NORTH CAROLINA COASTAL RESERVE & NATIONAL ESTUARINE RESEARCH RESERVE

CAPE FEAR REALTORS®

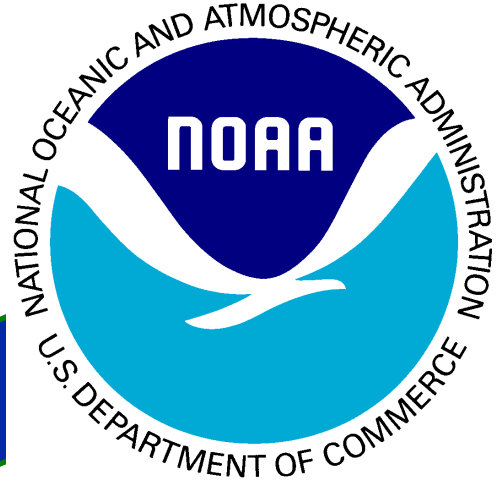
Low Impact Development Basics for Water Quality Protection

April 18 & 19, 2023

North Carolina Coastal Federation
Working Together for a Healthy Coast

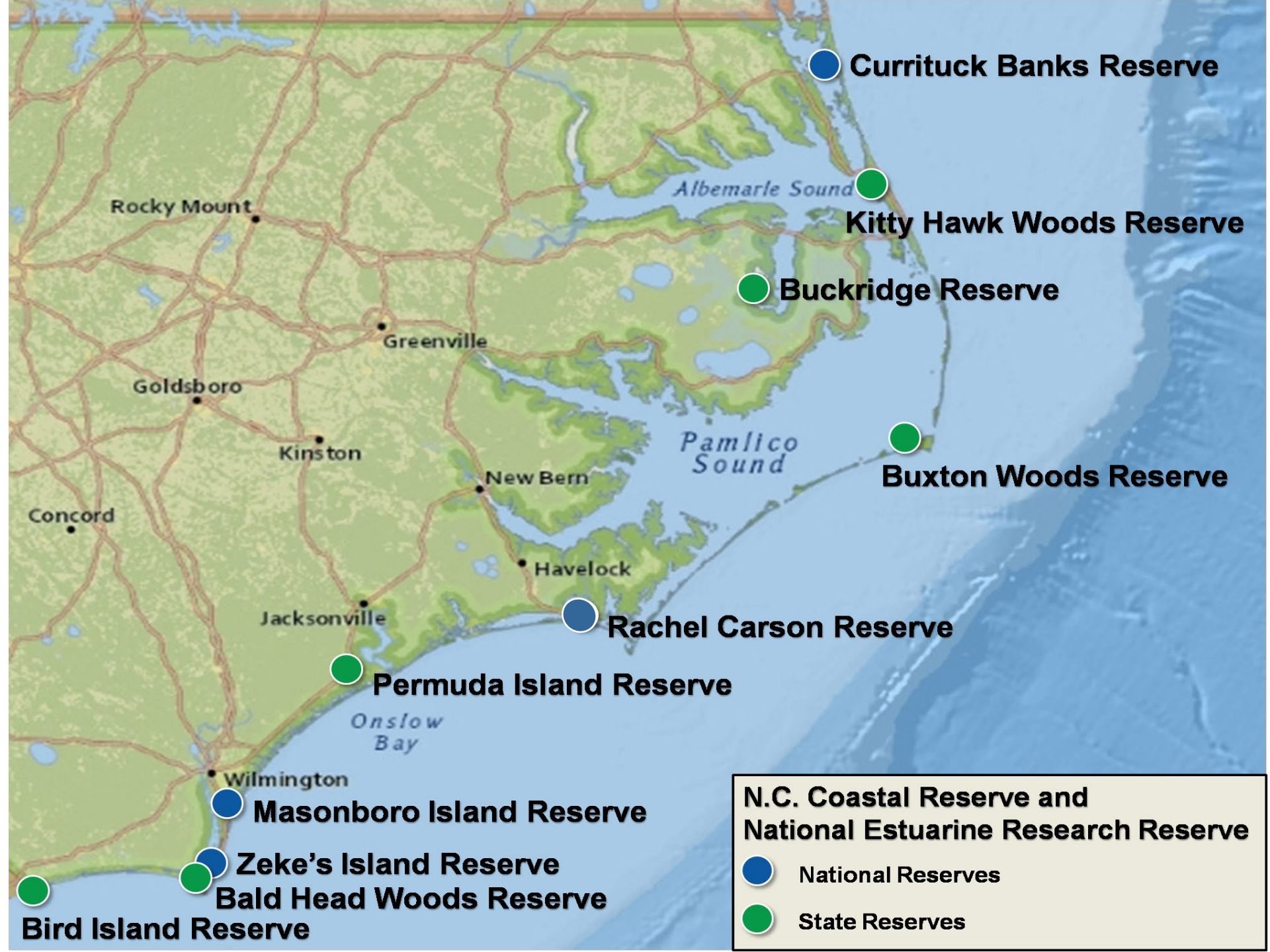
NC STATE EXTENSION

National Estuarine Research Reserve System



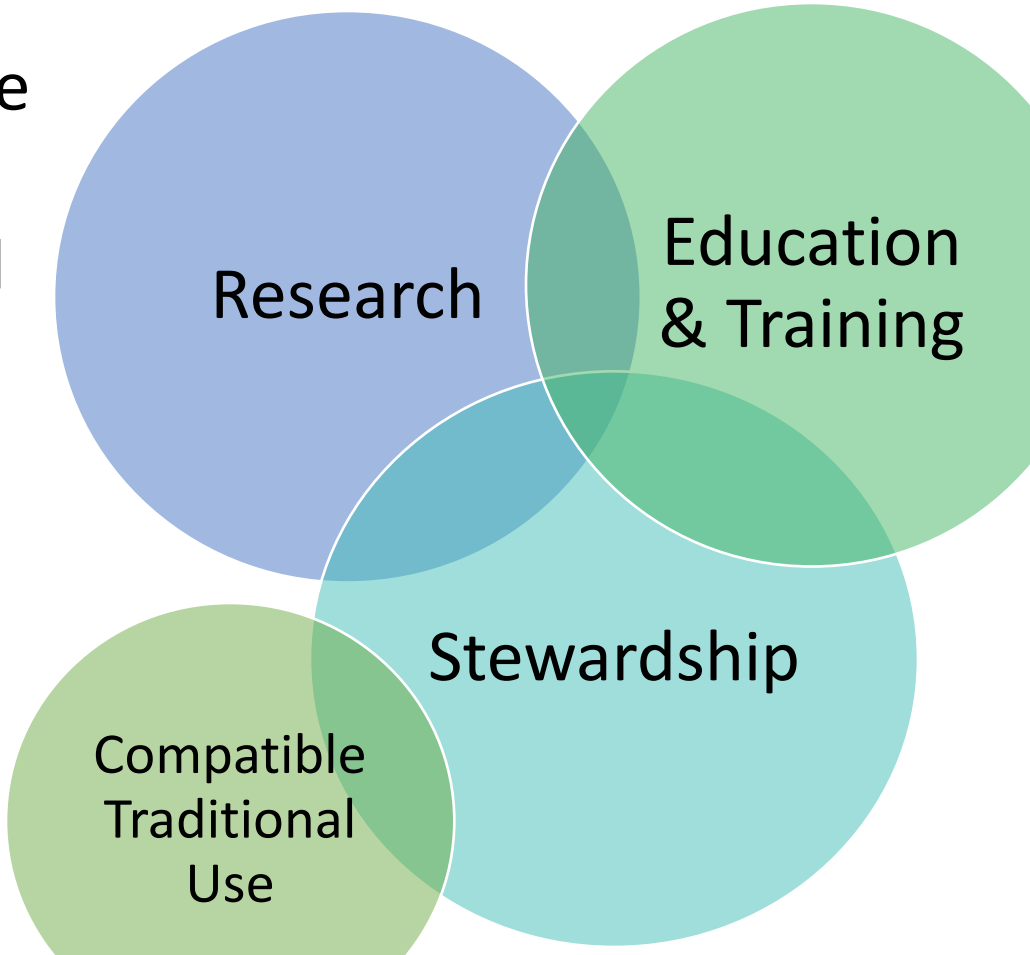
North Carolina Coastal Reserve

North Carolina National Estuarine Research Reserve


Currituck Banks Reserve
Albemarle Sound
Kitty Hawk Woods Reserve
Rocky Mount
Buckridge Reserve
Greenville
Goldsboro
Pamlico Sound
Kinston
Buxton Woods Reserve
New Bern
Concord
Havelock
Jacksonville
Rachel Carson Reserve
Permuda Island Reserve
Onslow Bay
Wilmington
Masonboro Island Reserve
Zeke's Island Reserve
Bald Head Woods Reserve
Bird Island Reserve
N.C. Coastal Reserve and National Estuarine Research Reserve
National Reserves
State Reserves

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


@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

Today's Purpose

- Learn how land use decisions impact water quality
- Learn about Low Impact Development (LID) techniques that help protect water quality
- Learn about the costs and benefits of implementing LID
- Learn about managing stormwater control measures (SCMs) to meet state and local regulations and to maintain functionality and aesthetics
- Discuss how we can influence the use of LID within the development community
- Provide you continuing education credits while increasing your professional knowledge

