



LIVING IN SENSITIVE AREAS

A HOMEOWNERS GUIDE FOR RESIDENTS OF GRAND HAVEN



ACKNOWLEDGMENTS

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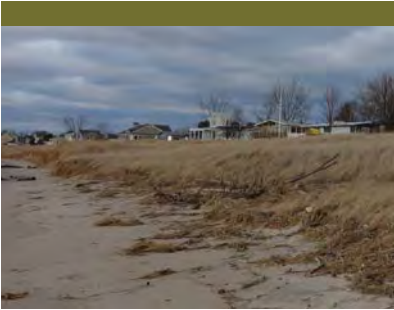
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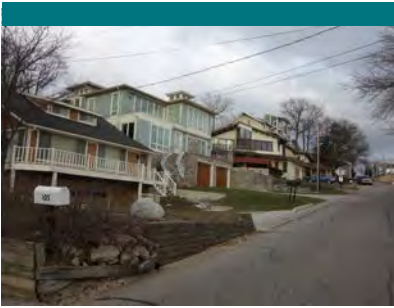
A toolkit of best management practices for homeowners living in sensitive areas.



CHAPTER 1

LIVING ALONG THE COAST

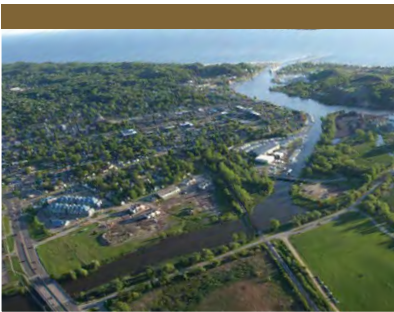
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INTRODUCTION

Michigan is fortunate to have some of the most unique natural features in the world.



Michigan's dynamic Great Lakes coastline frames nearly 20% of the world's fresh surface water while providing the backdrop for countless beach vacations, long walks through the surf and breathtaking sunsets. Michigan's coastal dunes rise dramatically from the shoreline, providing spectacular views as well as unique habitat for plants and wildlife. The state's inter-coastal waterways and wetlands support recreational boating and also help to improve water quality, store floodwater and provide habitat for a variety of fish and animals.

In Grand Haven, all these extraordinary features weave together, providing a visual tapestry as well as a distinctive mix of ecological communities that support rare and endangered species, irreplaceable habitats and dynamic biological interactions. Ideally, development within and adjacent to these natural features should support and enhance the property owners' enjoyment of these areas while simultaneously protecting the very characteristics that make it unique and valuable to begin with.

Most residents would agree that living within and near these natural features is quite desirable. However, the impacts of new construction, increased density and exotic landscaping can create serious impacts on the surrounding environment.

This guidebook is intended to provide homeowners with the tools, strategies and best practices to better protect these unique and sensitive areas of the City:

- Lake Michigan Coastline
- Dunes
- Riverine Areas and Floodplains
- Wetlands

In addition, we hope this guidebook will also encourage architects and builders to place increased importance on natural resource protection.



CHAPTER 1

LIVING ALONG THE COAST

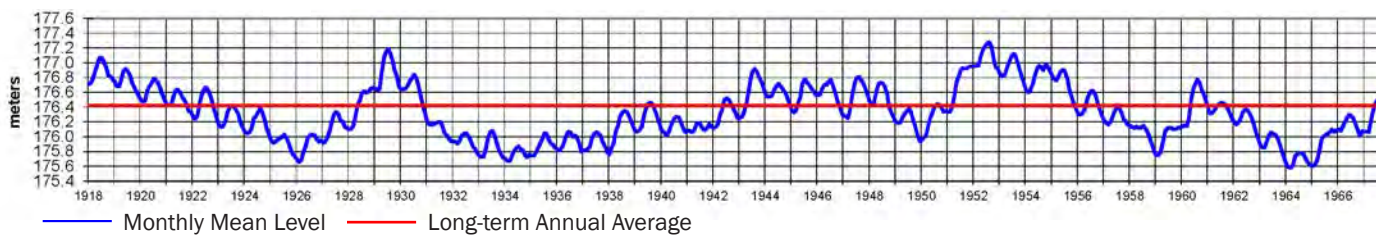
It's no secret the Lake Michigan coastline is one of the most unique and well-visited natural features in Grand Haven. The city has roughly 2.2 miles of coastline along Lake Michigan. A large portion of the city's coastline is part of Grand Haven State Park. However, about 74 homes (mostly in the North Shore District) are located directly on the coastline.

