

Appendix 4 Adaptation Strategies

Below are adaptation strategies based on input from a series of five stakeholder meetings. These strategies can be implemented to help increase the health and resilience of coastal ravine systems to current and future changes in climate in the Chicago Wilderness region. These actions are meant to represent a suite of climate-informed ravine conservation practices that can be used as the basis to develop a coordinated landscape scale management approach intended to achieve the land management goal of “Restoring ecological functions and environmental conditions that results in habitat for the unique assemblage of highly diverse floristic and faunal communities associated with coastal ravines”. Many of these actions are near-term, representing actions that can be taken within the next 5 years. Some of the actions can be taken by individual organizations, while others are actions best achieved through coordinated efforts; which means an organization will need to step up to help lead and coordinate multiple other organizations and jurisdictions. In terms of the collection of any baseline data, it is vital that efforts be implemented in a way that not only achieves a long-term monitoring goal, but also connects whether and how the observed information and trends are related to climate stressors, so this data can be used to continually inform and refine adaptation strategies designed to mitigate climate impacts to the ravine system.

Stormwater	Stakeholder Comments & Commitments	% of webinar votes
<p>Individual Jurisdictions Address upstream stormwater impacts and implement projects and policies designed to divert stormwater away from the central sewers. This requires first using spatial analysis to delineate the drainage basin of a ravine, then identifying specific parcels where implementation of low-impact development strategies will have the biggest impact, and then conducting outreach to the owners of these key parcels to secure commitments from a sufficient number to implement best management practices designed to hold and filter water, either to ensure it infiltrates into the ground water, or is released cleanly and slowly to the closest receiving body of water.</p> <hr/> <p>Review and ensure municipal land use and zoning codes reflect low impact development strategies that protect riparian corridors (i.e. the ravines and shoreline) and mitigate runoff from impervious surfaces (e.g. parking lots, roads, sidewalks, driveways, roofs).</p> <hr/> <p>Determine if the implementation of the low impact development strategies that address stormwater impacts help communities meet MS4 and NPDES permit requirements, and advocate for this if needed.</p>	<p>Top management priority, because without addressing upstream impacts no conservation efforts will be effective, this includes both engineered bank and bed stabilization projects in addition to any habitat restoration projects.</p>	<p>4%</p>
<p>Coordinated Jurisdictions Identify a handful of model ravines with smaller drainage basins where a sufficient number of private and public property owners can implement stormwater BMP's on their land, secure their commitments, and secure funding for implementation. This process will require delineation of drainage basins, analysis of which properties and BMP's will have the biggest impact, outreach, and grant writing.</p>	<p>Top management priority, because without addressing upstream impacts no conservation efforts will be effective, this includes both engineered bank and bed stabilization projects in addition to any habitat restoration projects.</p>	<p>25%</p>

Coordinate with regulators (e.g. IEPA, US ACE) to ensure permitting standards for any permits needed to implement upstream stormwater BMPs align with and support ravine conservation goals.

Water Quality		Stakeholder Comments & Commitments	% of webinar votes
Individual Jurisdictions	Monitor water quality during and immediately after storm events and major thaw in winter in outfalls.	Top data collection priority.	17%
Coordinated Jurisdictions	Coordinate the collection of water quality data, determine when we need actual measurements vs. modeling; bring public health officials into the conversation, e.g. Illinois Coastal Management Program, IL EPA, Stormwater Management Commission, and Lake County Public Health officials.	Top data collection priority.	8%
Habitat		Stakeholder Comments & Commitments	% of webinar votes
Individual Jurisdictions	Continually ID, report and map existing and new invasive species on <i>public</i> lands using regional invasive species resources (e.g. Northeast Illinois Invasive Plant Partnership, New Invaders Program, Plants of Concern Program, etc.).	Top data collection priority. There is already good data for public lands, but there is a need to get more partners involved.	46%
Individual Jurisdictions	Continually ID, report and map existing and new invasive species on <i>private</i> lands using regional invasive species resources (e.g. Northeast Illinois Invasive Plant Partnership, New Invaders Program, Plants of Concern Program, etc.).	Top data collection priority. There is very little information about private lands, and building a program around this is a top priority.	
Individual Jurisdictions	Implement tree thinning and selective tree replacement goals for light management to increase species and structural diversity and maintain functionality.	Some individual landowners are already doing this, like Openlands, Forest Preserves, Park District of Highland Park.	29%
Coordinated Jurisdictions	Scale-up monitoring of plant communities, especially trends over time, in indicator ravines using existing plots to map community of plants in relationship to specific tree species and invasive species.	There are partners and locations where this is happening, the methodology needs to be summarized and shared with others, and especially those that manage model ravines.	46%
Coordinated Jurisdictions	Develop a regional seed source policy to promote interagency seed sharing. Important considerations include: evaluating existing public and non-profit growing capacity, exploring the pros and cons of using private sector professional growing services, and evaluating the feasibility for volunteers to assist with seed collection.	Top management priority, and Lake County Forest Preserves is committed to helping lead, goal is genetic diversity and ensuring ravine genotypes are available for conservation.	38%
Coordinated Jurisdictions	When implementing tree thinning and tree replacement goals, consider regional efforts (e.g. <i>Chicago Wilderness Urban Forest Adaptation Project</i>) that model tree species vulnerability, to help identify and select tree and woody plants species.		

p) Other:				
q) Other:				

15. In the past 3 years, who (*person*) gave you information about climate change impacts and how frequently? You don't need to fill in all blanks.

