Development Threatens Coastal Environments

Source: NOAA NOS
spo.nos.noaa.gov/.../population/population.html

High Density Coastal Development

Source: USGS
coastal.er.usgs.gov/.../figures/fig8.html

Human Disturbances to Estuaries: Construction

Construction projects like this housing development can cause major damage to estuaries through a variety of mechanisms. Construction debris and garbage may be inadvertently left at a site, or toxic compounds used in construction may leak or spill, causing potential long-term damage to the ecosystem and its plant and animal inhabitants

(Photo: Bernz/Clearwater)
Source: www.NOAA.nos.gov/education

Dredging in Estuaries

source: NOAA
http://response.restoration.noaa.gov/cpr/watershed/calcasieu/calc_html/calcenv.html

Channelization of Estuaries

Mississippi River, Louisiana

Source: response.restoration.noaa.gov/.../ calcenv.html

Toxic Substances in Estuaries

Toxic substances that find their way into estuaries cause severe harm not only to the native plant and animal species that live there, but also to people who may consume them.

(Photo: Stanne/NYSDEC)
Source: www.NOAA.NOS.gov/education

Pathogens Entering Estuaries

Storm-water runoff can transport pathogens to estuaries.

(Photo: Stanne/NYSDEC)

: **www.nos.noaa.gov/education**

Nutrient Pollution in Estuaries - Eutrophication

(Photo: Weeks Bay NERRS site)
Source: www.NOAA.NOS.gov/education

Thermal Pollution in Estuaries

Turkey Point Nuclear Power Plant South of Miami. The facility uses an extensive network of cooling canals.

Photo credit: Environmental Protection Agency, Still Pictures Branch, National Archives
at College Park. Image enhancement by FCIT.
Source: **fcit.usf.edu/.../ industry/electric/1753.htm**