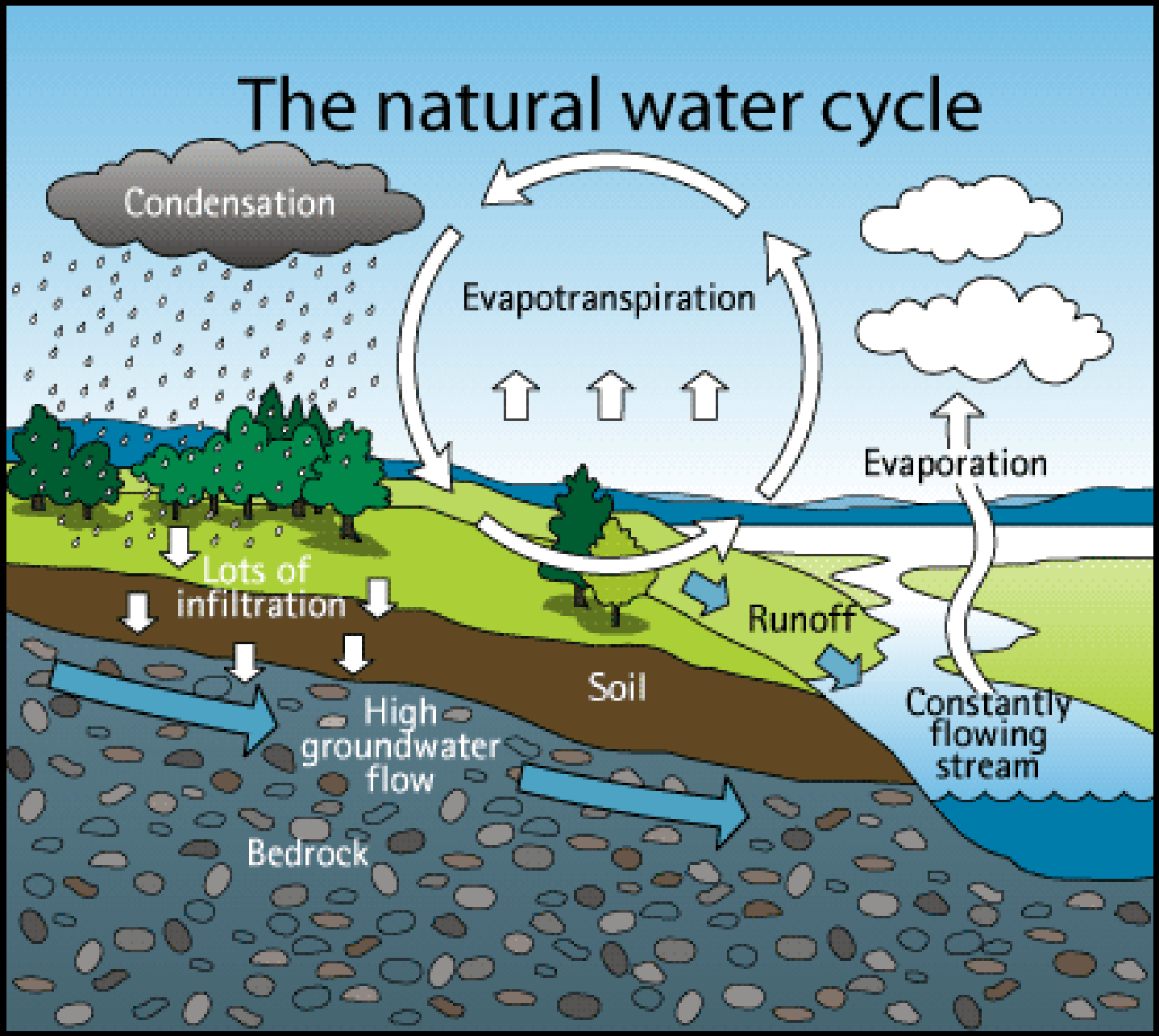
Agenda

- The Land Use - Water Quality Connection – Whitney Jenkins
- The North Carolina Watershed Game
- Break
- Low Impact Development (LID) Basics – Whitney Jenkins
- Why LID makes Economic Sense – Lauren Kolodij, North Carolina Coastal Federation
- Break
- Maintenance Costs of Stormwater Control Measures in North Carolina – Sarah Waickowski & Amber Ellis, N.C. State University
- Break
- Group Discussion: How do we influence LID within the development community? John Lennon, River Bluffs Development Corporation, Lauren Kolodij & Whitney Jenkins
- 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 this week
- I will send you an email this week that will include:
  - Workshop web page with links to presentations and resources
  - Workshop evaluation

The Land Use – Water Quality Connection


The natural water cycle
Condensation
Evapotranspiration
Evaporation
Lots of infiltration
Runoff
Soil
High groundwater flow
Constantly flowing stream
Bedrock


We have changed the
natural hydrology.

