



NORTH CAROLINA
COASTAL RESERVE &
NATIONAL ESTUARINE
RESEARCH RESERVE



Low Impact Development Basics for Water Quality Protection

September 2, 2026



National Estuarine Research Reserve System



What is an estuary?





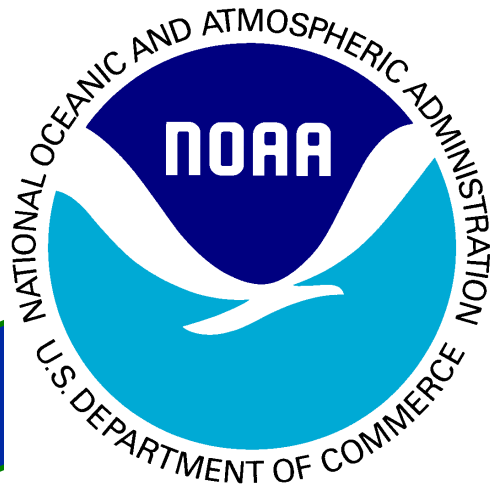
Natural Infrastructure



Wetlands and reefs
and mangroves...**oh my!**



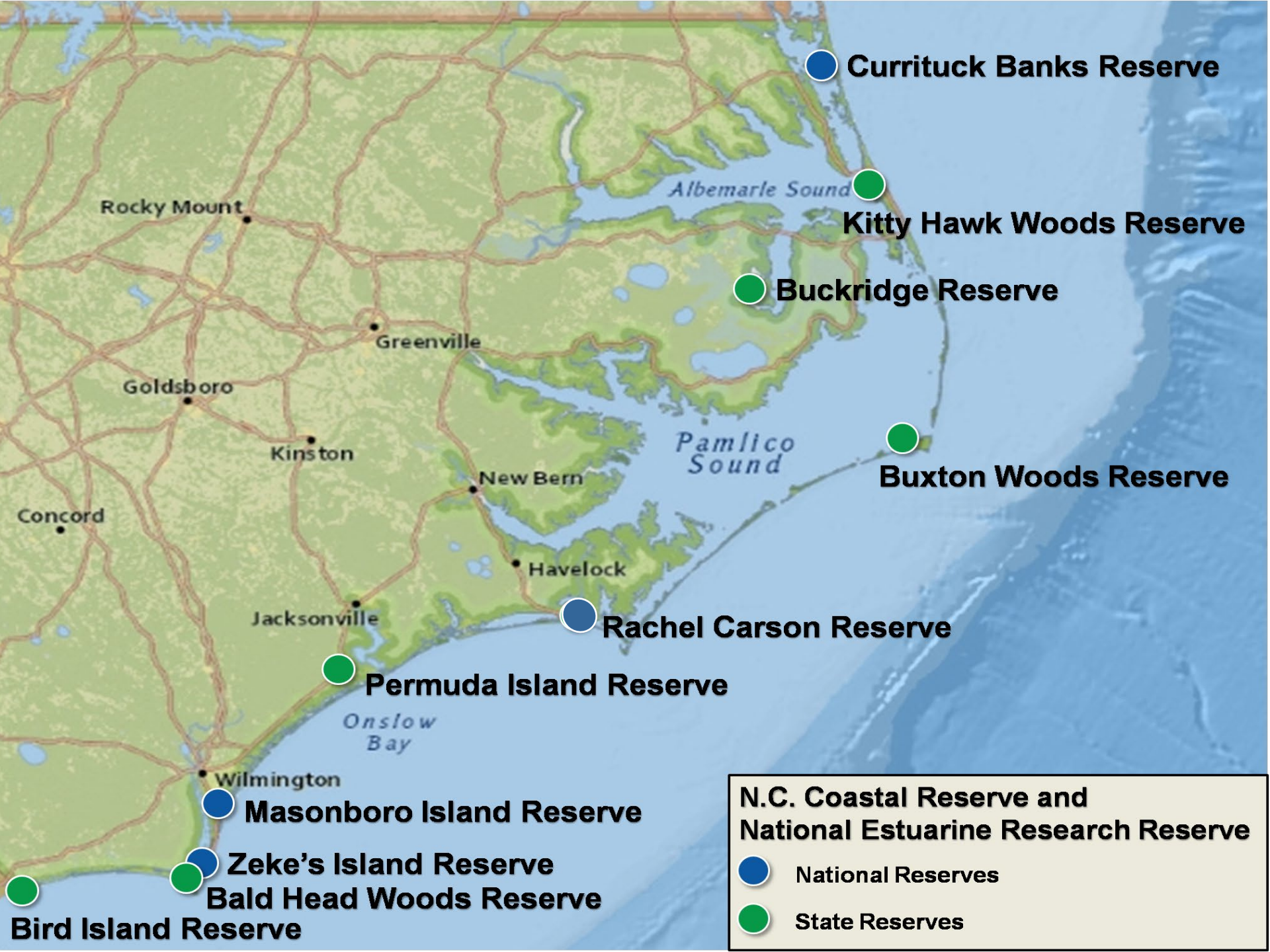
Billions in savings (\$23 billion/year),
services (water quality and storm protection),
and value (37% higher property value).