It is important for homeowners to understand that the Great Lakes function differently than other inland water bodies and tidal oceans. Understanding these dynamics can help homeowners think about and plan for naturally occurring changes along the shoreline.

Great Lakes water level changes result not from the moon's gravitational pull, but from cyclical changes in precipitation, evaporation and river and ground water inflows. These factors work together to raise and lower the water level of the Great Lakes in small increments daily, and in larger increments seasonally and over the course of years and decades. These long-term water levels fluctuate by multiple feet (see Chart 1.1).

As of this publication, water levels on all the Great Lakes are well above average. Due to the inter-connectedness of the Great Lakes, our current high waters have been developing since the spring of 2013, when a record-setting two-year rise in water levels began on the upper Great Lakes. Lake Michigan's water level in November of 2017 averaged 580.20 feet, which is only about one foot below the all-time high set in 1986.

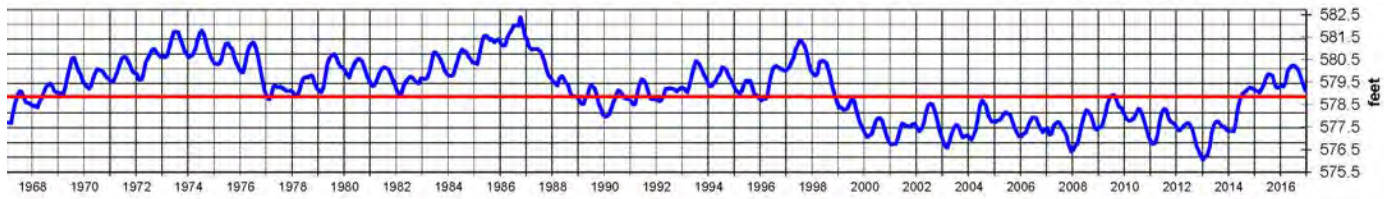


CHART 1.1 LAKE MICHIGAN WATER LEVELS (1918-2016)**HISTORICAL WATER LEVELS ALONG THE NORTH SHORE**

However, changes in water levels are not solely responsible for the movement of the shoreline landward and lakeward over time. The velocity and height of waves, erosion of shorelines, and the pace of changing water levels also contribute to coastal dynamics on the shoreline.



— 1970 — 1974 — 1986 — 1998



Source: U.S. Army Corps of Engineers

HIGH-RISK EROSION AREAS

In addition to the dynamic processes of Lake Michigan, portions of the coastline in Grand Haven have been identified by the State of Michigan as *High-Risk Erosion Areas* (HREAs). HREAs are those areas of the shore where erosion has been documented to occur at a long-term average of one foot or more per year. According to maps developed by the Michigan Department of Environmental Quality (DEQ), along a portion of the north shore, the 30-year projected recession distance is 65 feet, and the 60-year projected recession distance is 115 feet. Along a portion of the south shore, the 30-year projected recession distance is 80 feet, and the 60-year projected recession distance is 145 feet.

Unfortunately, this erosion process is irreversible. Once the shoreline has eroded inland, it will never come back as “permanent” shore, although loosely consolidated beach may reappear for periods of time when lake levels are relatively low.



