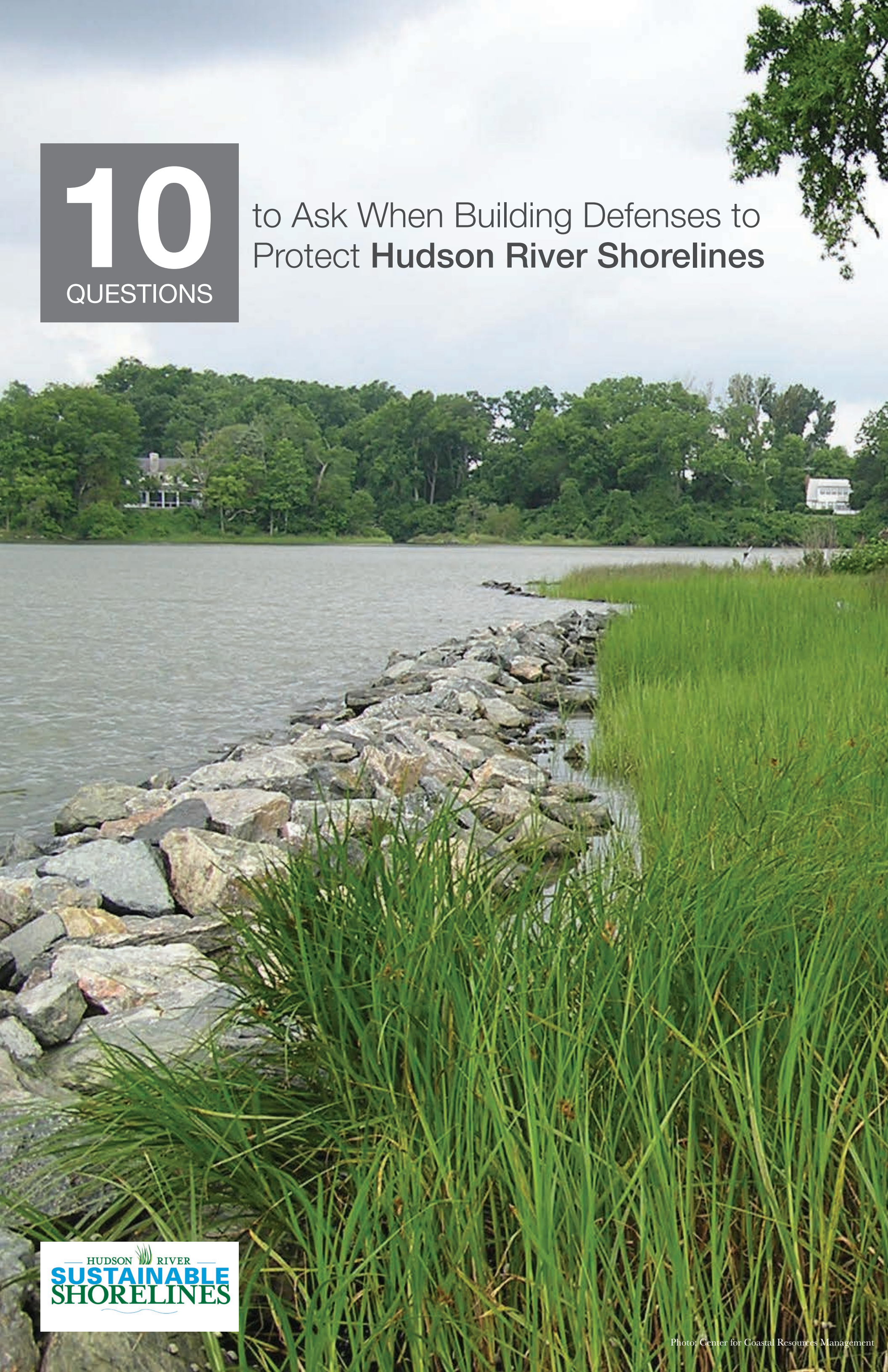


**10**  
QUESTIONS

to Ask When Building Defenses to  
Protect **Hudson River Shorelines**





*(Photo: Dave Strayer)*



*(Photo: HRSSP)*

*Depending on how shore zones are managed, they can provide few or many ecological benefits.*