North Carolina Coastal Reserve



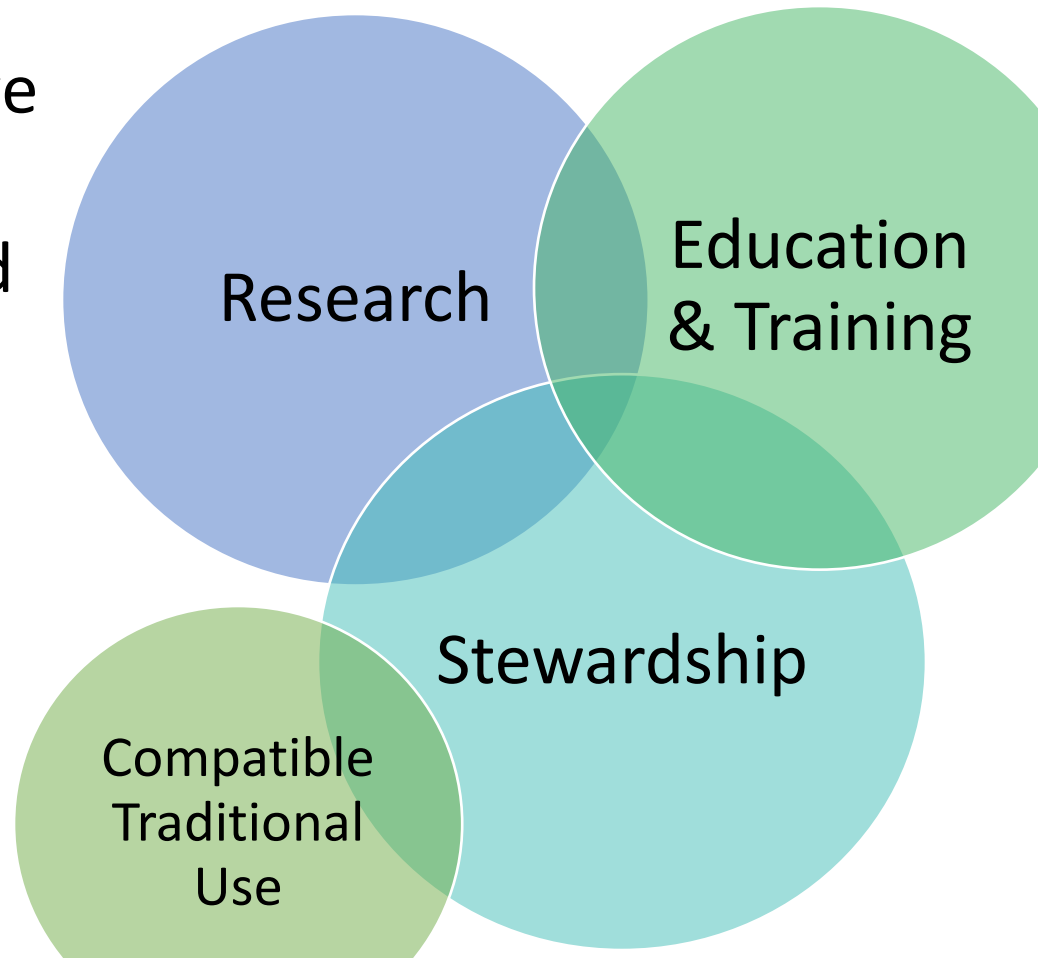
**North Carolina
National Estuarine Research Reserve**



Mission



To practice and promote stewardship of coasts and estuaries through innovative research, education, and training using a place-based system of protected areas.



Social Media



North Carolina Coastal Reserve



Rachel Carson Reserve



Masonboro Island Reserve



@NCReserve



Presentations Available Online

[Home](#)[Permits & Rules](#) ▾[Outreach & Education](#) ▾[Energy & Climate](#) ▾[Conservation](#) ▾[News](#) ▾[About](#) ▾

Past Workshop Resources



To obtain additional course documents from past workshops, please contact Coastal Training Program Coordinator [Whitney Jenkins](#) at 252-838-0882.

Coastal Training Program

[Scheduled Workshops](#)[Past Workshops](#)

<https://deq.nc.gov/past-workshops>

Today's Purpose

- Learn how land use decisions impact water quality.
- Learn how Low Impact Development techniques and native plants help protect water quality.
- Learn about managing stormwater control measures (SCMs) to meet state and local regulations and to maintain functionality and aesthetics.
- Provide you continuing education credits while increasing your professional knowledge.

Agenda

The Land Use - Water Quality Connection – Whitney Jenkins

The North Carolina Watershed Game

10:15am – 15-Minute Break

Debrief from the Watershed Game

Maximizing Property Value with SmartYards – Bonnie Mitchell, North Carolina Coastal Federation

11:25am – 10-Minute Break

Rooted in Nature: Conserving NC's Coast Using Native Plants and Trees – Amy Mead, North Carolina Cooperative Extension

12:10am – 10-Minute Break

Maintenance Costs of Stormwater Control Measures in North Carolina – Amber Ellis, North Carolina State University

