCA performance accordingly. Pilot study participants agreed that this approach to organizational readiness evaluation has merit for use as a tool to help conservation organizations manage for the uncertainties of climate change.

7. RECOMMENDATIONS

Recommendations from the workshops were recorded to help CA staff enhance current organizational strengths and leverage resources and partnerships to address the challenges of rapid climate change. The recommendations are presented according to short- to long-term internal actions and external actions and needs.

7.1. Internal – Immediate Needs

Treat climate change as a priority issue: Treat climate change as a priority issue in the strategic plan.

Enhance staff training: Identify funding opportunities and provide staff training opportunities designed to enhance staff knowledge about climate change and its known and potential effects on social and ecological systems in the watershed.

Formalize an internal communications process: Regular information sessions and messaging will help keep MVCA staff current on strategic initiatives, data collection programs, completed projects, and will inform discussions about the effects of climate change on MVCA programs.

Strategically plan on an ongoing basis: Create an ongoing process with a five-year lifecycle designed to review and evaluate the effectiveness of strategies, actions and programs implemented by the MVCA to manage for climate change, including adaptation. The review process should include recommendations to enhance or maintain collaborative working relationships with partner organizations with specific commitments and actions to respond to climate change.

Employ the data management system to support strategic initiatives: Under the auspices of the strategic five-year review process, assess the strengths and weaknesses of data collection programs (e.g., climate, water levels, fish, wildlife and species- at- risk) used to support adaptive decision-making. In the near-term, the MVCA should sponsor a strategic assessment of:

- The WISKI SODA program to optimize groundwater and surface water monitoring programs, and
- Climate change indicators (e.g., river flow, ice-in/ice-out periods, plant phenology and wild fire) that demonstrate a direct cause-and-effect relationship between climate change and the condition of natural assets³.

Invest in the volunteer data collection program: The MVCA should enhance the volunteer data collection program through support for training and extension programs, access to resources such as maps and photographs, and assistance with the design of data collection and reporting techniques.

Keep the public informed of climate change issues and solutions: Employ extension sessions about climate change and share ideas on how the public can help mitigate its effects.

³ The pilot study team notes that there is still a focus on ecological values and that social values will require assessment as well in the future.

Keep the public informed of monitoring results: Apprise the public of the results of climate-related data collection programs and seek guidance about future program design and implementation.

7.2. Internal – Short- to Medium-term Actions

Actively manage the strategic plan: Within the strategic plan, promote and encourage effective collaboration and expand networks (e.g., data collection public participation), especially volunteer networks. Employ the strategic plan to create and continually renew and/or update medium- and long-term goals (i.e., targets and thresholds for action). Incorporate a commitment to constantly assess organizational readiness to explore mandate, strategic direction, leadership, the policy dynamic, and internal and external decision-making processes.

Complete a watershed management plan: Complete a watershed management plan that addresses the MVCA's mandate to manage for climate change, is relevant at the subwatershed level of planning, subscribes to the source water protection model, provides direction on data and information collection (e.g., bathymetry) and identifies roles and responsibilities for MVCA staff and partners (where feasible), including collaboration with MOECC and MNRF on the management of low water conditions and thresholds/targets⁴ for decision-making.

Employ knowledge about values as a basis for relationships and partnerships with watershed communities: Emphasize the importance of understanding, selecting and describing ecological and social values, use this to foster relationships and partnerships with relevant actors in the Mississippi watershed communities, and draw on these relationships to inform decisions.

Employ education, research and marketing to bolster support: Use education, research and marketing to support explanations for levy increases needed to address issues related to climate change adaptation.

Maintain outreach programs: To perpetuate trusting relationships, continue to provide climate-oriented outreach programs for the public to assist with consultation and decision-making. In addition to minimizing potential trust issues, continuous outreach programs help the public understand changing social, economic and political realities, and related implications respecting living conditions in the watershed (e.g., access to properties for ecological surveys).

Maintain a relevant monitoring program: Revisit the Draft 2014 Monitoring Strategy to identify where climate change issues can be integrated into ongoing strategic commitments, to identify indicators that describe the effects of climate change on important ecological and

⁴ The MNRF vulnerability assessments may help inform threshold values.

social values (e.g., ice cover, phenology, and outdoor recreation opportunities) and to analyze and report on the condition of selected values.

Create a knowledge exchange and communications strategy: Create a knowledge exchange and communications strategy to help MVCA staff connect climate change issues to programs and decision-making.

7.3. Internal – Long-term Actions

Amend the MVCA’s regulatory mandate: Lobby the appropriate organizations (e.g., Conservation Ontario and Ontario government ministries) to facilitate amendments of the MVCA’s regulatory mandate to address climate change. Mainstreaming of climate change will encourage allocation of financial and human resources, prioritization of climate change issues in mitigation/adaptation strategies within the CA, and will help create a unified multi-agency approach where efforts can be leveraged. Conservation Ontario has initiated a dialogue with publication of a whitepaper on ‘Watershed Management Futures for Ontario’ (Conservation Ontario 2012); however, lack of response at the provincial level to date suggests that greater lobbying from Conservation Ontario and its constituents is required.

Scale data collection programs: In support of an enhanced regulatory mandate, data collection and information management should be scaled for the watershed and to complement data collection programs sponsored by partners.

Provide software training: Create a software/output strategy for WISKI SODA and link the collection and analyses of data to decision-making.

7.4. External Actions

Optimize collaboration with external partners: The MVCA is an important partner in regional, provincial and national programs, where collaboration and program integration are key to combating the effects of climate change. Integrated collaborative programs help agencies leverage their strengths and provide leadership at the different levels of government and management. For example, the MNRF works in response to a climate change strategic plan that includes a commitment to understand how climate change affects social and ecological systems through applied research programs and vulnerability assessments at many scales of decision-making (e.g., watershed, ecodistrict, ecoregion and forest management unit) (MNR 2010). In addition to many other strategic initiatives, work completed under the auspices of MNRF’s climate change program provides cause-and-effect indicators of change that will help the CA and partners use vulnerability assessments to inform adaptation strategies for the watershed. Given that vulnerability assessments are also useful at the municipal level of planning, the indicators will help the MVCA assist municipalities in decision-making as well.

Collectively create a list of multi-scalar strategic actions to improve agency

coordination: The MVCA should work with external partners and clients to establish a list of joint strategic actions. For example, drought management is an important policy issue that will affect the CA's ability to mitigate and/or adapt to the effects of climate change.

Workshop participants recommended that the MVCA's drought 'response' program be reconfigured into a drought 'information' program because water use regulations fall outside the CA's control (e.g., CA's do not have the authority to declare mandatory water use reductions) and the MVCA cannot measure consumption from private water systems (i.e., private well owners) even though these systems draw from the same aquifers. In addition, there is a tendency toward inconsistent and uncoordinated messaging from various agencies working in the watershed during severe events, such as drought (e.g., during the last drought, the City of Ottawa, which draws water from Ottawa River, contradicted water conservation messaging that adjacent municipalities and Conservation Authorities were providing). Coordinated action will enhance the adaptive capacity of all partners in all the affected jurisdictions.

Enhance interagency collaboration on policy and regulations: Policy and regulations are imperative to successful adaptive responses to climate change, yet they are often developed and implemented unilaterally. Meaningful progress in addressing climate change will depend on robust vertical (within organization) and horizontal (between organizations) policy integration reflected through mandates, strategic plans, planning regimes and operations (Dovers and Hezri 2010 and others).

8. CONCLUSIONS

Throughout this assessment of organizational readiness, the MVCA demonstrated dedication and commitment to the successful management of natural resources for which it is responsible, including climate change. Pilot study results suggest that the MVCA has a medium to high capacity to address hydrological issues that result from the effects of climate change. This commitment is highlighted by successful public outreach and knowledge dissemination programs, and diverse and strong partnerships. The MVCA subscribes to an adaptive approach to management and looks to create 'climate ready' data collection and monitoring programs by modifying existing programs and exploring new opportunities with partners, encouraging volunteerism, accessing the necessary financial and human resources, and working with partners to coordinate decision-making at the variety of management scales applied in the Mississippi River watershed.

The results of this pilot study suggest that this approach to assessing organizational readiness has merit, particularly if it is integrated into programs as an ongoing function. MVCA staff concluded that the process of reviewing survey results during the workshops helped staff and the project team complete a final report designed to inform strategic planning and operational decisions.

9. ACKNOWLEDGEMENTS

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APPENDIX 1. SURVEY AND WORKSHOP RESPONSES TO THE QUESTIONS

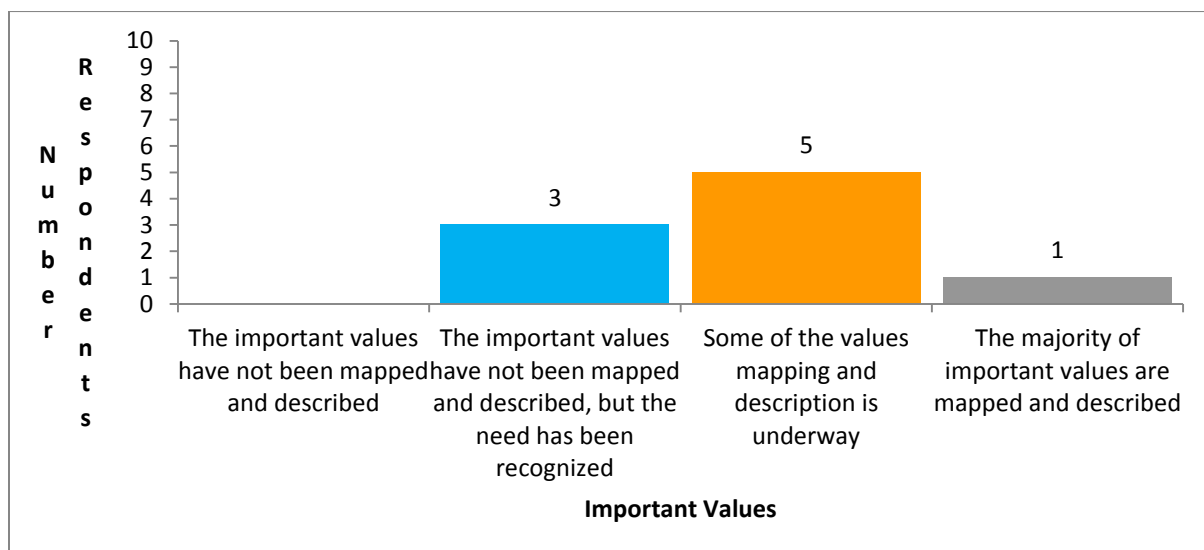
Spatial Boundaries

The spatial determinant examines the spatial boundaries used to describe and manage important social and ecological values in the watershed.

Question 11: Have all of the important social and ecological values in the Mississippi watershed been mapped and described?

This question seeks to understand whether spatial data are recorded and mapped using relevant ecological, thematic and administrative spatial units. Survey respondents indicated that information is available for a number of social and ecological values (Figure 1). However, workshop participants indicated that the database for ecological values is more extensive and detailed than the database for social values. Additionally, MVCA staff recognize that mapping important values is an ongoing process requiring constant evaluation of dynamic social-ecological systems. Human and financial resources often are insufficient to maintain this type of data collection. As a result, the process of describing social and ecological values is never complete.

Figure 1: Have all of the important social and ecological values in the Mississippi watershed been mapped and described?



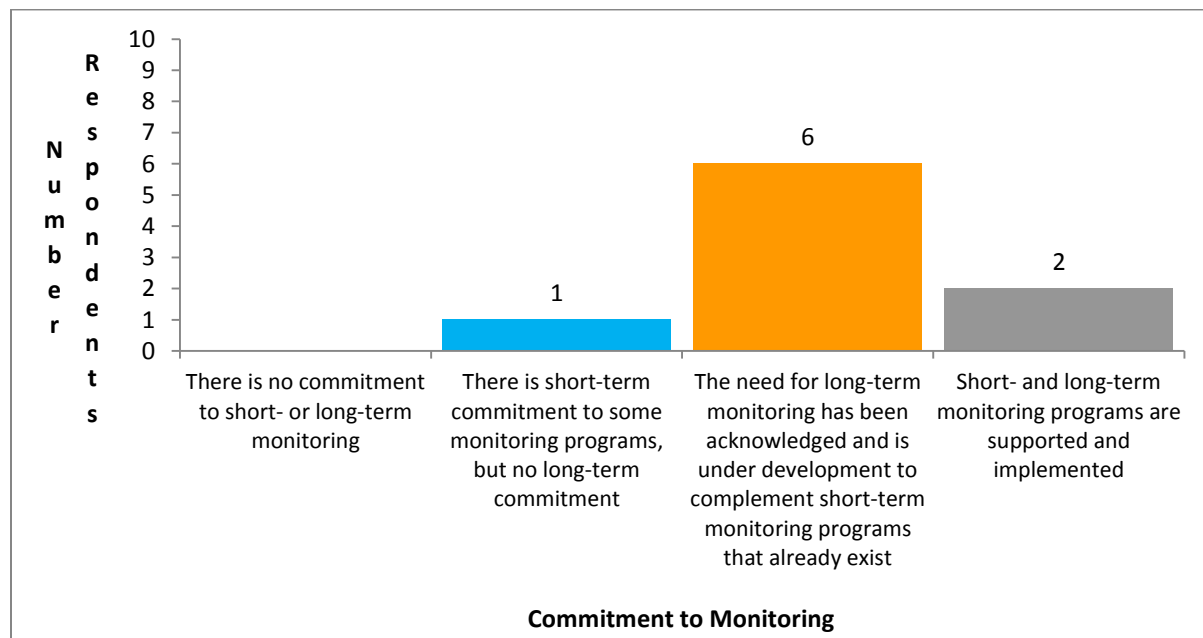
Timeframe

Time is an important consideration in successful implementation of scientific investigation, modelling, adaptive decision-making, monitoring and partnership. Time periods include the near-term (<1 year), short-term (1-5 years), medium-term (5-10 years) and long-term (10+ years). Generally, a capacity for all timeframes is important for the successful implementation of an adaptive approach to managing for climate change.

Question 12: Is the CA committed to the short- to long-term monitoring programs needed to assess the condition of important social and ecological values as the climate changes?

The MVCA has a moderately high capacity for short- to long-term monitoring (Figure 2). Some workshop participants identified a need for review of the relevance of monitoring program indicators and to identify opportunities for new programs. The importance of support for monitoring at the political level (e.g., Board of Directors) was also noted.

Figure 2: Is the CA committed to the short- to long-term monitoring programs needed to assess the condition of important social and ecological values as the climate changes?

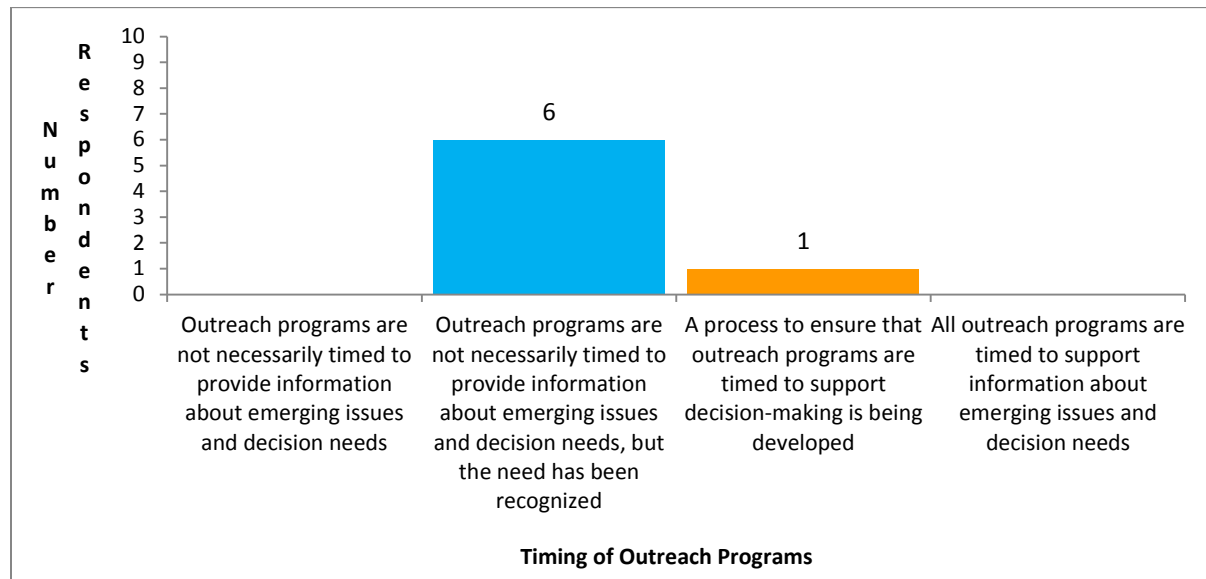


Question 13: Are ongoing outreach programs timed to address emerging issues and decision needs?