Parking Lots

Parking Lots Continued

Parking Lot & Street Runoff

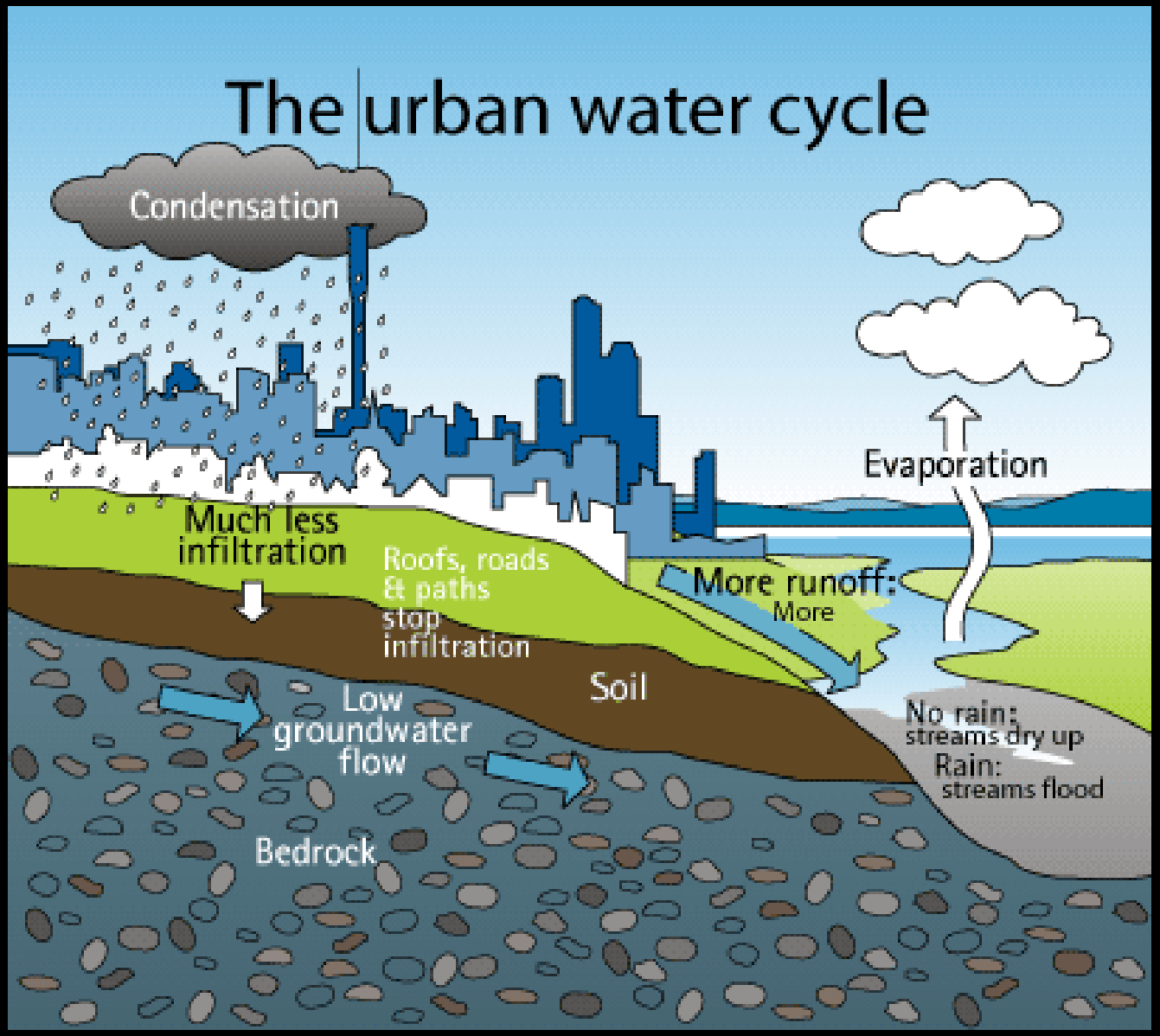
Ditching

Cul-De-Sacs

Rooftop Runoff

Curbs and Gutters

Vegetated Buffers & Living Shorelines


The urban water cycle
Condensation
Evaporation
Much less infiltration
Roofs, roads & paths stop infiltration
More runoff: More
Soil
Low groundwater flow
No rain: streams dry up
Rain: streams flood
Bedrock