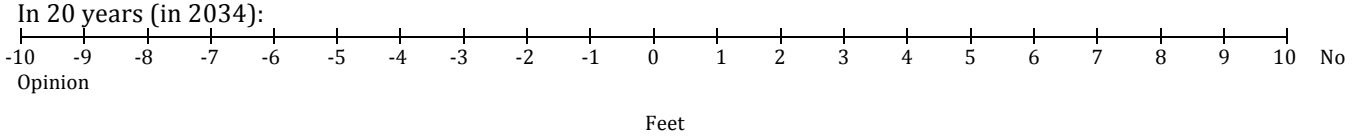
	Yearly	Monthly	Weekly	Daily
a)				
b)				
c)				
d)				
e)				
f)				
g)				
h)				
i)				
j)				

16. In the past 3 years, please list who (*person*) you have collaborated with on ravine management and indicate Yes or No for each type of collaboration. For example, if you shared data with John Smith, did not financially support him, partnered with him on a project and provided letter(s) of support, your data would look like this. You don't need to fill in all blanks.

	Shared Data	Financially Supported	Partnered on a Project	Provided a Letter of Support
a) <i>Example: John Smith</i>	Yes	No	Yes	Yes
b)				
c)				
d)				
e)				
f)				
g)				
h)				
i)				
j)				

The Great Lakes and Climate Change Adaptation

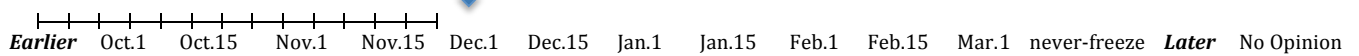
17. How do you think lake levels will change in the Great Lakes compared to what they are right now? Please indicate your answers in feet on the lines below (WHOLE NUMBERS ONLY). Please answer to the best of your knowledge.



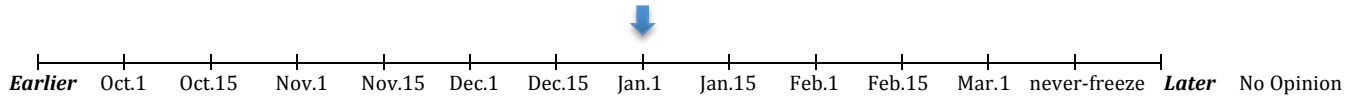
18. Think about the transition from fall to winter, how will the timing of the *first freeze* change for Lake Superior and the lower Great Lakes (Lakes Michigan, Huron, Erie, and Ontario) in the next 20 years? By *first freeze*, we mean that ice is mostly present on the near-shore surface of the lake. Please indicate your answers on the lines below (WHOLE NUMBERS ONLY). Please answer to the best of your knowledge.

The arrows are placed to indicate the current timing of the *first freezes*. *

Lake Superior:



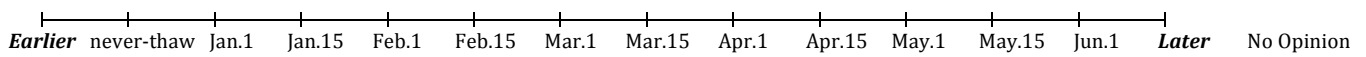
Lower Great Lakes (Lakes Michigan, Huron, Erie, and Ontario):



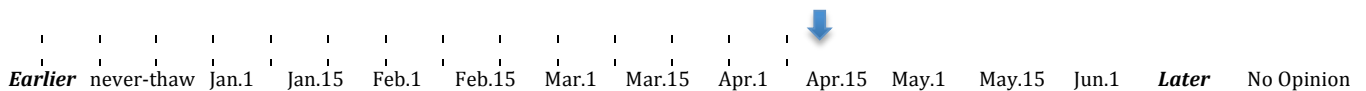
19. Think about the transition from winter to spring, how will the timing of the *first thaw* change for Lake Superior and Lake Erie in the next 20 years? By *first thaw*, we mean that ice is mostly gone from the near-shore surface of the lake. Please indicate your answers on the lines below (WHOLE NUMBERS ONLY). Please answer to the best of your knowledge.

The arrows are placed to indicate the current timing of the first thaws. *

Lake Superior:



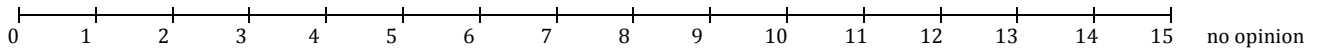
Lower Great Lakes (Lakes Michigan, Huron, Erie, and Ontario):



*National Climatic Data Center's Global Historical Climate Network-Daily Observational Dataset

20. Think about the freeze thaw cycles within a season (e.g. snow storm followed by complete melt of snow cover). How many land freeze thaw cycles do you expect to occur on average in northern Illinois and southern Wisconsin in January of 2034 (in 20 years)? Please indicate your answers on the line below (WHOLE NUMBERS ONLY). Please answer to the best of your knowledge.

Number of land freeze-thaw cycles in northern Illinois and southern Wisconsin in January of 2034 (in 20 years):



21. From what sources do you most frequently get information about lake levels? Please list names of specific documents/websites. You don't need to fill in all blanks.

	Name of source
Document 1	
Document 2	
Document 3	
Document 4	
Document 5	
Website 1	
Website 2	
Website 3	
Website 4	
Website 5	

22. From what sources do you most frequently get information about freeze thaw cycles? Please list names of specific documents/websites. You don't need to fill in all blanks.

	Name of source
Document 1	
Document 2	
Document 3	
Document 4	
Document 5	
Website 1	
Website 2	
Website 3	
Website 4	
Website 5	