Despite survey results (Figure 3), workshop participants felt that outreach is an MVCA strength. For example, the MVCA has been called upon by other organizations to act as a source of information on flooding. As a result, the structure of this question was challenged during the first workshop. Participants felt that while efforts to match outreach events with the timing of decision-making is important, the reality of the logistics required to disseminate information

often means convening public sessions at times that are convenient for stakeholders. Additional discussion was focused on the different meanings of consultation and outreach, where consultation requires public participation and outreach is used to provide information. As such, a more relevant question is ‘Does the CA have the capacity to carry out outreach and deal with public concerns?’ Workshop participants indicated that the rating for this question would be high.

Figure 3: Are ongoing outreach programs timed to address emerging issues and decision needs?



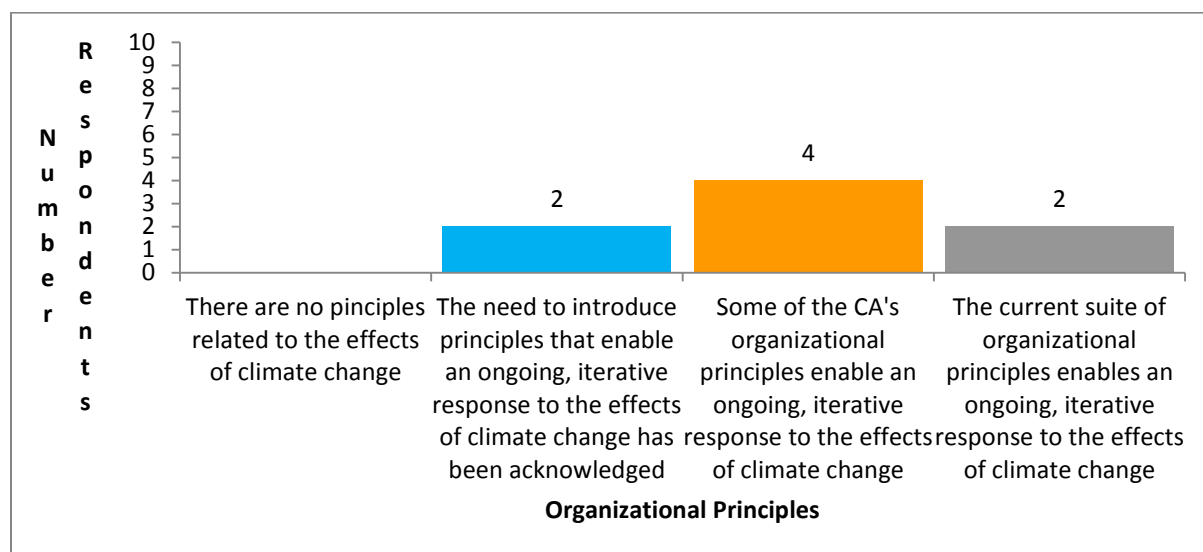
Principles

A principle is a ‘standard’ for moral and ethical decision-making. Adaptively managing for climate change is, in part, guided with principles that address sustainable living, an ecosystem approach to management, ecological integrity, fairness and equity, and health and well-being.

Question 14: Do the over-arching organizational principles embraced by the CA enable an ongoing, iterative response to the effects of climate change?

Survey respondents indicated that ongoing iterative responses to ecological and social changes in the watershed are important, and most believe that the MVCA has a high level of capacity for this (Figure 4). One respondent referred to the MVCA’s mission and vision statements, which clearly demonstrate agency resolve to engage in watershed management through adaptation to changing social and ecological conditions. Workshop participants reinforced this by clarifying that while principles do not explicitly acknowledge monitoring as the basis for iterative decision-making, it is, in fact, used regularly to inform decisions.

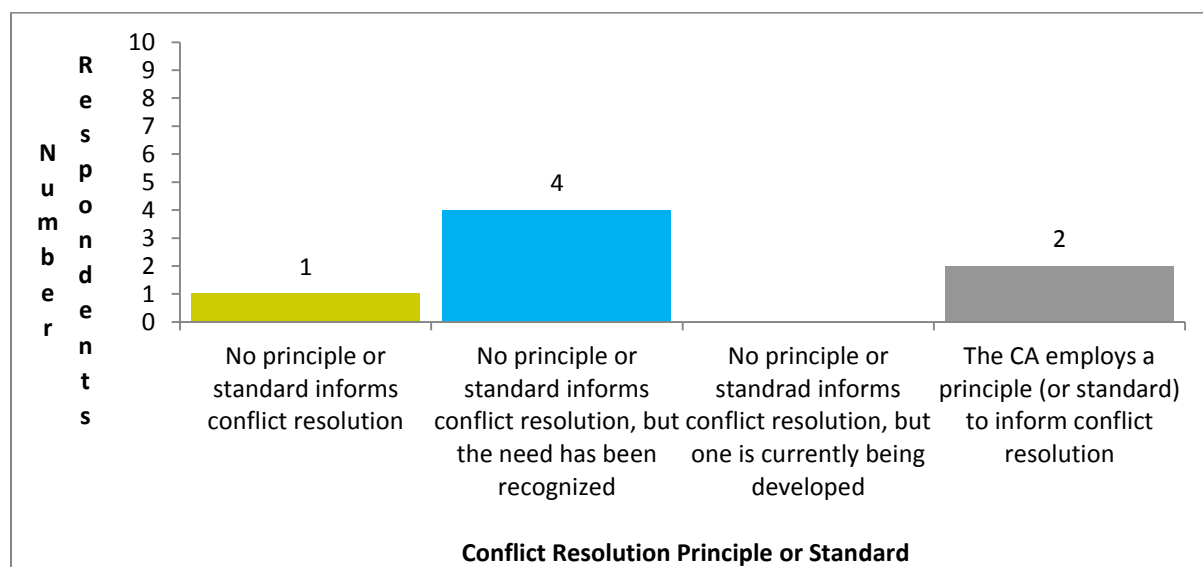
Figure 4: Do the over-arching organizational principles embraced by the CA enable an ongoing, iterative response to the effects of climate change?



Question 15: Is there an organizational principle(s) (or standard decision-making process) that informs conflict resolution?

Some respondents found this question confusing, particularly with respect to the scope and type of issue (Figure 5). On the basis of clarifying statements provided at the workshop, participants reported that conflict resolution is addressed under the auspices of the Water Management Plan where there is a defined process. MVCA staff acknowledged that conflicts are ever-present in other areas of operation not addressed by the Water Management Plan. Given that conflict resolution processes are not described for many of the operations performed by the MVCA, the lower ratings reflect the current reality. Generally however, the MVCA works to mitigate conflict while maintaining the ecological integrity of the watershed and simultaneously balancing the interests of stakeholders.

Figure 5: Is there an organizational principle(s) (or standard decision-making process) that informs conflict resolution?



Values

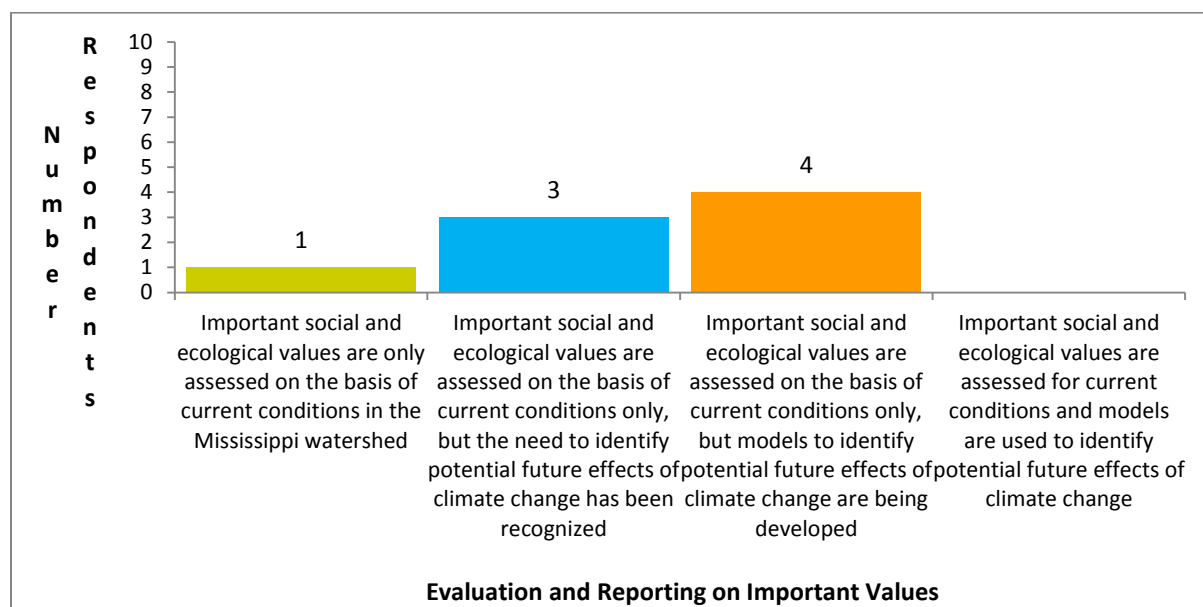
Values are used by an organization as a basis for the variety of commitments and initiatives such as sustainable living, an ecosystem approach to management, ecological integrity, fairness and equity, and health and well-being. The concept of ‘value’ is often contextual, so there are many definitions that need to be considered simultaneously, such as ecological value, cultural value, economic value, financial value, life-support value and aesthetic value.

Question 16: Do any CA programs evaluate and report on the important social and ecological values in the Mississippi Watershed?

Given that the MVCA has not defined or had access to some of the important social and ecological values, survey respondents had difficulty answering the question (Figure 6). In addition, respondents indicated that the ecological-social duality further complicated the question and recommended that ecological and social values be explored separately.

While there is a watershed report card that employs ecological values, social values are not well represented in reports and publications. In addition, social values are more difficult to describe and are often combined with multi-sector economic values such as agriculture or forestry. On the basis of workshop participant feedback, and in recognition of a bias for the use of ecological values, the MVCA’s capacity rating for values measurement is medium.

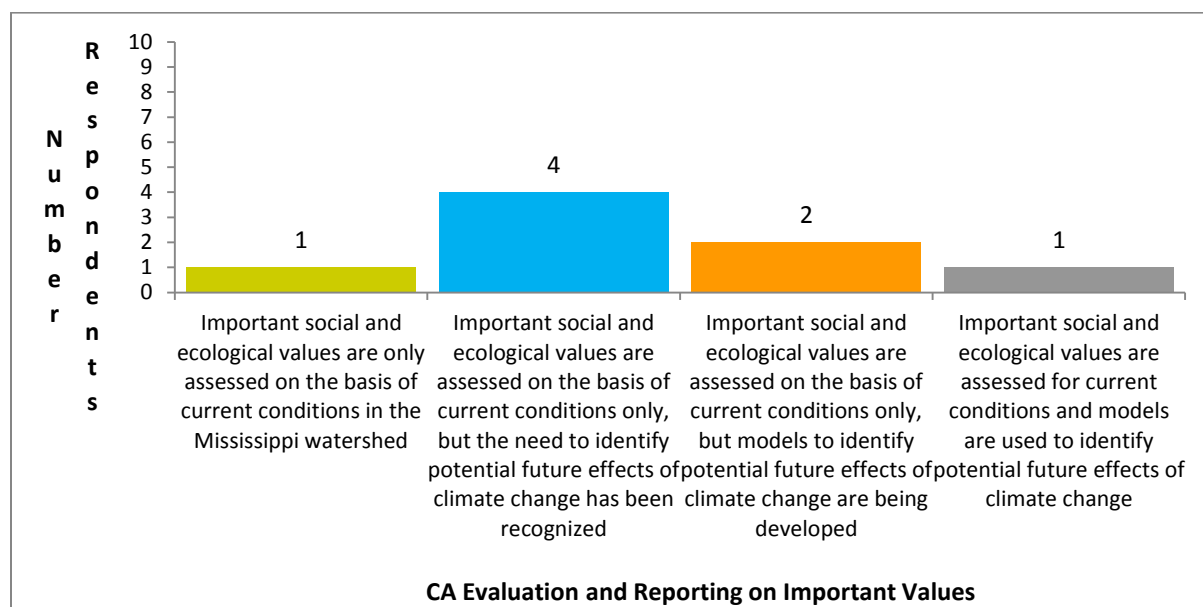
Figure 6: Do any CA programs evaluate and report on the important social and ecological values in the Mississippi Watershed?



Question 17: Do the CA (Conservation Authority) programs assess how climate change affects important social and ecological values?

A range of ratings for CA climate assessment programs was recorded, which resulted from varied familiarity with climate modelling and other evaluation techniques employed by the MVCA (Figure 7). Workshop participants stated that the MVCA has begun to use climate model outputs to inform decisions. In reality, the ratings are likely higher than assigned by survey respondents even though the model results are not always directly linked to decision-making.

Figure 7: Do the Conservation Authority programs assess how climate change affects important social and ecological values?



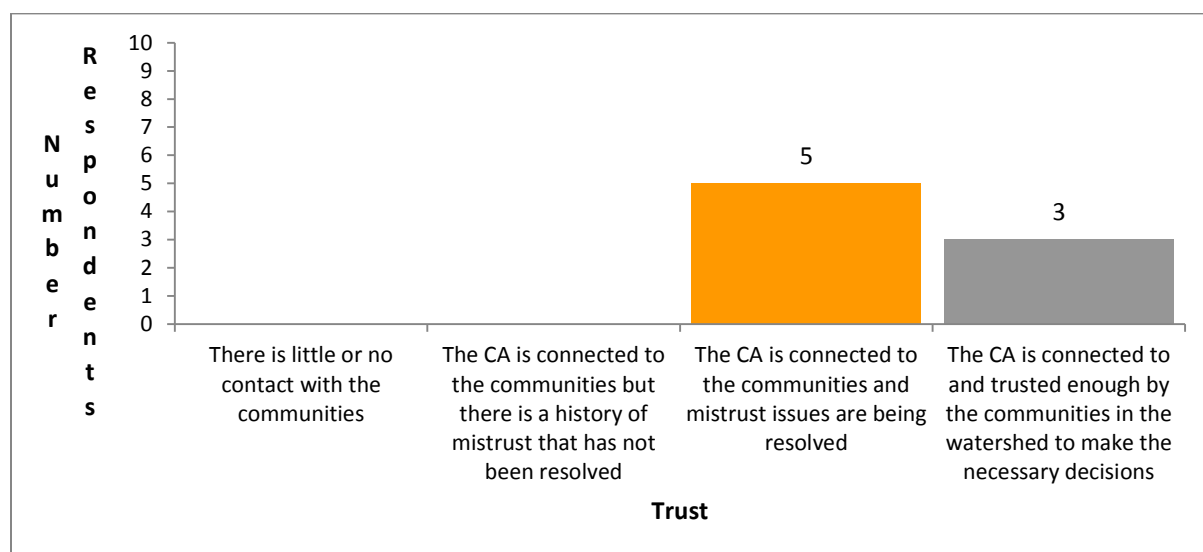
Trust

If society trusts in the ability of an organization to make fair, accountable and transparent programs with meaningful public engagement, the chances of successfully managing for climate change are enhanced. For example, trust results when an agency continually demonstrates fairness, explicitly justifies decisions and explains actions through ongoing outreach programs.

Question 18: Given the possible need for rapid responses to the effects of climatic changes, and given the associated trade-offs often associated with decisions, do communities (towns, hamlets etc.) in the watershed trust the CA to make the necessary decisions?

MVCA staff believe that communities in the watershed trust in the CA's ability to make the necessary decisions (Figure 8). Workshop participants suggested that a question designed to determine the community's level of confidence in the CA's ability to make decisions would have been more meaningful. That said, trust by the communities and other organizations in the MVCA is high.

Figure 8: Given the possible need for rapid responses to the effects of climatic changes, and given the associated trade-offs often associated with decisions, do communities in the watershed trust the Conservation Authority to make the necessary decisions?