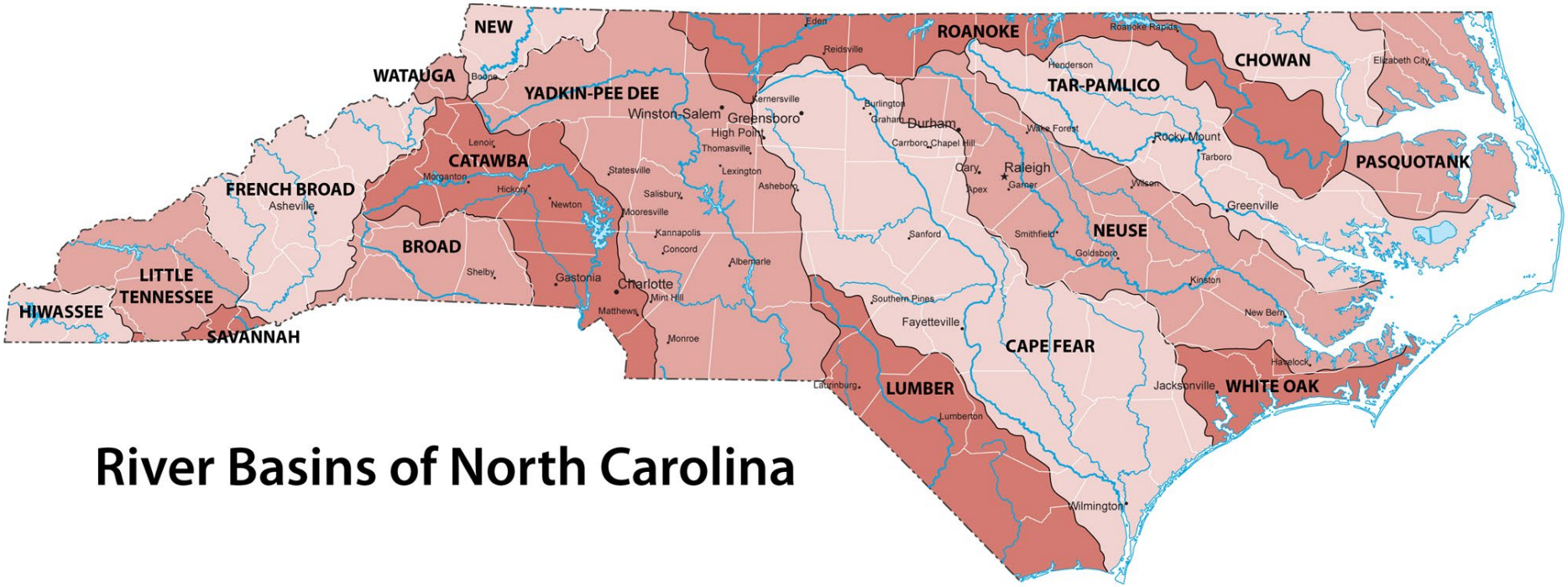
What is a watershed?

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