## Importance of shore zones

Shore zones (the area near the shore, on both the land and water sides) are valuable for both people and nature. People use shore zones for all kinds of recreation – hiking, swimming, fishing, hunting, boating, bird-watching, and contemplation – as well as building houses, marinas, roads, sewage treatment plants, and other infrastructure. Shore zones also are often vital habitat for fish, shellfish, wildlife, birds, and plants, and can perform important ecological services (water purification, erosion protection) for people.

People often build shore defenses like bulkheads, revetments, levees, and breakwaters to protect shore zones against erosion and flooding, or improve them for specific human uses. In the past, these typically were built without regard to their ecological effects, and often caused serious ecological damage. We now realize that careful design, construction, and management of shore defenses can both meet human needs and protect (or even enhance) habitat for the species that share shore zones with us.

The following questions are designed to help you choose the right kind of shore defenses (if any) for your site. They are intended to open and guide your discussions with engineers, landscape architects, and regulators who will work with you. Of course, this is just a beginning.

**And always keep in mind that your best choice may be to build no structure at all.**

# RESOURCES to help you choose the right treatment for your site:

Hudson River Sustainable Shorelines Project  
[www.hrnerr.org/hudson-river-sustainable-shorelines](http://www.hrnerr.org/hudson-river-sustainable-shorelines)

New Jersey's "Living Shorelines Engineering Guidelines"  
[www.state.nj.us/dep/cmp/docs/living-shorelines-engineering-guidelines-final.pdf](http://www.state.nj.us/dep/cmp/docs/living-shorelines-engineering-guidelines-final.pdf)

## 1. How strong are the physical forces acting on your shoreline?

The strength of physical forces from waves, wakes, currents, ice, and floating debris determines whether defenses are likely to survive, and whether they are necessary. In general, you have more options at sites where physical forces are mild. Be sure to think about the strength of physical forces not just on a fine summer day, but during severe storms and when the water level is higher – during a flood or after years of sea-level rise. During high water, waves, ice, and debris may be able to reach and damage areas that are usually dry. You can use the link below to get a general idea about the strength of physical forces.

web resources:

### **Spatial Information for Designing a Shoreline**

[www.hrnerr.org/hudson-river-sustainable-shorelines/spatial-information-designing-shoreline](http://www.hrnerr.org/hudson-river-sustainable-shorelines/spatial-information-designing-shoreline)



*Ice is one of the physical forces that can damage Hudson River shorelines. (Photo: HRNERR)*

## 2. How quickly is the shoreline eroding?

Sites that are eroding rapidly often need to be treated differently from sites that are eroding slowly or are stable. You can assess how badly your shoreline has been eroding by looking at historical photographs (e.g., at Google Earth or Historic Aerials) or by using "Is Your Shoreline Eroding?" to help you interpret the condition of your shoreline.

web resources:

### **Google Earth**

[www.google.com/earth](http://www.google.com/earth)

### **Historical Aerials**

[www.historicaerials.com](http://www.historicaerials.com)

### **Is Your Shoreline Eroding?**

[www.hrnerr.org/hudson-river-sustainable-shorelines/shorelines-engineering/shoreline-eroding](http://www.hrnerr.org/hudson-river-sustainable-shorelines/shorelines-engineering/shoreline-eroding)



*A shoreline that is eroding rapidly. (Photo: Peter Turner)*

## 3. What do people use the site for?

Human uses of the site and nearby properties are critically important for choosing the best shoreline treatment. Is there valuable infrastructure on the site? Do large boats need to have deepwater access? Will people need to get to the water's edge to swim or fish? Is the site used mainly for hiking and bird-watching? Would occasional flooding completely ruin the planned uses of the site, or just be a mild inconvenience?