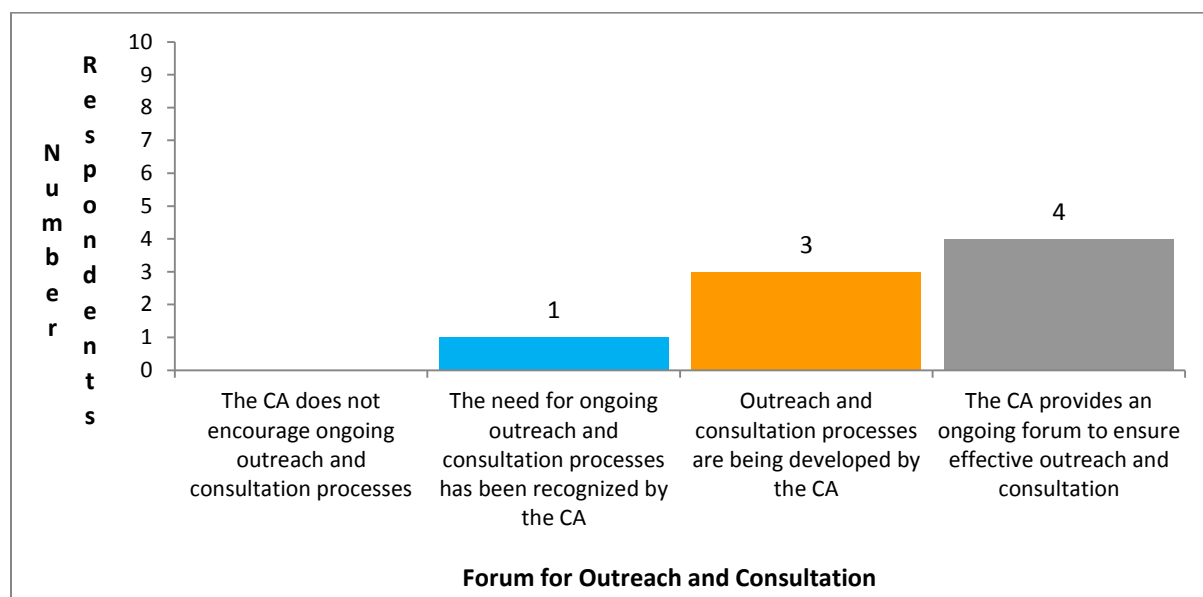
Community Engagement

Decision-making in the context of a rapidly changing climate benefits from the active engagement of people with diverse goals, values, interests and perspectives who can work together in trusting relationships. This cooperative approach to the management of important social and ecological values requires an organization to engage with partners in the public and private sectors, including community and non-government organizations.

Question 19: Does the CA provide an ongoing forum to ensure effective outreach and consultation?

The MVCA's overall capacity to consult with stakeholders and conduct outreach is high (Figure 9). The relocation of the Conservation Centre to Carleton Place has also improved the CA's capacity to meet its goals and objectives. One respondent indicated that outreach and consultation about regulations and planning issues is very good, while another suggested that more risk assessments are needed before outreach or consultation activities on climate change can take place.

Figure 9: Does the Conservation Authority provide an ongoing forum to ensure effective outreach and consultation?



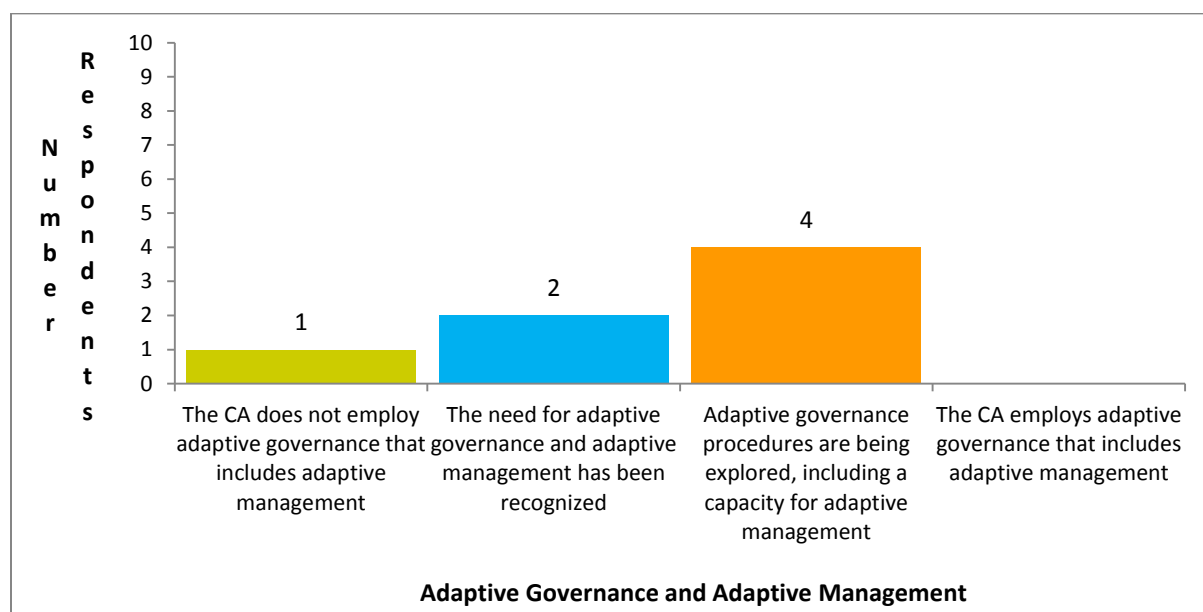
Institutional Culture and Function

Adaptive governance in a rapidly changing climate requires consensus building, commitment to the provision of information to support decision-making, constant monitoring, efficient procedures to update policies and programs, public trust, optimal balance between the classic bureaucratic hierarchical structure and matrixed relationships, effective information transfer and the capacity to make decisions under great uncertainty.

Question 20: Does the CA practice adaptive governance that includes adaptive management?

Survey ratings indicate that the MVCA does practice adaptive governance (Figure 10). Survey respondents noted that adaptive governance is overseen by the Board of Directors and is tied to funding. Workshop participants indicated that external partners may inhibit the ability of the MVCA to implement adaptive management/governance due to current practices and the nature of collaborative arrangements. While the CA cannot control the decision-making processes employed by partners, ongoing encouragement and information exchange may help the co-evolution of an adaptive approach to governance in a rapidly changing climate.

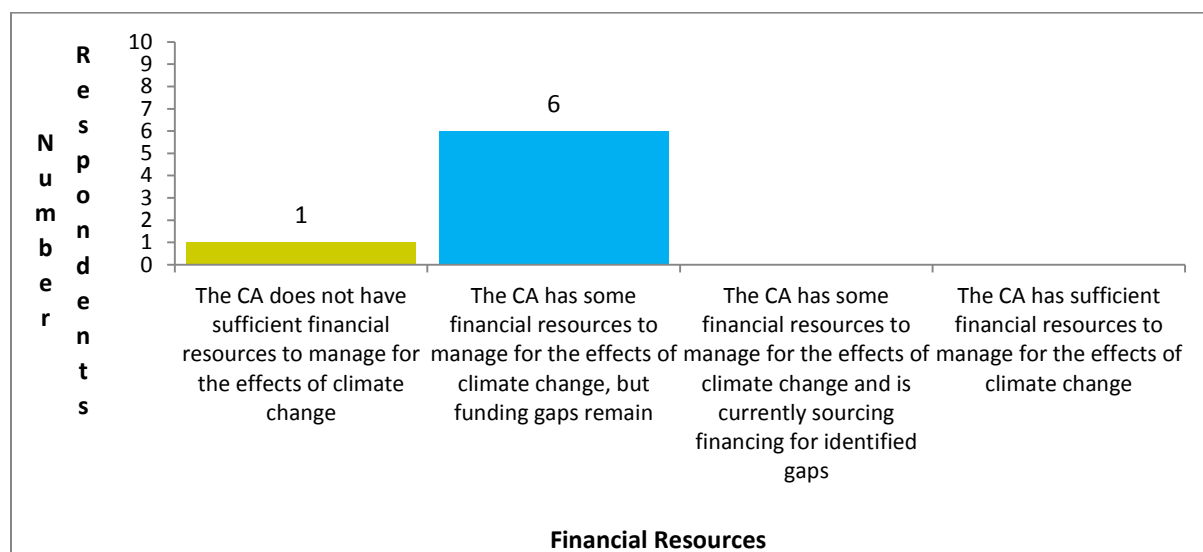
Figure 10: Does the Conservation Authority practice adaptive governance that includes adaptive management? (Adaptive governance denotes the structures [e.g., program design] and processes [e.g., policies] that an organization uses to shape actions to attain the cultural, social, economic and ecological conditions to which it aspires. Adaptive management is a systematic process designed to increase the chances of making the right decisions in an ever-changing social and ecological context. Adaptive management is about learning while doing, and can involve learning through different combinations of experimentation and experience).



Question 21: Does the CA have sufficient financial resources to manage for the effects of climate change?

Financial resources play a critical role in any organization's ability to hire and train staff, and implement programs. Currently, MVCA programs are not sufficiently funded to address the effects of climate change (Figure 11). As a result, it is anticipated that funding issues will continue to affect the CA's ability to respond to climate change. On a promising note, the MVCA has enhanced its internal capacity to manage for climate change and has found the finances to allocate staff resources for scientific assessments, risk management and other climate change-related programs.

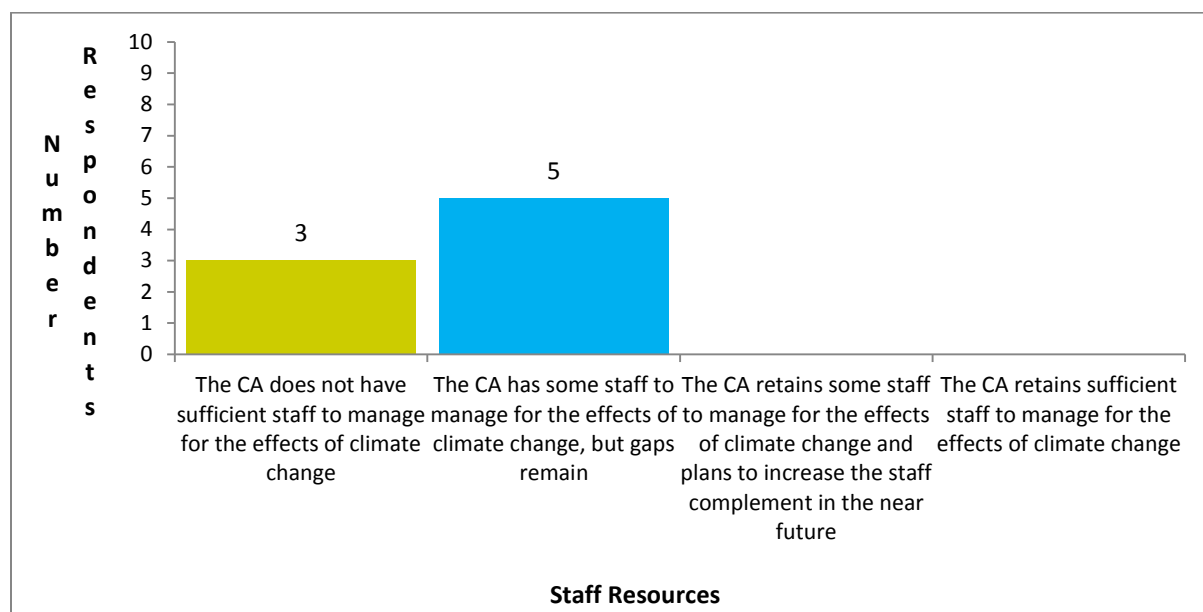
Figure 11: Does the Conservation Authority have sufficient financial resources to manage for the effects of climate change?



Question 22: Does the CA have sufficient human resources (staff) to manage for the effects of climate change?

In addition to financial issues, the CA does not have sufficient human resources to manage for the effects of climate change (Figure 12). Workshop participants noted that agencies like the MVCA, with small staff complements and inadequate financial assets, are challenged to respond to new and emerging issues like climate change because of the broad ranging implications to ecosystem health and social well-being.

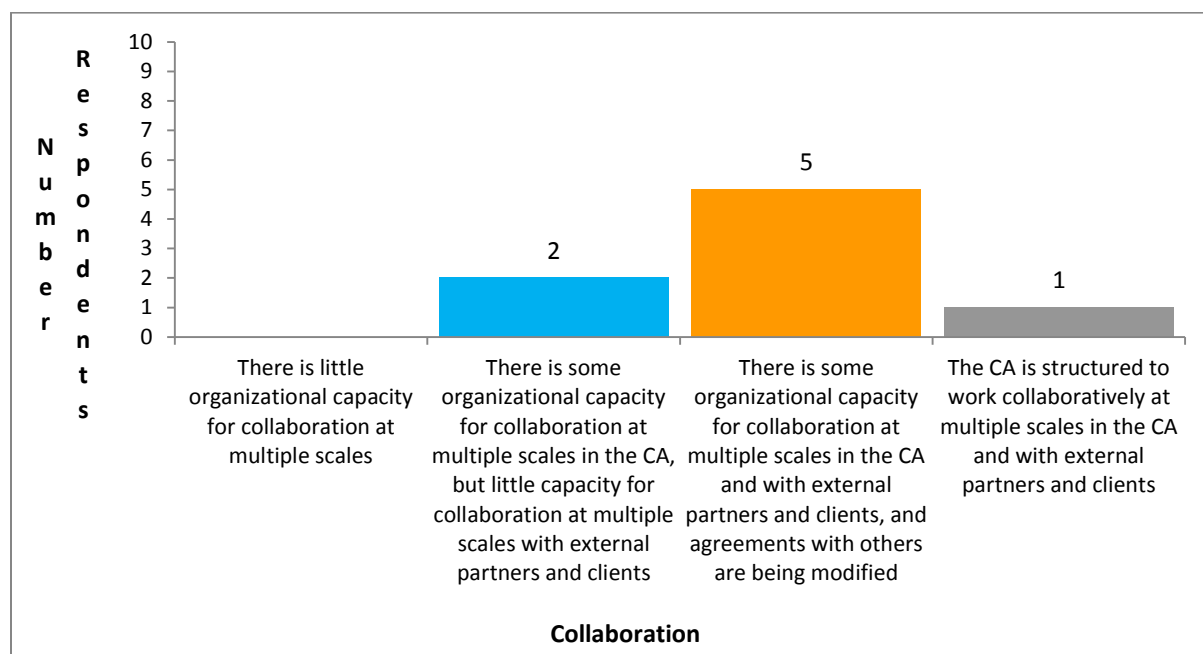
Figure 12: Does the Conservation Authority have sufficient human resources (staff) to manage for the effects of climate change?



Question 23: Does the CA’s institutional structure and function provide for collaboration at multiple scales of decision-making? Examples of multiple scales include different levels of government, different mapping scales, and different time regimes.

Survey respondents agreed that the MVCA has a moderate to high capacity for collaboration (Figure 13). MVCA staff are proud of their capacity for collaboration, particularly in monitoring and planning programs. New agreements with greater flexibility for collaborative decision-making will enhance the MVCA’s capacity to respond to the effects of climate change.

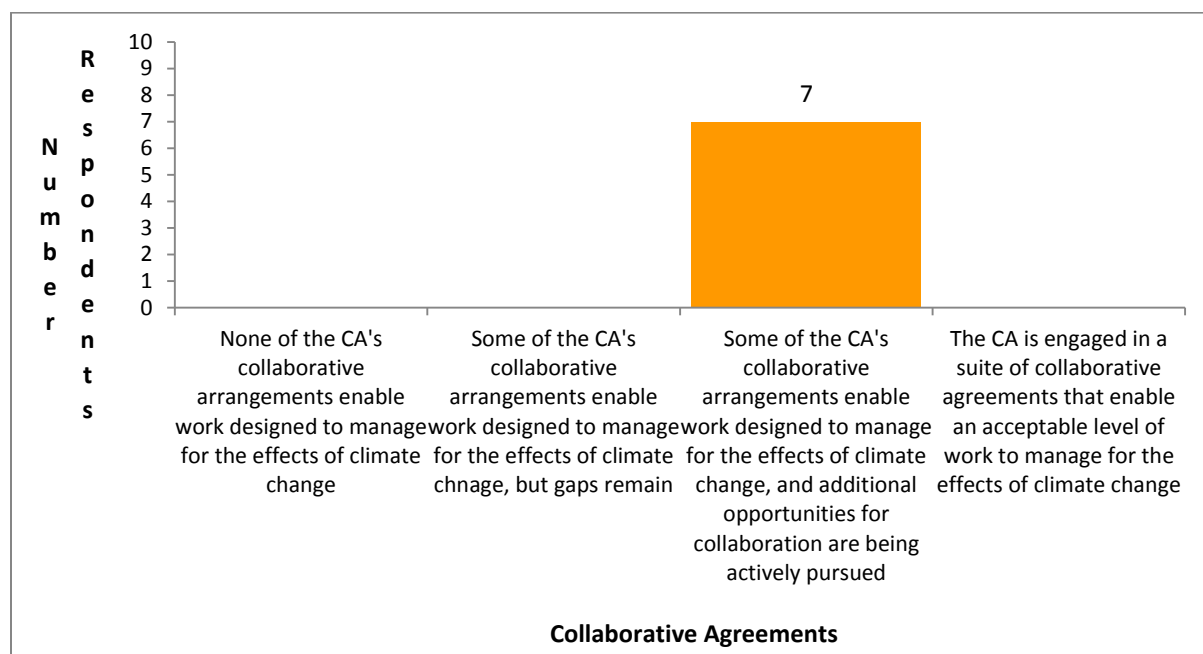
Figure 13: Does the Conservation Authority's institutional structure and function provide for collaboration at multiple scales of decision-making?