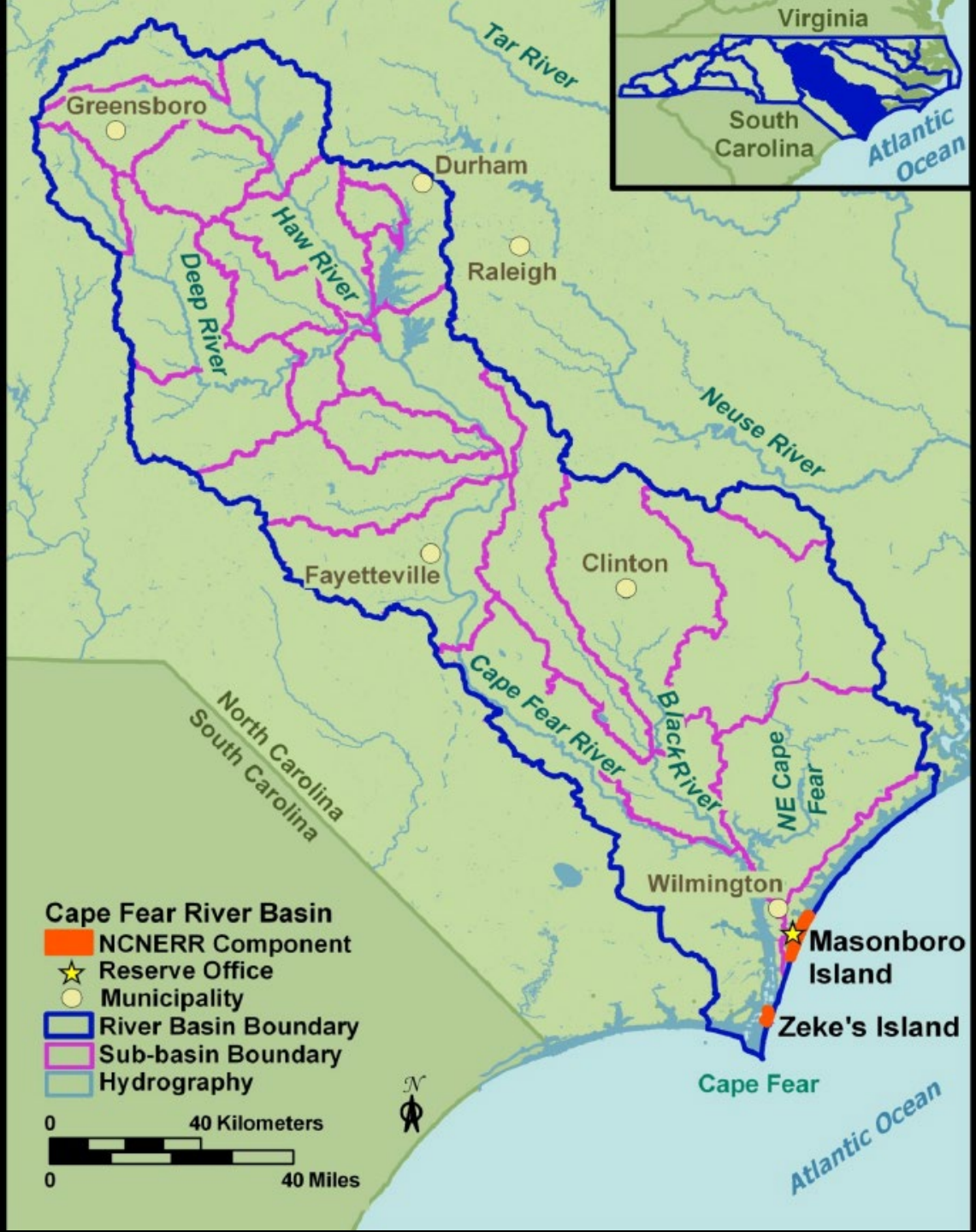
What is a Watershed?