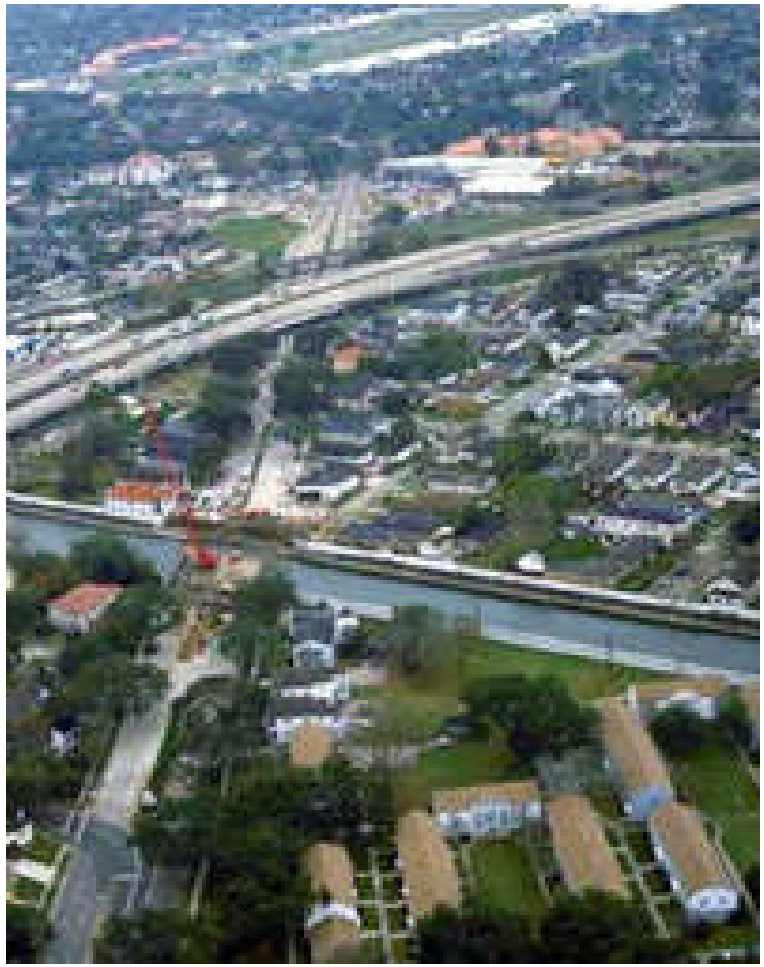
Wetland Clearing

source: US Fish and Wildlife Service

Wetland Conversion to Agriculture

source: www.ucsusa.org/ gulf/gcplacesmis.html

Clearing Wetlands for Development



source: www.ucsusa.org/ gulf/gcplacesmis.html

Draining Wetlands for Irrigation

www.epa.gov/owow/ wetlands/vital/status.html

Wetland Channelization

source: www.ucsusa.org/ gulf/gcplacesmis.html

Siting Industrial Operations in a Wetland

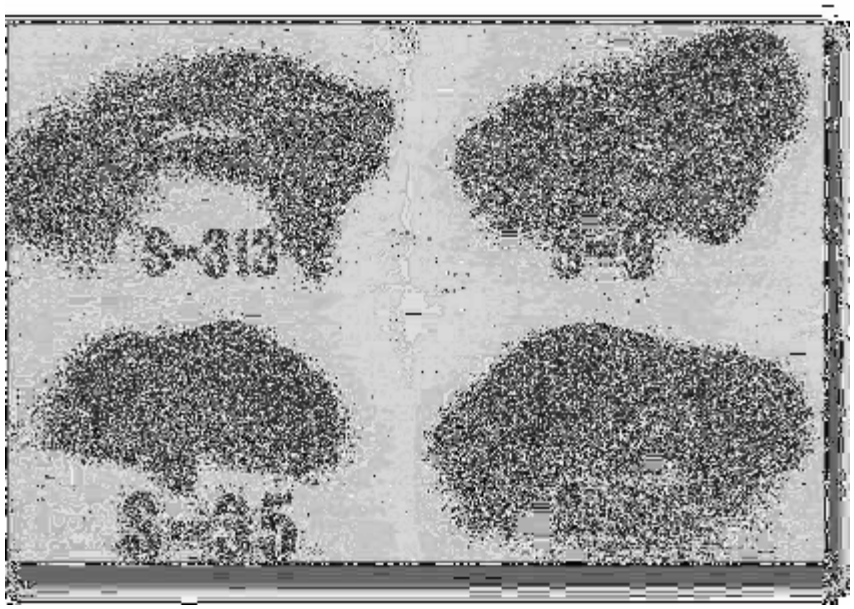
source: www.epa.gov/owow/ wetlands/vital/status.html

Agricultural Runoff into Wetlands

Agricultural runoff can carry fertilizers, including traces of antibiotics and hormones, into waterways.