Sites that can tolerate some erosion and flooding (e.g., a park) will benefit from different shoreline protection than sites with valuable and sensitive infrastructure (e.g., sewage treatment plant). Is there enough room to build anything that you'd like, or do current or planned uses in and around the site limit the size of possible designs? And because many kinds of shore defenses have visual and physical impacts (e.g., erosion) on nearby sites, it is important to consider current and future uses in the neighborhood as well. Be sure that your choice fits the planned uses of your site, and does not harm your neighbors.



*People use this site for fishing, so access to the water's edge is important, and occasional flooding probably is not. (Photo: DEC)*

## 4. What does Mother Nature use the site for?

Shoreline habitats are among the most valuable habitats on the planet, and often are heavily used by fish, birds, wildlife, plants, and other species. Unless you know otherwise, it is best to assume that shoreline habitats are ecologically valuable, and can be preserved or enhanced by careful management or damaged by careless treatment. Many shoreline sites have exceptional natural value, in the form of special habitats such as submerged plant beds or wetlands, or rare plants and animals. Before you get very far into the planning process, it is worth checking whether there are special habitats nearby (e.g., beds of submerged plants or wetlands), or if any rare or protected plants or animals live on or near the site.

web resources:

**Aquatic Habitats of the Hudson River Estuary** (submerged vegetation)  
[www.dec.ny.gov/lands/87297.html](http://www.dec.ny.gov/lands/87297.html)

**Hudson Valley Natural Resource Mapper** (wetlands)  
[hudson.dnr.cals.cornell.edu/mapper](http://hudson.dnr.cals.cornell.edu/mapper)

**Natural Heritage Data** (rare plants and animals)  
[www.dec.ny.gov/animals/31181.html](http://www.dec.ny.gov/animals/31181.html)



Well-managed shore zones provide valuable habitats for many plants and animals. (Photo: Dave Strayer)

## 6. How will sea-level rise affect the intended uses of the site?

Ocean tides and water levels reach up the Hudson all the way to Troy, so sites all along the river will be flooded by rising sea level. No one knows exactly how fast or how far sea level is going to rise, but water levels are going to come up by feet, not inches (you can see estimates for the Hudson at the web sites listed below, and map projected flooding from sea-level rise along the Hudson). There is no use spending a lot of money today for a site use and shoreline treatment that will be ruined by rising water tomorrow. Think carefully about how rising water might affect use of your site and effectiveness of your shoreline treatment, and whether your defenses can be adapted to deal with rising waters.

web resources:

**NYS Sea-Level Rise Projections**  
[www.hrnerr.org/14125.html](http://www.hrnerr.org/14125.html)

**Sea Level Rise Mapper**  
[scenichudson.org/slr/mapper](http://scenichudson.org/slr/mapper)



Rising water levels will flood many riverside properties, especially during storms. (Photo: Scenic Hudson)

## 5. What are elevations on the land side and depths on the water side at your site?

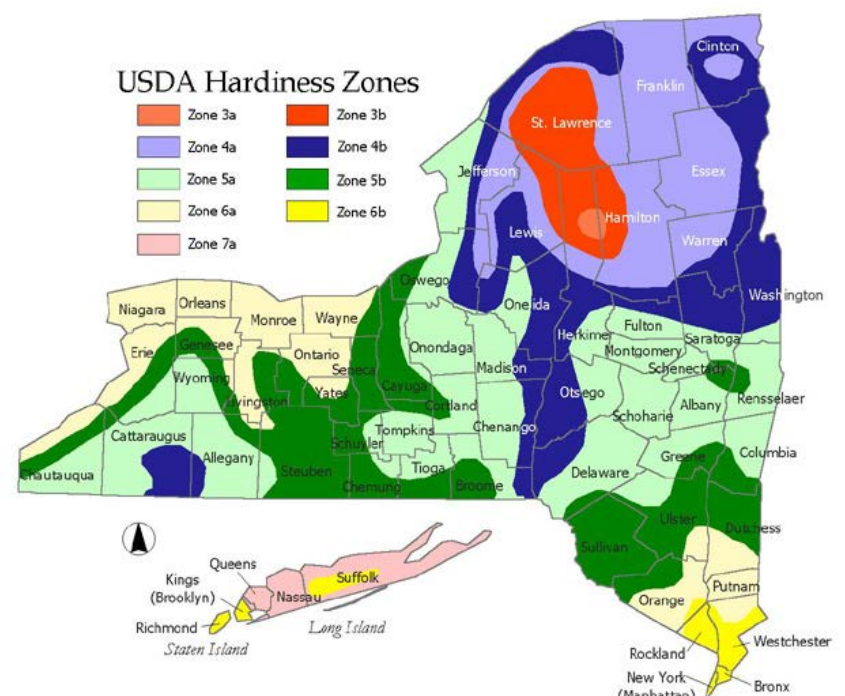
Flat sites and steep sites are suited to different uses – try playing baseball on a hillside or docking a boat in ankle-deep water! They also are suited to different kinds of shore defenses. In particular, many shoreline treatments are suited only for gradual slopes, and may fail if used on steep slopes. On the other hand, defenses like bulkheads that are useful on steep sites may be overkill when used on flatter sites.