Question 24: Do the CA's collaborative arrangements optimize its capacity to manage for the effects of climate change? Examples of collaborative arrangements include an agreement between partners to jointly collect data, to jointly develop and implement policy, to jointly sponsor outreach programs and to share information.

While MVCA staff are proud of their capacity for collaboration, particularly in monitoring and planning programs (Figure 14), they believe that new agreements with local partners to achieve common objectives will enhance the MVCA's capacity to respond to the effects of climate change.

Figure 14: Do the Conservation Authority's collaborative arrangements optimize its capacity to manage for the effects of climate change?



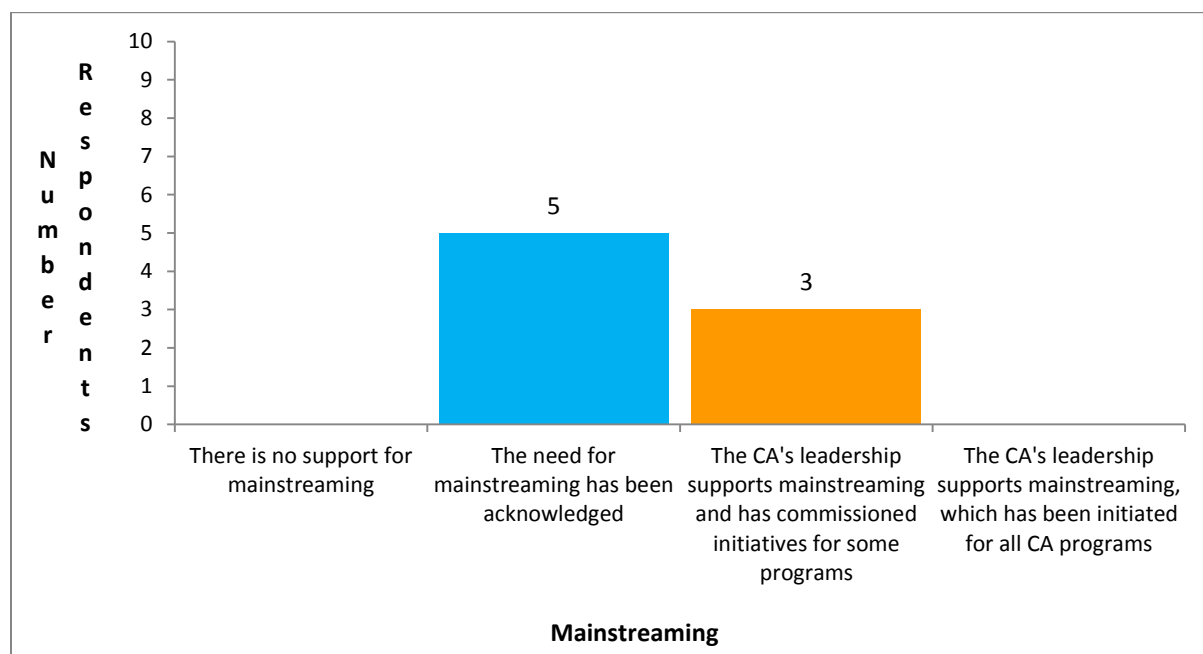
Leadership

Effective leadership ensures that management processes are designed to achieve strategic goals and objectives to meet a mandate and ensure meaningful, ongoing involvement by staff, partners and the general public. There are many qualities of leadership that are important when adaptively managing for the effects of climate change, including, but not limited to a visionary who can recognize and respond to changes in the world, who is a good communicator capable of accepting and using advice, who supports life-long learning and who encourages innovation.

Question 25: Does the CA's leadership support the need to mainstream climate change into its programs? Mainstreaming is the integration of climate change into policies, strategies, plan and guidelines used by an organization to successfully meet its core business goals and objectives.

As representatives of the MVCA leadership team, survey respondents confirmed that the need for mainstreaming has been acknowledged and that some work to mainstream climate change into programs has been initiated (Figure 15). Workshop participants decided that the survey ratings underestimated current support for mainstreaming, particularly in view of the fact that efforts to integrate climate change into decision-making is already evident through the MVCA's commitment to adaptive management and changes to the structure of monitoring and reporting programs.

Figure 15: Does the Conservation Authority's leadership support the need to mainstream climate change into its programs? Mainstreaming is the integration of climate change into policies, strategies, plan and guidelines used by an organization to successfully meet its core business goals and objectives.



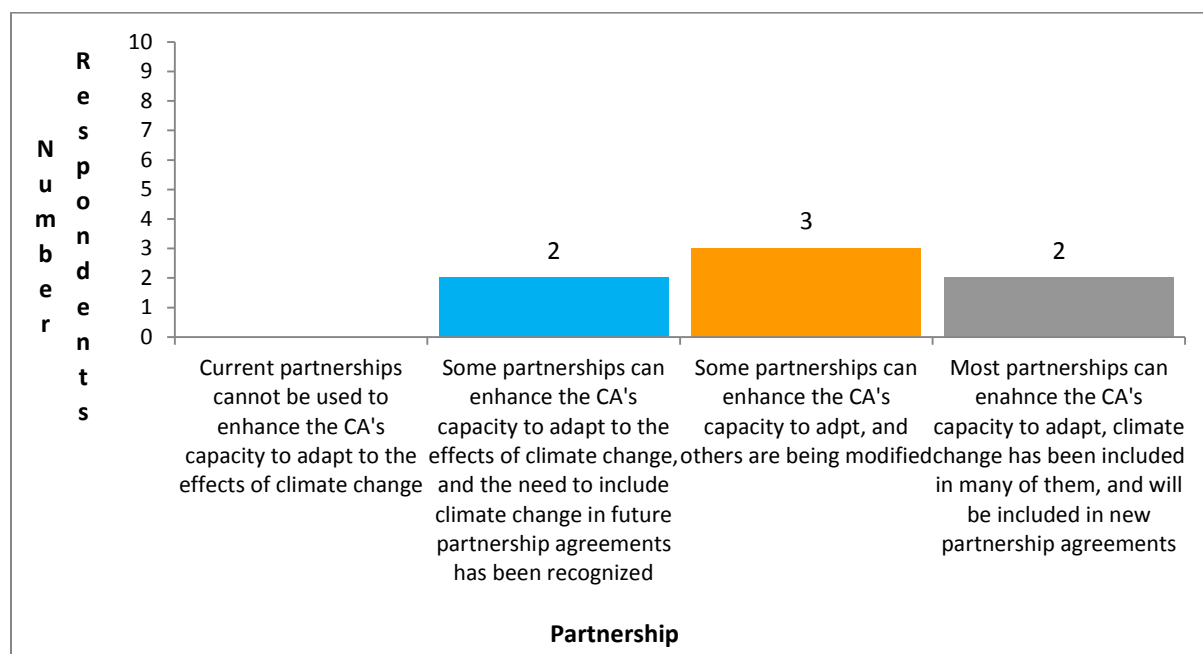
Partnerships

A culture of collaboration is key to successful management of climate change issues and partnerships are a fundamental requirement for most, if not all, adaptive decision-making and program management activities. The chances of successful partnerships are higher when they are created by committed organizations that share a vision for the future, are guided by a mutually acceptable agreement and are product-oriented.

Question 26: Can current partnerships be used to enhance the CA's capacity to adapt to the effects of climate change?

The CA employs collaboration and partnership to enhance its capacity to respond to the effects of climate change. Survey respondents indicated that MVCA partnerships provide a range of opportunities for enhancing climate change adaptation (Figure 16). Workshop participants agreed that the MVCA capacity for partnership is high. MVCA partners include Natural Resources Canada, the Ontario Ministry of Natural Resources and Forestry (OMNRF), other CAs and Conservation Ontario, municipalities, cottage associations and other community groups, among others.

Figure 16: Can current partnerships be used to enhance the Conservation Authority's capacity to adapt to the effects of climate change?



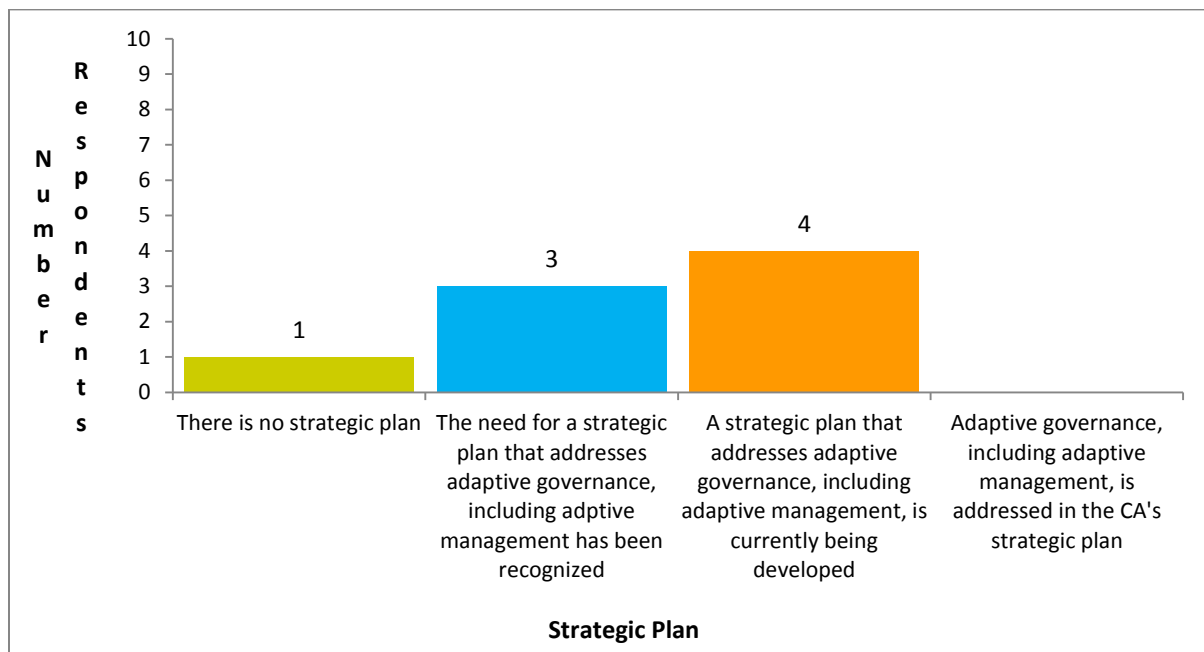
Strategic Planning

Strategic planning is used both as a catalyst for change and a tool to manage for change. Strategic planning serves to identify, establish and modify short- to long-term direction in support of an organization's vision for the future.

Question 27: Does the CA subscribe to a strategic plan that recognizes the importance of adaptive governance, including adaptive management, to manage for the effects of climate change?

The 2002 Strategic Plan identifies priorities needed to pursue adaptive management and address climate change at local and regional levels. Workshop participants felt that the survey responses undervalued the current strategic capacity of the MVCA to address climate change (Figure 17) and suggested that a rating of moderate to high be applied. There was general consensus among workshop participants that adaptive management is very much a part of the MVCA daily operations.

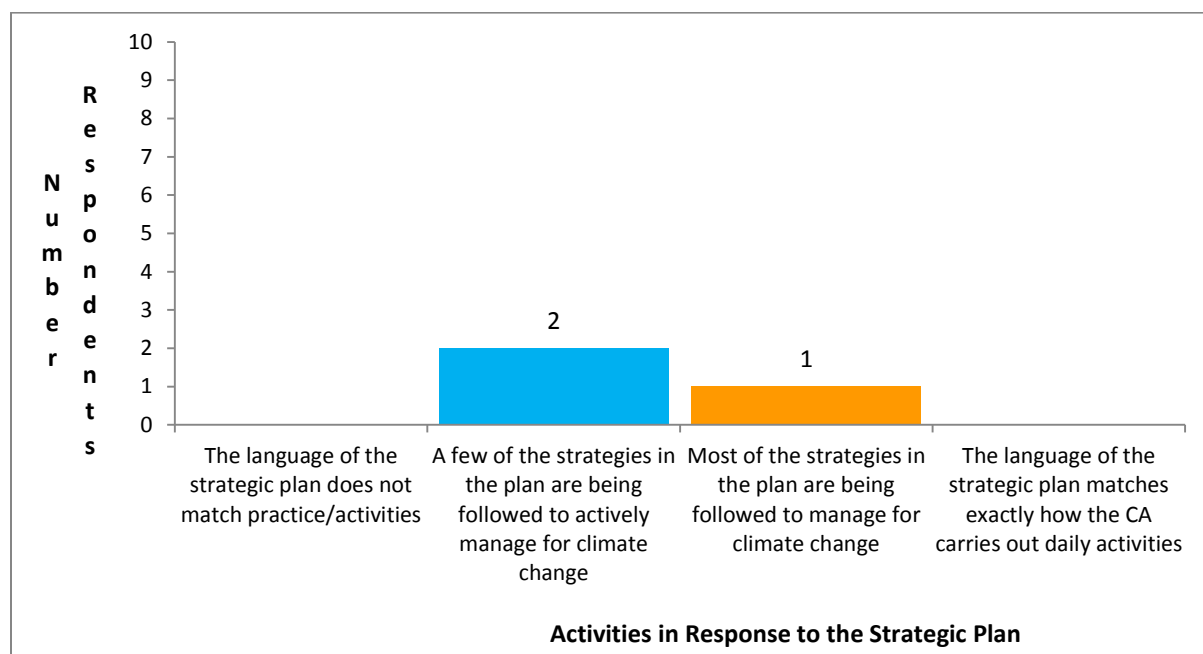
Figure 17: Does the Conservation Authority subscribe to a strategic plan that recognizes the importance of adaptive governance, including adaptive management, to manage for the effects of climate change?



Question 28: If climate change is addressed in the strategic plan, does the language used match practices/activities within the CA?

This question was intended to determine whether practice matches commitments in the strategic plan. While most respondents skipped this question (Figure 18), two of the three respondents who answered identified some disparity between the strategic commitment and reality during discussions at the first workshop. Even though the low response rate precludes analysis, the responses hint at some disconnects between the strategic plan and operational budgets and work plans. Workshop participants stated that in future the CA may elect to iteratively review the status of strategic plan commitments during internal training sessions or staff meetings to help allocate resources and plan activities to manage for climate change issues in the watershed.

Figure 18: If climate change is addressed in the strategic plan, does the language used match practices/activities within the Conservation Authority?



