

Prepared by the Northwestern Indiana Regional Planning Commission for the Indiana Department of Natural Resources Lake Michigan Coastal Program.

INDIANA COASTAL WATERSHED HAZARDS RESILIENCY

A COMMUNITY SELF-ASSESSMENT TOOL



A Local Government-Based
Self-Assessment Tool



Summary Report
2024

ACKNOWLEDGMENTS

The Northwestern Indiana Regional Planning Commission (NIRPC) prepared this report for the Indiana Department of Natural Resources Lake Michigan Coastal Program (LMCP). Funding was provided by the Indiana LMCP and the National Oceanic and Atmospheric Administration, Office for Coastal Management under Grant # NA21NOS4190081.

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Local Government Authorities (LGAs)

| | |
|------------------------|---------------------------|
| Town of Beverly Shores | Town of Merrillville |
| Town of Chesterton | City of Michigan City |
| Town of Dune Acres | Town of New Chicago |
| City of East Chicago | Town of Ogden Dunes |
| City of Gary | City of Portage |
| Town of Griffith | Town of Porter |
| City of Hammond | Town of Pottawatomie Park |
| Town of Highland | Town of Schererville |
| City of Hobart | City of Valparaiso |
| Lake County | City of Whiting |



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EXECUTIVE SUMMARY

The Northwestern Indiana Regional Planning Commission (NIRPC) was contracted by the Indiana Department of Natural Resources Lake Michigan Coastal Program (LMCP) to develop a coastal resiliency community self-assessment tool for Northwest Indiana coastal local government authorities (LGAs) and to support LGAs in completing the self-assessment. The Indiana Coastal Watershed Hazards Resiliency Needs Self-assessment is available as a fillable PDF or printable Word document on NIRPC's website at [Natural Hazards Resiliency Needs Assessment - NIRPC](#).

The self-assessment is intended to help LGA (municipal and county) staff and decision-makers of Indiana coastal watershed communities evaluate the potential impacts of natural hazards and consider planning and mitigation actions to increase resilience. It consists of two parts:

Part 1: Identifying Coastal Watershed Hazard Risks - This tool helps LGAs prioritize hazard issues (coastal flooding, riverine flooding, coastal erosion, fluvial erosion, lake level change, and coastal storms) in by rating their perceived probability, impact, and preparedness.

Part 2: Resilient Practices Questionnaire - A series of questions to help identify common planning and mitigation actions LGAs can implement to address coastal watershed hazard issues. Part 2 includes:

- Understanding Coastal Hazard Impacts
- Hazard Mitigation Planning
- Local Government Planning
- Local Ordinances
- Implementing Best Practices
- Public Education and Engagement
- Shoreline and Fluvial Erosion Protection
- Stormwater Management
- Natural Areas, Open Space, and Public Access
- Marinas

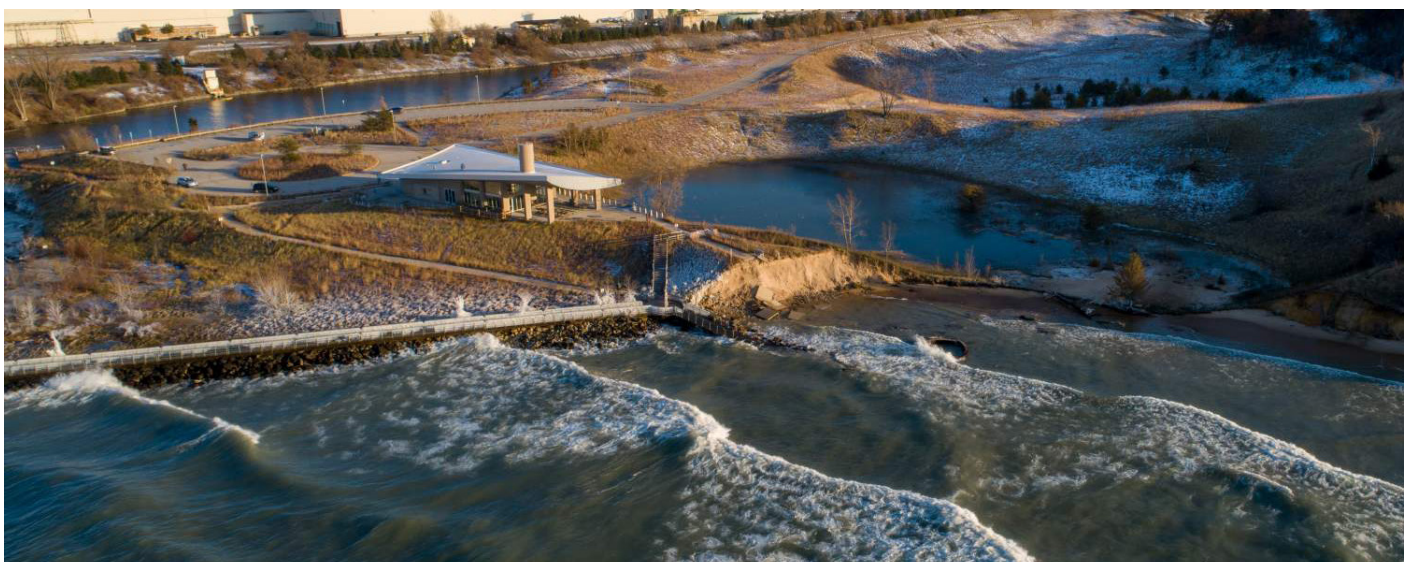
NIRPC held one or more listening sessions with 27 of the 34 (79%) LGAs in Northwest Indiana's coastal watershed. NIRPC received completed assessments from 20 of the 34 (59%) LGAs in the watershed. The following communities submitted assessments: Beverly Shores, Chesterton, Dune Acres, East Chicago, Gary, Griffith, Hammond, Highland, Hobart, Lake County, Merrillville, Michigan City, New Chicago, Ogden Dunes, Portage, Porter, Pottawatomie Park, Schererville, Valparaiso, and Whiting. Half of the respondents indicated that shoreline-specific issues were applicable to their community.

In addition to developing the self-assessment, NIRPC assisted and encouraged LGAs to complete the assessment. LGA representatives were contacted to arrange “listening sessions” to assist LGAs in completing the self-assessment, gather feedback, and answer questions about the tool.

This summary report details NIRPC’s actions, results, and key findings. Recommendations and lessons learned are provided to help LMCP and partners identify areas in which they can help LGAs improve their natural hazards resiliency planning and capacity.

Key findings include:

- Most LGAs perceive low or moderate probability of riverine flooding, yet most also commented on flooding concerns and planning and actions to alleviate flooding.
- Many LGAs reported working closely with partners and agencies. such as the Little Calumet River Basin Development Commission (LCRBDC), FEMA, Army Corps of Engineers (ACOE), and County Surveyors.
- Most LGAs are aware of the potential risks of contamination of waterways due to coastal watershed hazards across all hazard issues with riverine flooding and fluvial erosion most pronounced.
- Responses indicated confusion regarding the Multi-Hazard Mitigation Planning process. Most respondents were unfamiliar with FEMA Hazard Mitigation Grants and the BRIC program.
- LGAs tend to indirectly address resiliency in their plans without explicitly addressing “community resilience” or “climate mitigation” in those terms.
- Self-reported top priorities for enhancing resiliency are shoreline protection, flood reduction, and a combination of nature-based and traditional infrastructure solutions.
- Staff completing the assessment were sometimes unaware of their LGA’s plans or their contents.
- Most LGAs participate in the National Flood Insurance Program but not the Community Rating System (CRS). Many LGAs are not familiar with the CRS.
- Most LGAs don’t regularly educate the public about natural hazards but are most likely to conduct outreach for riverine flooding.
- Roughly half of LGAs take projected precipitation increases into account in their stormwater management plans and manage infrastructure for future climate risks. Most lack flood management plans.
- Most LGAs have explored hybrid-structural or non-structural options for erosion control but lack the in-house knowledge and capacity to maintain these options.
- Many LGAs inventory open space but have not mapped beaches, dunes, riparian areas, and recreation uses. LGAs often use publicly available layers from IndianaMap and LMCP’s Indiana Coastal Atlas.
- Most LGAs lack a formal plan for managing access to public beaches and rivers during times of high lake levels or shoreline erosion, though many take actions that are not formally documented in a plan.





- 85%

WETLANDS LOST IN INDIANA

WHY ARE WETLANDS IMPORTANT IN STORMS?

Wetlands are vital for reducing storm impact and increasing resilience to natural disasters by acting as sponges that absorb and gradually release water. Vegetation in wetlands also slows flood water and distributes it evenly across floodplains.

Source : www.in.gov/idem/wetlands/resources/indianas-wetland-resources/

INTRODUCTION



Between 2022 and 2024, the Northwestern Indiana Regional Planning Commission (NIRPC) was contracted by the Indiana Department of Natural Resources Lake Michigan Coastal Program (LMCP) to develop a coastal resiliency community self-assessment tool for Northwest Indiana local government agencies (LGAs) and to support them in completing the self-assessment. The Indiana Coastal Watershed Hazards Resiliency Needs Self-assessment is available as a fillable PDF or printable Word document on NIRPC's website at [Natural Hazards Resiliency Needs Assessment - NIRPC](#).

The Indiana Coastal Watershed Hazards Resiliency Needs Self-assessment consists of two parts:

Part 1: Identifying Coastal Watershed Hazard Risks - This tool helps LGAs prioritize hazard issues by rating their perception of:

- (1) Frequency of occurrence
- (2) Impact on the community
- (3) Level of preparedness.

Part 2: Resilient Practices Questionnaire - A series of questions to help identify common planning and mitigation actions LGAs can implement to address coastal watershed hazard issues.

The self-assessment is intended to help local government (municipal and county) staff and decision-makers of Indiana coastal watershed communities (Figure 1) evaluate potential impacts of natural hazards and consider planning and mitigation actions to increase resilience. In the context of this self-assessment, resilience is the ability to respond to, withstand, and adapt to natural hazards. The self-assessment summary results will assist the LMCP in

identifying, developing, and delivering the technical resources coastal watershed communities need to reduce or prevent natural hazard risks.

This self-assessment is not a complete vulnerability assessment, nor is it intended to rank communities against each other. Rather, this is an exercise to help communities consider actions that can build their resilience to coastal watershed hazards while also informing LMCP enhancement strategies.

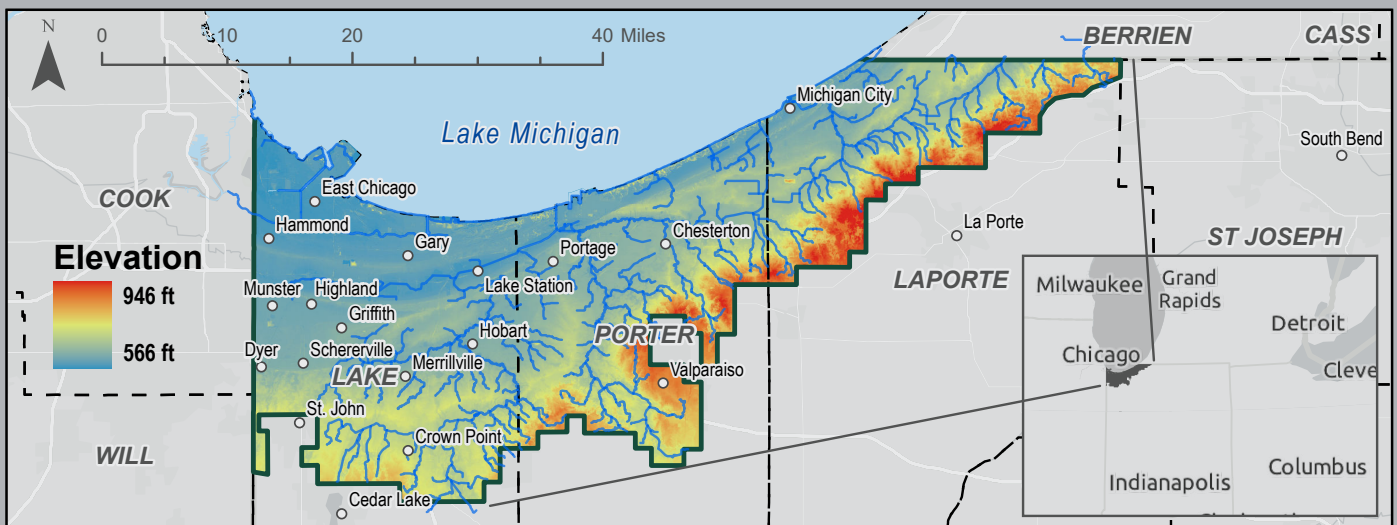
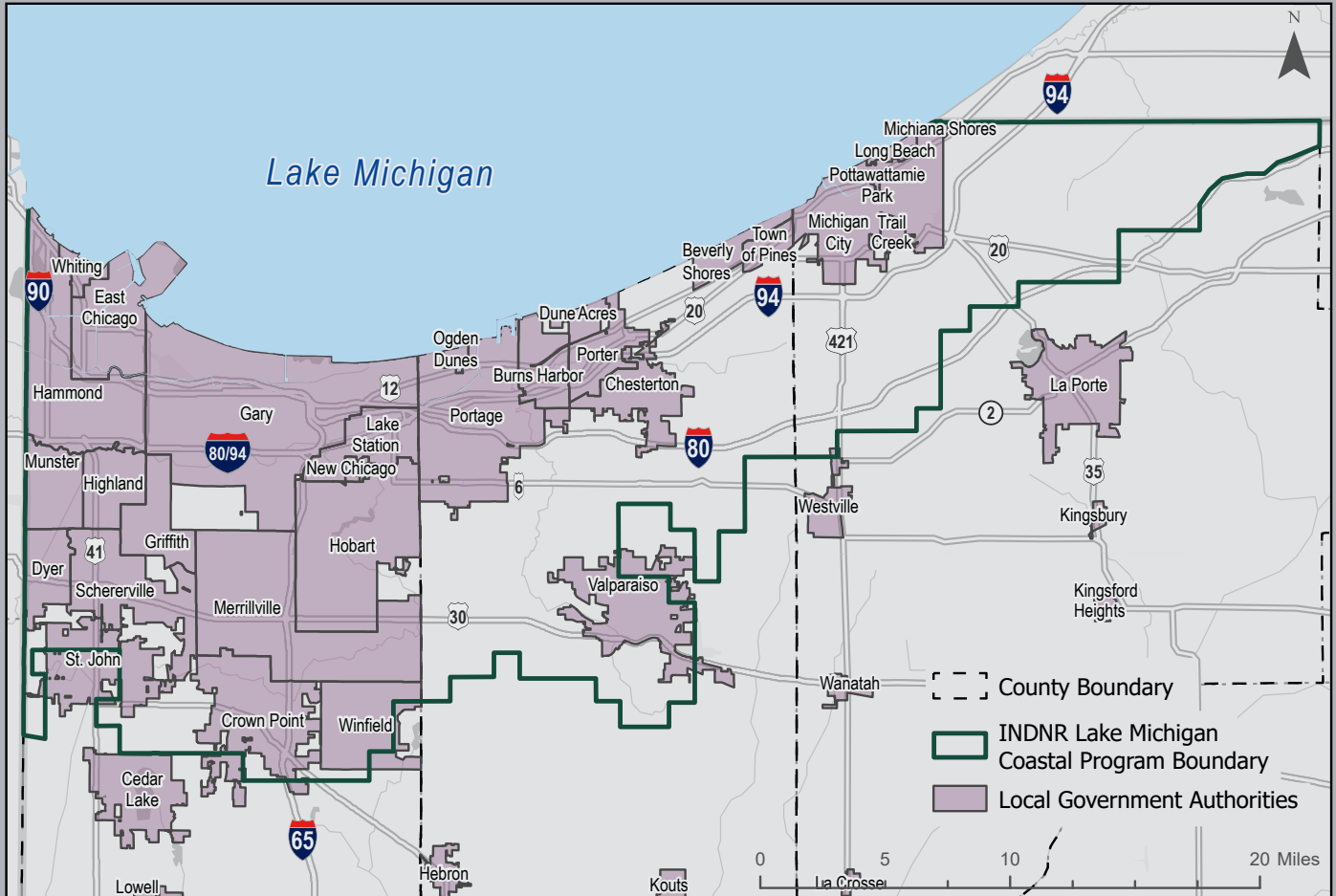
NIRPC developed the Indiana Coastal Watershed Hazards Resiliency Needs Self-assessment and helped LGAs complete it through in-person and virtual workshops. NIRPC also arranged "listening sessions." The listening session objectives were to assist LGAs in completing the self-assessment tool, gather community feedback, and answer questions regarding the tool.

In this self-assessment, resiliency refers to the ability to respond to, withstand, and adapt to natural hazards.