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


Virginia
South Carolina
Atlantic Ocean
Tar River
Greensboro
Durham
Haw River
Deep River
Raleigh
Neuse River
Fayetteville
Clinton
Cape Fear River
Black River
NE Cape Fear
North Carolina
South Carolina
Wilmington
Masonboro Island
Zeke's Island
Cape Fear
Atlantic Ocean
Cape Fear River Basin
NCNERR Component
Reserve Office
Municipality
River Basin Boundary
Sub-basin Boundary
Hydrography
0
40 Kilometers
0
40 Miles
N

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.

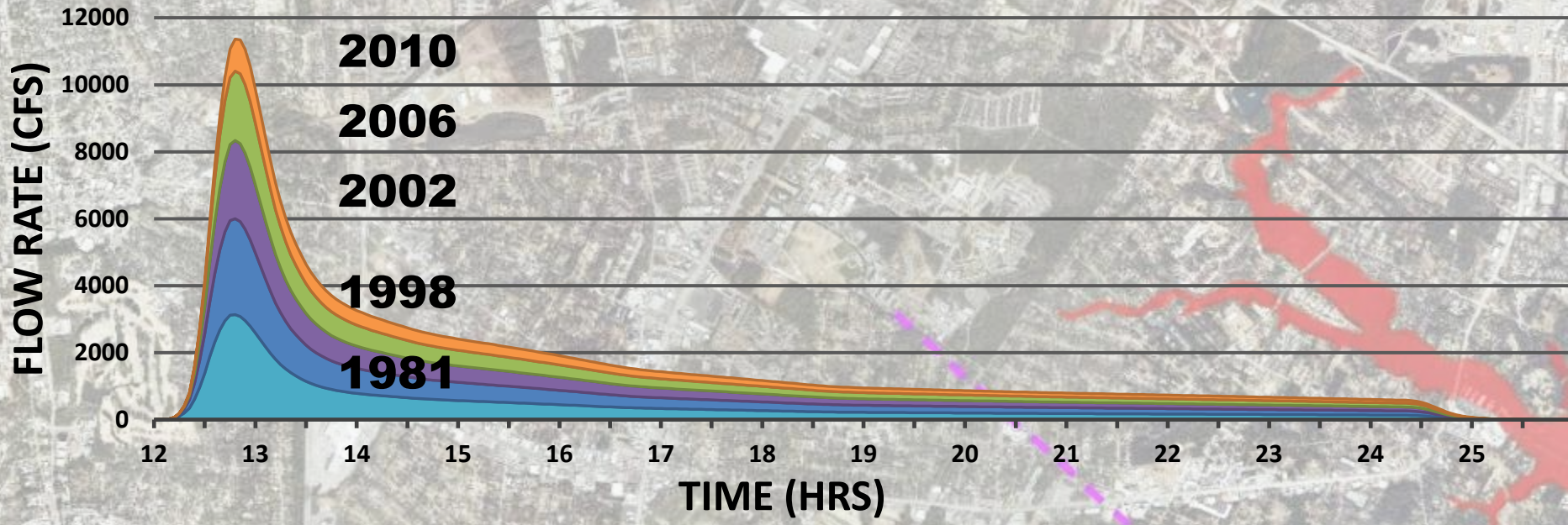
Shellfish Water Harvest Closure Map

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

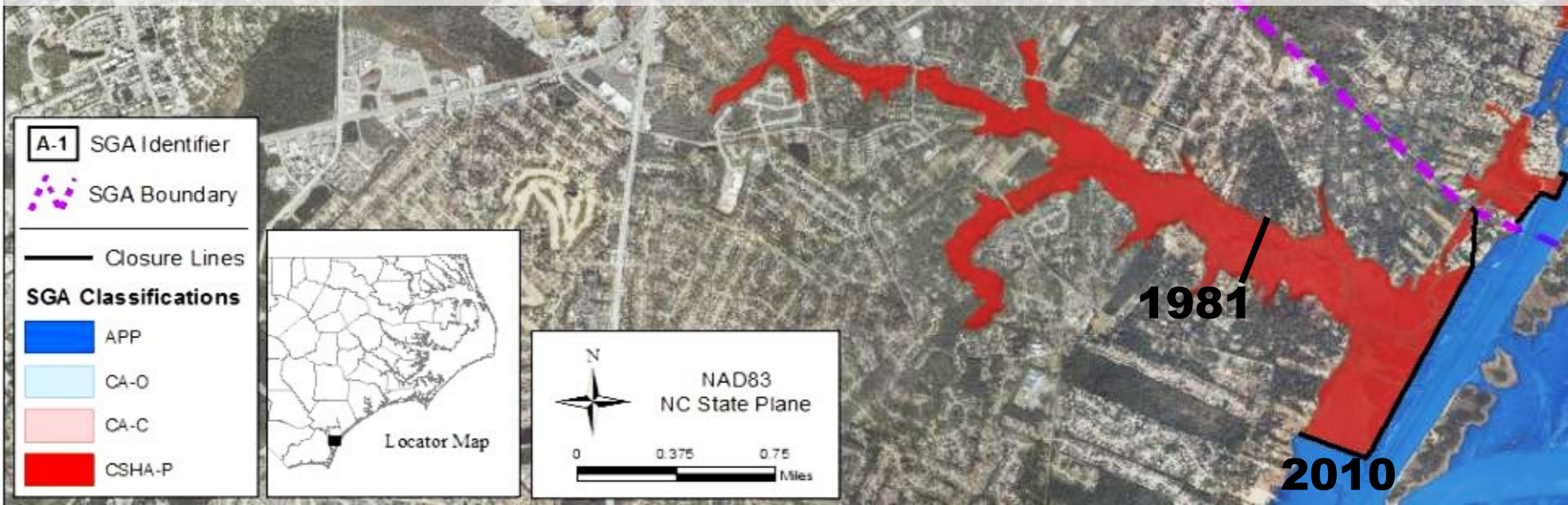
Swimming Advisory Map

https://ncdenr.maps.arcgis.com/apps/webappviewer/index.html?id=3a38378983874a88aeaf6c3027292587

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


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.