HIGH-RISK EROSION AREAS





In most instances, property owners along the coastline have invested a lot of money, time and family history in their lakefront homes, and they understandably want to take whatever steps they can when their home is affected by movement of the shoreline. That desire often includes the expectation of building shoreline “armoring” structures such as revetments, seawalls or groins in an attempt to stop the progression of shoreline erosion.

However, the construction of shoreline armoring can cost substantial funds to build and then to maintain and rebuild over time as the lake relentlessly works to erode it away. More importantly, because shoreline sediments move in response to hardened structures along the shore, such structures can yield a variety of harmful impacts, including: scouring away the entire beach lakeward of the armored structure; preventing natural movement of the beach as a viable ecosystem and a place to walk; interrupting the longshore movement of sediments; scouring away beach at the edges of the structure; and destroying native vegetative cover and nearshore habitat. In short, the armoring may work to protect the individual beach house, but not the beach.



BEST PRACTICES

A. DO NOT PLACE ARMORING STRUCTURES ALONG THE BEACH.

Individual seawalls, revetments and groins can scour away the beach and seriously impact neighboring property owners.

B. PRESERVE NATIVE VEGETATION.

Native vegetation has adapted to survive the extreme dry conditions of the dune area as well as wind and blowing sand. Native vegetation helps to support and provide habitat for other native species and mitigates erosion.

C. DO NOT ALTER OR REMOVE THE DUNE.

Do not clear dune vegetation or alter the dune to gain views and/or access from the home to the beach. Removing vegetation and clearing the dune increases the likelihood of destabilizing the dune and causing erosion. In addition, install pile-supported timber walkways over vulnerable sand ridges to protect native vegetation.

D. HELP BUILD THE DUNE.

Replant the dune with native beach grass and utilize slot-type snow fences to help build and stabilize the dune.

E. KEEP ATVS OFF THE DUNE AND BEACH.

Don't use all-terrain vehicles (ATVs) on beaches, sand ridges or dunes, as they will destroy native vegetation and destabilize the dune.

F. BE PREPARED TO MOVE.

Understand the true costs and considerations of moving your home away from the shore.





CHAPTER 2

LIVING IN THE DUNES

Michigan's dunes are one of the most striking environmental features in the world. Together, they represent the largest freshwater dune ecosystem in the world.

There are about 225,000 acres of sand dunes in Michigan. Of that, the Michigan DEQ classifies 74,000 acres as Critical Dune Areas (CDAs). Development within CDAs is regulated by the state, and property owners must receive a permit for many activities that either alter the appearance or contours of a CDA.

The City of Grand Haven has 600 acres of Critical Dune Areas. They are primarily located east of North Shore Drive and south of the Grand River.

LANDSCAPING IN THE DUNES

Plants and vegetation in the dune landscape help to stabilize the sand, reduce water and wind erosion, provide shade, provide habitat for animals, birds and insects, and provide a natural and aesthetically pleasing environment.

Dune vegetation is especially sensitive to human disturbance. Walking or driving on dune vegetation may destroy surface vegetation and cause roots to die. Eliminating or altering dune vegetation can also alter animal habitat. Typical home amenities such as decks, patios, parking areas and stairs can increase the utility of the site, but must be carefully designed and constructed to avoid the damaging effects of erosion.

A. PRESERVE NATIVE VEGETATION.

Native vegetation has adapted to survive the extreme and dry conditions within the dune area as well as wind and blowing sand. Native vegetation helps to support and provide habitat for other native species and mitigates erosion.



These photos illustrate a home (above) that has utilized native and natural landscaping techniques, unlike their neighbor next door (below).

CRITICAL DUNE AREAS



B. UTILIZE NATIVE VEGETATION.

Non-native plants often require increased maintenance, additional watering and soil enhancement. Any new plants should be native to the existing natural ecosystem.

C. REMOVE INVASIVE SPECIES.

Invasive species can rapidly expand their coverage, eliminate native species and overtake a habitat.