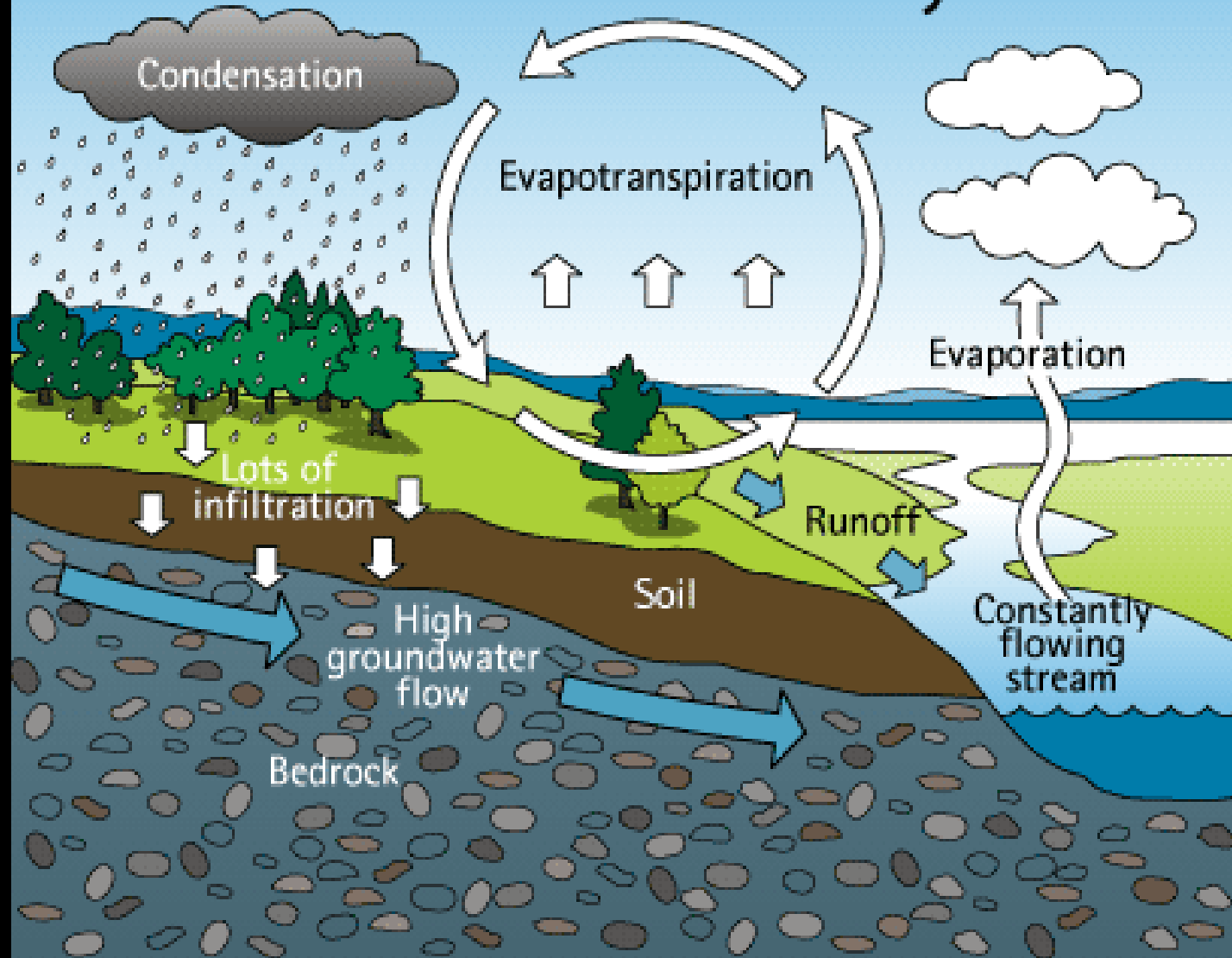
1:00pm – Adjourn

Logistics

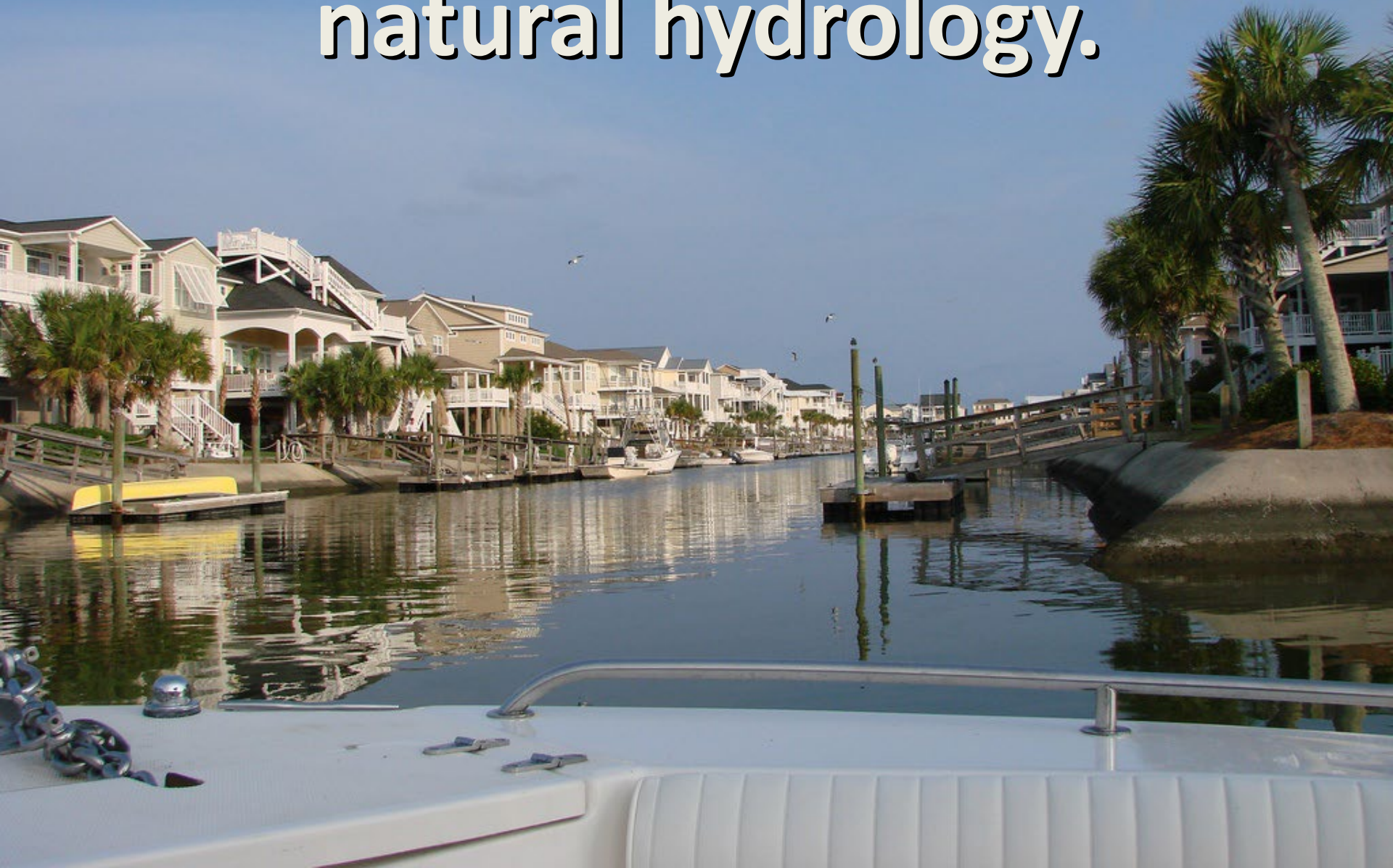
- Your certificate of completion will be available at the end of today's class
- I will upload your license numbers to the NC Real Estate Commission tomorrow
- QR code on agenda and an email tomorrow:
 - Workshop web page with links to presentations and resources
 - Workshop evaluation