Source: US Environmental Protection Agency

Agricultural Runoff Causes Waterfowl Embryo Deformities

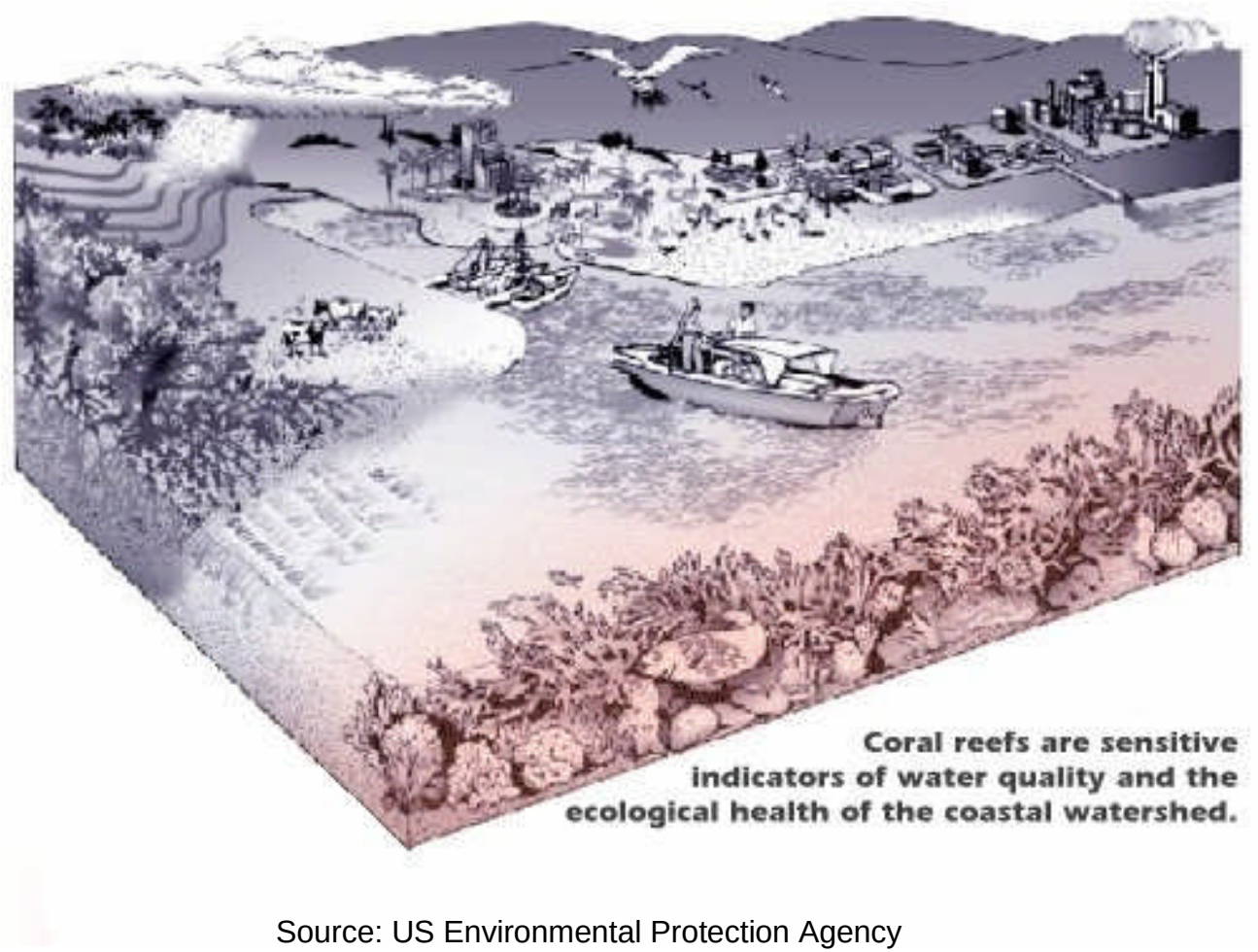


Underground drainage from agricultural irrigation systems promoted the excessive concentration of selenium, causing grotesque deformities in waterfowl embryos.

Kesterson Wildlife Refuge

Source: USGS **wrgis.wr.usgs.gov/wreg/env/birds.html**

Coral Reefs Indicate Coastal Watershed Health



Source: US Environmental Protection Agency
www.epa.gov

Coral Reef Degradation

Bioerosion has made this coral brittle and prone to collapse.

Source: www.pnl.gov/energyscience/09-99/art1.htm

Dead Coral

Source: www.abc.net.au/science/ news/stories/s312547.htm

Bleaching Hard Coral

Notice that the entire coral is not bleached; the polyps around the edges are still healthy

Photo taken by J Hoogesteger

Source: **www.marinebiology.org/ coralbleaching.htm**

Visitors Damage Coral Reefs

Scuba divers and snorkelers may damage delicate coral reef structures

Source: www.pnl.gov/ energyscience/09-99/art1.htm

Sea Lamprey

Great Lakes Sea Grant Network Exotic Species Graphics Library
Source: US EPA; www.epa.gov/glnpo/ image/viz_iss4.html

Rusty Crayfish

Lake Superior
Minnesota Sea Grant, Jeff Gunderson
Source: US EPA; www.epa.gov/glnpo/ image/viz_iss4.html

Sea Squirt

These siphon-feeding animals form dense mats, made of many thousands of individuals, encrusting and smothering hard sea bottom and organisms attached to it.

Source: NOAA; www.noaanews.noaa.gov/stories2003/s2125.htm

Purple Loosestrife

Purple loosestrife (*Lythrum salicaria*), shown above, invades approximately 1 million acres of wetlands each year—an area the size of Rhode Island.

Source: The Nature Conservancy; http://nature.org/initiatives/invasivespecies/

Water Hyacinth

***Eichhornia crassipes*, water hyacinth, is believed to have been introduced into the U.S. in 1884 at an exposition in New Orleans**

Source: Florida Sea Grant: aquat1.ifas.ufl.edu/ seagrant/eiccra2.html

Ballast Water Brings Invasives

Every hour around the clock, two million gallons of ballast water, often containing aquatic invasive species from around the world, are dumped into U.S. waters.