Indiana Coastal Watershed Hazards Resiliency: Community Self Assessment Tool

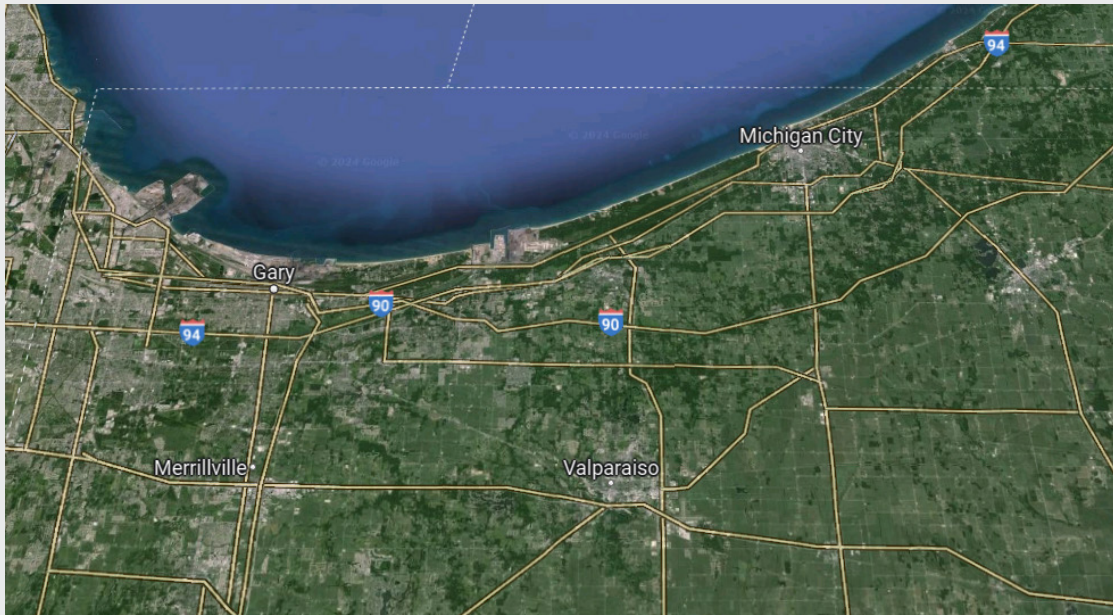


PROJECT LOCATION



*Funding for this project was provided in part by the National Oceanic and Atmospheric Administration and the Indiana Department of Natural Resources Lake Michigan Coastal Program

Figure 1. The Lake Michigan Coastal Program boundary.



IDNR Lake Michigan Coastal Area

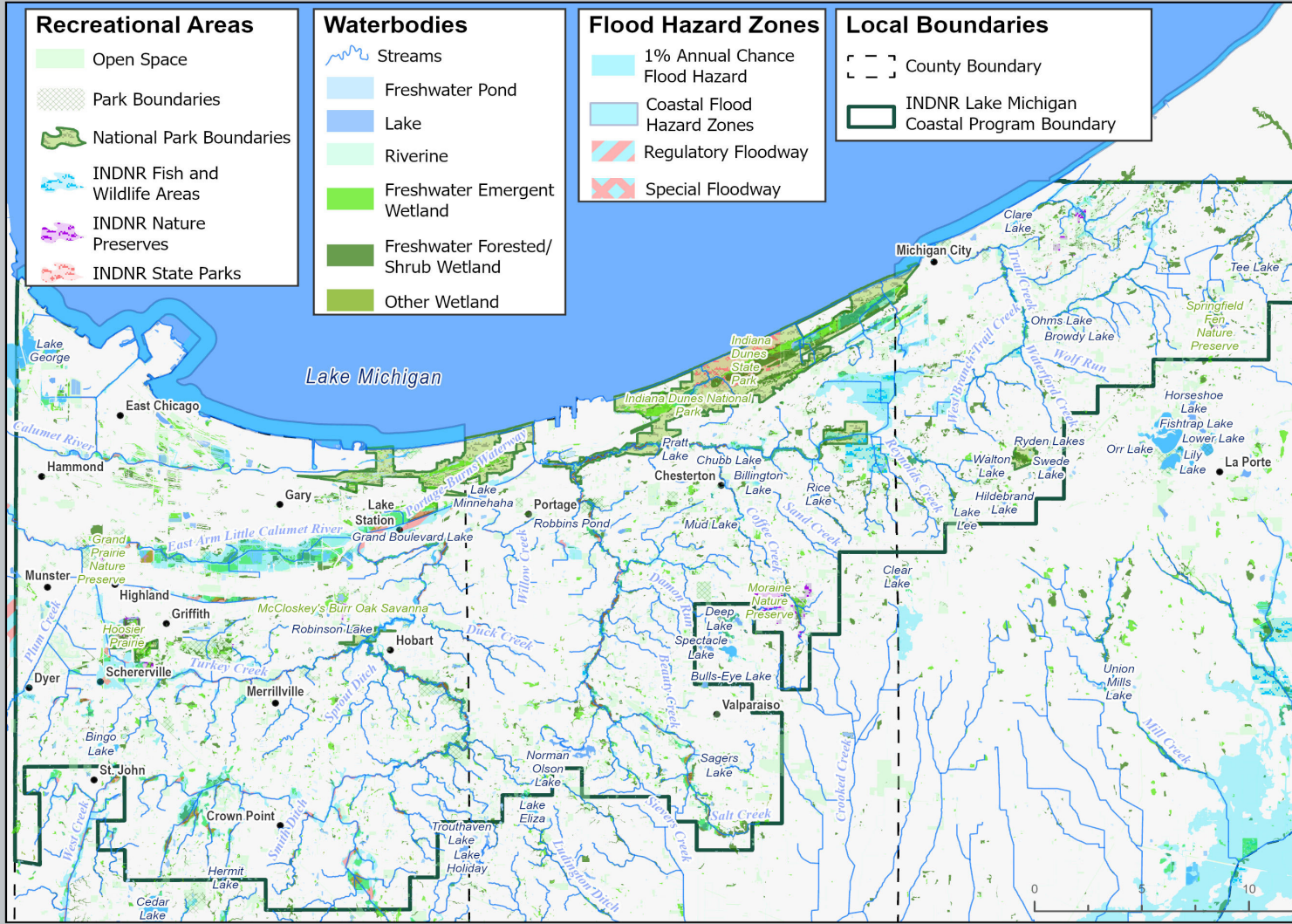
“The Coastal Program Area inland boundary is described based on U.S. Geological Survey Quadrangle maps and major roads for each county. The program boundary is located in the northern portion of Lake, Porter, and LaPorte counties and extends into Lake Michigan to the jurisdictional border with Illinois and Michigan. It excludes lands owned, leased, or held in trust for the federal government. At its widest extent, the boundary extends away from the shoreline 17 miles to the Crown Point area and at its narrowest point, less than 2 miles, just north of Hudson Lake in LaPorte County. The boundary follows the 45-mile shoreline and the approximately 52 miles along an east-west trajectory across the Valparaiso Moraine. The western extent of the inland boundary lies along the Indiana-Illinois state line. The northern extent lies along the lakeward boundary and the Indiana-Michigan state line in LaPorte County. The townships that define the inland boundary range from 35 North to 38 North and approximately from Range 1 West to 9 West. The inland boundary includes all or a portion of the following quadrangles: Lake Calumet, Calumet City, Dyer, St. John, Highland, Whiting, Gary, Crown Point, Palmer, Portage, Ogden Dunes, Dune Acres, Chesterton, Valparaiso, Westville, Michigan City West, Michigan City East, LaPorte West, Springville, and New Carlisle”

NOAA and IDNR LMCP and Final Environmental Impact Statement

Indiana Coastal Watershed Hazards Resiliency: Community Self Assessment Tool



EXISTING CONDITIONS



*Funding for this project was provided in part by the National Oceanic and Atmospheric Administration and the Indiana Department of Natural Resources Lake Michigan Coastal Program

Figure 2. Existing conditions in the Lake Michigan Coastal Zone.

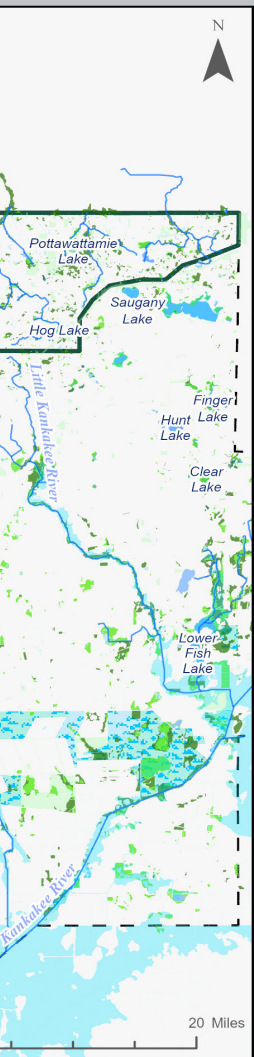
The assessment covers natural hazards relevant to Northwest Indiana's coastal area:

Coastal Flooding - Coastal flooding occurs when low-lying coastal land is flooded by lake water. Storm surges and waves primarily cause coastal flooding, but many other factors have an influence. Flooding on the Great Lakes shorelines depends on local lake levels, which vary due to precipitation, evaporation, other natural processes, and anthropogenic activities. ¹

Riverine Flooding - Riverine flooding occurs when streams and rivers exceed the capacity of their natural or constructed channels causing water to overflow the banks, spilling out into adjacent land. ²

Coastal Erosion - Coastal erosion is the process of wave energy moving material from the shore to greater water depths. Coastal erosion is caused mainly by storms and winds. While coastal erosion occurs even during low water levels, it is exacerbated when lake levels are high. ³

Fluvial Erosion - Fluvial erosion is in-stream erosion of the bed and banks. This includes bed erosion - the lowering of the bed of a stream, and bank erosion - the retreat of stream banks that occurs as a stream widens or migrates laterally. ⁴



Lake Level Change - Great Lakes water level changes result from cyclical changes in rainfall, evaporation, and river and groundwater inflows. These factors work together to raise and lower the water levels of the Great Lakes in small increments daily and larger increments seasonally and over the course of years and decades. Long-term water levels fluctuate by multiple feet.⁵

Coastal Storms - Coastal storms can cause large waves and storm surge, or “piling up” of water along the coast due to storm winds and atmospheric pressure gradients. Coastal storms can increase coastal flooding and erosion.⁶



Source: Little Calumet River flooding in Munster, Indiana (Credit: John Lucito, Flickr)

¹ The Great Lakes Coastal Flood Study. (2022, July 7). Wave Hazards and VE zones on the Great Lakes. https://www.greatlakescoast.org/pubs/factSheets/Region_V_VE_Zone_FS_V7_012219_FINAL.pdf

² Federal Emergency Management Agency. (2022, July 7). National Risk Index: Riverine Flooding. <https://hazards.fema.gov/nri/riverine-flooding>

³ Wisconsin Department of Natural Resources. (2022, July 7). History and geology of the Great Lakes. <https://dnr.wisconsin.gov/topic/Waterways/shoreline/greatLakesProcesses.html>

⁴ U. S. Geological Survey. (2022, July 7). Fluvial erosion hazards primer. <https://wim.usgs.gov/geonarrative/FEHprimer/>

⁵ Resilient Michigan. (2022, July 7). Northwest lower Michigan coastal resilience atlas. http://www.resilientmichigan.org/nw_atlas.asp

⁶ Wisconsin Coastal Resilience. (2022, July 7). Waves and coastal storms and erosion, oh my! <https://wicoastalresilience.org/waves-coastal-storms-erosion/>

FACTS

Since 1895, average annual precipitation in Indiana has increased by about 15%, or about 5.6 inches, based on a linear trend. This trend is projected to continue, though the type of precipitation and when it falls are changing and will continue to do so.

- Across most of Indiana, streamflow is on the rise. Of the 109 U.S. Geological Survey (USGS) streamflow monitoring sites, 98 report increased flow over the last 30 years. These trends in streamflow align with observed trends in precipitation, but attributing increased flows directly to climate change is difficult since land management and changing infrastructure play an important role in local flow. Still, multiple factors indicate that climate change, especially increasing precipitation, is a major driver.
- Increased precipitation throughout Indiana is generally expected to result in higher annual streamflow, with increases primarily happening in the winter and spring seasons. Indiana's projected wetter winters and springs will lead to higher average streamflow in the state's rivers and a greater risk of flooding, making streams more susceptible to record flooding events when local weather events bring wet weather to the region.

Alan Hamlet et al. "Impacts of Climate Change on the State of Indiana: ensemble future projections based on statistical downscaling." *Climate Change Publications*. Accessed March 27, 2024, <https://docs.lib.purdue.edu/climatepub/1>.



METHODS AND APPROACH

Development of the Self-assessment

NIRPC staff created the Indiana Coastal Watershed Hazards Resiliency Needs Self-assessment in partnership with LMCP. NIRPC reviewed the best practices of existing resiliency self-assessment tools to refine and create a tool specific to Northwest Indiana coastal resources. The following tools were reviewed:

- [Maryland's CoastSmart Communities Scorecard](#)
- [Michigan's Community Sustainability Self-Assessment Tool](#)
- [Wisconsin's Coastal Resilience Self-Assessment](#)

The Indiana Coastal Watershed Hazards Resiliency Needs Self-assessment was largely modeled after [Wisconsin's Coastal Resilience Self-assessment](#) with questions tailored to the Indiana Lake Michigan Coastal Zone and the needs of LMCP. LMCP and their resiliency working group provided input on the appropriate scope of the tool. The self-assessment is available in fillable PDF and printable Word formats on the NIRPC website at <https://www.in.gov/nirpc/environment/natural-hazards-resiliency/>.

Outreach and Listening Sessions

NIRPC planned, promoted, and conducted a coastal resiliency self-assessment tool kick-off webinar on November 2, 2022. Additionally, in-person workshops were held on September 1, 2022, and November 15, 2022. The webinar and workshop objectives were to introduce the tool and to provide initial instructions and resources for completion. The target audience was LGAs and intended users of the tool. While initially only one webinar was planned, the project team added two in-person sessions to offer one-on-one assistance in completing the assessment.

NIRPC staff worked to schedule, organize, and conduct listening sessions with LGAs, including 31 municipalities and three counties within Northwest Indiana's Lake Michigan Coastal Zone. NIRPC announced the self-assessment tool and requested action and listening sessions from LGAs at one or more NIRPC meetings, including the Full Commission, Environmental Management Policy Committee, Land Use Committee, Technical Planning Committee, and Surface Transportation Committee. Additionally, NIRPC announced the project at partner meetings, such as the Northwest Indiana Stormwater Advisory Group and

Northwest Indiana Urban Waters Federal Partnership.

NIRPC conducted direct outreach to encourage LGAs to complete the assessment and to schedule listening sessions. Multiple e-mails were sent to LGA staff, officials, and NIRPC contacts. Phone calls were made to follow up when communities could not be reached via e-mail. Listening sessions took place in person, virtually, or via phone. NIRPC's Planning Manager, NIRPC's Natural Resources Planner, and LMCP's Coastal Resources Coordinator participated in meetings.

ASSESSMENT RESULTS

79%
of LGAs
held listening
session, call, or
meeting

59%
of LGAs
completed
Assessments

NIRPC held one or more listening sessions with 27 of the 34 (79%) LGAs in Northwest Indiana's coastal watershed. NIRPC received completed assessments from 20 of the 34 (59%) LGAs in the watershed. The following communities submitted completed assessments: Beverly Shores, Chesterton, Dune Acres, East Chicago, Gary, Griffith, Hammond, Highland, Hobart, Lake County, Merrillville, Michigan City, New Chicago, Ogden Dunes, Portage, Porter, Pottawatomie Park, Schererville, Valparaiso, and Whiting (Figure 4).

In addition to the communities fully completing the assessment, NIRPC held one or more listening sessions with an additional seven LGAs. These communities made some progress on the assessment and may submit completed assessments in the future. NIRPC could not contact the seven remaining LGAs despite many e-mails and phone calls to multiple LGA staff and officials. Many of the unresponsive communities were smaller communities and/or straddled the boundary of the Lake Michigan/Kankakee watershed.

Status of Assessment for 34 Indiana Coastal LGAs

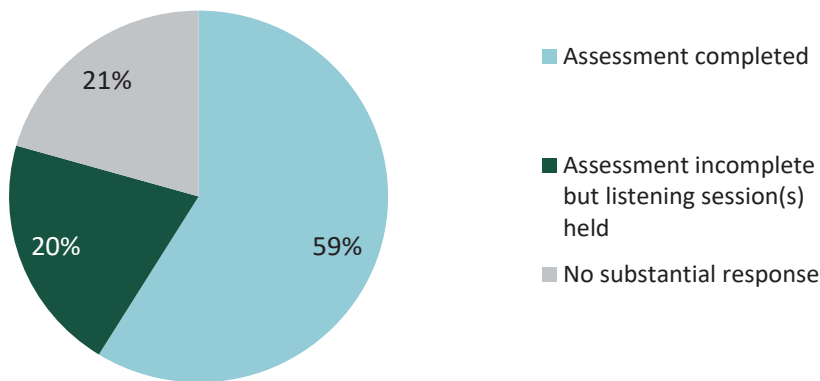


Figure 3. Status of Assessment for 24 Indiana Coastal LGAs as of May 31, 2024.