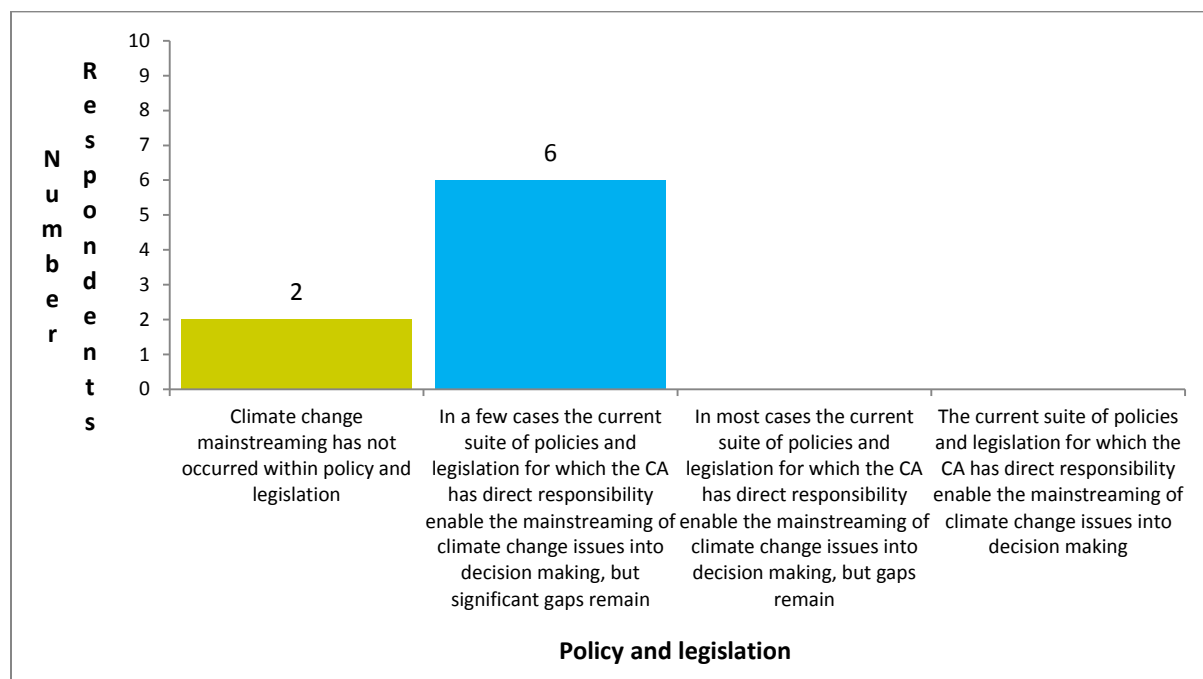
Policy and Legislation

Given that natural resource allocation will become more complex as the climate warms and the demand for access to limited resources increases, ‘climate ready’ policy and legislation must be kept current, responsive and relevant.

Question 29: Does the current suite of policies and legislation for which the CA has direct responsibility enable the mainstreaming of climate change issues into decision-making?

While the CA recognizes the importance of ‘climate ready’ policies and has begun to mainstream climate change issues into decision-making, respondent ratings suggest that there are some disconnects between operations and policy/legislation (Figure19).

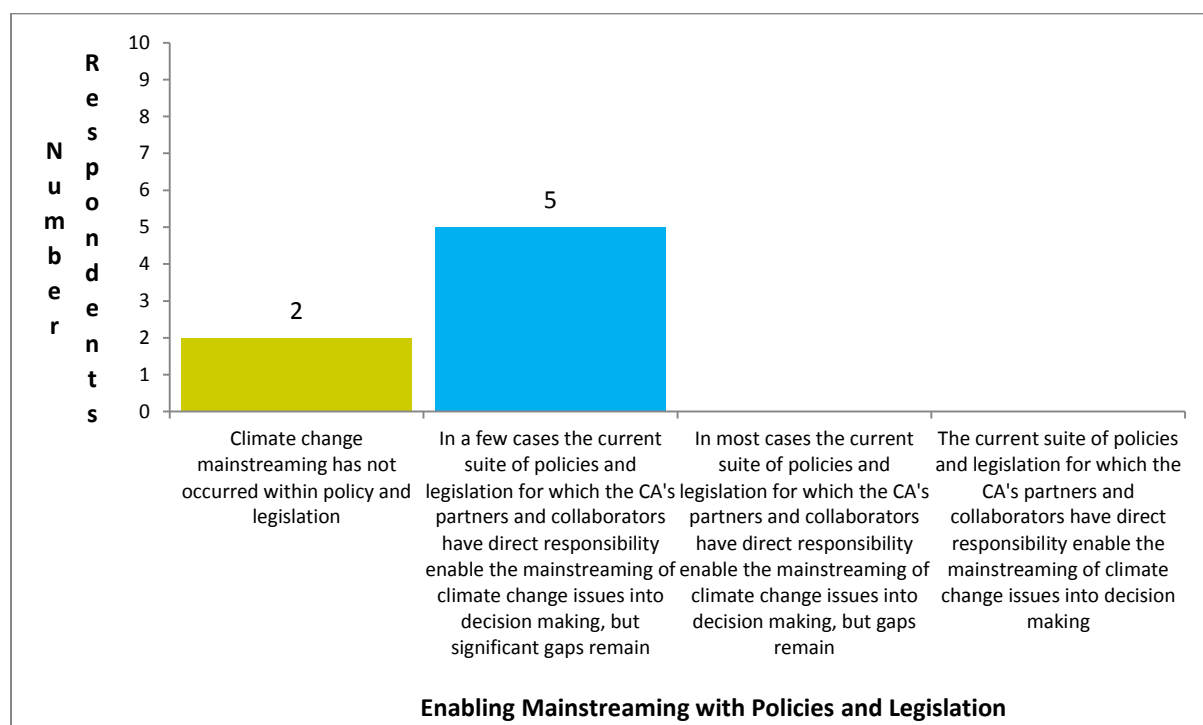
Figure 19: Does the current suite of policies and legislation for which the Conservation Authority has direct responsibility enable the mainstreaming of climate change issues into decision-making?



Question 30: Does the current suite of policies and legislation for which the CA's partners and collaborators have direct responsibility enable the mainstreaming of climate change issues into decision-making?

While mainstreaming of climate change into provincial and federal natural resource policies or legislation has begun, there are significant gaps (Figure 20). Much of the operations and mandate of Conservation Authorities in Ontario are directed by provincial policies and legislation. As a result, the adaptive capacity of the MVCA is directly affected by policies and legislation that staff cannot easily modify. However, workshop participants indicated that municipalities regularly consult with the MVCA on a variety of issues affecting policies and programs.

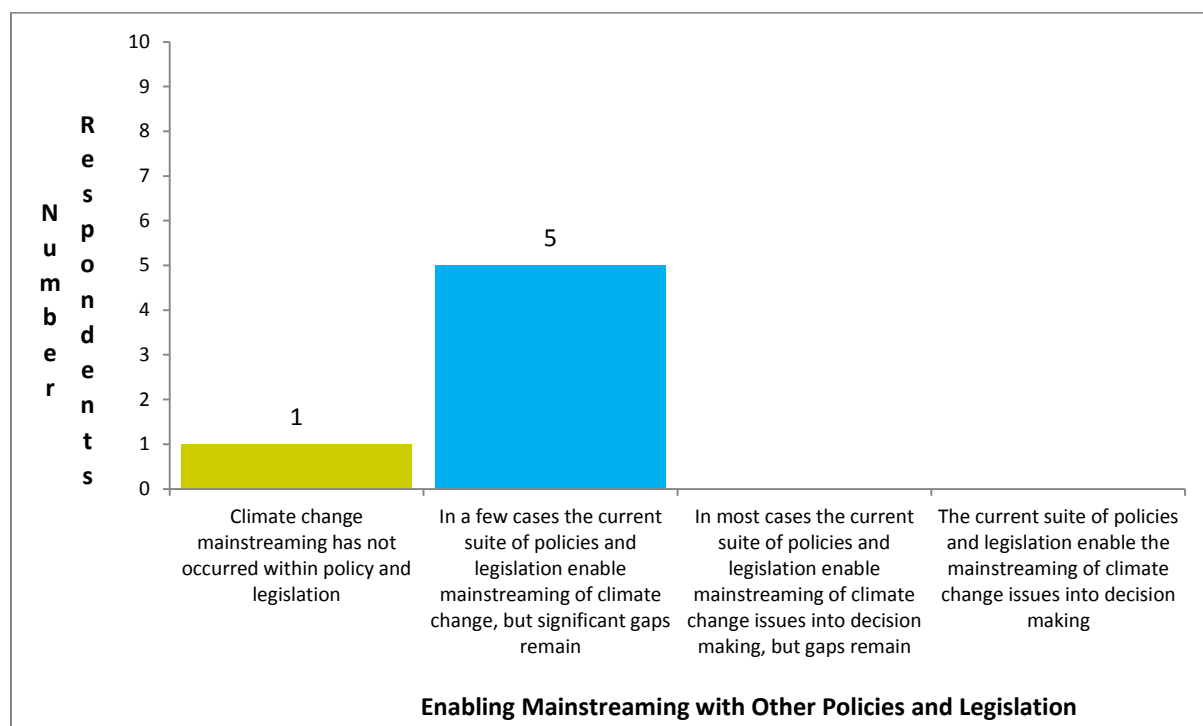
Figure 20: Does the current suite of policies and legislation for which the Conservation Authority's partners and collaborators have direct responsibility enable the mainstreaming of climate change issues into decision-making?



Question 31: Do other policies and legislation which the CA is subject to enable mainstreaming of climate change?

Overall, climate change has been mainstreamed into few policies and programs, but this is changing (Figure 21). For example, the Permit to Take Water Program is being modified, the MNRF has adjusted the Smallmouth Bass fishing season regulation, and the 2014 Provincial Policy Statement acknowledges the need to account for the effects of climate change.

Figure 21: Do other policies and legislation which the Conservation Authority is subject to enable mainstreaming of climate change?



Knowledge Management

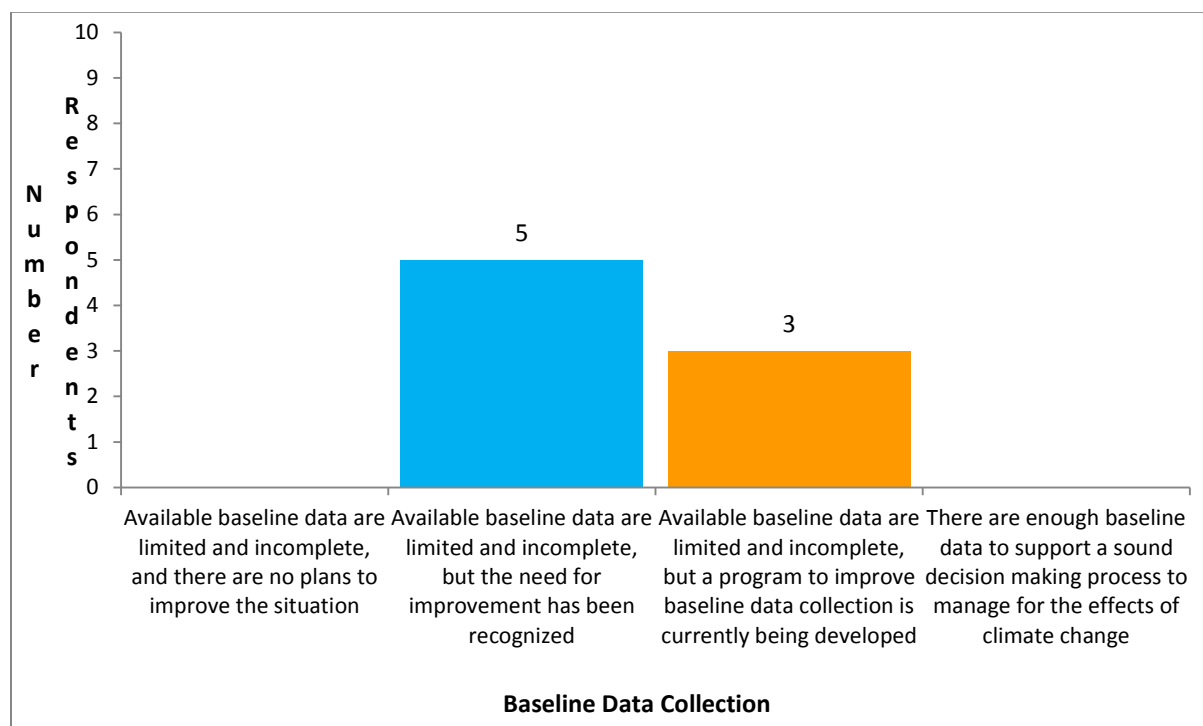
Knowledge management involves the gathering of knowledge through research, inventory, monitoring and assessment, and storage in user-friendly formats. A robust information management program is an important source of data and information for the development of climate model-scenario projections and species-habitat relationships, and for comparative analyses that support strategic decision-making.

Question 32: Are there enough baseline data to support a sound decision-making process to manage for the effects of climate change impacts?

Survey respondents indicated that baseline data programs require enhancement (Figure 22). Workshop participants raised several issues about data management including the cost of and access to data maintained by other agencies, the specific data required by MVCA staff for current programs and the challenge of integrating data into decision-making. The poor ratings in the on-line survey reflect a paucity of baseline data for a number of important ecological values. Workshop participants stated that new databases should build on existing databases for water levels, rainfall patterns and social conditions. The Ontario Government (e.g., the MNR) develops and uses Intensity-Duration-Frequency (IDF) curves and floodplain mapping to support

land use planning decisions affected by water levels. Unfortunately, funding for IDF curve calculations and floodplain maps remains an issue. Results from a Climate Change Adaptation Workshop in 2011⁵ suggest that the MNRF and CAs should update the IDF curves and floodplain maps based on the best available data and projections to help local decision-makers manage for changing ecological conditions.

Figure 22: Are there enough baseline data to support a sound decision-making process to manage for the effects of climate change impacts?

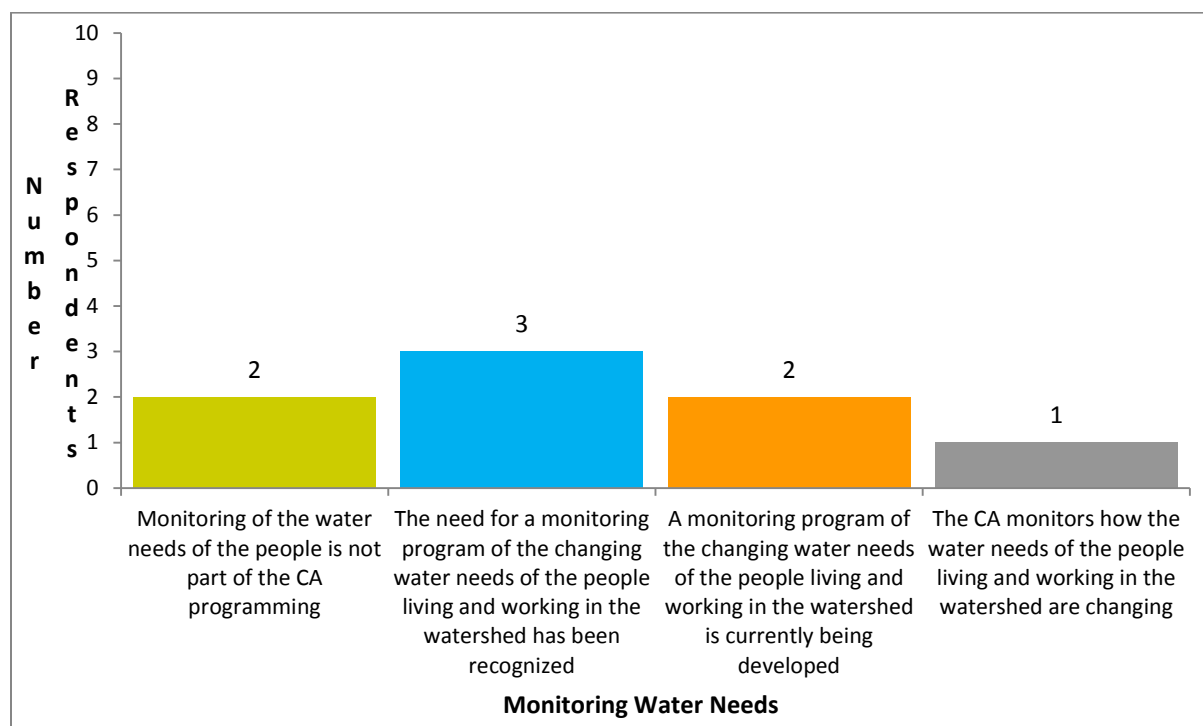


Question 33: Does the CA monitor how all of the water needs of people living and working in the watershed are changing?

Survey respondents provided a range of ratings in response to the question on water needs monitoring (Figure 28) and suggested that the question should have been split into two, one question focused on water quantity and the other on water quality. While workshop participants agreed that a low rating for monitoring of water needs is reasonable, they acknowledged that this is a sensitive and complex issue in the Mississippi River watershed. As a result, ‘water needs’ is another issue requiring further assessment as part of social values monitoring programs.