Source: The Nature Conservancy;
http://nature.org/initiatives/invasivespecies/

Zebra Mussels

Zebra mussels washed up on beach, Lake Erie
Bay City Times

(courtesy Great Lakes Environmental Research Lab)
Source: US EPA; **www.epa.gov/glnpo/ image/viz_iss4.html**

Brown Tree Snake

Source: USGS; www.fort.usgs.gov/.../ EcoForecasting/default.htm

Guam Rail

The Guam rail is one of many bird species wiped out in the wild by the snakes

Source: CNN; www.cnn.com/TECH/science/9807/07/snakes/gallery/

Adult Nutria

Source: U.S. Fish & Wildlife Service
www.invasivespecies.gov/ profiles/nutria.shtml

Alligator Weed

Source: Port Stephens Council, Australia
portstephens.local-e.nsw.gov.au/

Dune Destruction

Dune plants can be destroyed by driving, trampling, and heavy recreational use.

source: www.ecy.wa.gov/.../coast/plants/dune_plants.html

Beach Renourishment

Source: www.uncwil.edu/.../ Shallotte%20Inlet.htm

Beach Scraping: Earthmovers Loading Sand

Source: www.coastalscience.com/.../ 050301_seabrook.html

Equipment with Scraper Blades

Source: www.coastalscience.com/.../ 050301_seabrook.html

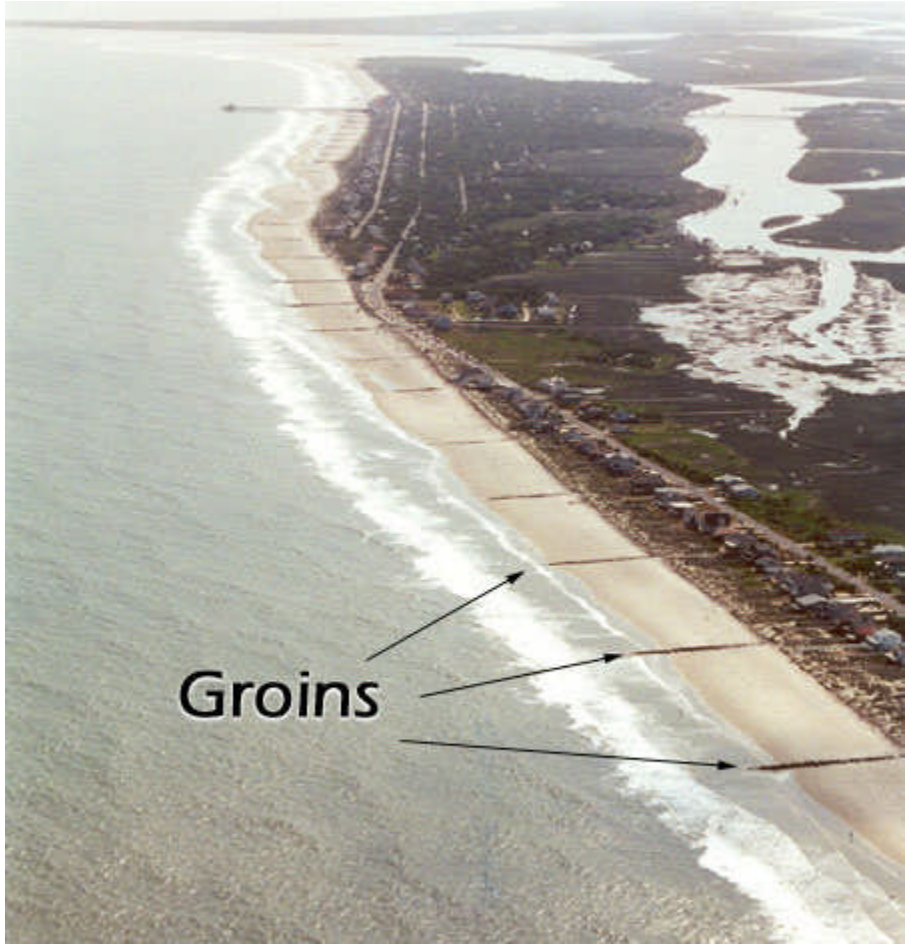
Beach Scraping: Regrading and Dressing Slopes