There are 34 Local Government Authorities in Northwest Indiana, including cities, towns, and counties. Half of the LGAs that completed the assessment indicated that they are shoreline communities.



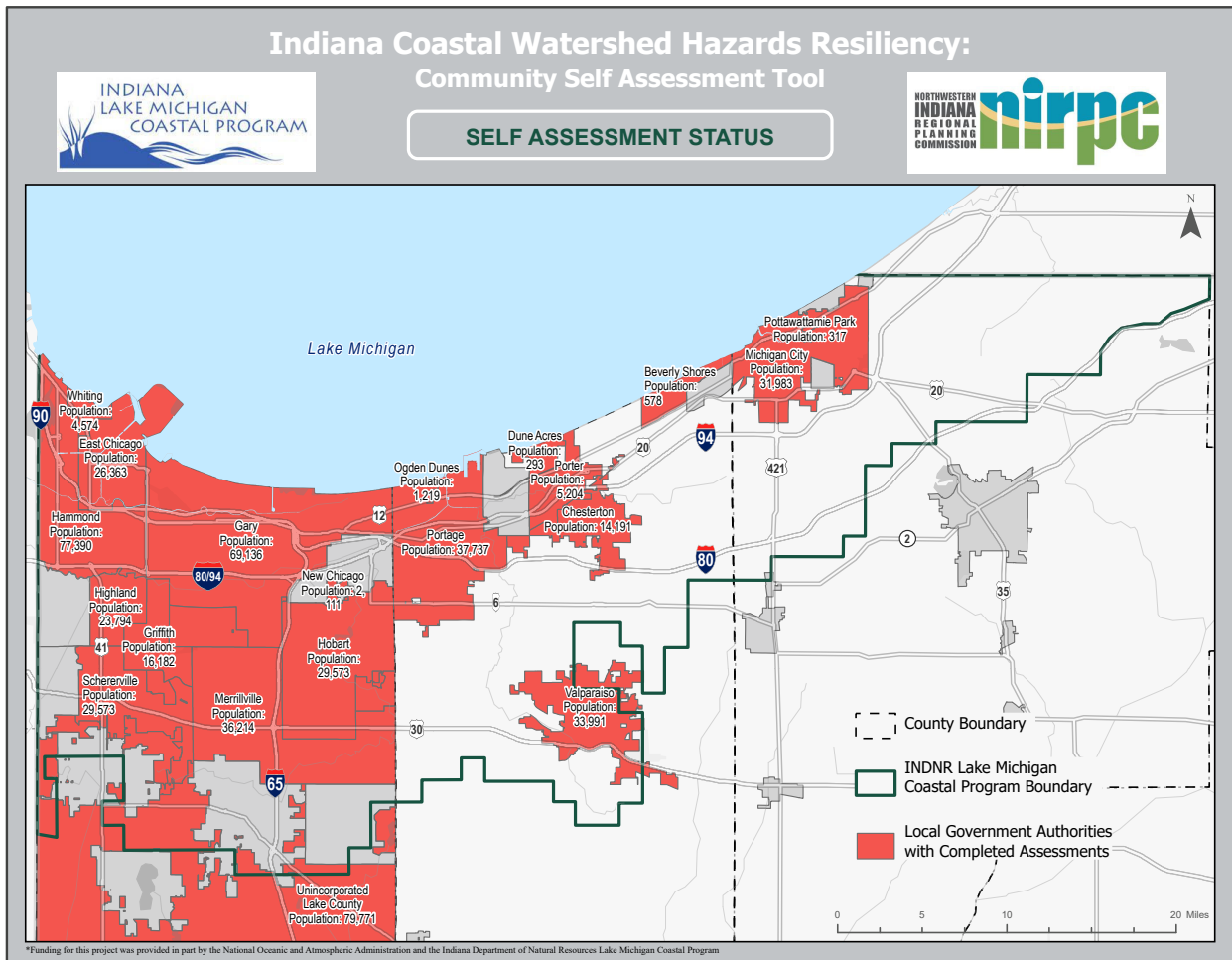


Figure 4. Local Government Authorities (LGAs) with completed self-assessments

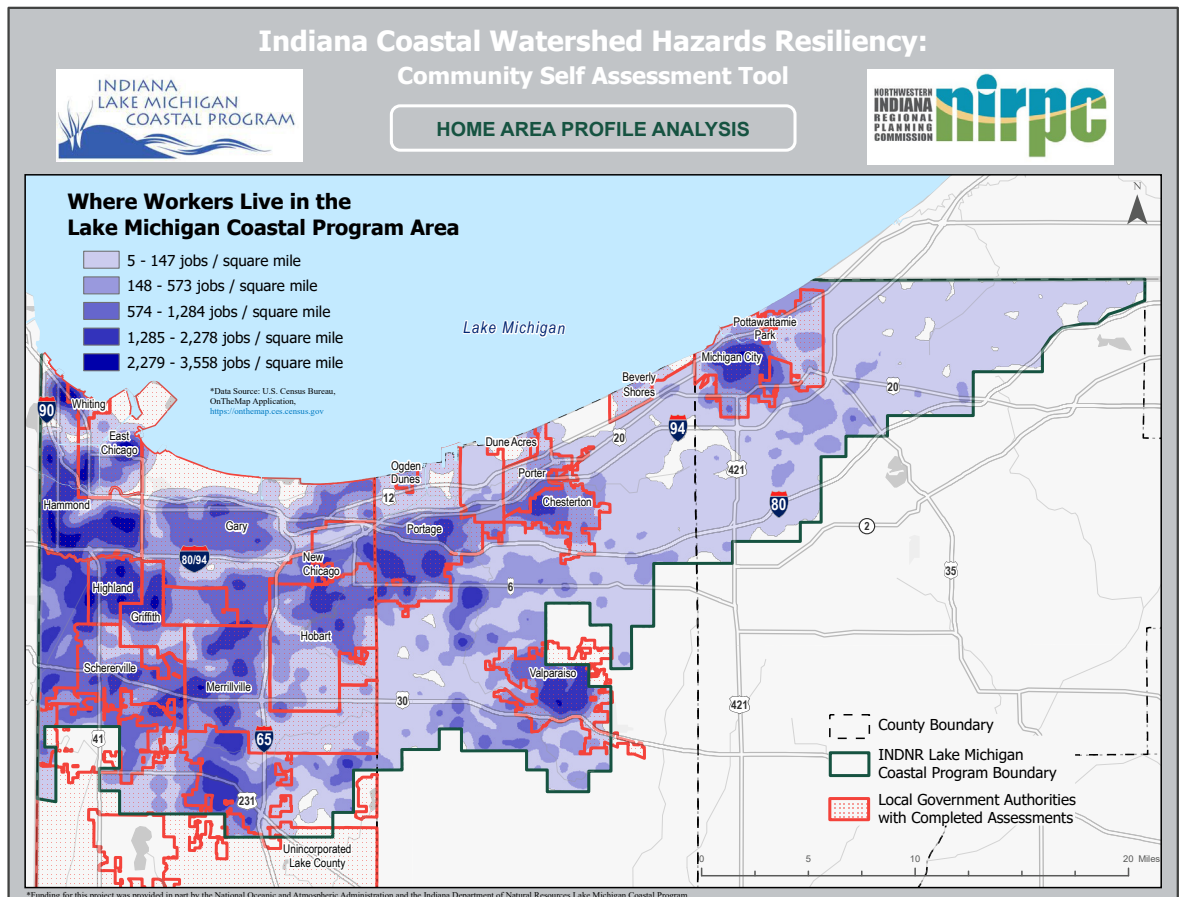


Figure 5
Population and job
concentration in the
LMCP area to aid
in prioritizing storm
hazard-affected high-
activity zones.

FINDINGS

Part 1: Identifying Coastal Watershed Natural Hazards

Part 1 of the assessment is a matrix intended to help LGAs identify what coastal watershed hazards pose the most critical risks to their government. Risk is the potential for negative impacts or damage due to a hazard event, a combination of (1) the probability that a hazard event will occur, (2) the consequences that the hazard would have, and (3) the actions that have been or should be taken to mitigate those consequences. For each coastal watershed hazard issue, LGAs were instructed to assign a score of “Low”, “Moderate”, “High”, or “NA (Not applicable)” for their *perception* of each of the following criteria:

- **Probability-** The likelihood that an issue is expected to occur.
- **Impact-** The extent to which a given coastal watershed hazard issue can cause death or injury, property damage, or service interruption.
- **Preparedness-** The level of effective planning or action that has taken place to reduce the overall impact of a hazard on your community.

| Hazard Issue | Probability | | | Impact | | | | | | | | | Preparedness | | |
|-------------------|-----------------------------|-----|------|-----------------------------|-----|------|----------------------|-----|------|----------------------|-----|------|------------------------------|-----|------|
| | Likelihood issue will occur | | | Possibility of death/injury | | | Property loss/damage | | | Service interruption | | | Level of planning for issues | | |
| | Low | Mod | High | Low | Mod | High | Low | Mod | High | Low | Mod | High | Low | Mod | High |
| Coastal Flooding | 2 | 5 | 3 | 9 | 1 | 0 | 3 | 3 | 4 | 6 | 3 | 1 | 2 | 4 | 3 |
| Coastal Erosion | 0 | 1 | 9 | 8 | 2 | 0 | 0 | 2 | 8 | 2 | 4 | 4 | 2 | 6 | 1 |
| Lake Level Change | 1 | 2 | 7 | 6 | 2 | 2 | 0 | 4 | 6 | 2 | 5 | 3 | 1 | 5 | 3 |
| Coastal Storms | 1 | 3 | 6 | 7 | 1 | 2 | 1 | 5 | 4 | 3 | 3 | 4 | 3 | 4 | 1 |
| Riverine Flooding | 7 | 7 | 3 | 15 | 1 | 1 | 7 | 6 | 4 | 8 | 6 | 3 | 4 | 5 | 7 |
| Fluvial Erosion | 6 | 8 | 3 | 17 | 0 | 0 | 11 | 4 | 1 | 12 | 3 | 0 | 5 | 6 | 4 |

Table 1. Summary of Responses to Identifying Coastal Watershed Natural Hazard Risks

Hazard mitigation is the effort to reduce the loss of life and property by lessening the impact of disasters. Mitigation works best when it is part of a long-term strategy integrated with existing processes and plans. Mitigation planning allows states, territories, tribes, and local municipalities to act before a disaster to reduce their losses later.

Federal Emergency Management Agency. (2024, May 9). Hazard Mitigation Planning Successes: Stories from around the Nation.¹



RESPONSES

Responses that were “NA” were removed from the analysis to show only responses from LGAs that perceived the specific hazard issue applied to them. Half (10) of LGAs perceived shoreline-specific issues (coastal flooding, coastal erosion, lake level change, and coastal storms) issues applied to them. While some respondents left some fields blank, on average 16.5 (82.5%) of LGAs perceived all hazard issues applied to them. Only an average 3.5 (17.5%) of LGAs indicated that non-shoreline-specific issues (riverine flooding and fluvial erosion) did not apply to their community (Figure 6).

While the matrix intermixed shoreline-specific issues (coastal flooding, coastal erosion, lake level change, and coastal storms), for some issues, trends sometimes emerged in response patterns for shoreline-specific issues and non-shoreline-specific issues (riverine flooding and fluvial erosion).

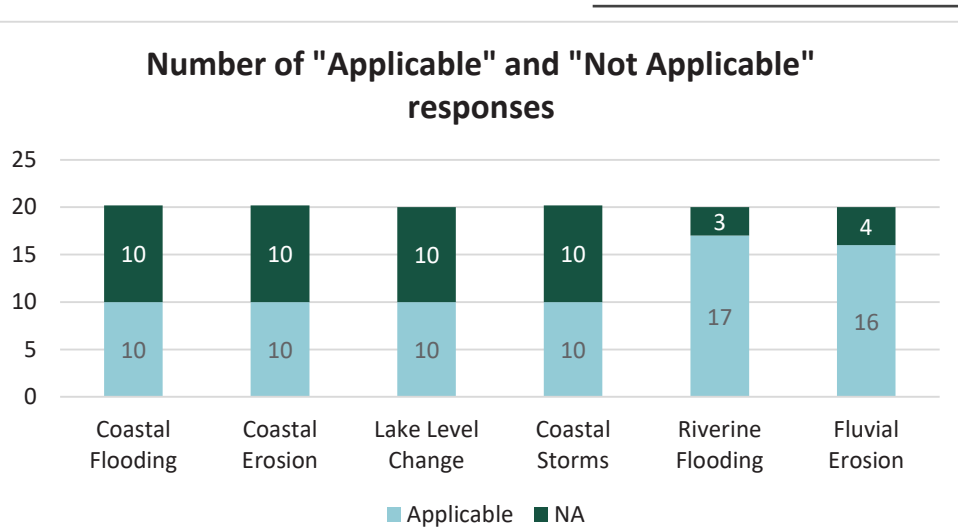
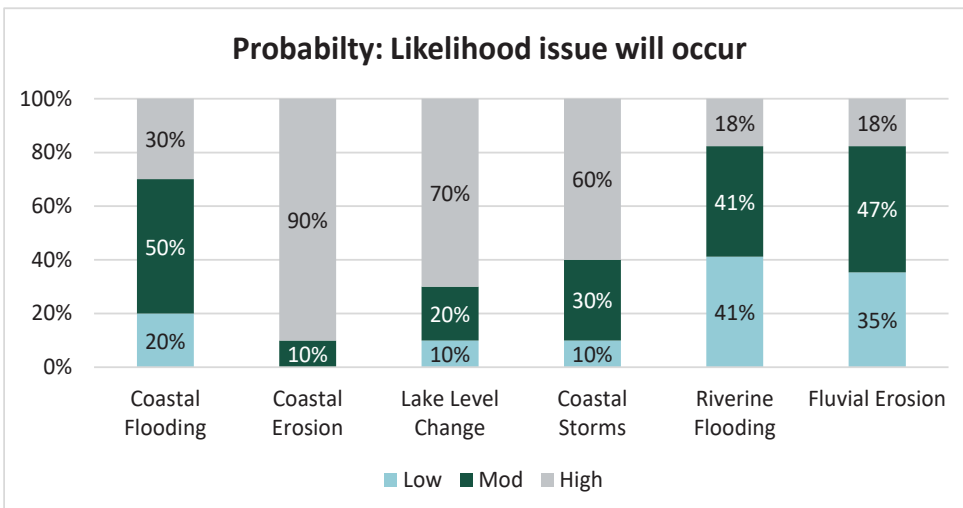


Figure 6. Average number of “Applicable” and “Non-applicable” responses.

Probability

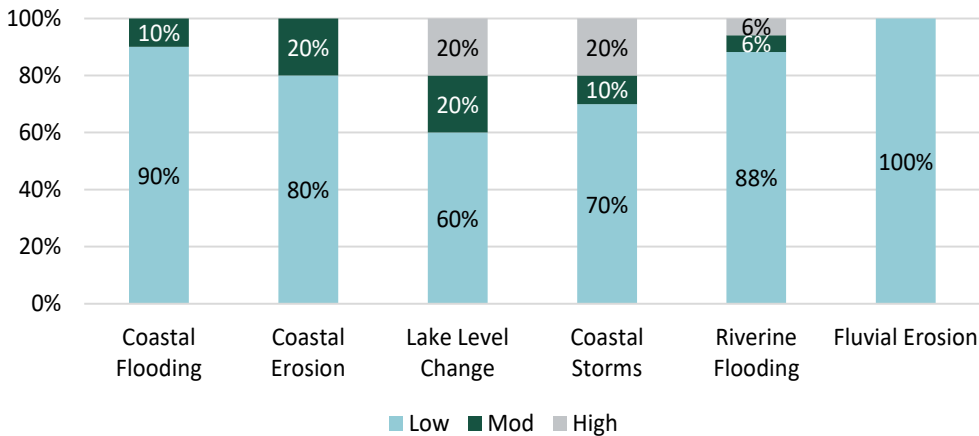


Except for coastal flooding, most LGAs responding to shoreline-specific hazard issues perceived a high or moderate probability of shoreline-specific hazard issues. For coastal flooding and non-shoreline specific issues, most LGAs perceived low or moderate probability (Figure 7).

Figure 7. Perceived probability of hazard issues by percent (NA removed)

Impact

Impact: Possibility of death/injury



Most LGAs responding perceived a low possibility of death/injury across all hazard issues (Figure 8).

Figure 8. Perceived Impact: Possibility of death/injury (NA removed)

Most LGAs perceived low or moderate risk of property loss/damage for non-shoreline specific issues. Responses for shoreline-specific issues varied. The majority of LGAs indicated a high risk of property loss/damage for coastal erosion and lake level change, and none responded “low” for these issues. Responses for coastal flooding and coastal storms varied (Figure 9).