⁵ DuRocher, L. (2011)

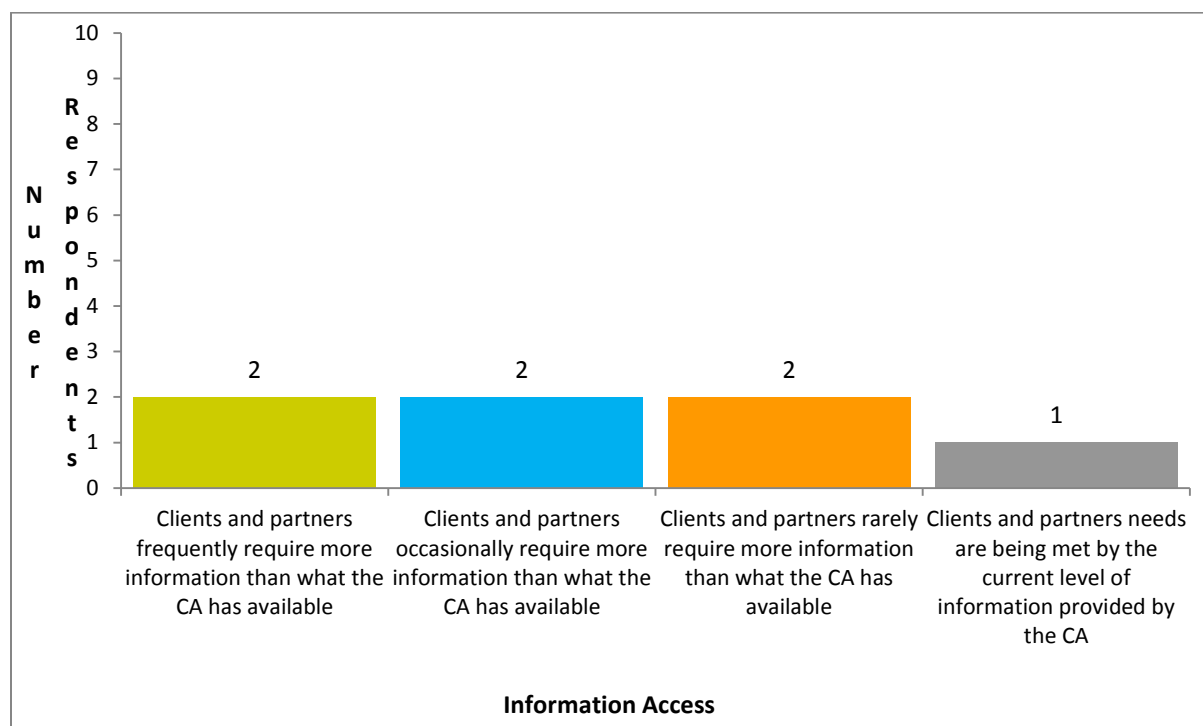
Figure 23: Question: Does the Conservation Authority monitor how all of the water needs of people living and working in the watershed are changing?



Question 34: Does the CA provide clients and partners access to its information management system?

Survey respondents provided a range of ratings, likely because of differences across program areas and a perceived disconnect between the question and rating scale options (Figure 24). Workshop participants indicated that the CA recognizes the importance of sharing information and recommended a higher rating for information sharing and data management programs because the CA does provide access to information and there are no intentional restrictions governing knowledge management practices.

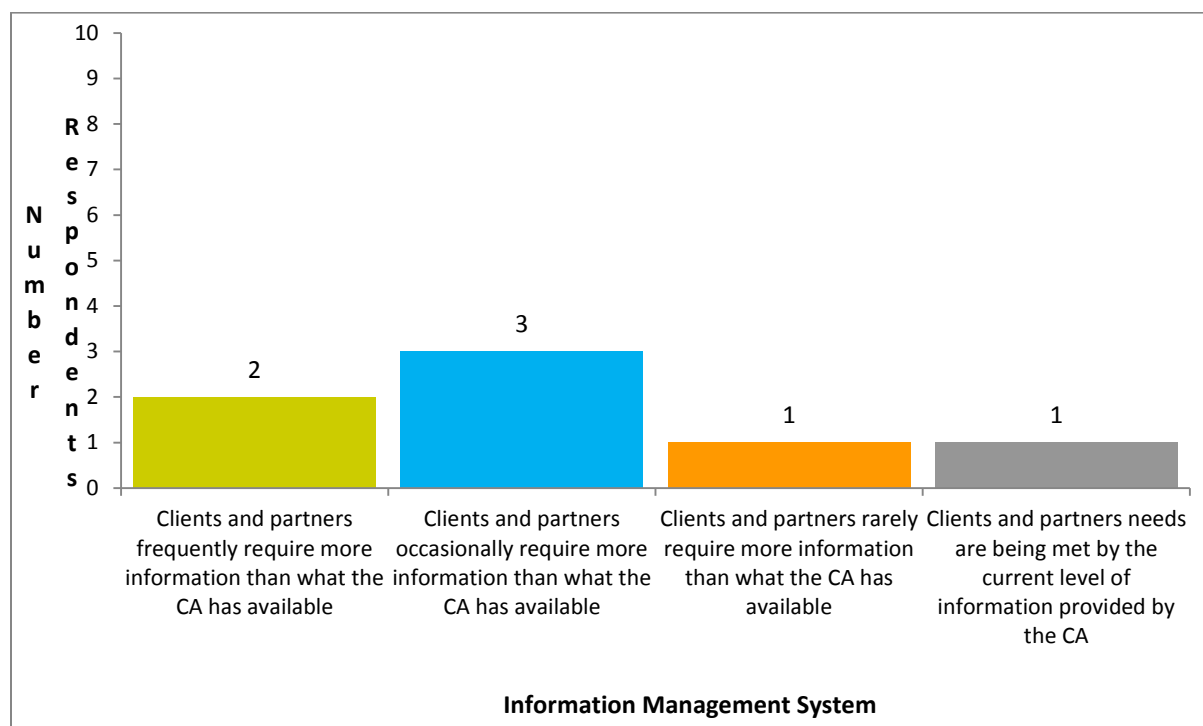
Figure 24: Does the Conservation Authority provide clients and partners access to its information management system?



Question 35: Does the CA's information management system meet client and partner needs?

Clients and partners can access data and information collected by the MVCA (Figure 25); however, there are times when the data being requested are not available in a format conducive to easy interpretation. Where possible, MVCA staff work to accommodate requests by converting data into more readily accessible formats. Information exchange, particularly related to water, in the Eastern Region of Ontario is good. Data sharing is easily completed by staff and with partner agencies, but enabling public access to data can be challenging due to issues related to data formats. Workshop participants agreed that the MVCA should be rated on the higher end of the scale for information sharing and data management because of its track record and the fact that there are no intentional restrictions limiting access.

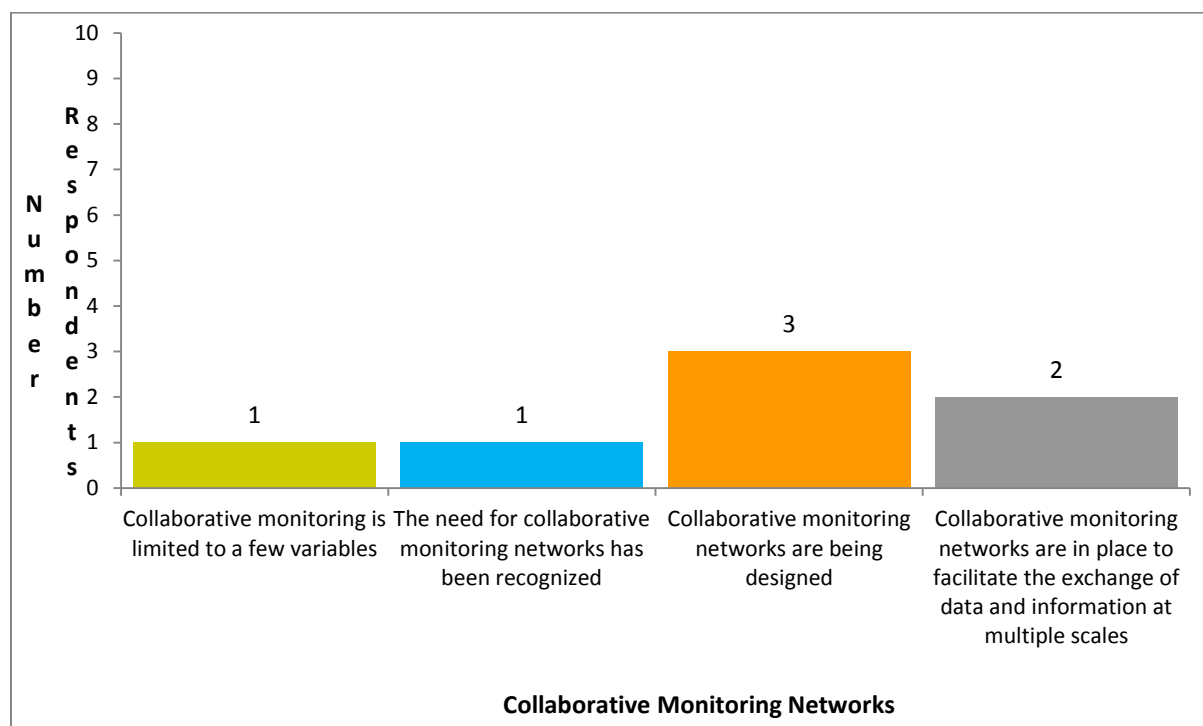
Figure 25: Does the Conservation Authority's information management system meet client and partner needs?



Question 36: Are collaborative monitoring networks in place to facilitate the exchange of data and information at multiple scales?

The MVCA participates in collaborative monitoring networks and data/information exchange programs (Figure 26). As a member of Conservation Ontario, the MVCA collects data using tools and techniques employed by other CAs. Beyond the CAs, the MNRF and the Ontario Ministry of the Environment and Climate Change (MOECC) do not share data easily; this is a barrier to decision-making. Conversely, the lower levels of government collaborate more with stakeholders to collect and exchange information in support of effective decision-making. In addition, some monitoring programs are being scaled back. For example, selected weather stations and other data collection points are being eliminated across the country by the federal government. In reality, current data collection and sharing is based on bottom-up, needs driven collaboration between the CA, stakeholders and local partners.

Figure 26: Are collaborative monitoring networks in place to facilitate the exchange of data and information at multiple scales?



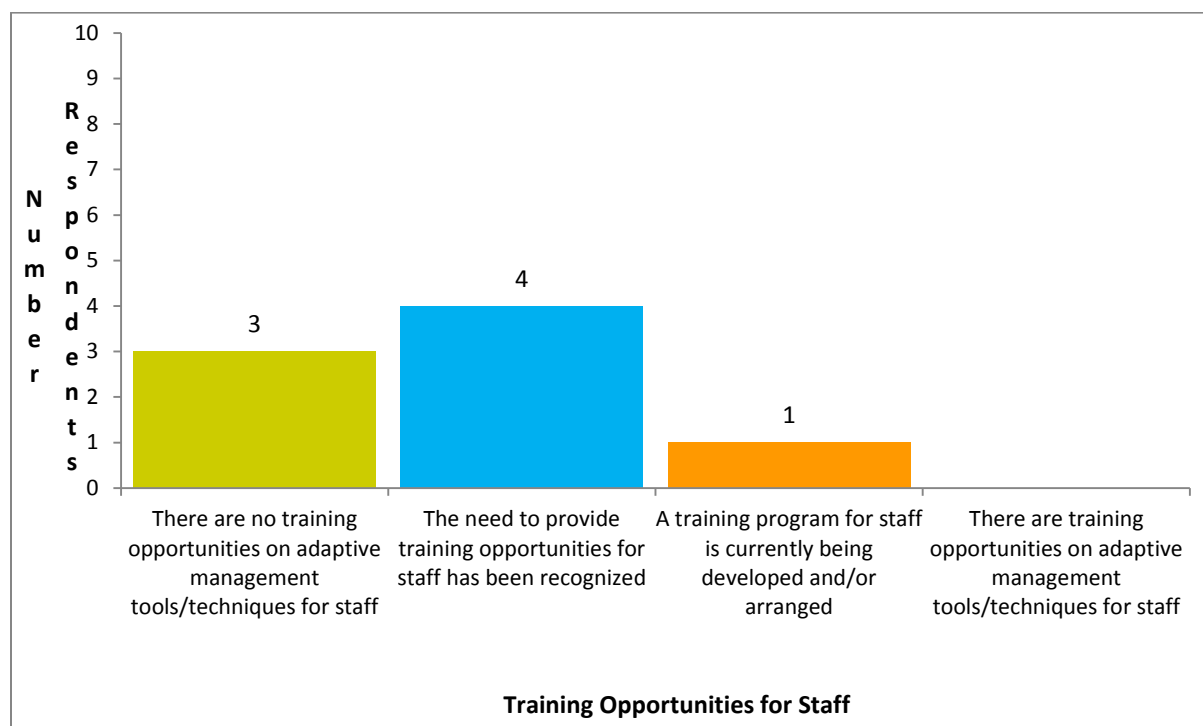
Knowledge Dissemination

Knowledge dissemination (or exchange) is the process of communicating and sharing knowledge. These activities include education, extension courses, and other types of outreach activities such as news releases, webinars, fact sheets, website information and face-to-face meetings.

Question 37: Are staff training opportunities, which focus on adaptive management tools/techniques to help with decision-making under great uncertainty, available?

While MVCA staff have developed a sound understanding of the fundamental effects and implications of climate change, formal training courses are either not available or are cost prohibitive in some sectors. Therefore, the capacity rating for training opportunities is low (Figure 27).

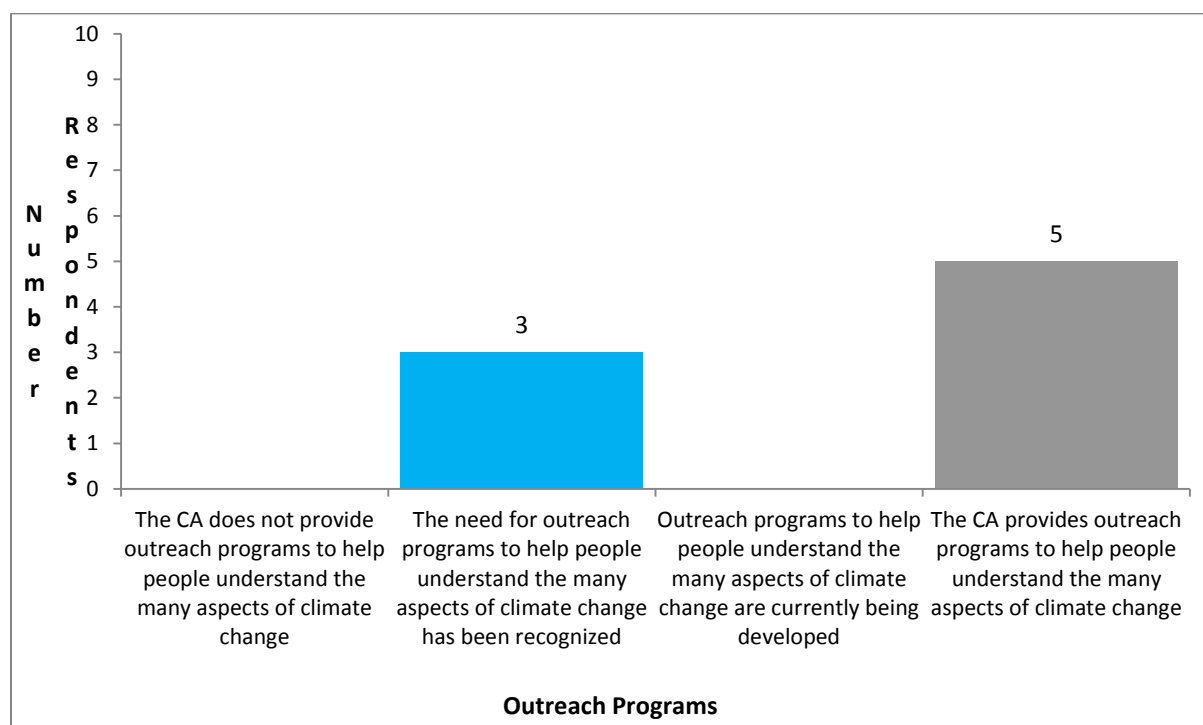
Figure 27: Are staff training opportunities, which focus on adaptive management tools/techniques to help with decision-making under great uncertainty, available?



Question 38: Does the CA provide outreach programs that help people understand the ethical, social, economic and ecological aspects of climate change to increase awareness and participation in decision-making?

Survey respondents indicated that staff and external partners recognize the range of high quality outreach programs provided by the MVCA (Figure 28). The divergent responses to this question resulted more from the inclusion of goals to ‘increase awareness’ and encourage ‘participation in decision-making’ than from concerns about program delivery. Typically, the MVCA sponsors outreach programs focused on ecological rather than social issues. Nevertheless, the MVCA has a good capacity to provide outreach programs that address a range of issues in the Mississippi Valley watershed.