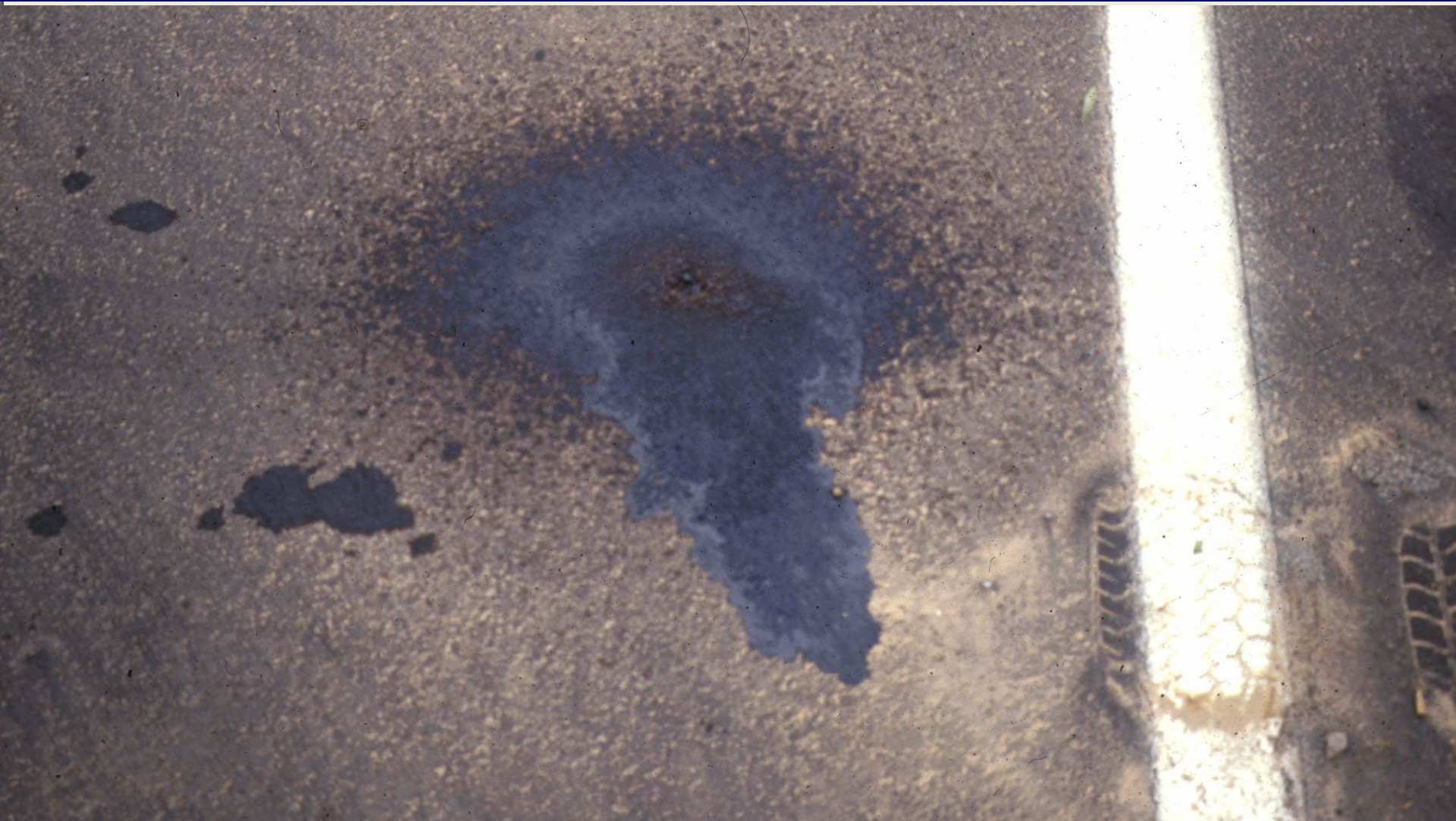
OFFICE OF THE STATE HEALTH DIRECTOR


Sediment
CAT
315C
CAT

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
Condensation
Evaporation
Contaminated runoff
Soil
Stream
Much better infiltration
Wetland treatment
Bedrock

Watershed Game

Overall Goals:

- Introduce concepts
- Be involved in land use decisions
- Wear different hats
- Learn from each other

Watershed Game

- Board is a fictional watershed
- Currently, there are 300 pollution units entering the waterbody, including upstream sources

Algal blooms are occurring periodically & there were fish kills this summer. What can cause this?

A. Excess nutrients
B. Bacteria
C. Viruses
D. Sediment
E. All of the above

Submerged aquatic vegetation (or seagrass) has been lost in some areas of the sound because the sunlight cannot reach the plants. What can cause this?

A. Excess nutrients
B. Bacteria
C. Viruses
D. Sediment
E. All of the above

Oyster beds have been closed to harvesting. This is due to high levels of bacteria found in the water. Where are the microbes coming from?

A. Pet waste
B. Wildlife waste
C. Failing septic systems
D. Sewer system overflows
E. Improperly managed livestock
F. Marinas with no pump-out stations
G. All of the above

Watershed Game

This waterbody isn’t meeting its intended uses!

Watershed Game

- There needs to be a reduction in pollution reaching the waterbody
- **Goal:** Reduce the pollution load to the sound to the pre-established limit of **130 pollution units**
- Local government, businesses, & residents have decided to reduce pollution coming from stormwater before new rules are imposed upon them

Watershed Game

- There are five land uses on this game board
  - Agriculture/Forest
  - Residential
  - Downtown
  - Commercial
  - Park/Golf Course/Undeveloped
- You will be divided into game groups
- Two or three-person teams for each land use
- Each land use has five “solution cards” that can be played to reduce pollution, but all cost “money”

Rules of Game

- Each team gets a budget of 6 candies
- Each team plays 1 solution card per round and explains the card and why it was chosen
- Pay the banker after playing the solution card
- Teams cannot swap solution cards
- After each round the banker will determine the new pollution unit amount for the waterbody
- Goal: reduce pollution (as a group) from 300 to 130 units
- **Have fun!**