Impact: Property loss/damage

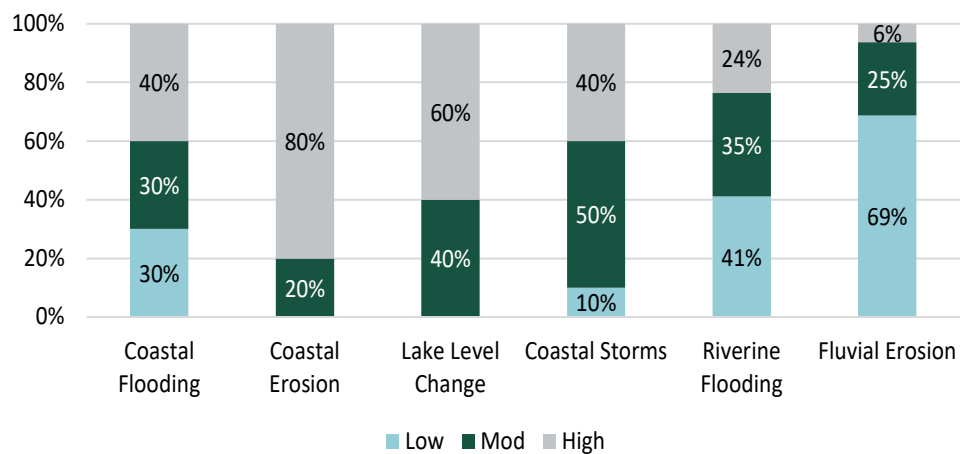


Figure 9. Perceived Impact: Possibility of property loss/damage (NA removed)

Across all hazard issues, most LGAs indicated a low or moderate risk of service interruption. The low to moderate perception of service interruption risk was most pronounced for coastal flooding and non-shoreline specific issues with no LGAs reporting a high risk for fluvial erosion (Figure 10).

Impact: Service interruption

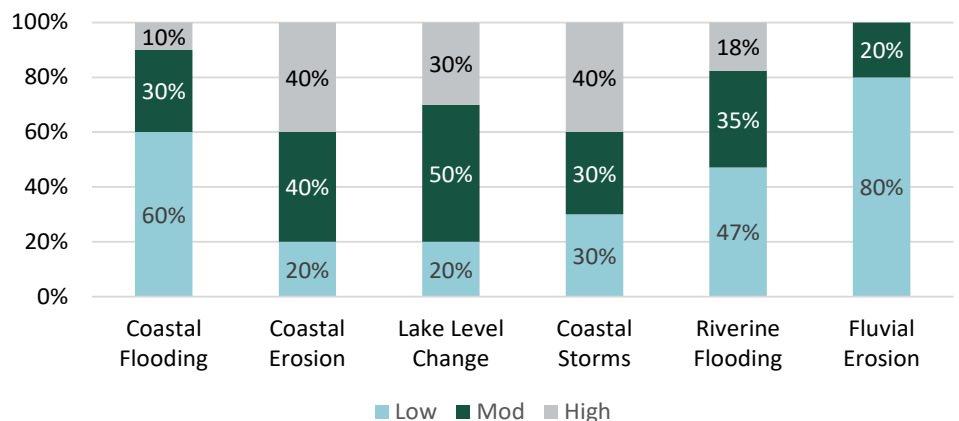


Figure 10. Perceived Impact: Service interruption (NA removed)

Preparedness: Level of planning for issue

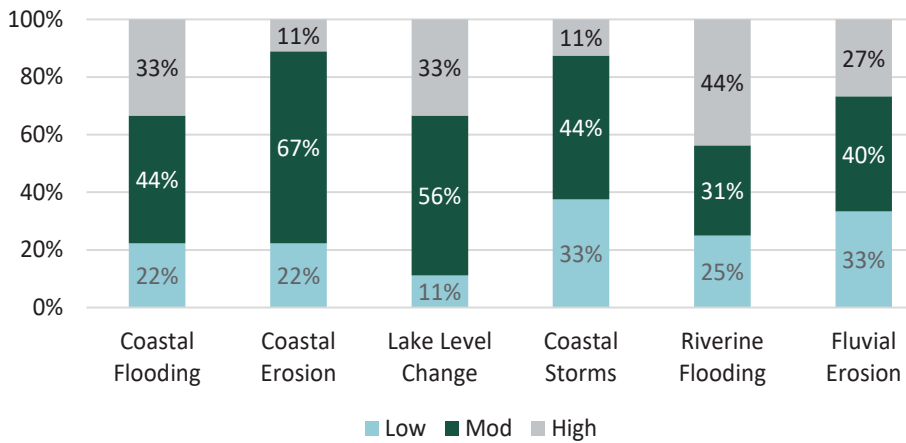


Figure 11. Perceived preparedness: level of planning for issue (NA removed)

The level of planning varied across all hazard issues. LGAs generally reported the highest levels of planning for riverine flooding (44% high), followed by coastal flooding (33% high) and lake level change (33% high). Except for riverine flooding, moderate was the most common response across all issues (Figure 11). Many LGAs reported in the comments that they work closely with partners such as the Little Calumet River Basin Development Commission (LCRBDC), FEMA, Army Corps of Engineers (ACOE), and their County Surveyor to plan for and address hazards.



PART 2:

RESILIENCE PRACTICES

QUESTIONNAIRE

Knowing the locations, populations, and properties vulnerable to coastal watershed hazards is the starting point to developing resilient strategies to reduce risk and avoid losses.

Part 2 of the assessment is a series of questions to help LGAs identify opportunities to strengthen their local government's approach to planning for and mitigating the impacts of coastal watershed hazards and may reveal vulnerabilities not previously considered. Respondents were asked to answer each question by checking "Yes", "No", "NA" (meaning not applicable), "?" (meaning not sure), or other listed options.

It is important to note that "? /not sure" is especially meaningful information for LMCP. It may indicate that an LGA is unfamiliar with a topic, has questions, or would benefit from additional resources. Respondents were asked to provide appropriate comments to clarify their responses and/or questions.

It is important to consider risk elements to understand how disasters unfold. Risks are the function of the hazard, the exposure of people and assets to hazards, and the conditions of vulnerability of the exposed population or assets. These factors are not static and can be improved, depending on the institutional and individual capacity to cope and act to reduce risk and increase resilience. Development patterns can increase exposure and vulnerability in the social and environmental realms and create new risks.¹

¹UN Office for Risk Reduction. *How To Make Cities More Resilient*
*A Handbook For Local Government Leaders Successes: Stories from around the Nation.*¹



Understanding Coastal Watershed Hazard Impacts

Background: Knowing the locations, populations, and properties vulnerable to coastal watershed hazards is the starting point for developing resilient strategies to reduce risk and avoid losses.

Questions 1-3 (Figure 11, Figure 12, and Figure 13) pertain to identifying and documenting the historical geographic extent and damage/cost and assessing potential future risks. Response patterns were similar for shoreline-specific vs. non-shoreline-specific hazards. Most LGAs

responded “no” to questions 1-3 for shoreline-specific hazards, while the majority responded “yes” to riverine flooding and fluvial erosion. They were more likely to have documented past impacts and assessed future risks for non-shoreline-specific hazard issues.



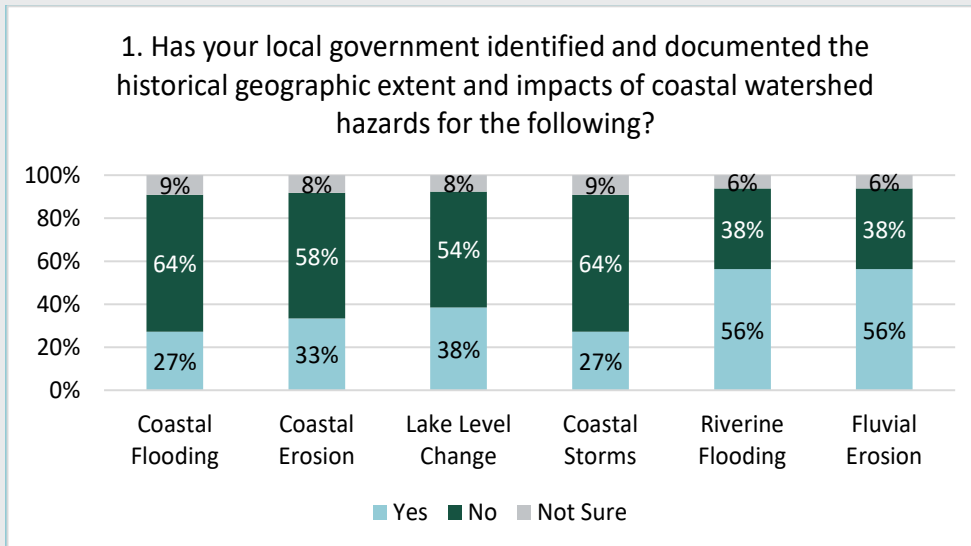


Figure 11. LGA responses to Question 1

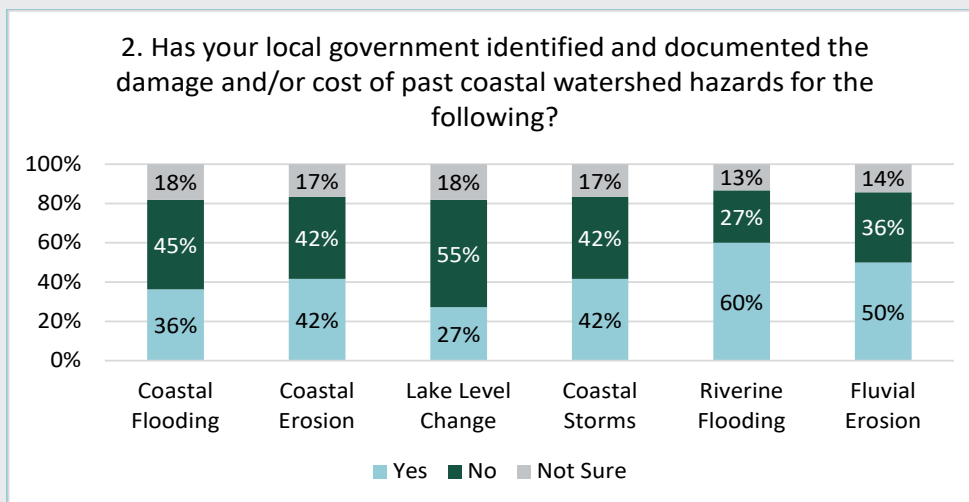


Figure 12. Responses to Question 2

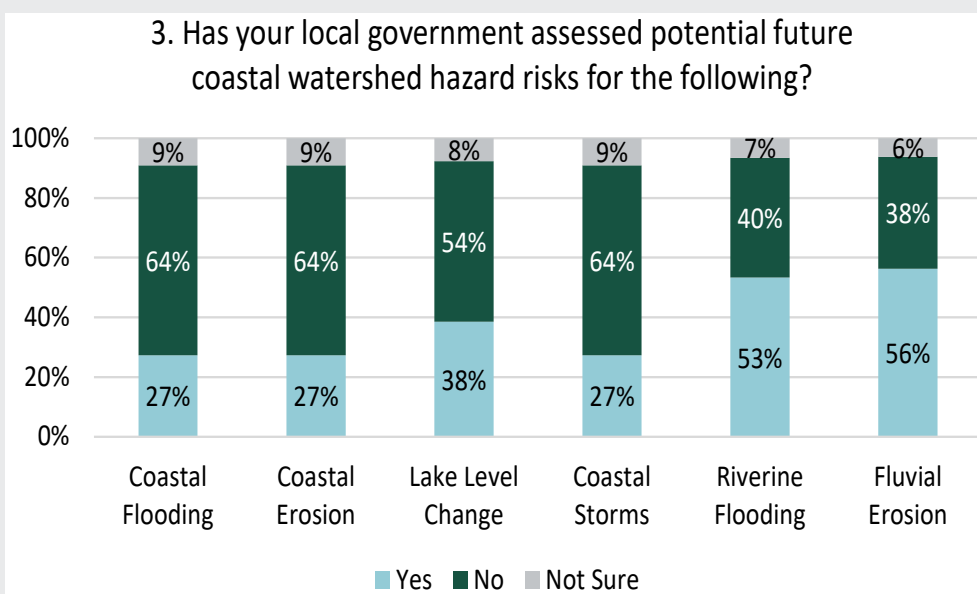


Figure 13. Responses to Question 3

Questions 4 and 5 pertain to LGA access to Geographical Information Systems (GIS), and responses are combined in Figure 14 for clarity. For the follow-up Question 5: “If yes, is GIS mapping and analysis done by staff, external consultants, or both?” The majority indicated reliance on both staff and consultant, approximately one-third indicated reliance on staff, and only one on consultant alone or no GIS access (Figure 14).

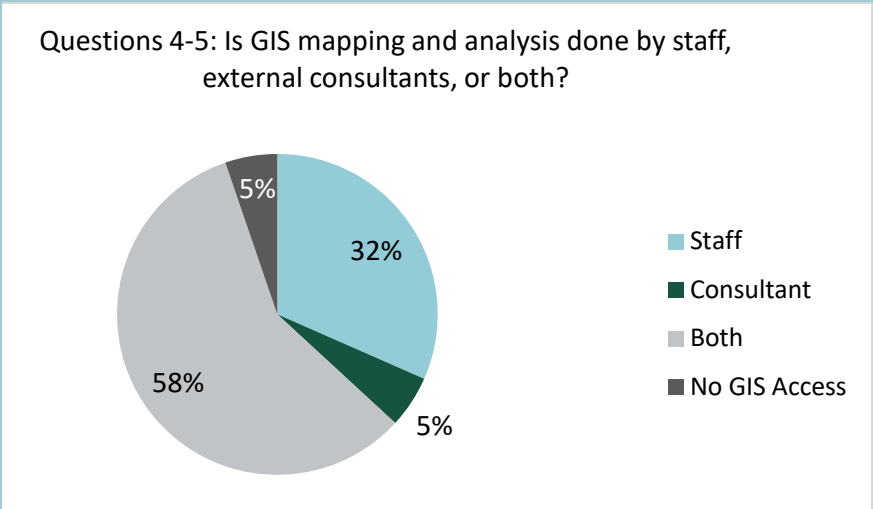


Figure 14. Responses to Questions 4-5

For Question 6: “Does your local government have maps or spatial data that identify areas at risk to coastal watershed hazards?”, the majority of LGAs responded “yes” across all hazard issues except coastal storms (Figure 15).

6. Does your local government have maps or spatial data that identify areas at risk to coastal watershed hazards for the following?

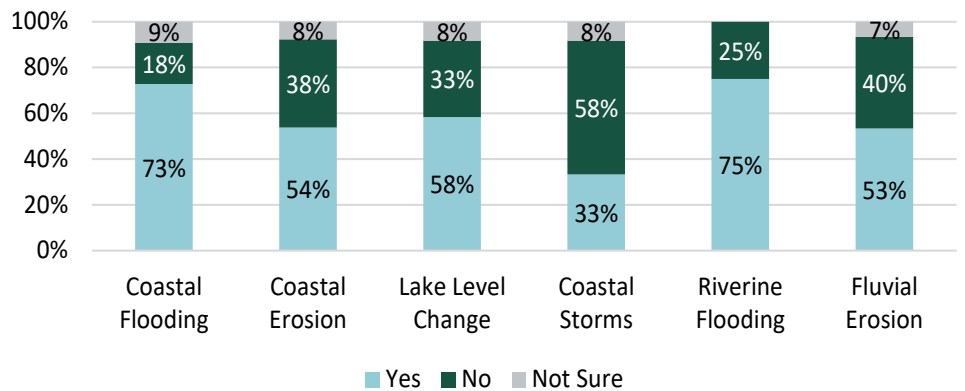


Figure 15. Responses to Question 6

Most LGAs responded yes to Question 7: “Is your local government aware of potential risks of contamination of waterways due to coastal watershed hazards?” across all hazard issues. In particular, LGAs reported being aware of risks of contamination due to riverine flooding and fluvial erosion with all LGAs being aware of potential riverine flooding risks.

7. Is your local government aware of potential risks of contamination of waterways due to coastal watershed hazards, such as flooding or erosion of infrastructure or contaminated land?