Source: www.coastalscience.com/.../ 050301_seabrook.html

Scraped Sand in Place Against Seawall

Source: www.coastalscience.com/.../ 050301_seabrook.html

Groins at Folly Beach, SC



Source: www.cofc.edu/ CGOInquiry/human.htm

Groins at Work

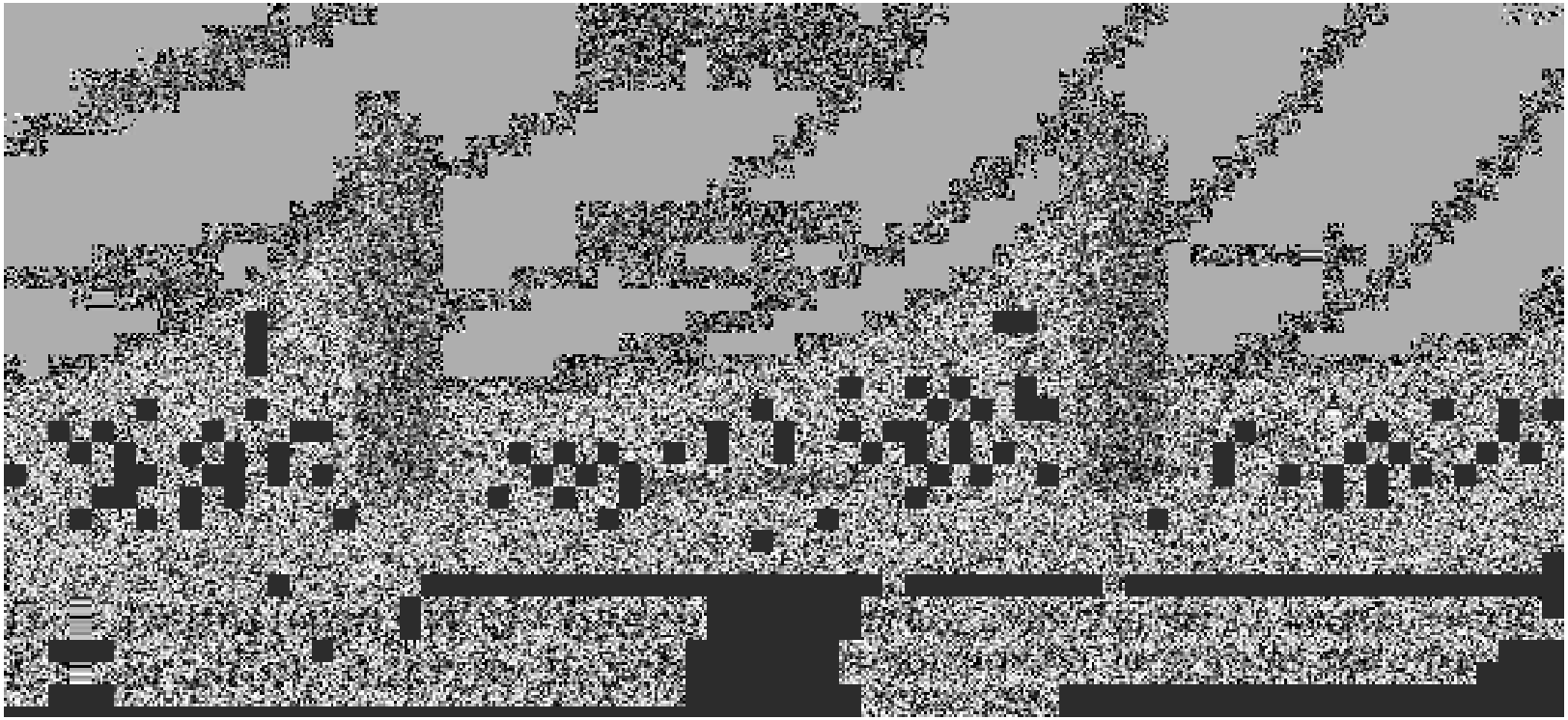


Photo provided by http://pbisotopes.ess.sunysb.edu/geo101_f00/ notes/11-1-00.htm
Source: **www.cofc.edu/ CGOInquiry/human.htm**