The Land Use – Water Quality Connection

The natural water cycle



**We have changed the
natural hydrology.**



Parking Lots



Parking Lots Continued



Parking Lot & Street Runoff



Ditching





Cul-De-Sacs

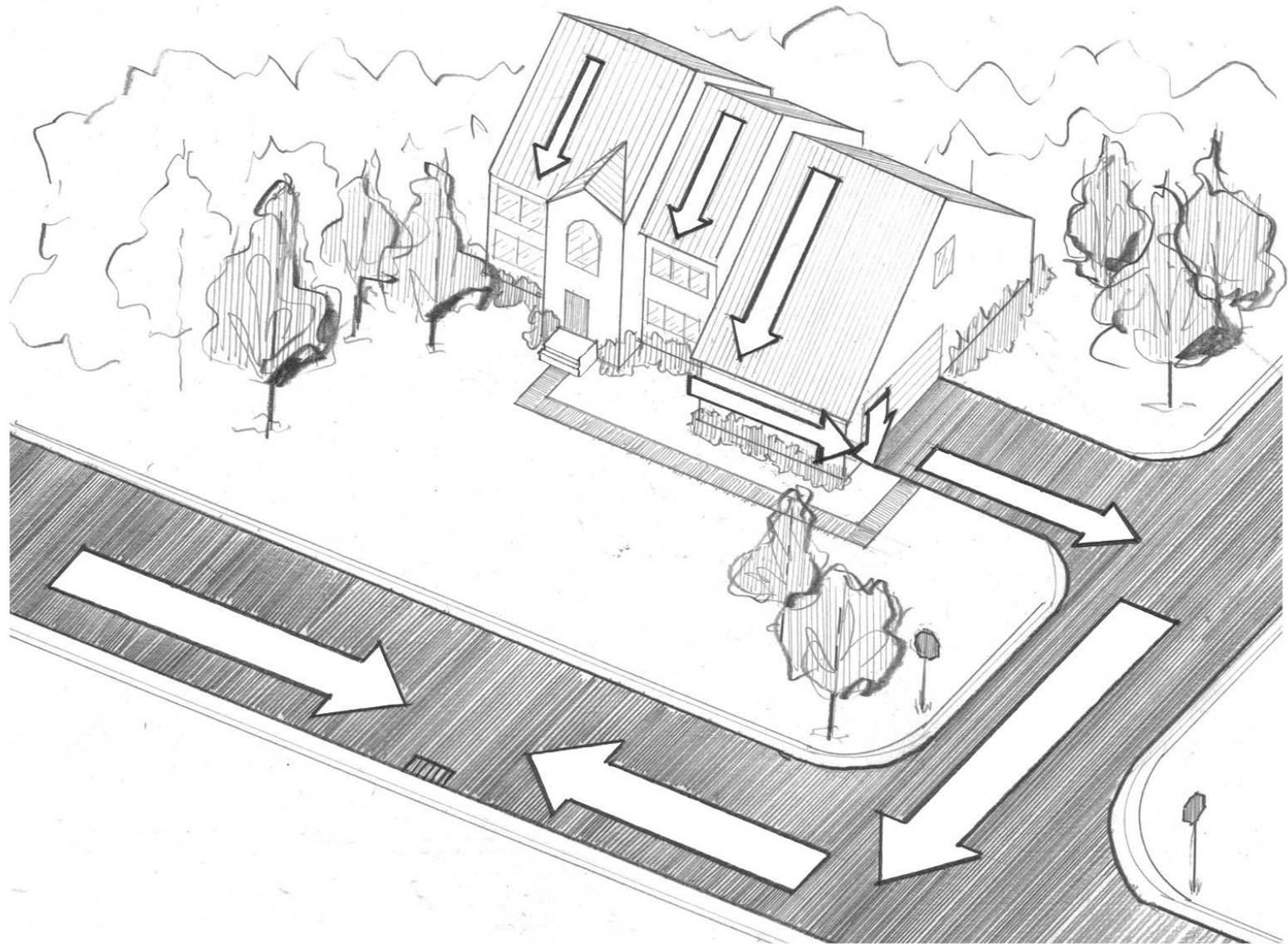
Rooftop Runoff



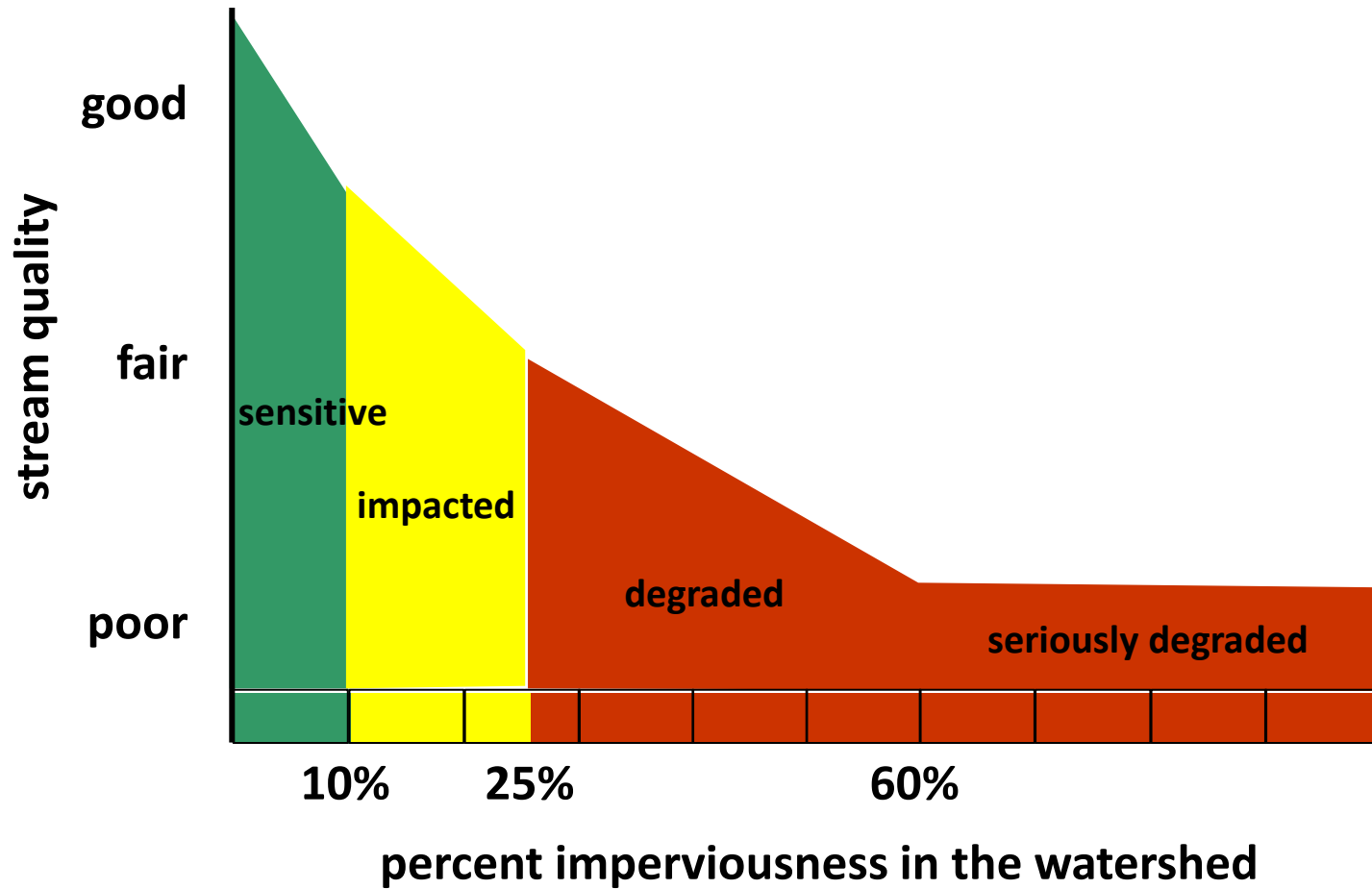
Curbs and Gutters



The Stormwater “Super-Highway”