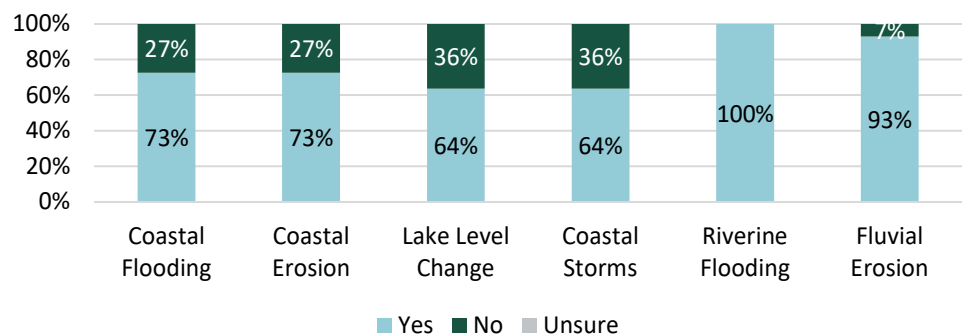


Figure 16. Responses to Question 7



Source: Lucas County Port Authority

Hazard Mitigation Planning

Background: Multi-hazard mitigation planning begins with governments identifying natural disaster risks and vulnerabilities common in their area. After identifying these risks, they develop long-term strategies for protecting people and property from similar events. A *current, approved Multi-Hazard Mitigation Plan (MHMP)* is required for certain FEMA funding assistance.

In theory, response patterns to questions 8, 9, 11, and 12 would have been similar, because MHMPs are developed and updated at the county level with LGAs adopting the county plans. Many LGAs responded that they do not have an MHMP (Figure 17) yet indicated that they have adopted the county-level MHMP (Figure 20) and that the plan has not expired (Figure 21). Several LGAs that indicated “not sure” clarified in the comments that they were unsure if their LGA had formally adopted the plan, were unaware that the plan needed to be formally adopted, or needed more information. These comments may indicate confusion about the MHMP process and requirements.

8. Does your local government have a FEMA-approved Multi-Hazard Mitigation Plan?

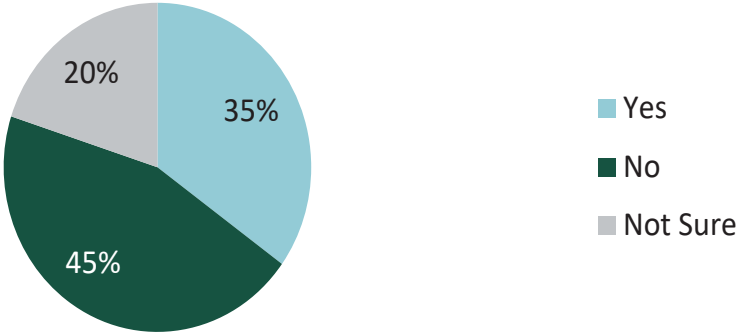


Figure 17. Responses to Question 8

NIRPC received various responses to the open-ended question, “If ‘Yes,’ how often does your local government consult the county plan and consider it in planning and zoning decisions?” (Figure 19). However, 33% of respondents indicated they consult the county MHMP rarely, 25% frequently, regularly, or often and the remaining 42% provided varied responses.

Hazard mitigation is the effort to reduce the loss of life and property by lessening the impact of disasters. Mitigation works best when it is part of a long-term strategy integrated with existing processes and plans. Mitigation planning allows states, territories, tribes, and local municipalities to act before a disaster to reduce their losses later.

Source: FEMA

9. Does your local government participate in a county level FEMA-approved Multi-Hazard Mitigation Plan?

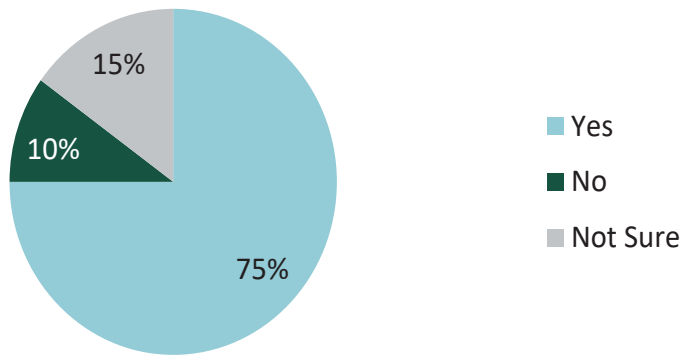


Figure 18. Responses to Question 9

10. If “Yes”, how often does your local government consult the county plan and consider it in planning and zoning decisions?

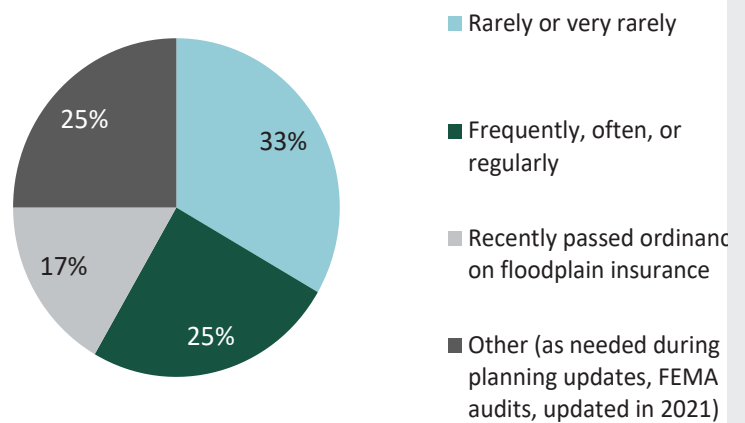


Figure 19. Responses to Question 10



Source: Michigan Sea Grant Extension, Carole Y. Swinehart

11. Has your local government adopted the county level FEMA-approved Multi-Hazard Mitigation Plan?

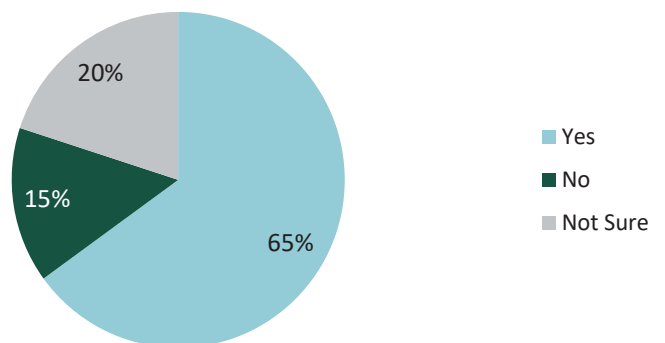


Figure 20. Responses to Question 11

12. Is your local Multi-Hazard Mitigation Plan approved and not expired?

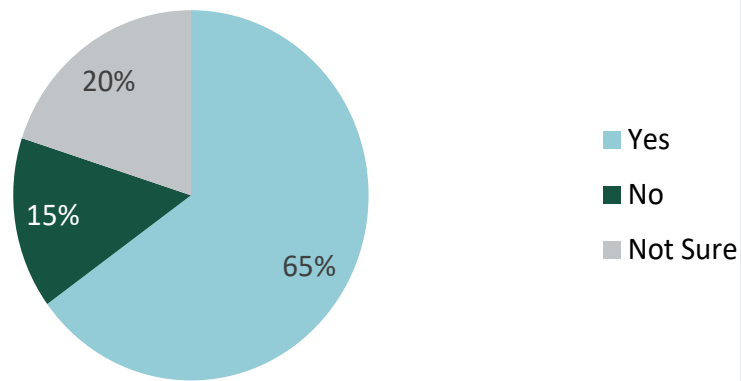


Figure 21. Responses to Question 12

Questions 13 and 14 pertain to whether the MHMP documents past mitigation efforts and identifies strategies to address hazard issues. LGAs reported that the MHMPs were more likely to cover these elements for riverine flooding and fluvial erosion compared to shoreline-specific issues. They also responded not sure more frequently for riverine flooding and fluvial erosion.

Very few LGAs indicated that the strategies from the MHMP have been fully implemented in their jurisdiction. The majority of LGAs indicated that the MHMP identifies opportunities to integrate hazard mitigation with other planning mechanisms.



Source: Porter County MS4



Explore mitigation planning [examples on the Mitigation Planning Success Stories story map](#). This FEMA story map highlights success stories on plan implementation, integration, outreach, engagement and equity.

HAZARD MITIGATION RESULTS

32%

of
LGAs have a
disaster response and
recovery plan

65%

of
LGAs have a valid
approved Multi-
Hazard Mitigation Plan

32%

of
LGAs are aware
of FEMA Hazard
Mitigation and BRIC
Grants

53%

of
LGAs identified personnel
responsible for actions on
disasters

55%

of
LGAs implemented
strategies from the
Muti-Hazard Mitigation
Plan



Local Government Planning

Background: Local government planning efforts, such as comprehensive plans, land use, capital investment, and economic development plans, guide the local government’s development and other investment actions. Integrating strategies to mitigate the effects of coastal watershed hazards into these plans can help reduce the exposure of development and other local assets to risk.

Most respondents responded “yes” to Question 21. “Does your local government address resiliency (the ability to respond to, withstand, and adapt to the impacts of natural hazards) in your plans?” (Figure 22). The majority (70%) of LGAs indicated that they do not have a shared vision of “community resilience” (Figure 23) or include climate mitigation goals (Figure 24) in plans. It seems that LGAs are more likely to generally address resiliency in their plans, but not to explicitly highlight “community resilience” or address climate mitigation.

21. Does your local government address resiliency in your plans?

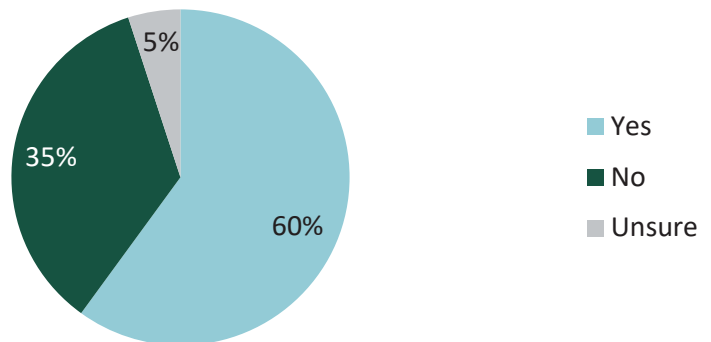
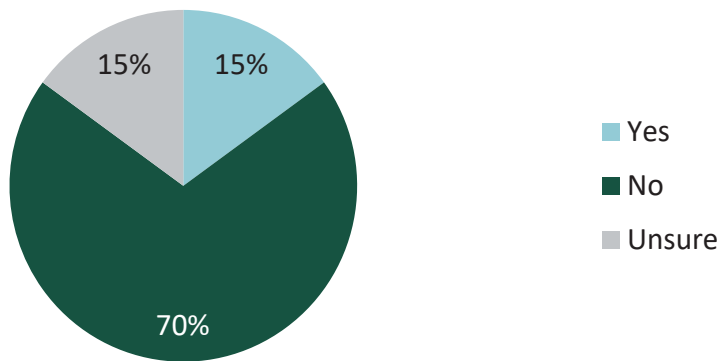


Figure 22. Responses to Question 21

LOCAL GOVERNMENT DEVELOPMENT AND INVESTMENT ACTIONS TO MITIGATE COASTAL WATERSHED HAZARDS

22. Does your local government have a shared vision of 'community resilience' documented in plans?



60%
of
LGAs address
resiliency in their
plans

Figure 23 Responses to Question 22

Source: National Park Service



Most LGAs indicated they do not have a land use plan that makes land use recommendations to reduce vulnerabilities for shoreline-specific issues, but half or more did for non-shoreline-specific issues (Figure 25).

This pattern was similar for Question 25: “Do planning horizons incorporate potential long-term coastal watershed hazards for shoreline-specific issues” (Figure 26).

23. Does your local government include climate mitigation goals and objectives in the comprehensive plan or other policy document?

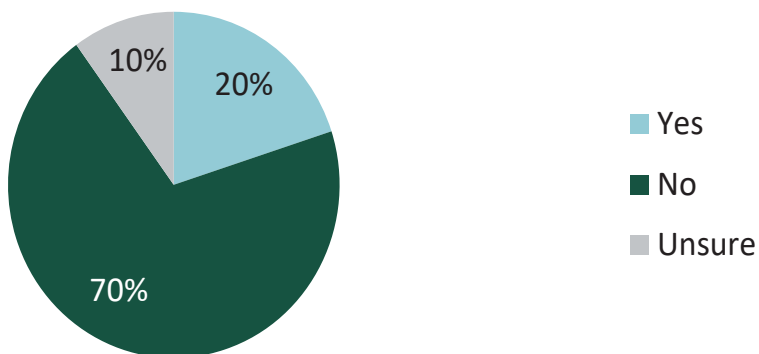


Figure 24. Responses to Question 22

20%
of
LGAs include climate mitigation goals and objectives in their plans

Source: Porter County MS4



LOCAL GOVERNMENT DEVELOPMENT AND INVESTMENT ACTIONS TO MITIGATE COASTAL WATERSHED HAZARDS

40%
of
LGA plans include recommendations for relocation, abandonment, or protection of at risk infrastructure

40%
of
LGAs update their plans in consideration of nearby municipalities' plans for future development

24. Does your local government have a land use plan that makes recommendations to reduce coastal watershed hazard vulnerabilities?

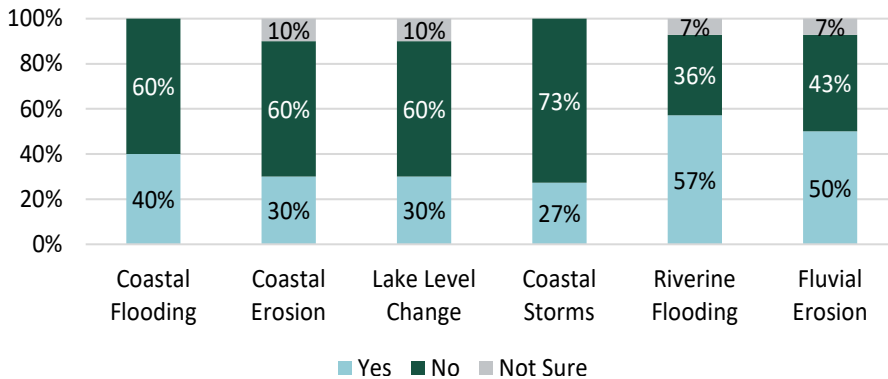


Figure 25 Responses to Question 24

25. Do planning horizons incorporate potential long-term coastal watershed hazards?

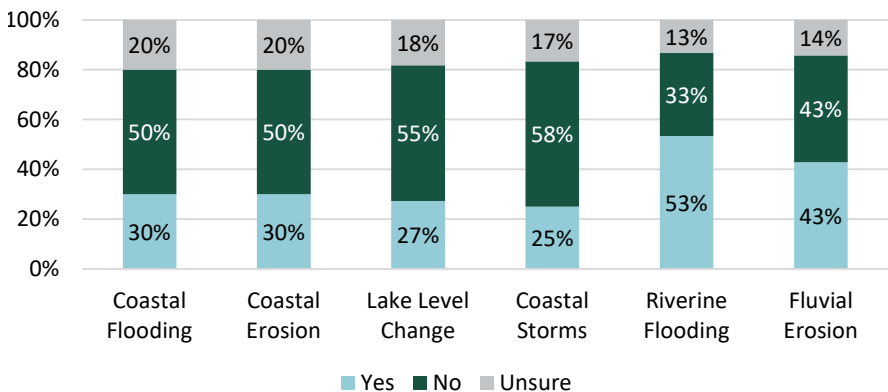


Figure 26. Responses to Question 25

For Questions 26: “Do plans for public infrastructure include recommendations for relocation, abandonment, or protection of infrastructure at-risk to coastal watershed hazards?” and Question 27: “Does your local government update its plans in consideration of and/or have joint plans with nearby municipalities’ plans for future development?” 60% of LGAs indicated “no”.

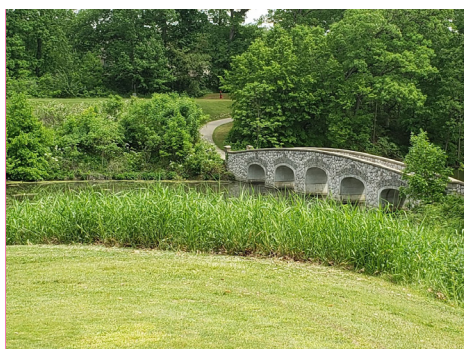
Roughly half of the LGAs responded “no” or “unsure” to Question 28: “Did your local government conduct a natural resource inventory or assessment and incorporate protection of priority natural systems through the subdivision or development process?”.