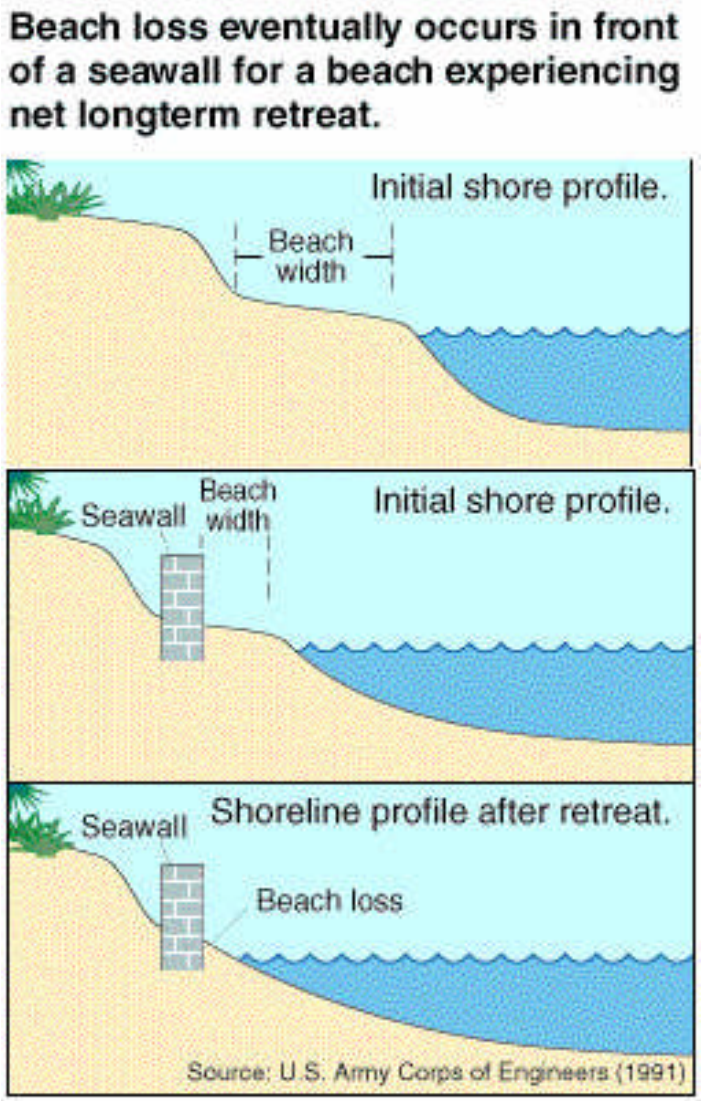
Inlet and Jetties

Source: www.cccturtle.org/ florida/threats2.htm

Seawall in Front of Private Home

Source: www.cccturtle.org/ florida/threats2.htm

Seawall at Work



Source: www.cofc.edu/ CGOInquiry/human.htm

Seawall at Folly Beach, SC

Photo by Elizabeth Rogers
Source: www.cofc.edu/ CGOInquiry/human.htm

Gabion Revetment

Gabion revetments may permit sand accumulation and dune grass growth.

Source: www.snh.org.uk/.../ erosion/appendix_1.8.shtml

Damaged Gabion

Damaged gabions forming a public safety hazard and releasing non-indigenous cobbles onto the beach.