Steep sites with little room to maneuver and flat, open sites require very different treatment. (Photos: Dave Strayer)

## 7. Where along the river is your site?

Environmental conditions vary a lot along the course of the Hudson, so shoreline treatments that are very good for New York City may not perform well in Albany, and vice versa. Here are three things to consider. First, ice is common upriver, where it frequently damages shoreline structures and vegetation, and is less common and severe downriver. Second, the climate is so much milder in New York City (USDA zone 7) that many plants that thrive there will be killed by severe winters in Albany (zone 5b-6a). Third, although the river is fresh water north of Newburgh, it becomes increasingly salty moving downriver to New York City. Species like oysters and cordgrass need some salt and will die in fresh water, while other species need fresh water and will die in salty water. As a result, any plans that involve plants and animals will need to consider the position of the site along the river.



Winters are much warmer in New York City than in Albany. (Map: Cornell Cooperative Extension)



Muddy, sandy, and rocky soils have different abilities to support vegetation and infrastructure. (Photos: Cary Institute of Ecosystem Studies)

## 9. Will you inspect and repair the structure regularly?

Shoreline defenses that are not inspected and repaired regularly are prone to costly failure (as shown by studies of storm effects on shore defenses along the Hudson; visit the links below for details). Try to design your structure so that it can be inspected regularly (at least after every major storm) and repaired if it is damaged, and be sure to budget for inspections and repairs. It's tempting to ignore these costs, but doing so may bring grief later (you know what happens when you don't keep up with inspections and repairs on your car, and a failed shoreline defense can cost a lot more than a bad starter). And be very careful about design and construction if you can't easily monitor the performance of structures.

web resources:

**An Analysis of Shorelines Following Three Historic Storms**

[www.hrner.org/shorelinesforensicanalysis](http://www.hrner.org/shorelinesforensicanalysis)



Storms can damage shore defenses, leading to erosion and even loss of the structure. (Photo: U.S. Fish and Wildlife Service)

## 8. What kinds of soils are on the site?

The soils along the Hudson vary widely in their ability to resist erosion, support structures, and maintain plants. It is therefore important to determine the nature of the soils on the site, and match the site plan to the capabilities of the soils (especially their soil bearing capacity and ability to support plants). Soils often vary over short distances, so it may be necessary to take samples from several places across the project site. It may be possible to bring in or improve soils to make them more suitable for plants.

## 10. Is the structure you're planning legal for your site?

Many activities in the shore zone, including building new structures, require permits from federal, state, or local authorities. Be sure that the structure you have in mind is permissible (keeping in mind that structures that are legal elsewhere may not be permitted along the Hudson). You can save yourself a lot of trouble by getting in touch with your permitting agency early in the planning process.



Understanding permit requirements early in the planning process can prevent later problems.

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Visit our website at:

[www.hrner.org/hudson-river-sustainable-shorelines](http://www.hrner.org/hudson-river-sustainable-shorelines)

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