Local Government's Highest Priorities / Major Initiatives Planned to Improve Resiliency

Question 29 was an open-ended question: "What are your local government's highest priorities or major initiatives planned to improve resiliency?". Responses pertained to:

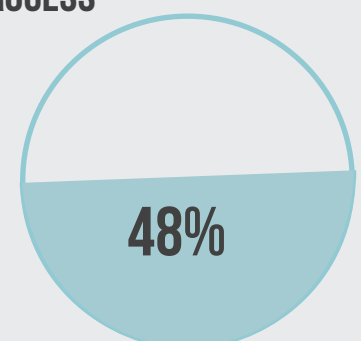
- Protecting lakefront and shoreline
- Reducing impact of localized and road flooding
- Protecting residents from flooding along rivers
- Tree planting and urban forestry
- Native plantings
- Addressing food deserts
- Park accessibility
- Protecting water quality
- Restoring and improving wetlands
- Public safety, public health, and quality of life
- Stormwater management
- Regulation improvements and implementation
- Protection of homes and infrastructure
- Erosion prevention
- Expanding GIS inventory of culverts and flooding
- Revetment work

Major waterways within the Lake Michigan watershed include the Grand Calumet River, Trail Creek, and the Little Calumet River and its tributaries, including Deep River and Salt Creek. These waterways and inland lakes and wetlands should be buffered and protected from development to preserve water quality and protect communities from flooding and erosion.



Aberdeen, Valparaiso-IN: A golf course community developed by using PUD zoning. The subdivision was planned to preserve natural features.

ABOUT HALF OF LGAS CONDUCTED A NATURAL RESOURCE INVENTORY OR ASSESSMENT AND INCORPORATED PROTECTION OF PRIORITY NATURAL SYSTEMS THROUGH THE SUBDIVISION OR DEVELOPMENT PROCESS





Source: Indiana Dunes Tourism

Local Ordinances



Background: Local zoning ordinance provisions can reduce the risk that new development is exposed to and limit adverse impacts. Conservation planning is one tool for protecting valuable natural resources. Good practices of conservation planning are cluster developments, open space neighborhoods, and planned unit developments (PUD), as shown on the previous page on the Aberdeen subdivision.

Questions 30 – 34 pertain to zoning regulations, ordinances to support sustainable development and conservation, ordinances requiring new development setbacks from shorelines and streambanks, and limiting development in floodplains. The majority of LGAs reported having these ordinances in place.



LOCAL GOVERNMENT EXISTING CODES & ORDINANCE REQUIREMENTS

74%

of

LGAs adopted codes and ordinances to support sustainable development and conserve natural resources

75%

of

LGAs require new development to be set back some distance from shorelines and streambanks

33. Do existing ordinances require new development in the 1% annual chance (100-year) floodplain to take measures that reduce flood impacts such as elevating buildings a certain height above the base flood elevation?

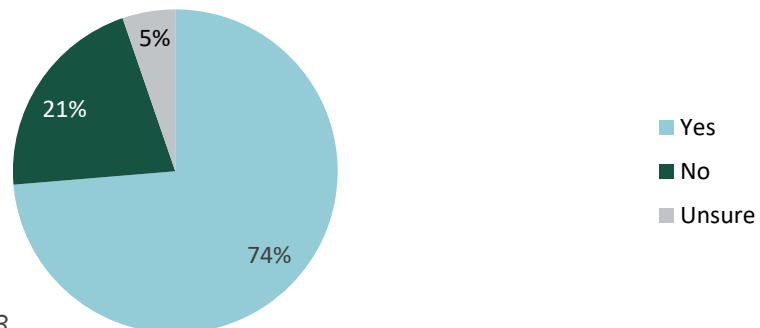


Figure 27. Responses to Question 33



Source: Michigan Sea Grant Extension, Carole Y. Swinehart



Example of Elevated Building above the Flood Level
 Source: [ArchDaily- How Can Architecture Combat Flooding?](#)

Implementing Best Practices



Background: The National Flood Insurance Program works with communities required to adopt and enforce floodplain management regulations that help mitigate flooding effects. The Community Rating System (CRS) is a voluntary program for communities participating in the National Flood Insurance Program. CRS offers National Flood Insurance Program policy premium discounts in communities that develop and execute extra measures beyond minimum floodplain management requirements to provide protection from flooding.

The majority of LGAs indicated that they participate in the National Flood Insurance Program (Figure 28) but not the Community Rating System (CRS) (Figure 29). Responses were mixed regarding whether LGAs had considered participating in the CRS and whether they would be interested in a regional CRS (Figure 30). One respondent commented that they had considered the program but determined it did not make economic sense for their community. The high number of “unsure” responses to Question 37 may indicate a need for more information about CRS and the nature of a regional program (Figure 30).



Flooding in Munster in 2008. Source: LMCP

LOCAL GOVERNMENT PARTICIPATION IN THE NATIONAL FLOOD INSURANCE

34. Does your local government participate in the National Flood Insurance Program?

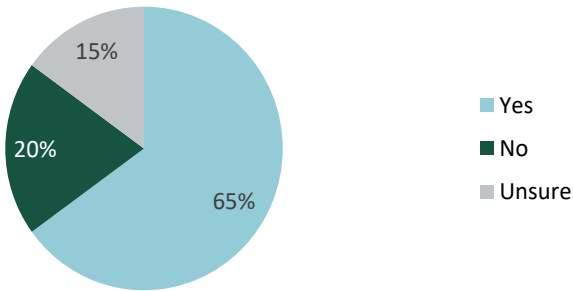


Figure 28. Responses to Question 34

35. If your local government participates in the National Flood Insurance Program, does your local government also participate in the Community Rating System?

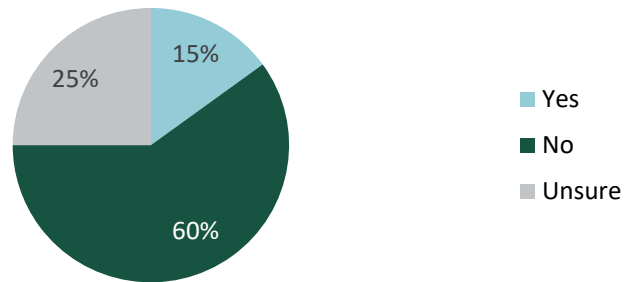


Figure 29. Responses to Question 35

Most respondents indicated that they know how many flood insurance policy holders are in their jurisdiction, and some specified numbers in the comments. Responses were mixed regarding whether they had considered relocation or voluntary acquisition of repetitive loss or high-risk structures (Figure 31). The majority indicated that their permitting processes review practices that could have adverse impacts on shoreline stability (Figure 32). Several respondents commented that they had been working for years to remove properties from the floodplain and making progress, making the National Flood Insurance Program seem less necessary to them.

37. Would your local government be interested in participating in a regional Community Rating System program?

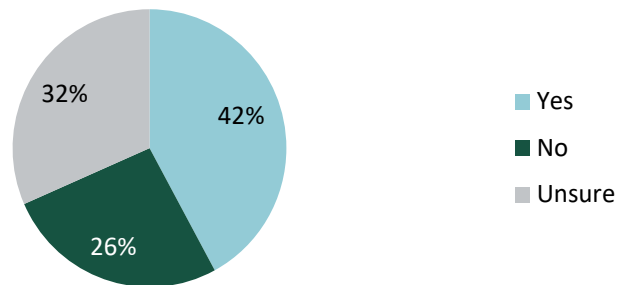


Figure 30. Responses to Question 37

39. Has your local government considered relocation or voluntary acquisition of repetitive loss structures or those structures which are at high risk to coastal watershed hazards?

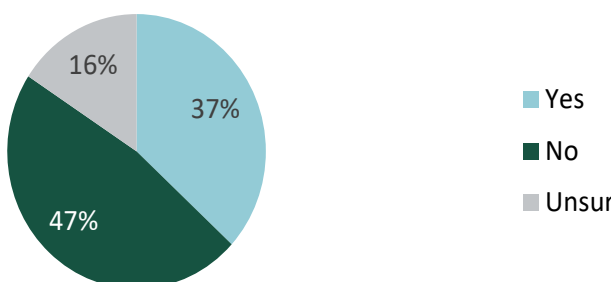


Figure 31. Responses to Question 39

40. Do permitting processes review practices that could have adverse impacts on shoreline stability?

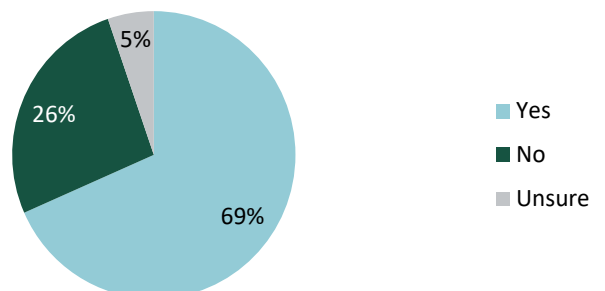


Figure 32. Responses to Question 40



Source: Trail Creek Watershed Partnership



The majority of LGAs indicated that they do not routinely conduct public outreach and education focused on coastal watershed hazards across all hazard types (Figure 33). LGAs were more likely to conduct outreach and education for non-shoreline specific issues, especially riverine flooding. Roughly half indicated they have hazard information available to residents and property owners upon request for shoreline-specific issues and fluvial erosion (Figure 34). More LGAs reported having this information available for riverine flooding. Most LGAs indicated that the public has not been involved with identifying historic coastal watershed hazard impacts, areas that are at risk, or strategies to address coastal watershed hazards across all issues (Figure 35). LGAs were more likely to have involved the public in non-shoreline specific issues, especially riverine flooding.

PUBLIC EDUCATION & ENGAGEMENT

Background: Properties can frequently change hands, leaving property owners unaware of or unprepared for hazards. On the other hand, residents and business owners may have local knowledge of hazards that can inform resilience strategies. Educating and engaging residents can help to manage coastal watershed hazards.

41. Does your local government routinely conduct public outreach and education focused on coastal watershed hazards for the following?

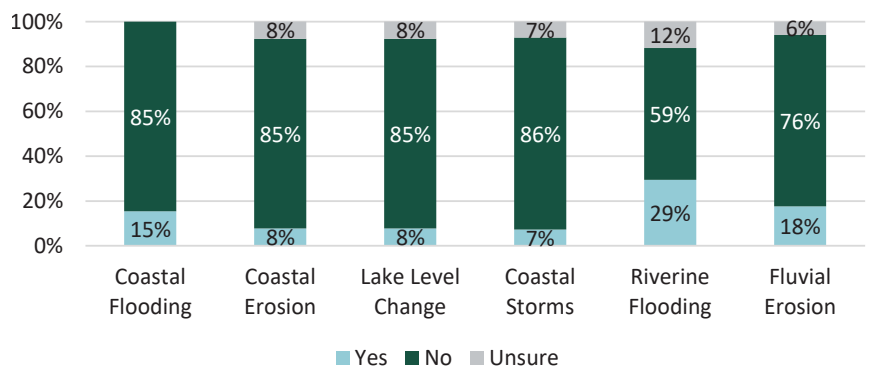


Figure 33. Responses to Question 41

42. Does your local government have hazard information, such as maps and guidance on management practices, available to residents and property owners upon request?

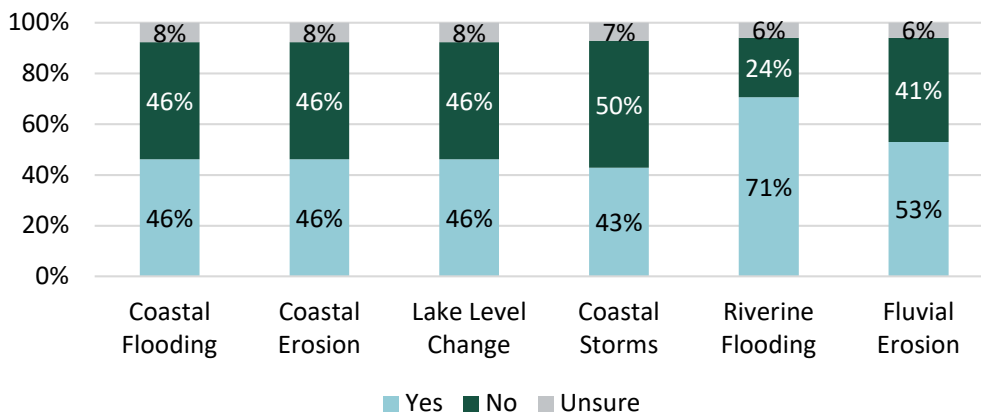


Figure 34. Responses to Question 42

43. Has the public been involved with identifying historic coastal watershed hazard impacts, areas that are at risk, or strategies to address coastal watershed hazards?

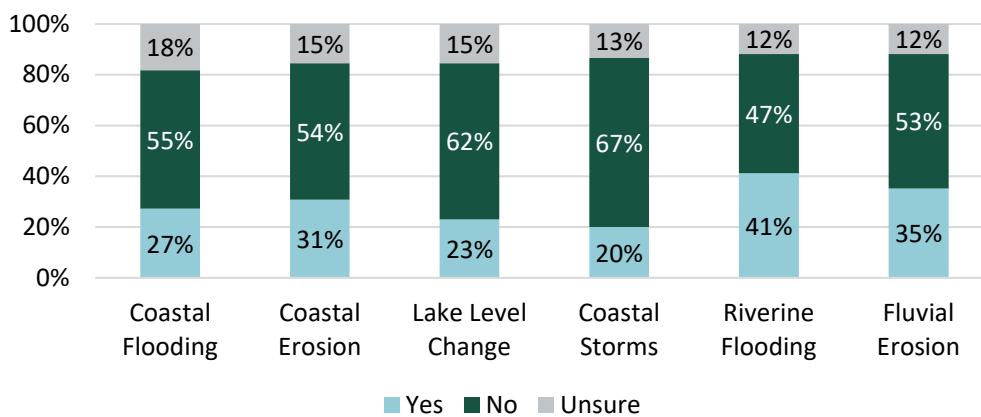


Figure 35. Responses to Question 43



Source: Trail Creek Watershed Partnership

SHORELINE & FLUVIAL

EROSION PROTECTION

Background: Structural shoreline and fluvial protection measures are commonly used to protect property from erosion and flooding. To achieve the expected level of protection, these structures need to be engineered, monitored, maintained, and replaced when necessary. Alternative hybrid-structural options (nature-based, living shoreline, or engineering with nature approaches) or non-structural options (slope stabilization, vegetation, beach nourishment, or asset relocation) may be considered due to cost, aesthetics, public access, habitat, or adverse impacts to adjacent properties.

Source: LaPorte County Parks



47. Has your local government documented instances where erosion protection structures adversely impact adjacent shoreline or downstream areas?

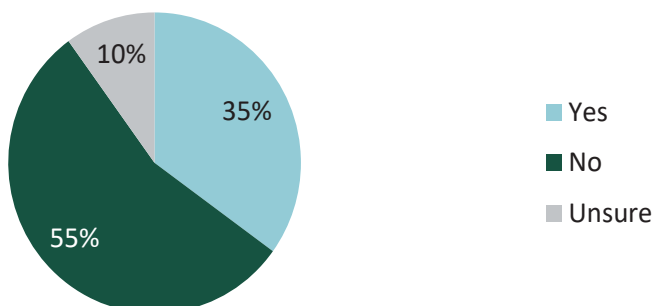


Figure 36. Responses to Question 47



75%

of

LGAs documented the location of erosion protection structures

- Most LGAs (75%) indicated that they had documented the location of and about 60% routinely inspected and maintained erosion protection structures. However, they were evenly split on whether or not they had documented the erosion protection structures' condition, effectiveness, and life expectancy. The majority of LGAs indicated that they had not documented instances where erosion protection structures adversely impacted adjacent shorelines or downstream areas (Figure 36).
- Most LGAs (75%) considered hybrid-structural options or non-structural options. In the comments, LGAs noted asset relocation, beach nourishment, and streambank stabilization projects. 55% of LGAs indicated that they do not have the internal expertise and capacity to maintain hybrid-structural options. Some LGAs that responded "no" indicated that they rely on consultants for expertise and maintenance. One LGA that responded "yes" indicated that their expertise was limited and they would be interested to learn more.



Streibel Pond- Michigan City

STORMWATER MANAGEMENT

Background: Stormwater management practices on the landscape can mitigate or exacerbate coastal watershed hazards, such as flooding and erosion. Your community may or may not be a Municipal Separate Stormwater System (MS4). MS4s are defined as “a conveyance or system of conveyances owned by a state, city, town, or other public entity that discharges to waters of the United States and is designed or used for collecting or conveying stormwater.”

Indiana Department of Environmental Management. (2022, August 17). Municipal Separate Stormwater Systems. <https://www.in.gov/idem/stormwater/municipal-separate-storm-sewer-systems-ms4/>

The majority (80%) of LGAs indicated they are MS4 communities, and 95% indicated they had adopted stormwater infiltration/management strategies to reduce or mitigate runoff from impervious surfaces. Roughly half of respondents indicated that they consider projected increases in precipitation intensity in their stormwater management plans (Figure 37) and manage stormwater infrastructure to

mitigate risk from future climate change (Figure 38). LGAs commented that they utilize the following green infrastructure practices: ponds, regional detention, naturalized retention ponds, bioswales, rain gardens, permeable pavement, urban forest, tree boxes, green streets, underground storage, and rain barrels. The majority of LGAs indicated that they do not have a flood management plan (Figure 39).