Source: www.snh.org.uk/.../ erosion/appendix_1.8.shtml

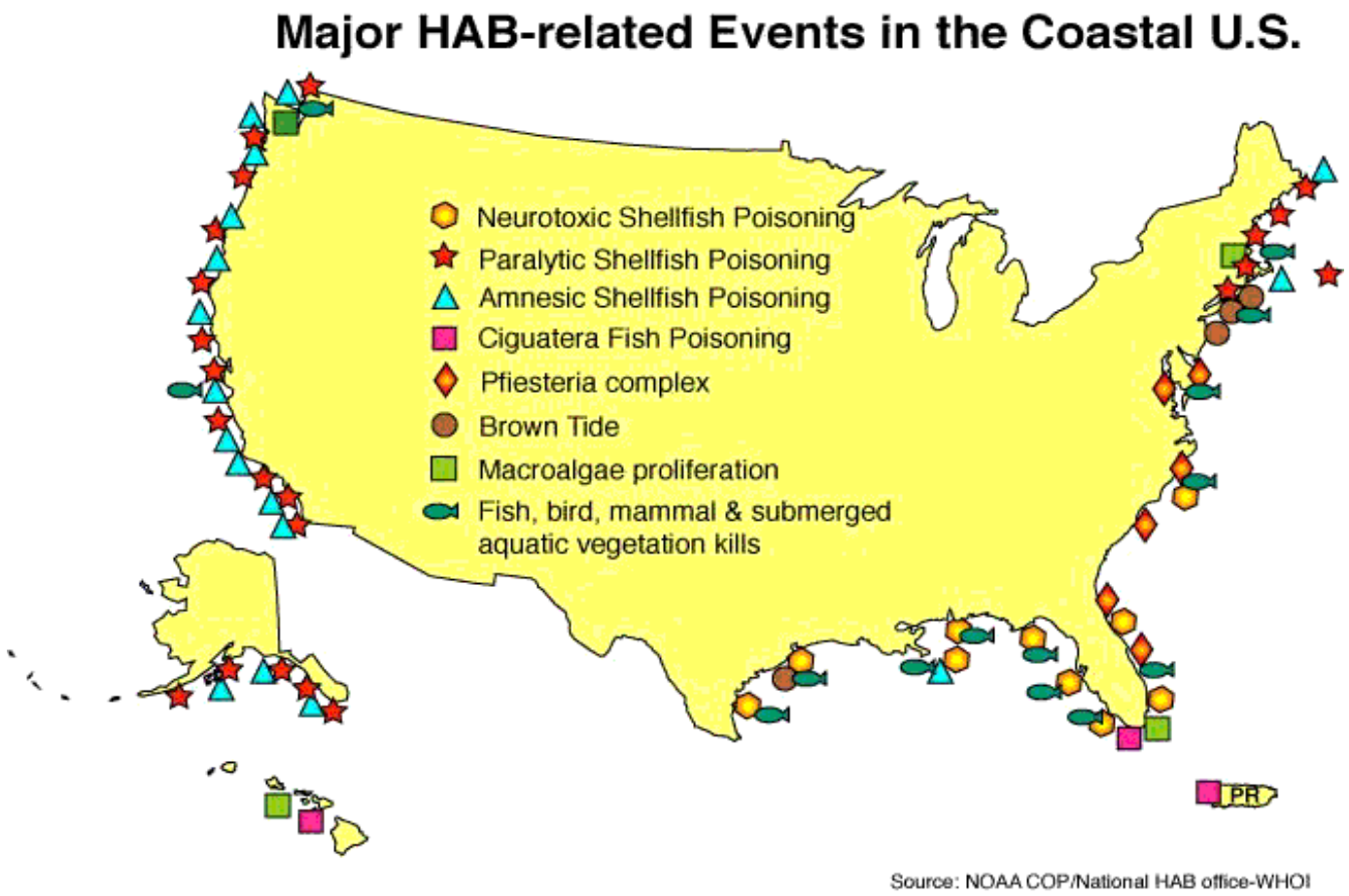
Harmful Algal Bloom

Photo by NOAA
Source: www8.nos.noaa.gov/.../index.aspx?letter=r

Red Tide

Source: NOAA Center for Sponsored Coastal Ocean Research
http://www.cop.noaa.gov/stressors/extremeevents/hab/overview.html