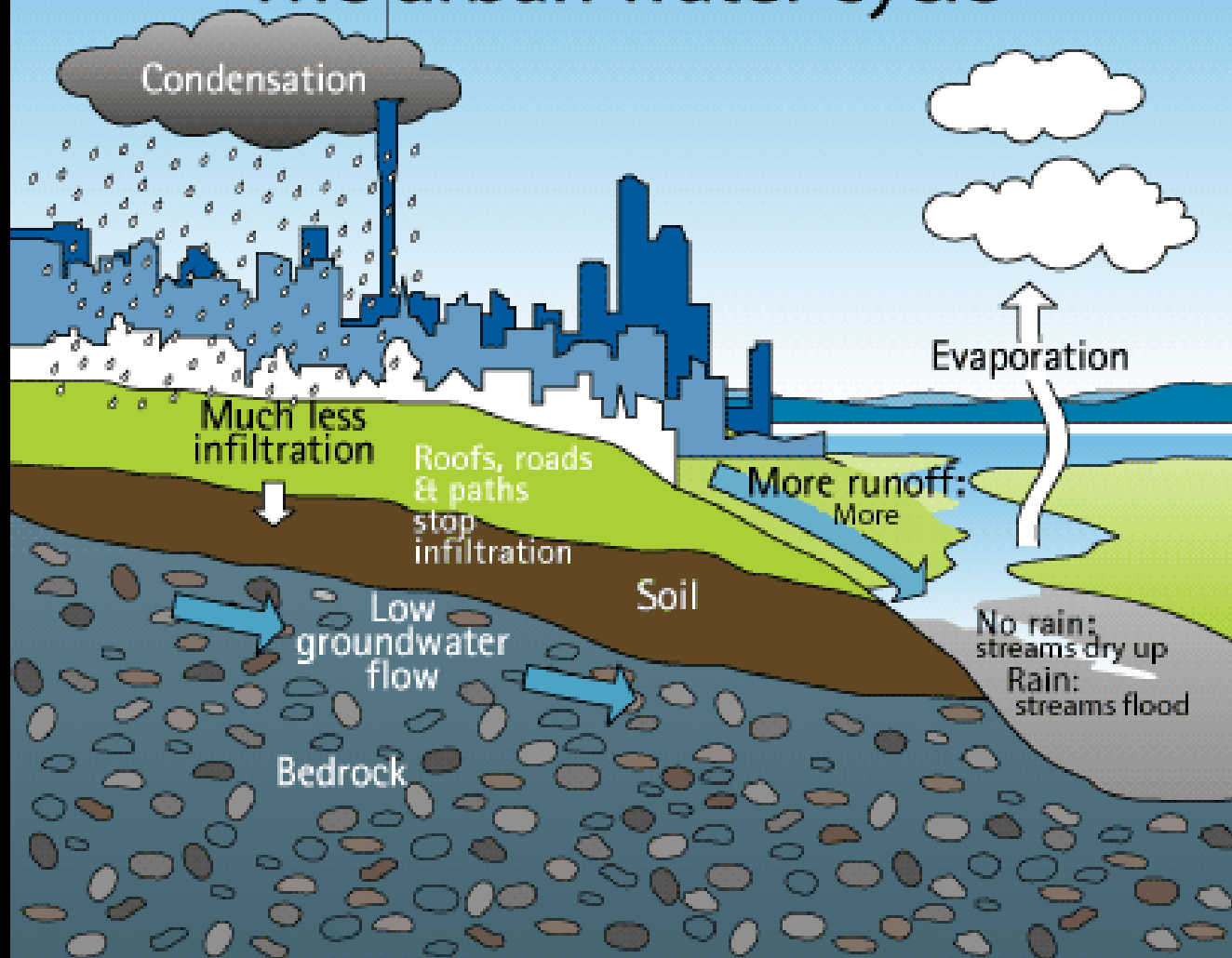
Imperviousness effects stream quality



Vegetated Buffers & Living Shorelines



The urban water cycle



What is a watershed?

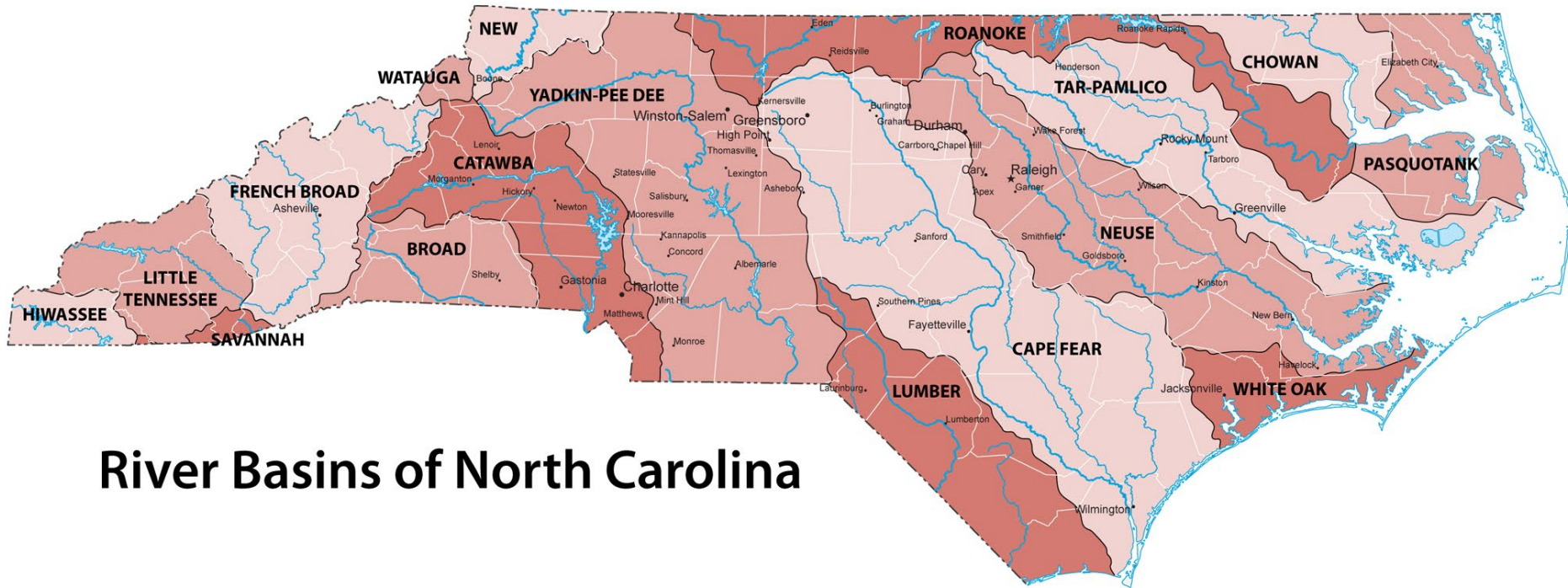
- A. An area of land defined by topography, not political boundaries?
- B. An area of land that catches rain and drains or seeps into a marsh, stream, river, or groundwater
- C. An area of land located in a river basin
- D. All of the above

What is a Watershed?