Green Infrastructure

Green infrastructure utilizes vegetation, soil, and engineered systems to mimic natural processes of slowing or storing stormwater. These practices can improve water quality and reduce flooding by intercepting, infiltrating, filtering, and evaporating stormwater. Green infrastructure can provide additional ecological services that traditional gray infrastructure does not, such as improving air quality, reducing the urban heat island effect, providing pollinator habitat, and beautifying communities.



Source: City of Valparaiso

52. Does your local government consider projected increases in precipitation intensity in its stormwater management plans?

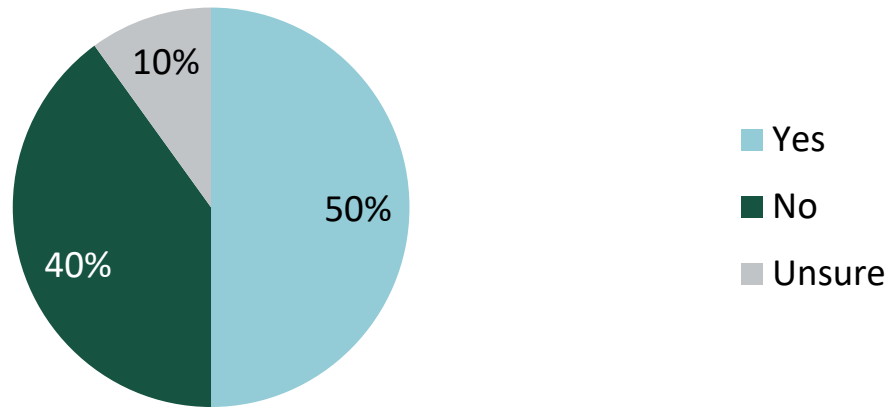


Figure 37. Responses to Question.52

53. Does your local government manage stormwater infrastructure to mitigate risk from future climate change?

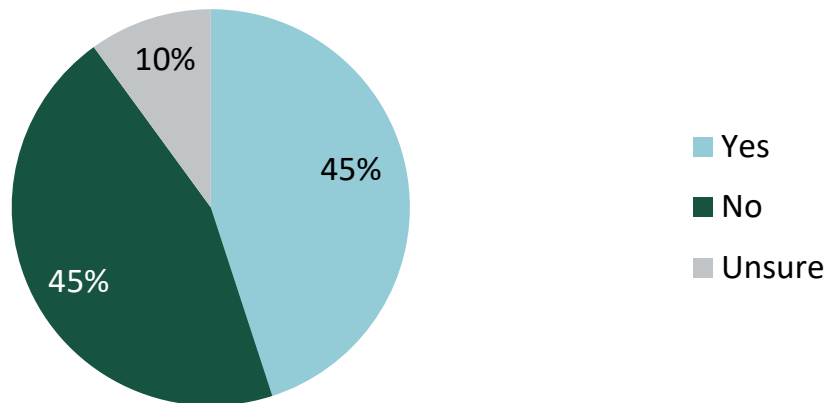


Figure 38. Responses to Question 53

54. Does your local government have a flood management plan?

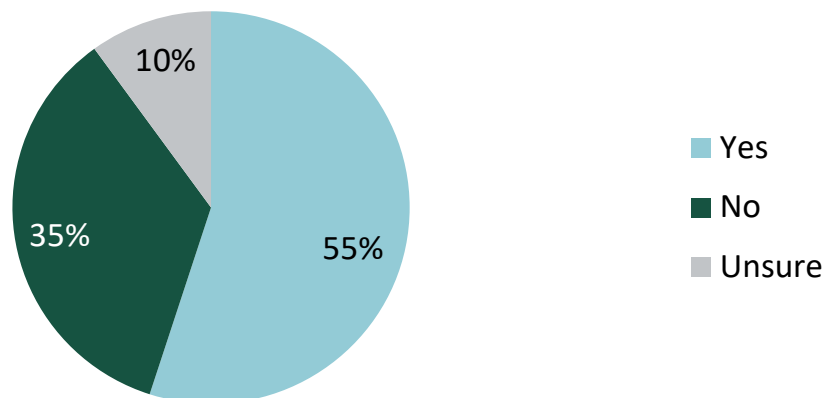


Figure 39. Responses to Question 54



Source: Indiana Dunes Tourism

NATURAL AREAS, OPEN SPACE, AND PUBLIC ACCESS

Background: Open space and natural areas can buffer against coastal watershed hazards and provide for public access, recreation, and tourism. Open space means there are no buildings, storage, fill, significant pavement, or other encroachments to flood flows. Open space can include green space (land that is partly or completely covered with grass, trees, shrubs, or other vegetation). Open space can also include natural areas, such as forests or wetlands.

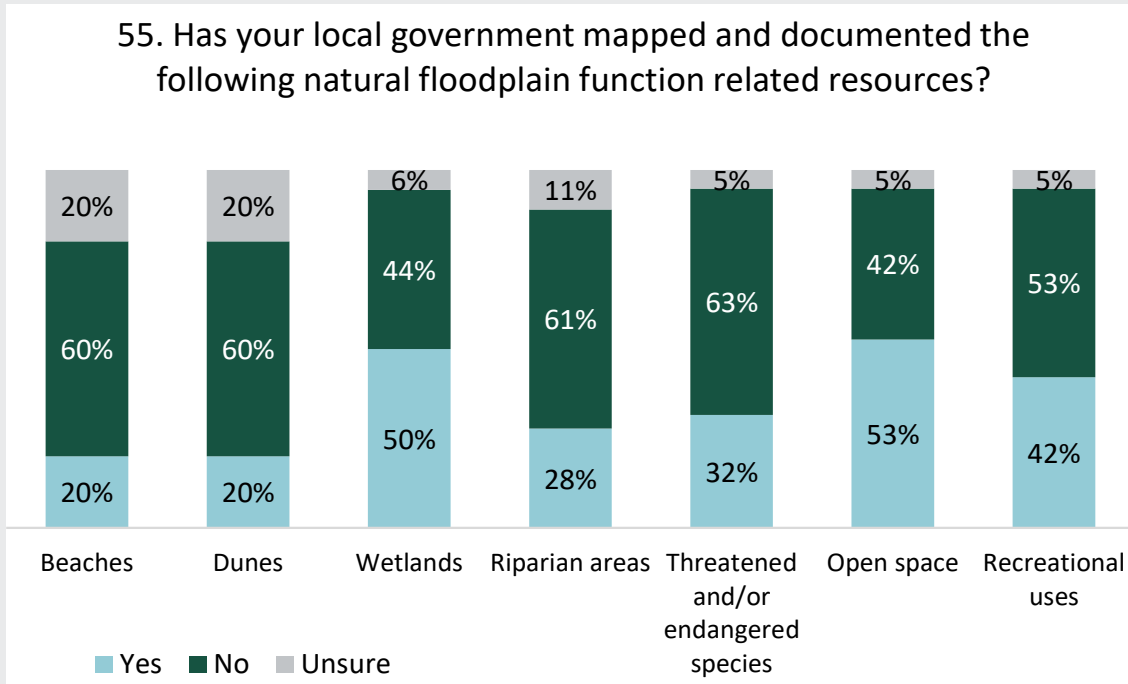


Figure 40. Responses to Question 55



Source: Indiana Dunes Tourism

Roughly half of LGAs indicated that they had mapped and documented wetlands and open space. The majority of LGAs indicated that they had not mapped beaches, dunes, riparian areas, and recreational uses (Figure 40). Several LGAs commented that they rely on publicly available layers through federal and state websites, such as IndianaMap and the Indiana Coastal Atlas. Most LGAs indicated that they inventory open space (Figure 41). Comments indicated that LGAs have this information in park plans and inventories, zoning maps, and a list of vacant lots for development.

Most LGAs indicated that they have developed plans and ordinances to protect open space (Figure 42). Comments indicated comprehensive plans, low density ordinances, steep slope and wetland protective ordinances, park plans, open space ordinances, redevelopment plans, comprehensive maintenance plans, master plans, land use plans. Roughly half of LGAs indicated that they do not have a plan that details strategies for beach management operations during periods of high lake levels or shoreline erosion (Figure 43). Some commented that while they do not have a formal plan, they do take regular actions. Most LGAs indicated that they do not have a plan that details strategies for public beach or river public access during periods of high lake levels or shoreline erosion (Figure 44).

59. Does your local government have a plan that details strategies for public beach or river public access during periods of high lake levels or shoreline erosion?

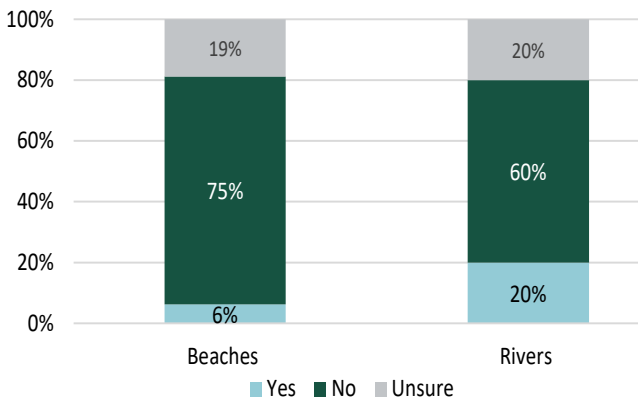


Figure 44. Responses to Question 59

56. Does your local government inventory open space?

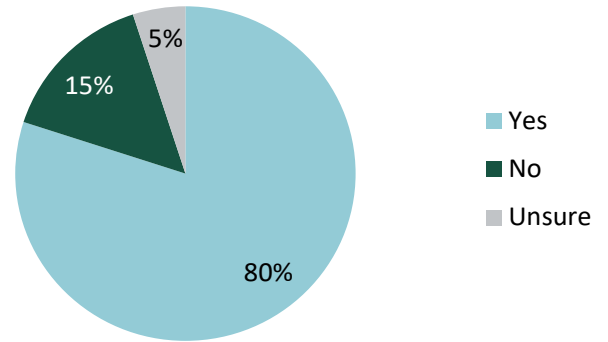


Figure 41. Responses to Question 56

57. If yes, have you developed plans and ordinances to protect open space, particularly in areas where it is lacking (e.g. park master plan, comprehensive plan, redevelopment plan)?

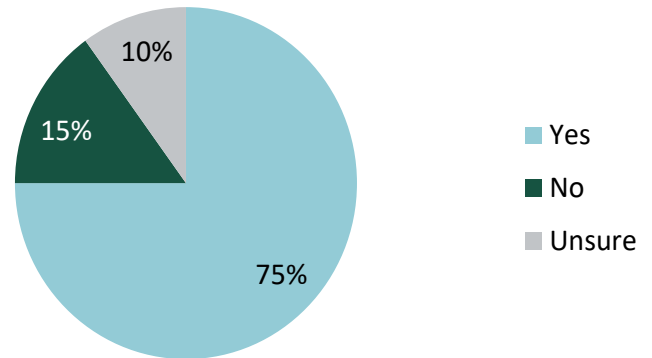


Figure 42. Responses to Question 57:

58. Does your local government have a plan that details strategies for beach management operations during periods of high lake levels or shoreline erosion?

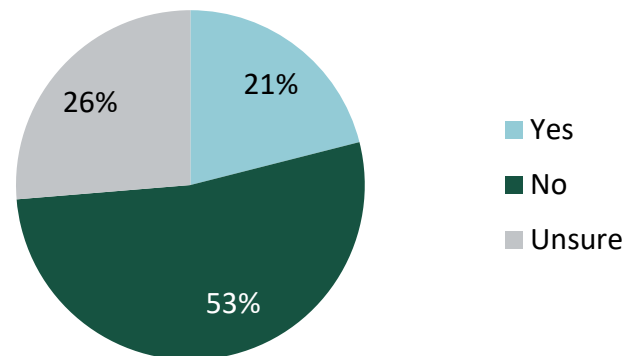


Figure 43 Responses to Question 58



MARINAS

Background: Marinas are centers of commerce and recreation. The ability for these facilities to withstand coastal hazards is important to the economic security of communities that rely on them.

4
 LGAs indicated that they have a public marina

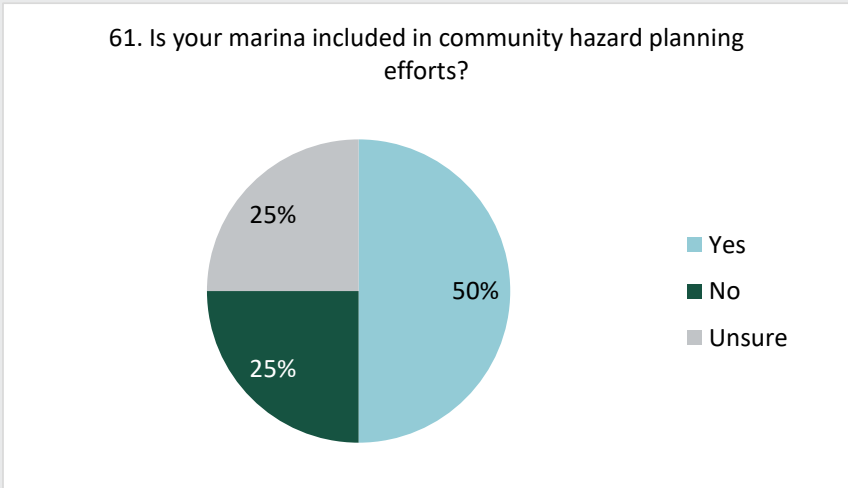


Figure 45. Responses to Question 61

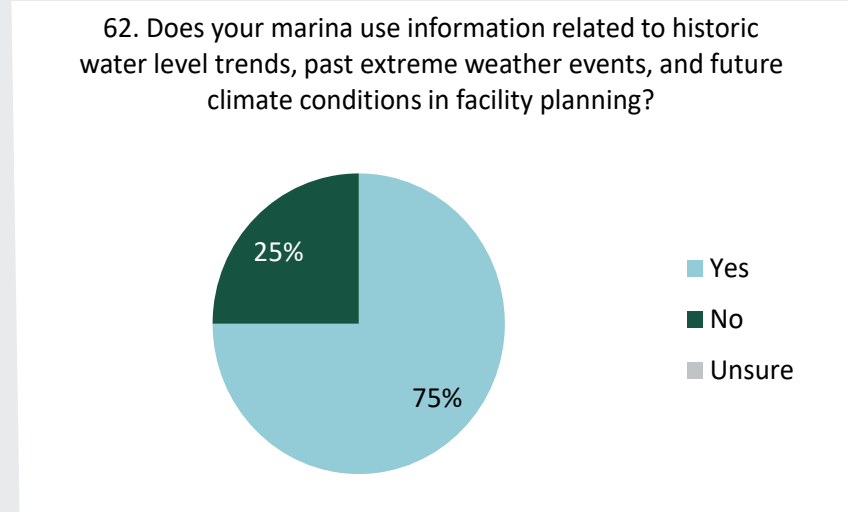


Figure 46. Responses to Question 62

- Half of respondents indicated that their marina is included in community hazard planning efforts (Figure 45), and 75% indicated that their marina uses information related to historic water level trends, past extreme weather events, and future climate conditions in facility planning (Figure 46). Responses were varied regarding whether marinas had performed risk assessments to identify necessary property upgrades (Figure 47).
- Marinas were more likely to have performed risk assessments for high water, ice, and extreme precipitation and least likely to have done so for flooding. Some LGAs (3) responded to Question 64 (Figure 48) despite responding they do not have a public marina, indicating that some responses may refer to infrastructure other than marinas. The majority indicated that they had invested in property upgrades to limit damage from coastal hazards. In the comments, LGAs referred to dock systems, shoreline hardening, sea walls, adjustable piers, deicers, and electric rewiring elevated above high-water mark.

63. Has your marina performed risk assessments to identify the property upgrades necessary to limit damage and maintain function for the following hazards?

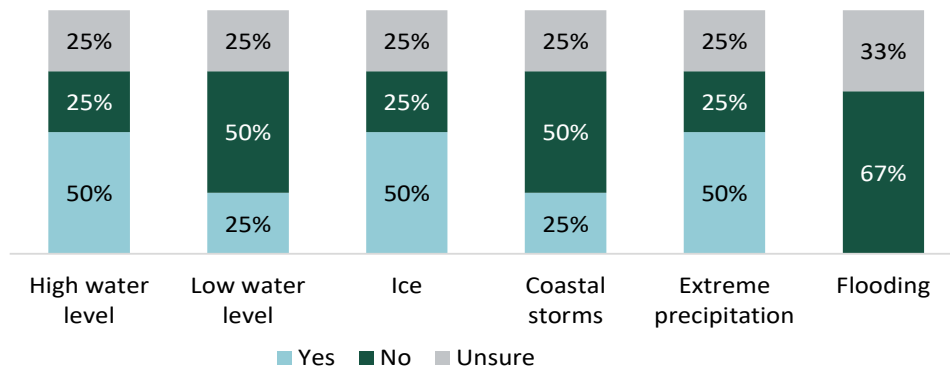


Figure 47. Responses to Question 63

64. Have you invested in property upgrades that limit damage and maintain function during varying lake levels, ice, coastal storms, extreme precipitation, and flood events?