Figure 28: Does the Conservation Authority provide outreach programs that help people understand the ethical, social, economic and ecological aspects of climate change to increase awareness and participation in decision-making?



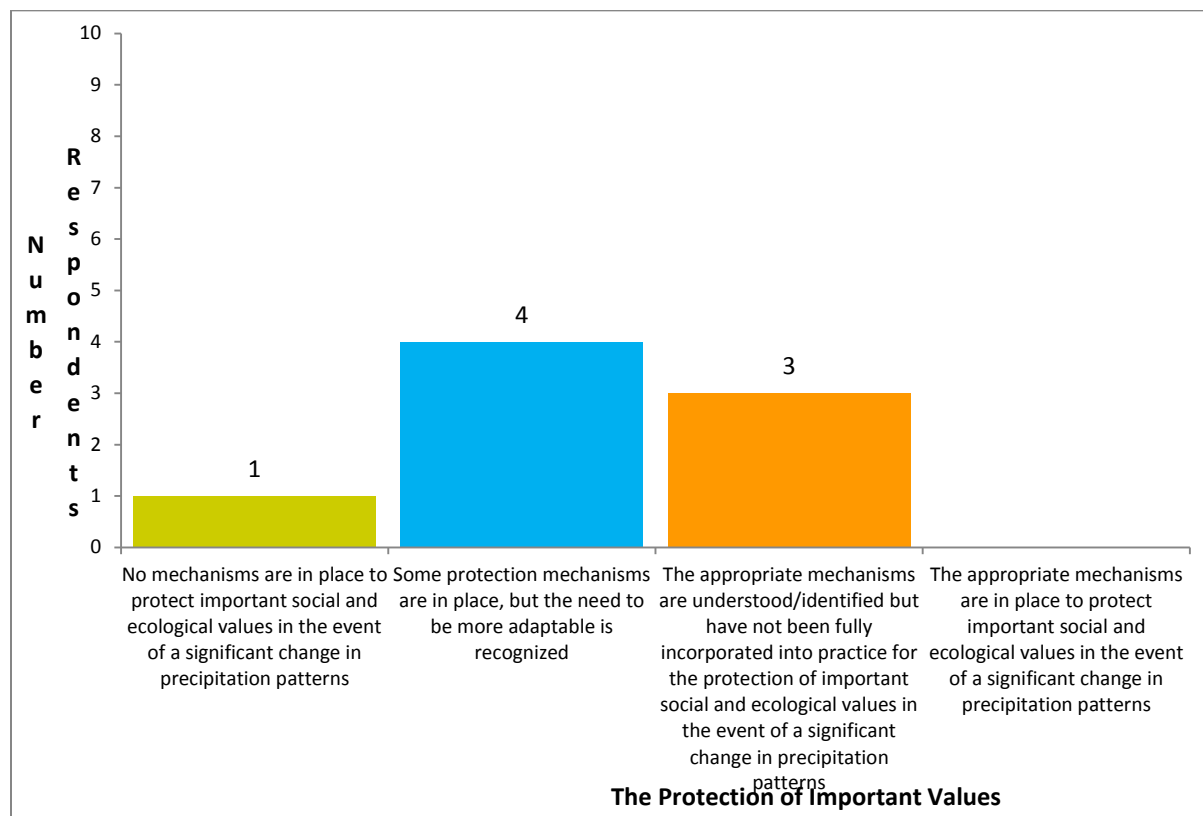
Operations/Implementation

This final determinant relates to the implementation of strategies, principles, policies and programs examined in previous sub-sections. Important concepts include the integration of adaptation options into operations and the tools and techniques to deliver, monitor, assess and adjust management decisions.

Question 39: Does the CA have appropriate mechanisms in place to protect important social and ecological values in the event of a significant change in precipitation patterns?

While some protection mechanisms for social and ecological values have been implemented by the MVCA, additional work is required (Figure 29). MVCA staff acknowledge that complete protection of all important values is not possible and that the nature of issues in the watershed demands a strong capacity for adaptation and flexibility to manage for varying seasonal and annual conditions that emerge. In addition, managing public expectations under varying circumstances is an ongoing challenge. MVCA staff are comfortable with the decision-making tools available to them and the organization's commitment to develop short- to long-term responses as needed. Workshop participants elected to rate the MVCA's capacity to protect important values higher than indicated by survey results.

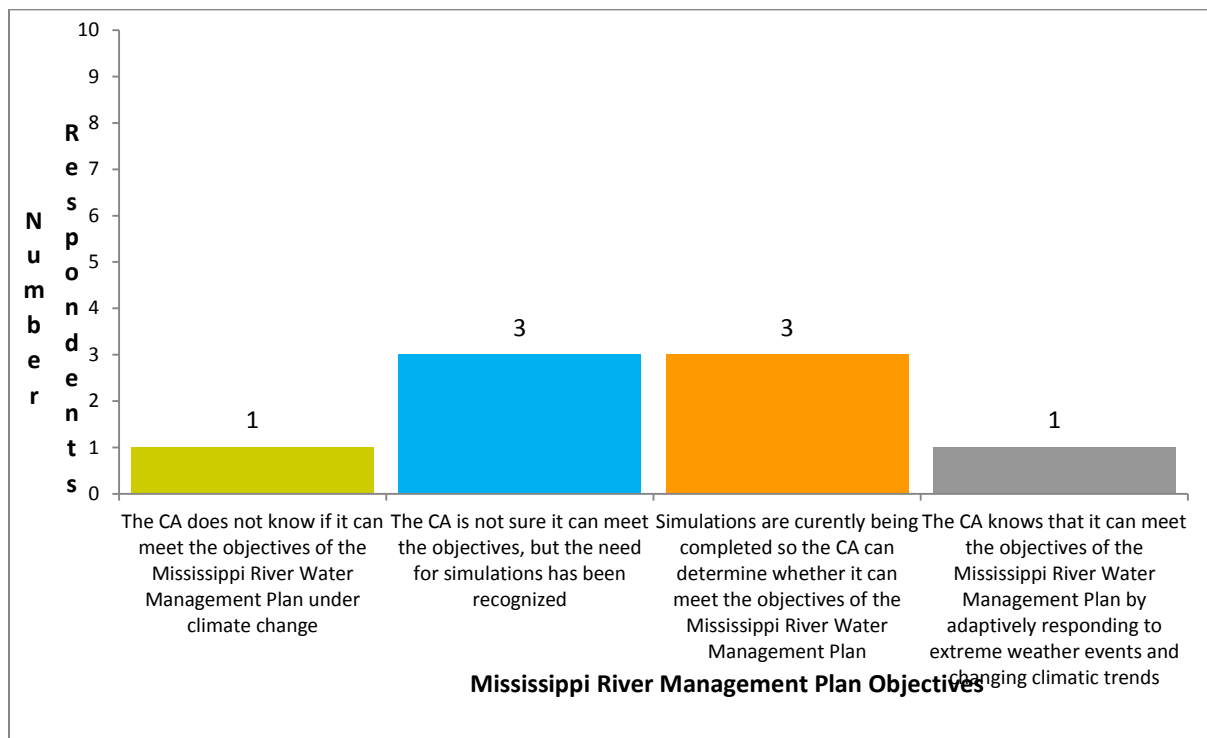
Figure 40: Does the Conservation Authority have appropriate mechanisms in place to protect important social and ecological values in the event of a significant change in precipitation patterns?



Question 40: Does the CA know if it can meet the objectives of the Mississippi River Water Management Plan by adaptively responding to extreme weather events and significant changes in climatic trends?

Survey respondents and workshop participants agreed that the MVCA's capacity to respond to extreme weather events and significant changes in climatic trends is medium to high (Figure 30). The MVCA recognizes the need for more computer simulations and to inform discussions about future actions to maintain or enhance its capacity to meet the objectives of the Water Management Plan.

Figure 30: Does the Conservation Authority know if it can meet the objectives of the Mississippi River Water Management Plan by adaptively responding to extreme weather events and significant changes in climatic trends?



APPENDIX 2. SURVEY: ORGANIZATIONAL READINESS IN CONSERVATION ORGANIZATIONS

Note: numbered values (blue text) correspond with the sections of the survey. These sections generally correspond with the determinants of adaptive capacity.

1. Respondent Information: How many years have you been involved in conservation or natural resources planning and management?

Within your current organization: _____ Career: _____

What best describes your current involvement in conservation or natural resources planning and management (please select all that apply):

Strategic planning

Legislation and policy development

Selection, evaluation and design of protected areas

Management direction

Operations and development (including recreation resource management)

Research, monitoring and reporting

Education, interpretation and outreach

Other (please identify):

Age range: (ENTER YEAR OF BIRTH HERE) _____

Please select your gender:

Male Female

What is the highest degree, certificate or diploma you have obtained? (choose 1)

No certificate, diploma or degree

Secondary (high) school diploma or certificate

Registered apprenticeship or trades certificate or diploma

College, CEGEP or other non-university certificate or diploma

University certificate or diploma below the bachelor level

University certificate or diploma or degree at bachelor's level

University degree above Bachelor's level (Master's)

University degree above Master's level (PhD)

What best describes your academic background and/or professional training (please select all that apply):

Natural sciences

Physical sciences

Social sciences

Business/Economics

Engineering

Humanities

Other:

Scale and Coding
<p>How concerned are you about the climate change issue? <i>(please check one)</i></p> <p>1 – Not at all concerned 2 – Slightly concerned 3 – Somewhat concerned 4 – Moderately concerned 5 – Extremely concerned</p> <p>To what extent do you agree or disagree with the statement: “I have personally experienced the effects of climate change.” <i>(please check one)</i></p> <p>1 – Disagree strongly 2 – Disagree a little 3 – Neither agree or disagree 4 – Agree a little 5 – Agree strongly</p> <p>If ‘Agree a Little’ or ‘Agree Strongly’:</p> <p>Changes to seasons (e.g., longer growing season, warmer shoulder seasons) Changes to weather/weather patterns Changes to water body levels (e.g., higher/lower water levels in lakes) Changes to water body temperatures (e.g., warmer water temperatures) Changes to populations of animal species (e.g., observing new species) Changes to populations of plant species (e.g., earlier flowering) Changes in snowfall (e.g., more/less snowfall) Changes in temperature (e.g., warmer temperatures) Changes in rainfall (e.g., more/less snowfall) Impacts on human health (e.g., heat stress) Increased drought occurrences More extreme weather events occurring Loss of ice cover, ice sheets, or glaciers Increased forest and/or grass fire occurrences Economic impacts</p>

Other:	
What type of impact do you believe climate change will have on the following: <i>(please check one box for each statement)</i> The overall ecological health in the Mississippi River Watershed The ability of the Mississippi River Watershed to support current wildlife populations The ability of the Mississippi River Watershed to support current plant populations The ecological function of the Mississippi River Watershed The enjoyment people get from visiting the Mississippi River Watershed The ability of the Mississippi River Watershed to support hydrological power generation	1 – Very negative impact 2 – Somewhat negative impact 3 – No impact 4 – Somewhat positive impact 5 – Very positive impact

2. Space

Have all of the important social and ecological values (e.g., wetlands, wildlife habitat, forests, recreational areas, parks, etc.) in the Mississippi watershed been mapped and described?

The important values have not been mapped and described	The important values have not been mapped and described, but the need has been recognized	Some of the values mapping and description is underway	The majority of important values are mapped and described
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3. Timeframe

Is the MVCA committed to short- to long-term monitoring programs needed to assess the condition of important social and ecological values as the climate changes?

There is no commitment to short- or long- term monitoring	There is short-term commitment to some monitoring programs, but no long-term commitment	The need for long-term monitoring has been acknowledged and is under development to complement the short-term monitoring programs implemented that already exist	Short and long-term monitoring programs are supported and
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Are ongoing outreach programs timed to address emerging issues and decision needs?

Outreach programs are not necessarily timed to provide information about emerging issues and decision needs	Outreach programs are not necessarily timed to provide information about emerging issues and decision needs, but the need has been recognized	A process to ensure that outreach programs are timed to support decision-making is being developed	All outreach programs are timed to support information about emerging issues and decision needs
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4. Principles

Do the over-arching organizational principles embraced by the MVCA enable an ongoing, iterative response to the effects of climate change?

There are no principles related to the effects of climate change.	The need to introduce principles that enable an ongoing, iterative response to the effects of climate change has been acknowledged	Some of the CA's organizational principles enable an ongoing, iterative response to the effects of climate change, but further reviews are needed	The current suite of organizational principles enables an ongoing, iterative response to the effects of climate change
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Is there an organizational principle(s) (or standard decision-making process) which informs conflict resolution?

No principle or standard informs conflict resolution	No principle or standard informs conflict resolution, but the need has been recognized	No principle or standard informs conflict resolution, but one is currently being developed	The CA employs a principle (or standard) to inform conflict resolution
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5. Values

Do any CA programs evaluate and report on the important social and ecological values in the Mississippi watershed?

The CA does not support programs that evaluate or report on the important social and ecological values	The CA supports programs that evaluate OR report on the important social and ecological values, but the evaluations are not regularly carried out	The CA regularly executes programs where evaluation OR reporting on the important social and ecological values are included	The CA regularly executes programs where evaluation AND reporting on the important social and ecological values are included
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Do MVCA programs assess how climate change affects important social and ecological values?

Important social and ecological values are only assessed on the basis of current conditions in the Mississippi watershed	Important social and ecological values are assessed on the basis of current conditions only, but the need to identify potential future effects of climate change has been recognized	Important social and ecological values are assessed on the basis of current conditions only, but models to identify potential future effects of climate change are being developed	Important social and ecological values are assessed for current conditions and models are used to identify potential future effects of climate change
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6. Trust

Given the possible need for rapid responses to the effects of climatic changes, and given the associated trade-offs often associated with decisions, do communities in the watershed trust the CA to make the necessary decisions?

There is little or no contact with the communities	The CA is connected to the community but there is a history of mistrust that has not been resolved	The CA is connected to the community and mistrust issues are being resolved	The CA is connected to and trusted enough by the communities in the watershed to make the necessary decisions
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7. Community Engagement

Does the CA provide an ongoing forum to ensure effective outreach and consultation?

The CA does not encourage ongoing outreach and consultation processes	The need for ongoing outreach and consultation processes has been recognized by the CA	Outreach and consultation processes are being developed by the CA	The CA provides an ongoing forum to ensure effective outreach and consultation
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8. Institutional Culture and Function

Does the CA practice adaptive governance that includes adaptive management?

Adaptive governance denotes the structures (e.g., program design) and processes (e.g., policies) that an organization uses to shape actions to attain the cultural, social, economic, and ecological conditions to which it aspires.

Adaptive management is a systematic process designed to increase the chances of making the right decisions in an ever-changing social and ecological context. Adaptive management is about learning while doing, and can involve learning through different combinations of experimentation and experience.

The CA does not employ adaptive governance that includes adaptive management	The need for adaptive governance and adaptive management has been recognized	Adaptive governance procedures are being explored, including a capacity for adaptive management	The CA employs adaptive governance that includes adaptive management
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Does the CA have sufficient financial resources to manage for the effects of climate change?

The CA does not have sufficient financial resources to manage for the effects of climate change	The CA has some financial resources to manage for the effects of climate change, but funding gaps remain	The CA has some financial resources to manage for the effects of climate change and is currently sourcing financing for identified gaps	The CA has sufficient financial resources to manage for the effects of climate change
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Does the CA have sufficient human resources (staff) to manage for the effects of climate change?

The CA does not have sufficient staff to manage for the effects of climate change	The CA retains some staff to manage for the effects of climate change, but gaps remain	The CA retains some staff to manage for the effects of climate change and plans to increase the staff complement in the near future	The CA retains sufficient staff to manage for the effects of climate change
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Does the CA's institutional structure and function provide for collaboration at multiple scales of decision making?

Examples of multiple scales include different levels of government, different mapping scales, and different time regimes

There is little organizational capacity for collaboration at multiple scales	There is some organizational capacity for collaboration at multiple scales in the CA, but little capacity for collaboration at multiple scales with external partners and clients	There is some organizational capacity for collaboration at multiple scales in the CA and with external partners and clients, and agreements with others are being modified	The CA is structured to work collaboratively at multiple scales in the CA and with external partners and clients
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Do the CA's collaborative arrangements optimize its capacity to manage for the effects of climate change?

Examples of collaborative arrangements include an agreement between partners to jointly collect data, to jointly develop and implement policy, to jointly sponsor outreach programs, and to share information.