D. REVEGETATE IN STAGES.

Revegetate your property as portions of your site are complete, ideally within two weeks after completion. Vegetation that dies from natural or man-made causes should be replaced as soon as possible.

E. DO NOT CLEAR OR ALTER THE DUNE.

Don't clear dune vegetation or alter the dune to gain views and/or access from the home to the beach. Removing vegetation and clearing the dune increases the likelihood of destabilizing the dune and causing erosion.

F. MINIMIZE CLEARING AROUND THE HOME.

Clearing vegetation and trees around homes can also increase the likelihood of destabilizing the dune.

Use steps, bridges and ramps mounted on posts to traverse steep or unstable slopes. A path on a steep slope can contribute to killing the native vegetation, disturbing the sand and exacerbating erosion.

NATIVE PLANTING RESOURCES

1. Information about Native Plant Species can be found at the Michigan State University Department of Entomology: www.canr.msu.edu/nativeplants/plant_facts/local_info/index
2. A List of Common Native Plants for Michigan Sand Dunes can be Found at: www.michigan.gov/documents/deq/wrd-dunes-native-plants_453063_7.pdf

G. MAINTAIN THE FOREST CANOPY IN FORESTED DUNES.

Avoid tree removal that will interrupt the tree canopy. A mature tree canopy can help sustain continuity for the ecosystem, provide shade and reduce the cooling needs of the home.

H. MINIMIZE IMPERVIOUS SURFACES.

Homeowners should take steps to reduce and slow water runoff to avoid harmful erosion. Decks with spaced boards or patios with a stone course can provide hard surfaces that will not be a source for fast-flowing runoff.

I. TAKE CARE OF STEEP OR UNSTABLE SLOPES.

Use steps, bridges and ramps mounted on posts to traverse steep or unstable slopes. A path on a steep slope can contribute to killing the native vegetation, disturbing the sand and exacerbating erosion.

J. PROTECT AGAINST WILDFIRE.

Provide a defensible space around your property to prevent wildfire damage. Keep plants free of dead leaves and litter. Position portable gas heaters, firewood and other flammable items at least 50 feet from the home. Do not plant conifers or other flammable shrubs within 30 feet of the home. If flammable plants already exist, either remove them and replace with suitable native species, or prune the lower branches off to 8 feet or higher.



HOME DESIGN IN THE DUNES

The design of a home, including any exterior living spaces and ancillary structures, typically accounts for the bulk of disturbance within a site. Designing a home involves dealing with a number of interconnected issues and systems. The following considerations can affect the environment of the home.

A. MINIMIZE YOUR FOOTPRINT.

A smaller footprint leaves as much of the native environment undisturbed as possible. The use of multiple floors can create additional livable space on a smaller footprint.

B. REUSE EXISTING FOUNDATIONS.

A repurposed foundation can minimize vegetation removal and excavation.

C. USE INNOVATIVE TECHNIQUES TO EXPAND INDOOR AND OUTDOOR LIVING SPACES.

Cantilever floor space or balconies to preserve natural vegetation or slopes. Create rooms that serve multiple uses rather than rooms designated for one use.

D. USE PIERS AND POSTS.

Use piers or posts for structural support to minimize disturbance of the existing habitat or to avoid extensive excavations.

E. MINIMIZE EROSION FROM RAINWATER RUNOFF.

Avoid the use of a single point of discharge. A concentrated source can easily deliver water faster than the ground can absorb it and cause erosion. A sheet of water draining from a roof or large paved area is also likely to cause erosion. It is important to disperse the flow of runoff over a wide, flat area so that the water is slowed and a portion of it is readily absorbed. Rain barrels can also safely collect runoff.

F. BE SEEN IN AN EMERGENCY.

Aid firefighters and other emergency vehicles by making sure to identify private roads and individual driveways with reflective-metal street and address signs.

Designing a home involves dealing with a number of interconnected issues and systems.