What North Carolina River Basin do you live in?

- A. Cape Fear
- B. Chowan
- C. Lumber
- D. Neuse
- E. Pasquotank
- F. Roanoke
- G. Tar-Pamlico
- H. White Oak
- I. Other
- J. Don't know



River Basins of North Carolina



What are the intended uses of our water resources?

- A. Aquatic life habitat
- B. Drinking water
- C. Swimming and fishing
- D. All of the above

Intended Uses of Water Resources

- Aquatic life habitat
- Drinking water
- Swimming
- Fishing



What is a Water Quality Impairment?

The inability of a water resource to meet its intended uses.

For example, an estuary is impaired when high levels of bacteria ban the harvesting of oysters.

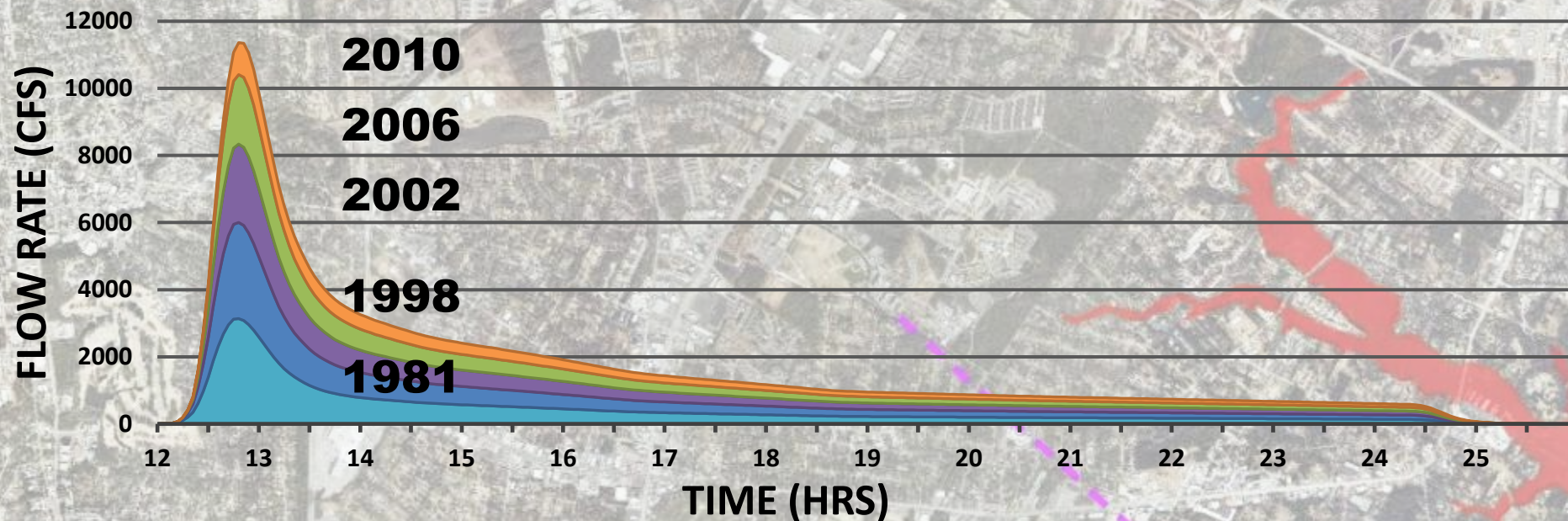
Shellfish Water Harvest Closure Map

<https://ncdenr.maps.arcgis.com/apps/webappviewer/index.html?id=5759aa19d7484a3b82a8e440fba643aa>

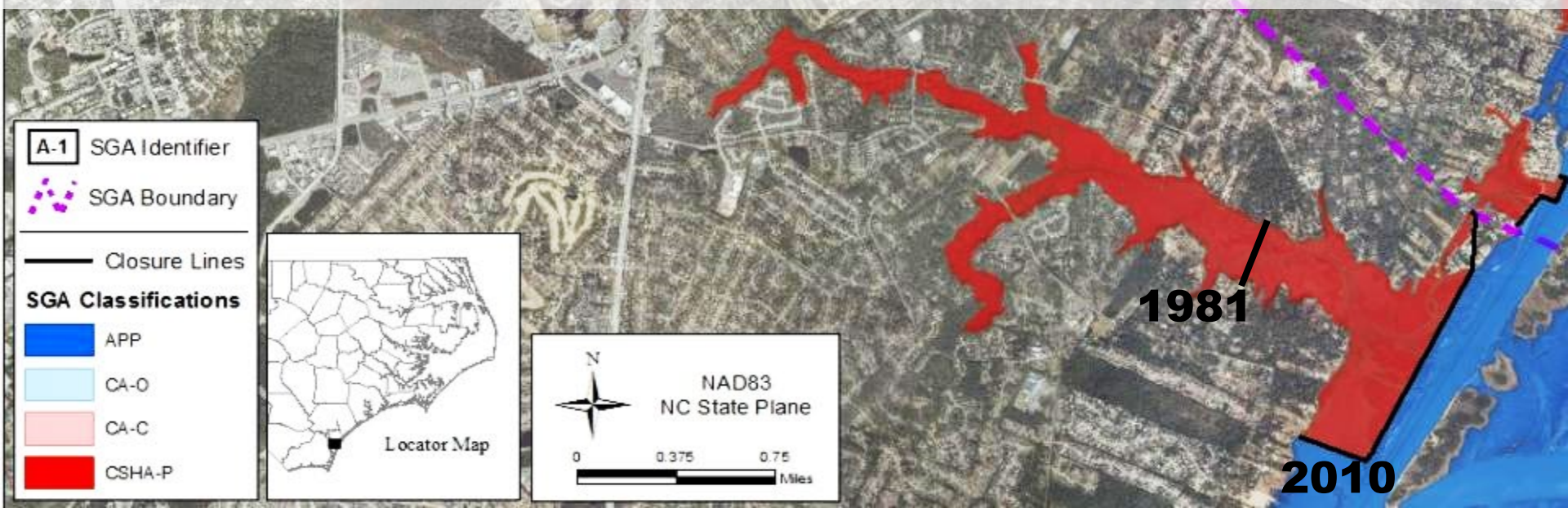
Swimming Advisory Map

<https://ncdenr.maps.arcgis.com/apps/dashboard/99430d6fd1824b78ae328c6a5538852f#>

HEWLETTS CREEK WATERSHED 1-YR STORM HYDROGRAPHS



CHANGES IN SHELLFISH CLOSURE BOUNDARIES



Pollution Sources: Point Source



Pollution Sources: Nonpoint Source



Pollutants of Concern

- **Nutrients**- nitrogen and phosphorus can lead to algal blooms, eutrophication, and fish kills
- **Microbes**- public health risk, can lead to closure of fishing areas and loss of revenue (i.e. bacteria, viruses, parasites)
- **Sediment**- clogs drainageways, clouds rivers, and degrades aquatic habitat