None of the CA's collaborative arrangements enable work designed to manage for the effects of climate change	Some of the CA's collaborative arrangements enable work designed to manage for the effects of climate change, but gaps remain	Some of the CA's collaborative arrangements enable work designed to manage for the effects of climate change, and additional opportunities for collaboration are being actively pursued	The CA is engaged in a suite of collaborative agreements that enable an acceptable level of work to manage for the effects of climate change
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9. Leadership

Does the CA's leadership support the need to mainstream climate change into its programs?

Mainstreaming is the integration of climate change into policies, strategies, plans, and guidelines used by an organization to successfully meet its core business goals and objectives.

There is no support for mainstreaming	The need for mainstreaming has been acknowledged	The CA's leadership supports mainstreaming and has commissioned initiatives for some programs	The CA's leadership supports mainstreaming, which has been initiated for all CA programs
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10. Partnerships

Can current partnerships be used to enhance the CA's capacity to adapt to the effects of climate change?

Current partnerships cannot be used to enhance the CA's capacity to adapt to the effects of climate change	Some partnerships can enhance the CA's capacity to adapt to the effects of climate change, and the need to include climate change in future partnership agreements has been recognized	Some partnerships can enhance the CA's capacity to adapt, and others are being modified	Most partnerships can enhance the CA's capacity to adapt, climate change has been included in many of them, and will be included in new partnership agreements
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11. Strategic Planning

Does the CA subscribe to a strategic plan that recognizes the importance of adaptive governance, including adaptive management, to manage for the effects of climate change?

There is no strategic plan	The need for a strategic plan that addresses adaptive governance, including adaptive management has been recognized	A strategic plan that addresses adaptive governance, including adaptive management, is currently being developed	Adaptive governance, including adaptive management, is addressed in the CA's strategic plan
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If climate change is addressed in the strategic plan, does the language used match practices/activities within the CA?

The language of the strategic plan does not match practice/activities	A few of the strategies in the plan are being followed to actively manage for climate change	Most of the strategies in the plan are being followed to manage for climate change	The language of the strategic plan matches exactly how the CA carries out daily activities
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12. Policy and Legislation

Does the current suite of policies and legislation for which the CA has direct responsibility enable the mainstreaming of climate change issues into decision making?

Climate change mainstreaming has not occurred within policy and legislation	In a few cases the current suite of policies and legislation for which the CA has direct responsibility enable the mainstreaming of climate change issues into decision making, but significant gaps remain	In most cases the current suite of policies and legislation for which the CA has direct responsibility enable the mainstreaming of climate change issues into decision making, but gaps remain	The current suite of policies and legislation for which the CA has direct responsibility enable the mainstreaming of climate change issues into decision making
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Does the current suite of policies and legislation for which the CAs partners and collaborators have direct responsibility enable the mainstreaming of climate change issues into decision making?

Climate change mainstreaming has not occurred within policy and legislation	In a few cases the current suite of policies and legislation for which the CA's partners and collaborators have direct responsibility enable the mainstreaming of climate change issues into decision making, but significant gaps remain	In most cases the current suite of policies and legislation for which the CA's partners and collaborators have direct responsibility enable the mainstreaming of climate change issues into decision making, but gaps remain	The current suite of policies and legislation for which the CA's partners and collaborators have direct responsibility enable the mainstreaming of climate change issues into decision making
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Please list examples of specific policies and legislation that enable/inhibit mainstreaming of CC.

Do other policies and legislation which the CA is subject to enable mainstreaming of climate change?

Climate change mainstreaming has not occurred within policy and legislation	In a few cases the current suite of policies and legislation enable mainstreaming of climate change, but significant gaps remain	In most cases the current suite of policies and legislation enable the mainstreaming of climate change issues into decision making, but gaps remain	The current suite of policies and legislation enable the mainstreaming of climate change issues into decision making
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Please list examples of specific policies and legislation that enable/inhibit mainstreaming of CC.

13. Knowledge management

Are there enough baseline data to support a sound decision making process to manage for the effects of climate change impacts?

Available baseline data are limited and incomplete, and there are no plans to improve the situation	Available baseline data are limited and incomplete, but the need for improvement has been recognized	Available baseline data are limited and incomplete, but a program to improve baseline data collection is currently being developed	There are enough baseline data to support a sound decision making process to manage for the effects of climate change
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Does the CA monitor how all the water needs of people living and working in the watershed are changing?

Monitoring of the water needs of the people is not part of the CA programming	The need for a monitoring program of the changing water needs of the people living and working in the watershed has been recognized	A monitoring program of the changing water needs of the people living and working in the watershed is currently being developed	The CA monitors how the water needs of the people living and working in the watershed are changing
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Does the CA provide clients and partners access to its information management system?

The information management system is not accessible to clients and partners	The need to provide clients and partners access to the CA's information management system has been recognized	A procedure to provide clients and partners access to the CA's information management system is currently being developed	Clients and partners have access to the CA's information management system
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Does the CA's information management system meet client and partner needs?

Client and partners frequently require more information than what the CA has available	Clients and partners occasionally require more information than what the CA has available	Clients and partners rarely require more information than what the CA has available	Clients and partners needs are being met by the current level of information provided by the CA
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Are collaborative monitoring networks in place to facilitate the exchange of data and information at multiple scales?

Collaborative monitoring is limited to a few variables	The need for collaborative monitoring networks has been recognized	The need for collaborative monitoring networks has been recognized	Collaborative monitoring networks are in place to facilitate the exchange of data and information at multiple scales
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14. Knowledge Dissemination

Are staff training opportunities, which focus on adaptive management tools/techniques to help with decision-making under great uncertainty, available?

There are no training opportunities on adaptive management tools/techniques for staff	The need to provide training opportunities for staff has been recognized	A training program for staff is currently being developed and/or arranged	There are training opportunities on adaptive management tools/techniques for staff
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Does the CA provide outreach programs that help people understand the ethical, social, economic and ecological aspects of climate change to increase awareness and participation in decision making?

The CA does not provide outreach programs to help people understand the many aspects of climate change	The need for outreach programs to help people understand the many aspects of climate change has been recognized	Outreach programs to help people understand the many aspects of climate change are currently being developed	The CA provides outreach programs to help people understand the many aspects of climate change
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15. Operations (implementation)

Does the CA have appropriate mechanisms in place to protect important social and ecological values in the event of a significant change in precipitation patterns?

No mechanisms are in place to protect important social and ecological values in the event of a significant change in precipitation patterns	Some protection mechanisms are in place, but the need to be more adaptable is recognized	The appropriate mechanisms are understood/identified but have not been fully incorporated into practice for the protection of important social and ecological values in the event of a significant change in precipitation patterns	The appropriate mechanisms are in place to protect important social and ecological values in the event of a significant change in precipitation patterns
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Does the CA know if it can meet the objectives of the Mississippi River Water Management Plan by adaptively responding to extreme weather events and significant changes in climatic trends?

The CA does not know if it can meet the objectives of the Mississippi River Water Management Plan under climate change

The CA is not sure if it can meet the objectives, but the need for simulations has been recognized

Simulations are currently being completed so the CA can determine whether it can meet the objectives of the Mississippi River Water Management Plan

The CA knows that it can meet the objectives of the Mississippi River Water Management Plan by adaptively responding to extreme weather events and changing climatic trends

APPENDIX 3. WORKSHOP #1 AGENDA

February 21, 2014

Mississippi Valley Conservation Authority
10970 Highway 7, Carleton Place, ON K7C 3P1

Context and Objectives

In support of the MVCA's commitment to manage for climate change, the February 21 workshop is part of a pilot project to engage staff in an exploration of the CA's capacity to manage for the effects of changing temperature and precipitation patterns. Workshop objectives include:

- To confirm the importance of an adaptive approach when managing for the effects of climate change.
- To talk about the concept of organizational readiness.
- To review the results of the survey completed by staff to assess the readiness of the Conservation Authority to adaptively manage for the ecological and socio-economic changes in the Mississippi Valley Watershed that result from climate change.
- To discuss the MVCA's organizational strengths and weaknesses to manage for climate change.
- To discuss the threats and opportunities presented by climate change.
- To explore recommendations and priorities going forward.

Time	Agenda Item	Lead
8:40 a.m. to 8:50 a.m.	Welcome and Introduction	Paul Lehman – MVCA
8:50 a.m. to 9:05 a.m.	Introductions	Al Douglas – OCCIAR
9:05 a.m. to 9:30 a.m.	Project History, Context and Background Reference Document	Gary Nielsen – MNR Paul Gray – MNR Al Douglas - OCCIAR
9:30 a.m. to 9:45 a.m.	Survey Results – Overview	Heather Stager – Wilfrid Laurier University
9:45 a.m. to 11:55a.m.	Survey Results and Discussion	Heather Stager – WLU Al Douglas - OCCIAR
11:55am to 12:05pm	Conclusions and Next Steps	Gary Nielsen - MNR
12:05 pm to 12:10 pm	Closing Remarks	Paul Lehman - MVCA
12:10 pm to 12:40 pm	Lunch	All

APPENDIX 4. WORKSHOP #2 AGENDA

March 28, 2014

Mississippi Valley Conservation Authority
10970 Highway 7, Carleton Place, ON K7C 3P1

Context and Objectives

In support of the MVCA's commitment to manage for climate change, the March 28 workshop is part of a pilot project to engage staff in an exploration of the CA's capacity to manage for the effects of changing temperature and precipitation patterns. Workshop objectives include:

- To review the results from the Organizational Readiness Assessment Survey, including the web diagram
- To allow MVCA staff the opportunity to clarify results and ask questions about the assessment process or the MVCA results
- To outline and specifically describe the strengths and weaknesses of MVCA
- To identify priority areas for MVCA to give attention to moving forward to build adaptive capacity
- To explore actions required to allow MVCA to develop and foster adaptive capacities
- To outline short, medium and long term actions for improving or maintaining MVCA's adaptive capacity to manage for climate change.

Time	Agenda Item	Lead
9:00 am to 9:05 am	Welcome	Paul Lehman – MVCA
9:05 am to 9:10 am	Introductions	Al Douglas – OCCIAR Paul Gray - MNR
9:10 am to 9:25 am	Survey results and Web Diagram Review	Heather Stager – Wilfrid Laurier University
9:25 am to 10:40 am	Group exercise: Determination of Strengths and areas of Improvement for MVCA	All
10:40 am to 10:50 am	BREAK	
10:50am to 11:55 pm	Create a Short list of Priorities and Identify Short/Medium/Long term Actions	Al Douglas - OCCIAR Heather Stager – WLU
11:55 am to 12:15 am	Further Discussion and Questions	Al Douglas – OCCIAR

12:15 pm to 12:30 pm	Conclusions and Closing Remarks	Gary Nielsen – MNR Paul Lehman - MVCA
12:30 to 1:00 pm	Lunch	All

APPENDIX 5: REVISIONS TO SURVEY QUESTIONS FOLLOWING THE PILOT APPLICATION

Minor adjustments to the wording of the questions were suggested during the first application of the survey. Below you will see first the presentation of the questions used during the pilot study with Mississippi Valley Conservation Authority (**in bold**), followed by the recommended edited question.

Edit 1: Social and Ecological values need to be examined in separate questions

The following questions should have been split into two questions, one asking about ecological values and a second focused solely on social values (the scales would be adjusted to match).

11. Have all of the important social and ecological values (e.g., wetlands, wildlife habitat, forests, recreational areas, parks, etc.) in the Mississippi watershed been mapped and described?

Have all of the important social values (e.g., recreational areas, parks, etc.) in the Mississippi watershed been mapped and described?

Have all of the important ecological values (e.g., wetlands, wildlife habitat, forests etc.) in the Mississippi watershed been mapped and described?

16. Do any CA programs evaluate and report on the important social and ecological values in the Mississippi watershed?

Do any CA programs evaluate and report on the important social values in the Mississippi watershed?

Do any CA programs evaluate and report on the important ecological values in the Mississippi watershed?

17. Do MVCA programs assess how climate change affects important social and ecological values?

Do MVCA program assess how climate change affects important social values?

Do MVCA program assess how climate change affects important ecological values?

39. Does the CA have appropriate mechanisms in place to protect important social and ecological values in the event of a significant change in precipitation patterns?

Does the CA have appropriate mechanisms in place to protect important social values in the event of a significant change in precipitation patterns?

Does the CA have appropriate mechanisms in place to protect important ecological values in the event of a significant change in precipitation patterns?

Edit 2: Questions with recommended changes in wording or the rating scales

13. Are ongoing outreach programs timed to address emerging issues and decision needs?

Outreach programs are not necessarily timed to provide information about emerging issues and decision needs	Outreach programs are not necessarily timed to provide information about emerging issues and decision needs, but the need has been recognized	A process to ensure that outreach programs are timed to support decision-making is being developed	All outreach programs are timed to support information about emerging issues and decision needs
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Amendment: Does the CA have the capacity to carry out public outreach programs and deal with public concerns?

The CA employs an approach to outreach that focuses on sharing changes to their own operations and their capacity to deal with concerns varies by issue	The CA has a good capacity for carrying out public outreach programs and can deal with some public concerns as they relate to the CAs own activities	The CA has an strong capacity for carrying out public outreach programs and deals with public concerns on a variety of issues related to the CAs own activities	The CA has developed a public outreach program that responds to public concerns proactively while timing outreach to emerging and sensitive issues
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18. Given the possible need for rapid responses to the effects of climatic changes, and given the associated trade-offs often associated with decisions, do communities in the watershed trust the CA to make the necessary decisions?

Amendment: Given the possible need for rapid response to the changes in weather and changes in season, and given the associated trade-offs often associated with decision making, do communities in the watershed trust the CA to make appropriate decisions?

26. Can current partnerships be used to enhance the CAs capacity to adapt to the effects of climate change?

Current partnerships cannot be used to enhance the CA's capacity to adapt to the effects of climate change	Some partnerships can enhance the CA's capacity to adapt to the effects of climate change, and the need to include climate change in future partnership agreements has been recognized	Some partnerships can enhance the CA's capacity to adapt, and others are being modified	Most partnerships can enhance the CA's capacity to adapt, climate change has been included in many of them, and will be included in new partnership agreements
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Amendment: Can the CAs current approach to partnerships be used to enhance their capacity to adapt to the effects of climate change?

The CAs current approach to partnerships cannot be used to enhance the CA's capacity to adapt to the effects of climate change	The CAs encourages a collaborative approach to partnerships but the capacity to adapt to climate change is not a guiding factor	The CA encourages a collaborative approach to partnerships and climate change is sometimes a guiding factor	The CA employs a collaborative approach to partnerships and the need to work with partners in order to effectively adapt to climate change is well established
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29. Does the current suite of policies and legislation for which the CA has direct responsibility enable the mainstreaming of climate change issues into decision making?

Amendments: Does the CA link decision making to the policy and policy tools for which it has direct responsibility?

Do the policy and policy tools for which the CA has direct responsibility enable the mainstreaming of climate change?

30. Does the current suite of policies and legislation for which the CAs partners and collaborators have direct responsibility enable the mainstreaming of climate change issues into decision making?

31. Do other policies and legislation which the CA is subject to enable mainstreaming of climate change?

32. Are there enough baseline data to support a sound decision making process to manage for the effects of climate change impacts?

Available baseline data are limited and incomplete, and there are no plans to improve the situation	Available baseline data are limited and incomplete, but the need for improvement has been recognized	Available baseline data are limited and incomplete, but a program to improve baseline data collection is currently being developed	There are enough baseline data to support a sound decision making process to manage for the effects of climate change
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Amendment: Are the existing baseline data appropriately incorporated into decision making on the management of climate change impacts?

Available baseline data are limited and incomplete so they cannot be incorporated into decision making related to the management of climate change impacts	Available baseline data are limited and incomplete, but the need for improvement has been recognized in order to incorporate data into decision making	Available baseline data are limited and incomplete, but a program to improve baseline data collection is currently being developed in order to incorporate data into decision making	Existing baseline data are appropriately incorporated into decision making on the management of climate change impacts
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34. Does the CA provide clients and partners access to its information management system?

The information management system is not accessible to clients and partners	The need to provide clients and partners access to the CA's information management system has been recognized	A procedure to provide clients and partners access to the CA's information management system is currently being developed	Clients and partners have access to the CA's information management system
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Amendment: Does the CA provide clients and partners access to its information management system?

The CA cannot provide clients and partners access to its information management system because of the storage format	The CA can provide clients and partners access to some of its information management system but the data is only available in limited formats	The CA provides clients and partners access to its information management system and assists in some cases to make it available in accessible formats	The CA information management system is fully accessible to all clients and partners
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