DRIVEWAYS IN THE DUNES

Automobile access to a home site usually disturbs more land area than any other single use. It requires more grading, removal of more trees and native plants, and causes more erosion than most other uses. Driveways also create edges and routes for invasive plants to move into otherwise natural areas. To reduce the damaging effects of driveways in dune areas, the following options should be considered.

A. SHARE DRIVEWAYS.

Share a drive with multiple homes, especially for a home set back on a lot, far away from the nearest paved public road. A shared driveway could substantially reduce the area of impervious surface within the building site.

B. ONE LANE.

Build a single-lane drive with pulloffs for passing if the driveway is long. Typically, when the width of a driveway that runs across a slope is widened, the required cut and fill is dramatically increased.

C. FOLLOW THE TERRAIN.

Locate the driveway to minimize grading and changes in the terrain.

D. AVOID PAVEMENT.

Request a waiver from the City to allow for the use of pervious driveway materials. Do not pave drives and parking areas with impervious materials unless it's impossible to avoid.

E. USE A PARK-AND-WALK APPROACH.

The driveway does not have to extend all the way to the home. Minimize parking and provide a small walking footpath to the home.



A driveway and parking area does not have to extend all the way to the home.



A shared driveway can reduce the area of impervious surface for multiple homes.

HOME LOCATION IN THE DUNES

Once a parcel is selected, one of the most important decisions in building a new home is where to site the structure on the property. This decision will determine what can and cannot be seen, and how extensively the site will need to be altered by grading, tree removal and clearing.

A. LOCATE THE HOUSE NEAR THE POINT OF ARRIVAL.

Doing so reduces the length of a driveway and reduces the extent of damage to build driveways and parking.

B. TAKE ADVANTAGE OF SITE CONDITIONS.

Work with the natural features and conditions of the site.

C. REMOVE AS LITTLE NATIVE VEGETATION AS POSSIBLE.

By placing the home in a location with a lower density of trees and other vegetation, or by building in the same area (footprint) of a previous home, homeowners can minimize disruption of native vegetation and reduce the chances of invasive species taking root on the site.

D. BUILD BACK FROM THE CREST OF THE DUNE.

Homes close to the crest are in danger of structural failure from sand erosion and movement. Erosion at the foot of the bluff and gravity acting together will cause the crest of the dune to recede. If repairs can be made, they will often be very expensive.

E. ORIENTATION.

Orient the long axis of the house across the slope to minimize the variation in elevation within the footprint of the structure. It will reduce the extent of excavations and construction costs as well.





CHAPTER 3

LIVING IN THE FLOODPLAIN

A river, stream or drain may occasionally overflow its bank and inundate adjacent lands, and the land that is inundated by water is defined as a floodplain. Floodplains serve as water recharge areas and natural water retention basins during periods of heavy precipitation or spring snow thaws.



The National Flood Insurance Program is an optional program managed by the Federal Emergency Management Agency (FEMA) in which communities, including Grand Haven, receive flood insurance for disaster relief by agreeing to regulate floodplain development.

Flood Insurance Rate Maps (FIRMs) are created and released by FEMA using event-based modeling and lake-level elevations determined by a single storm event from various return periods. The maps identify a base flood elevation sometimes referred to as the “100-year flood” zone. The FIRMs for Ottawa County were adopted in 2011 by the City of Grand Haven.

Flooding impacts are felt most significantly at the household level. Flooding causes immediate property damage, and it can also create a long-term burden for property owners struggling with lingering issues such as mold removal. In addition, flooding can seriously impact water quality throughout an entire community.

A home’s flood risk is based on its relative location to floodplains and other hazard areas. Looking at the age of a home can help determine the potential impacts of flooding. In general, homes built before 1940 used a more porous concrete material for basement construction, so water can flow more rapidly through the foundation.