Nutrients



Nutrients



Eutrophication



Nutrients & Microbes



Nutrients & Microbes



Nutrients & Microbes





Nutrients & Microbes



Nutrients & Microbes

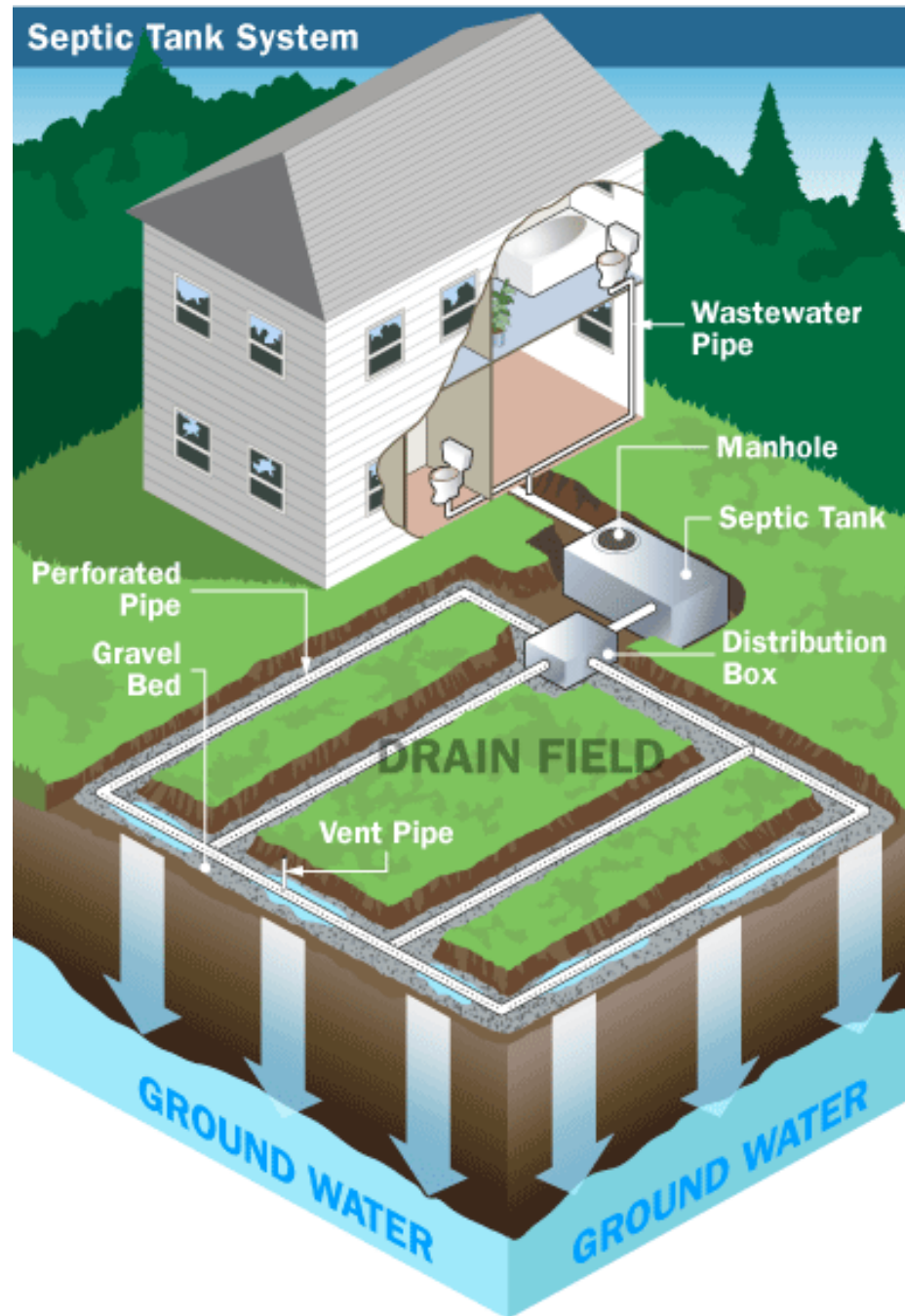


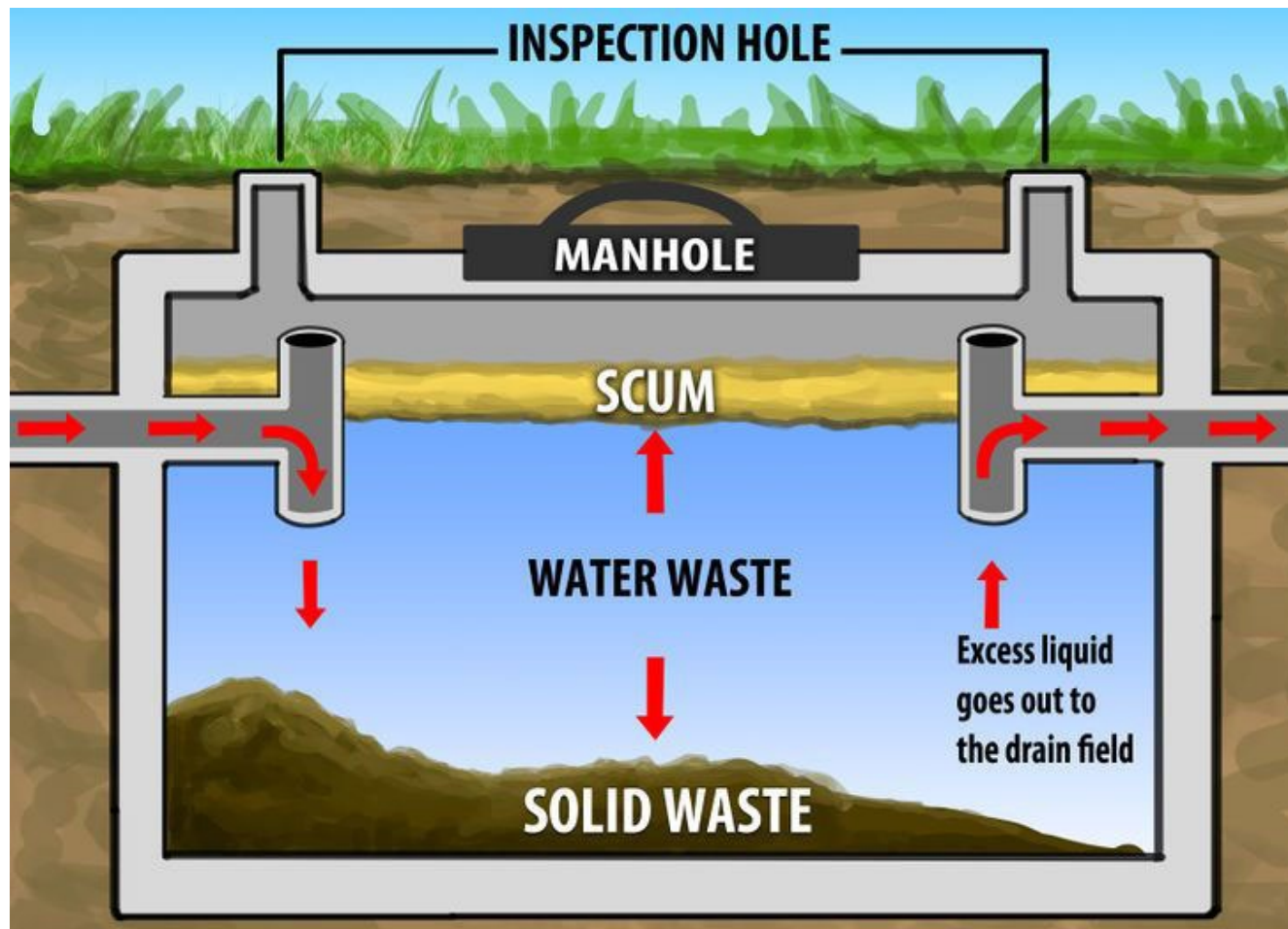
Nutrients & Microbes

Nutrients & Microbes



Septic Tank System





Nutrients & Microbes





CLOSED AREA

**UNLAWFUL TO TAKE OYSTERS,
CLAMS, OR MUSSELS.
SHELLFISH MAY CAUSE
SERIOUS ILLNESS IF EATEN.**



NC MARINE FISHERIES



ATTENTION

**SWIMMING IN THIS AREA
IS NOT RECOMMENDED.**

**BACTERIA TESTING
INDICATES LEVELS OF
CONTAMINATION THAT
MAY BE HAZARDOUS TO
YOUR HEALTH. THIS
ADVISORY AFFECTS
WATERS WITHIN 200'