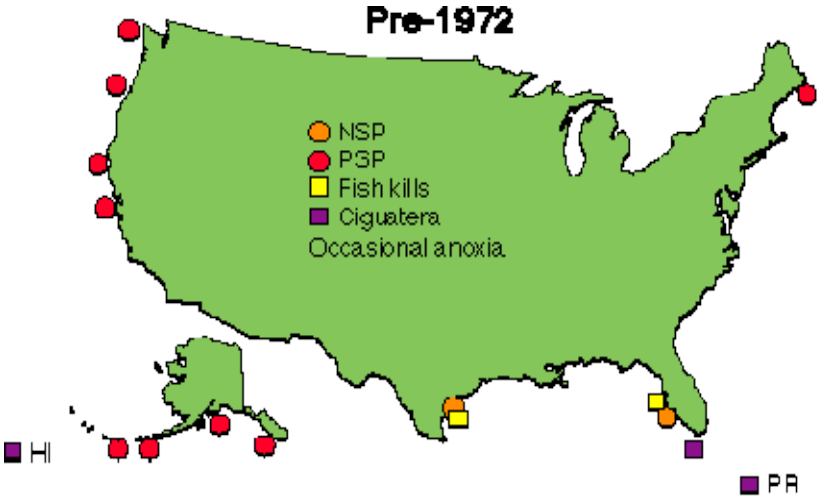
Harmful Algae Blooms

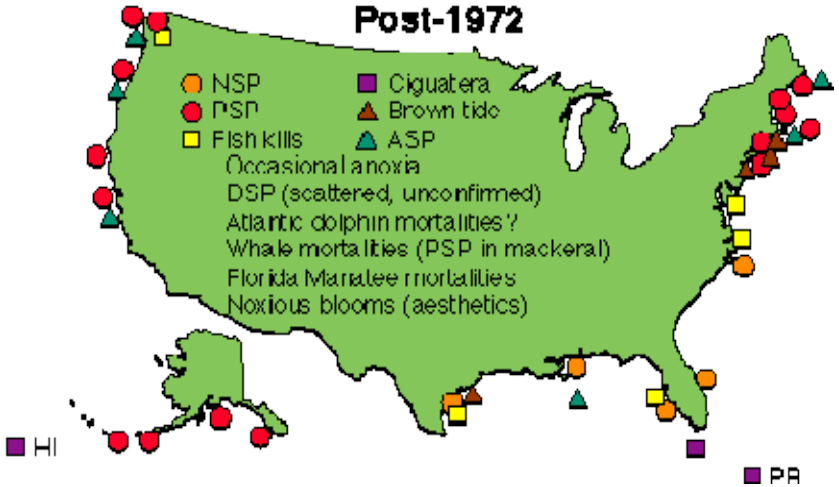


Occurrence of Harmful Algal Blooms

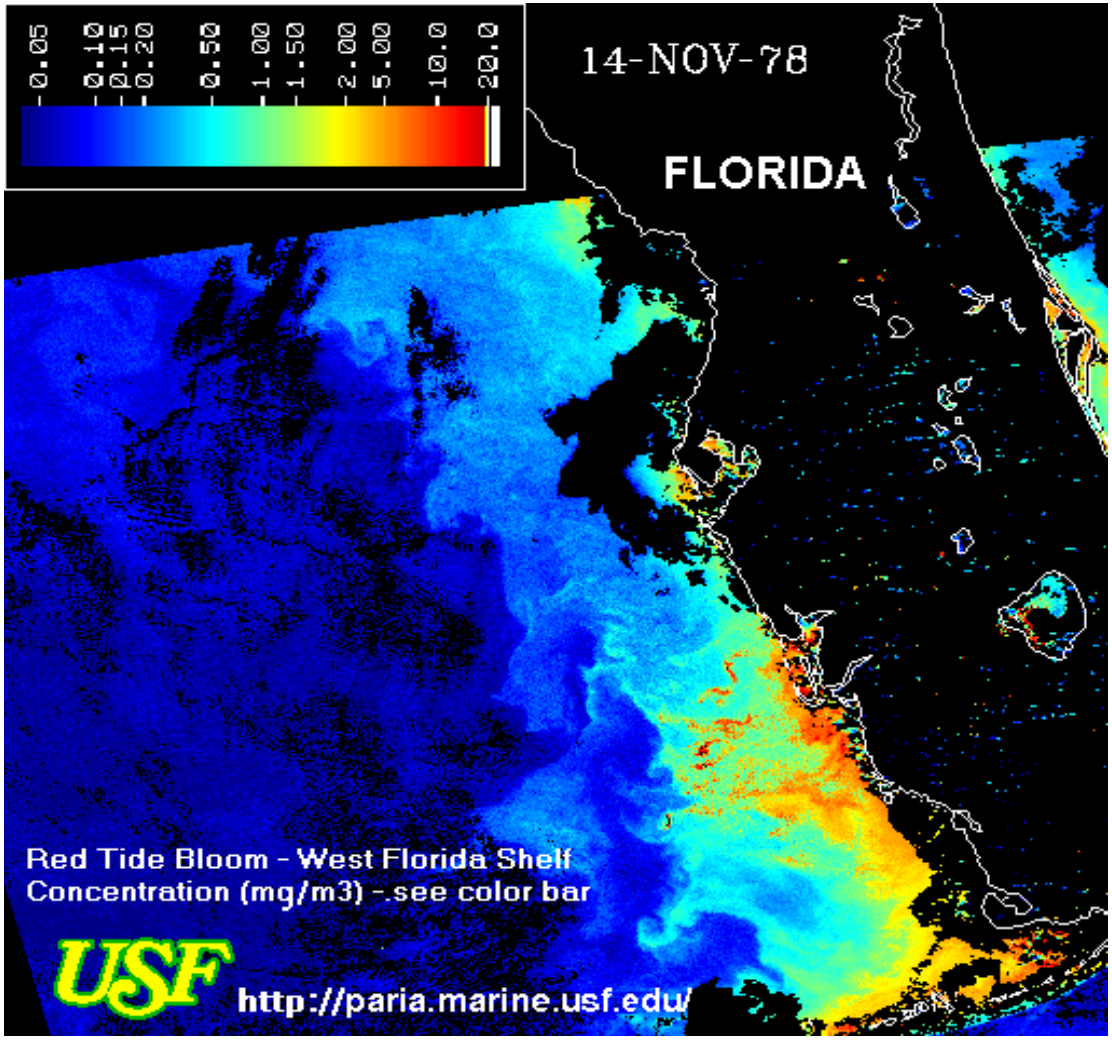
There has been an expansion of HABs since 1972. The exact causes for the expansion are unclear. Experts point to both pollution and natural causes as possible explanations for the increase in HABs.

Source: The Harmful Algae Page
http://www.whoi.edu/redtide/





Satellite Imagery of Harmful Algal Bloom



Harmful algal blooms (sometimes referred to as red tide) present a hazard to humans, shellfish, fish, birds, marine mammals and zooplankton.