Floodzone Terminology

The 100-year flood zone does not mean that the 100-year storm (and subsequent flooding) happens every 100 years. Rather, it means the storm (and subsequent flooding) has a 1% chance of occurring in any given year. 500-year flood zones have a 0.2% chance of occurring in any given year.

100-YEAR FLOODPLAIN

100 AND 500-YEAR FLOODPLAIN



HOMES BUILT BEFORE 1940

BEST PRACTICES

A. LIMIT IMPERVIOUS SURFACES AROUND THE HOME.

Impervious surfaces have a well-understood negative impact in a flood event. The increased runoff can exacerbate the risk of structural damage and reduce regional water quality. Minimize the amount of impervious surfaces around your home and/or utilize porous pavement.

B. MAINTAIN TREE CANOPY.

Trees help absorb some inundation during times of flooding. Homeowners should maintain as much tree canopy as possible.

C. MOVE STRUCTURES ABOVE THE BASE FLOOD ELEVATION.

Elevate structures and/or move accessory structures above the Base Flood Elevation.

D. TAKE STRUCTURAL MEASURES.

Implement structural measures to limit the damage of flooding if your home cannot be elevated (e.g., flood damage resistant material, elevating utilities).

E. USE RAIN BARRELS.

Using a rain barrel (or a series of rain barrels) will help reduce runoff volume, promote infiltration, and slow water runoff from the roof. During large storm events, rain barrels can also help reduce erosion. Rain barrels are fairly inexpensive, easy to install and take up little space.

F. ESTABLISH A BUFFER.

A buffer is a natural, undeveloped area. Buffers provide the initial filtering of sediments and other pollutants from runoff water. Buffers also slow runoff water, reducing erosion and flood flows.





CHAPTER 4

LIVING NEAR WETLANDS

Wetlands play a critical role in regulating the movement of water within the community. Wetlands are also incredible flood absorbers. The water-holding capacity of a specific wetland varies by its size, slope of the surrounding land, type of vegetation, its location relative to a flood path, and the water levels in the wetland prior to flooding. Coastal wetlands also control the severity of erosion along a shoreline during a storm.

In the City of Grand Haven, wetlands constitute about 20% of the natural features identified by the City, or about 270 acres. Wetlands are generally found in the northern part of the City (north of Madison) and sporadically in the southern and eastern portions of the City near the Grand River.

BEST PRACTICES

A. USE RAIN BARRELS.

Using a rain barrel (or a series of rain barrels) will help reduce runoff volume, promote infiltration, and slow water runoff from the roof. During large storm events, rain barrels can also help reduce erosion. Rain barrels are fairly inexpensive, easy to install and take up little space.

B. INSTALL A RAIN GARDEN.

A rain garden is a specialized landscape design that captures runoff from roofs, driveways or other impervious surfaces near the home. Rain gardens use plants to remove pollutants and improve infiltration, allowing water to slowly soak back into the ground.

C. UTILIZE PERMEABLE PAVEMENT OPTIONS.

Porous or permeable surfaces allow stormwater to infiltrate into underlying soils, thereby promoting pollutant treatment and groundwater recharge. Permeable paving options include block pavers, porous asphalt, and concrete and vegetated grid systems.

WETLANDS

D. PRESERVE NATIVE VEGETATION.

Preserve vegetation adjacent to the wetland and/or establish a greenbelt of native vegetation.

E. ELIMINATE THE USE OF FERTILIZERS.

Fertilizers and pesticides represent a potential threat to a wetland. If they are used on adjacent or upstream lawns, it is likely they will eventually enter local waterways and your wetland. These chemicals alter the ecological balance of wetlands.

F. ESTABLISH A BUFFER.

Buffers — natural, undeveloped areas surrounding a wetland — are a crucial part of the wetland system and should be protected. Buffers provide the initial filtering of sediments and other pollutants from runoff water. Buffers also slow runoff water, reducing erosion and flood flows.



REFERENCES AND SOURCES

Information on Best Practices described in this Guidbook were adapted from the sources listed below.

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