OF THIS SIGN.**

OFFICE OF THE STATE HEALTH DIRECTOR

Sediment



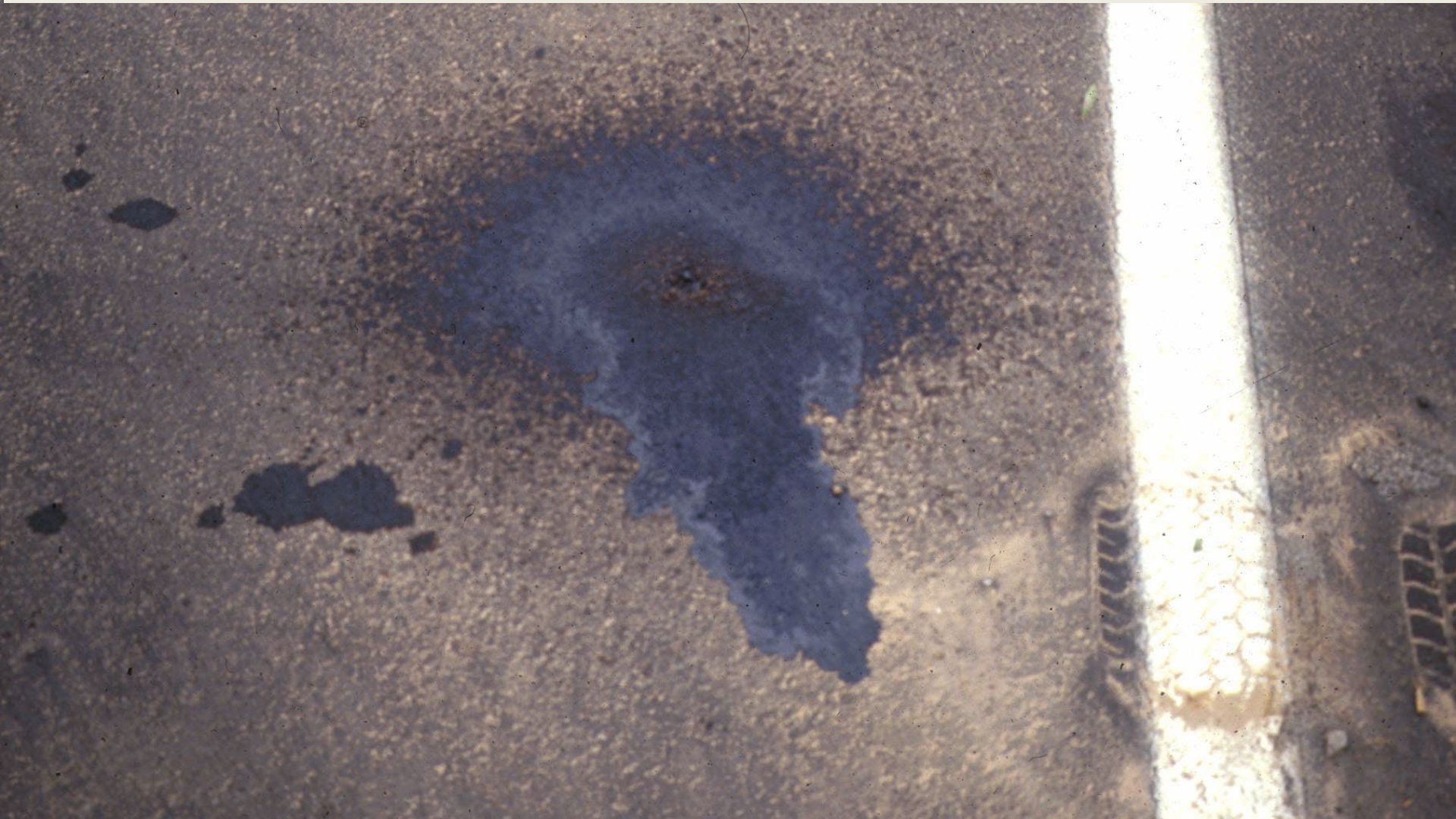


Sediment



Sediment

Stormwater pollutants also include any materials that can build up on impervious surfaces: oil, grease, trash, auto fluids, dirt, etc.



So what's the bottom line...

- Everything is connected
- What we do on the land affects...
 - Water quality
 - Animal habitat
 - Our economy (i.e. tourism, commercial fishing)
 - Our quality of life
- It has been proven that conventional development does not protect water quality
- We can develop the land AND protect water quality

Towards a more sustainable urban water cycle