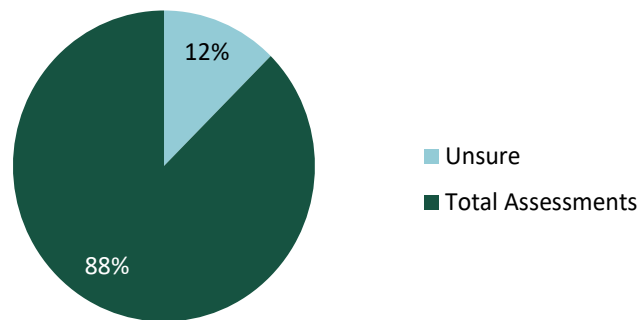


Figure 48. Responses to Question 64

Surges

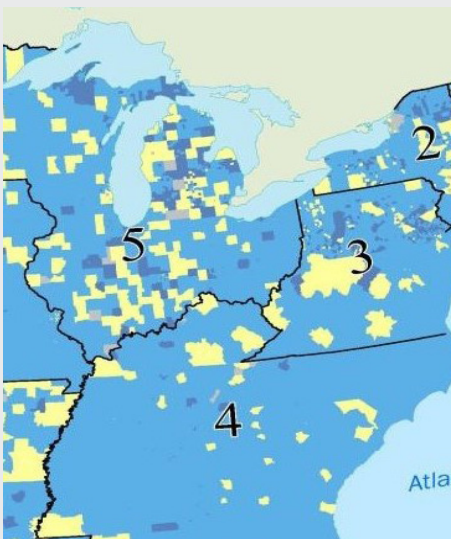
During a storm, the temperature drops, the wind shifts, and the water in the lake is disturbed, moving in the same direction as the storm. This phenomenon, known as a storm surge, occurs when a storm moves from one side of the lake to the other. The increase in water level at the eastern end of the lake and the decrease in the western end can result in a significant difference in water level, sometimes measuring several feet.



KEY FINDINGS AND RECOMMENDATIONS

Identifying Coastal Watershed Natural Hazard Risks

[LMCP's Coastal Atlas](#) is a central repository for Indiana's Lake Michigan coastal communities for information about coastal resources. The Atlas has four major sections: Wetlands, Floods, Erosion and Waves, Coastal Imagery, and Data Descriptions. It contains many resources relevant to natural hazard resiliency.



FEMA's national status map shows local jurisdictions with approved plans, approvable-pending-adoption plans, and expired Multi-Hazard Mitigation Plans.

Source: [FEMA Local Hazard Mitigation Plan Status-December 2023](#)

- The majority (83%) of LGAs indicated that non-shoreline-specific issues (riverine flooding and fluvial erosion) applied to their community. Of the communities that felt these issues were not applicable, one is highly urban and does not contain major waterways or floodplains. Two are small communities with rivers or ditches, and one contains large areas of wetlands.
- While the matrix intermixed shoreline-specific and non-shoreline-specific issues, for some issues, trends sometimes emerged in response patterns for shoreline-specific issues and non-shoreline-specific issues.
- Except for coastal flooding, most LGAs responding to shoreline-specific hazard issues perceived a high or moderate probability of shoreline-specific hazard issues. For coastal flooding and non-shoreline specific issues, most LGAs perceived low or moderate probability. *Given the many comments on flooding concerns in other sections, the low perception of riverine flooding probability is surprising.*
- LGAs report the highest level of planning for riverine flooding (44% high). However, some LGAs took actions to remove properties from the floodplain, which indicates the *low perception of flooding probability is possibly due to confidence in previous actions and planning.*
- Across all hazard issues, most LGAs responding perceived a low possibility of death/injury and a low or moderate risk of service interruption.
- *The importance of cross-jurisdiction coordination and partnerships is clear, and LGAs commented on working with agencies, such as the Little Calumet River Basin Development Commission (LCRBDC), FEMA, Army Corps of Engineers (ACOE), and County Surveyors.*

Understanding Coastal Watershed Hazard Impacts

- Most LGAs responded “no” to questions pertaining to identifying and documenting the historical geographic extent and damage/cost and assessing potential future risk for shoreline-specific hazard issues, while the majority responded “yes” to riverine flooding and fluvial erosion.
- GIS capacity appears strong for most LGAs with GIS done by staff and consultants. Most LGAs have maps and spatial data across hazard issues except for coastal storms.
- Most LGAs are aware of the potential risks of contamination of waterways due to coastal watershed hazards across all hazard issues with riverine flooding and fluvial erosion most pronounced. With such high awareness of potential contamination, *LMCP and partners might consider working with LGAs to document locations and develop plans for remediation or protection of these risk areas.*

Flooding can cause extensive damage to homes, businesses, and infrastructure. Damage can include undermining foundations of structures and in extreme cases pushing buildings off their foundations. Due to these risks, building standards in coastal areas should be more stringent.

All wetlands, regardless of type, serve important functions that benefit both the natural environment and people. Important functions may include removing excess nutrients and harmful chemicals from runoff, recharging groundwater, and protecting communities from flooding by providing floodwater storage.



Douglas Woods Wetland

Source: [The Nature Conservancy](#)

Hazard Mitigation Planning

- Many LGAs responded that they do not have an MHMP but have adopted the county-level MHMP. Some were unaware of the need for formal adoption. Many were unsure of the MHMP contents. *This suggests confusion and a need for additional support in the MHMP process.*
- LGAs reported that the MHMPs were more likely to document past mitigation efforts and identify strategies to address hazard issues for riverine flooding and fluvial erosion compared to shoreline-specific issues.
- Because this was a self-assessment, NIRPC did not assess MHMPs for LGAs. However, *LMCP and partners could evaluate the plans and collaborate with county leads in planning.*
- Most respondents were unfamiliar with FEMA Hazard Mitigation Grants and the BRIC program. *Additional outreach and training on these programs could be beneficial.*



Flooding at Wihala Beach. Source: Deb Man, National Weather Service

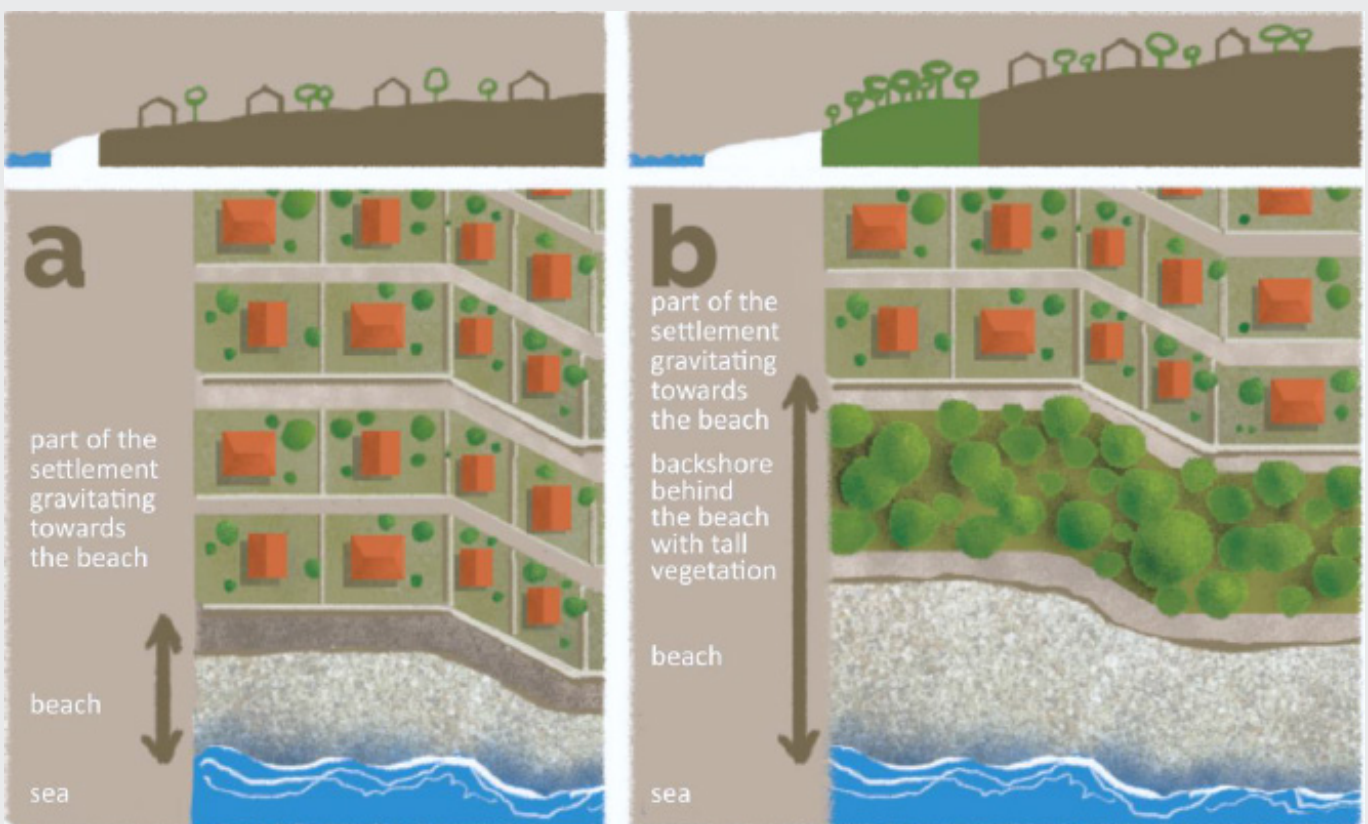
Local Government Planning

- LGAs tend to indirectly address resiliency in their plans without explicitly focusing on “community resilience” or climate mitigation. This may be because these terms have only gained prominence recently and have not been formally integrated into most plans. Political associations with these terms might discourage some LGAs from using them. *Assistance for resiliency planning or integrating it into other plans could be beneficial.*
- Less than half of LGAs recommend protecting or relocating public infrastructure, updating plans based on neighboring municipalities, conducting natural resource inventories, and including protection of natural systems. *LMCP and partners should promote resiliency in planning. NIRPC’s Sensible Tools Handbook+ offers a chapter with valuable resiliency tools.*

- Local governments' top priorities for enhancing resiliency are shoreline protection, flood reduction, and a combination of nature-based and traditional infrastructure solutions.
- NIRPC found that the staff completing the assessment were sometimes unaware of their LGA's plans or their contents. NIRPC sometimes knew about relevant information in LGA plans that the staff were unaware of but did not modify responses or review plans in detail due to the self-assessment nature of the project. *LMCP and partners could inventory LGA plans and review their resiliency components to improve communication and coordination among LGA staff and clarify the status of resiliency planning for LMCP and LGAs.*

Local Ordinances

- Most LGAs have zoning regulations, ordinances for sustainable development and conservation, requirements for setbacks from shorelines and streambanks, and limits on development in floodplains.



Source: [Coastal setback zones](#)

Implementing Best Practices

- Most LGAs participate in the National Flood Insurance Program but not the Community Rating System (CRS). Some LGAs have been working to remove properties from floodplains, making them feel that National Flood Insurance Program less necessary for them. *LMCP and partners should work to help LGAs understand the value of the program, as flooding is not limited to mapped areas.*
- Many LGAs are unsure about the CRS and might need more information about it. One LGA considered the program but found it economically impractical for their community. Responses regarding interest in a regional CRS were divided, with most expressing interest or uncertainty. *It may be helpful to assist LGAs in conducting economic analyses and to provide more information on the CRS program.*

Public Education & Engagement

- Most LGAs don't regularly educate the public about natural hazards or involve them in identifying historic impacts or strategies. However, they are more likely to conduct outreach for non-shoreline issues, particularly riverine flooding. Comments suggest this could be because they confuse it with the water quality education being done through MS4. *LMCP and partners should consider providing support in natural hazard outreach, perhaps providing hazard-specific information to supplement MS4 education.*

Stormwater Management

- Approximately 80% of LGAs are MS4 communities, and 95% utilize stormwater infiltration/management strategies to minimize runoff. Around half take projected increases in precipitation into account in their stormwater management plans and manage infrastructure for future climate risks. Most LGAs lack flood management plans. *These findings suggest that assistance from LMCP and partners around integrating projected climate changes into plans and developing flood management plans would be useful.*



Source: [How to Best Manage Stormwater?](#)

Shoreline and Fluvial Erosion Protection

- Most LGAs documented and routinely inspected erosion protection structures but were divided on documenting their condition, effectiveness, and life expectancy. The majority did not document adverse impacts on adjacent shorelines or downstream areas.
- Around 75% of LGAs explored hybrid-structural or non-structural options, but 55% lacked the knowledge and capacity to maintain hybrid-structural options. One LGA expressed limited expertise but showed interest in learning more. *This suggests that additional training and resources are needed to manage hybrid-structural and non-structural options.*

Natural Areas, Open Space, and Public Access

- Many LGAs inventory open space but have not mapped beaches, dunes, riparian areas, and recreation uses. *Mapping assistance could help. LGAs rely on publicly available layers from IndianaMap and Indiana Coastal Atlas, suggesting that these resources should be maintained and built upon to benefit the communities that use and depend on them.*
- Many LGAs lack a specific plan for managing access to public beaches and rivers during times of high lake levels or shoreline erosion. However, some take regular actions even without a formal plan. *It may be helpful to support and encourage LGAs to formally document their actions in a plan.*

Marinas

- Four LGAs have public marinas and answered related queries.
- About 50% of respondents reported their marinas to be part of community hazard planning. However, fewer marinas conducted risk assessments for flooding compared to other concerns, and most had made property upgrades to mitigate damage from coastal hazards.



Source: [Hammond, IN- Marina](#)

CHALLENGES AND LESSONS LEARNED

NIRPC's self-assessment process and challenges provide valuable insights for LMCP, future tool use or revision, and other agencies' planning similar projects.

- Reaching and motivating LGA staff to complete the assessment proved challenging. High attendance at the webinar training did not lead to LGA action, while more engaging in-person workshops were not well-attended. Neither the workshop nor the webinar effectively got LGAs to complete the assessment. Announcements about the assessment at NIRPC meetings also lacked follow-up engagement.
- Direct communication with LGA staff with strong connections with NIRPC or LMCP was the most successful form of outreach, while cold calls and emails were less successful. Persistence and frequent communication were necessary. Sending emails to multiple contacts within an LGA often resulted in no response. It was found that individual follow-up emails to only one recipient at a time were more effective, ensuring that recipients didn't assume someone else in their LGA would handle it. Finding a "team lead" at the LGA was crucial to completing the self-assessment. Progress on the assessment was sometimes halted due to staffing changes or elections when the team lead or an expert left the LGA.
- NIRPC emphasized the benefits of completing the assessment in their communication and increased this messaging over time. Some LGA contacts asked if completing the assessment would result in funding. While it could make LGAs more competitive for funding, completing the assessment itself does not guarantee any funding. To enhance interest, direct funding or a tangible reward could be considered.
- The original intent of "listening sessions" was to assist LGAs in completing the self-assessment tool, gather community feedback, and answer questions regarding the tool. However, the sessions turned into working sessions where NIRPC and LMCP worked through each question in the self-assessment and sometimes recorded the notes for the LGA. Many LGAs used the initial session to begin working on the assessment, but additional sessions and reminders were needed to ensure completion. In some cases, multiple sessions were held, including virtual and telephone sessions and supplemental emails to help LGAs.

- While NIRPC and LMCP took care to only include relevant questions in the assessment, the length of the assessment may have discouraged LGAs. Some LGAs finished quickly, while others required multiple sessions. Simplifying and shortening the assessment could make it less intimidating to LGAs.
- NIRPC and LMCP combined shoreline-specific and non-shoreline-specific issues in one assessment, but this made two-thirds of the issues not applicable to half of the responding LGAs. A better approach may have been to create a separate shortened assessment for non-shoreline communities or to auto-populate remaining fields as "NA" once a hazard is noted as such.
- Many non-shoreline LGAs were confused about whether the term "coastal" applied to their community. The title of the assessment, "Indiana Coastal Watershed Hazards Resiliency: A Community Self-assessment Tool," caused confusion. It would be clearer to rephrase it as "Natural Hazards Resiliency: a Self-assessment tool for Indiana communities. Additional outreach on what is meant by "coastal" is needed.
- Many LGAs expressed that they found the assessment valuable, discovering new facets of resiliency planning and actions. A small number of communities disregarded resiliency issues as irrelevant. One community marked all hazard issues as "NA". Others stated the assessment was not applicable as they were either partially outside the LMCP program boundary or not eligible for funding.
- To ensure clear and consistent responses, open-ended questions should be avoided for topics that can be categorized. For instance, Question 10 received varied responses, indicating the need for predefined answer options. Open-ended questions should be used only for questions aimed to generate open responses.

APPENDICES