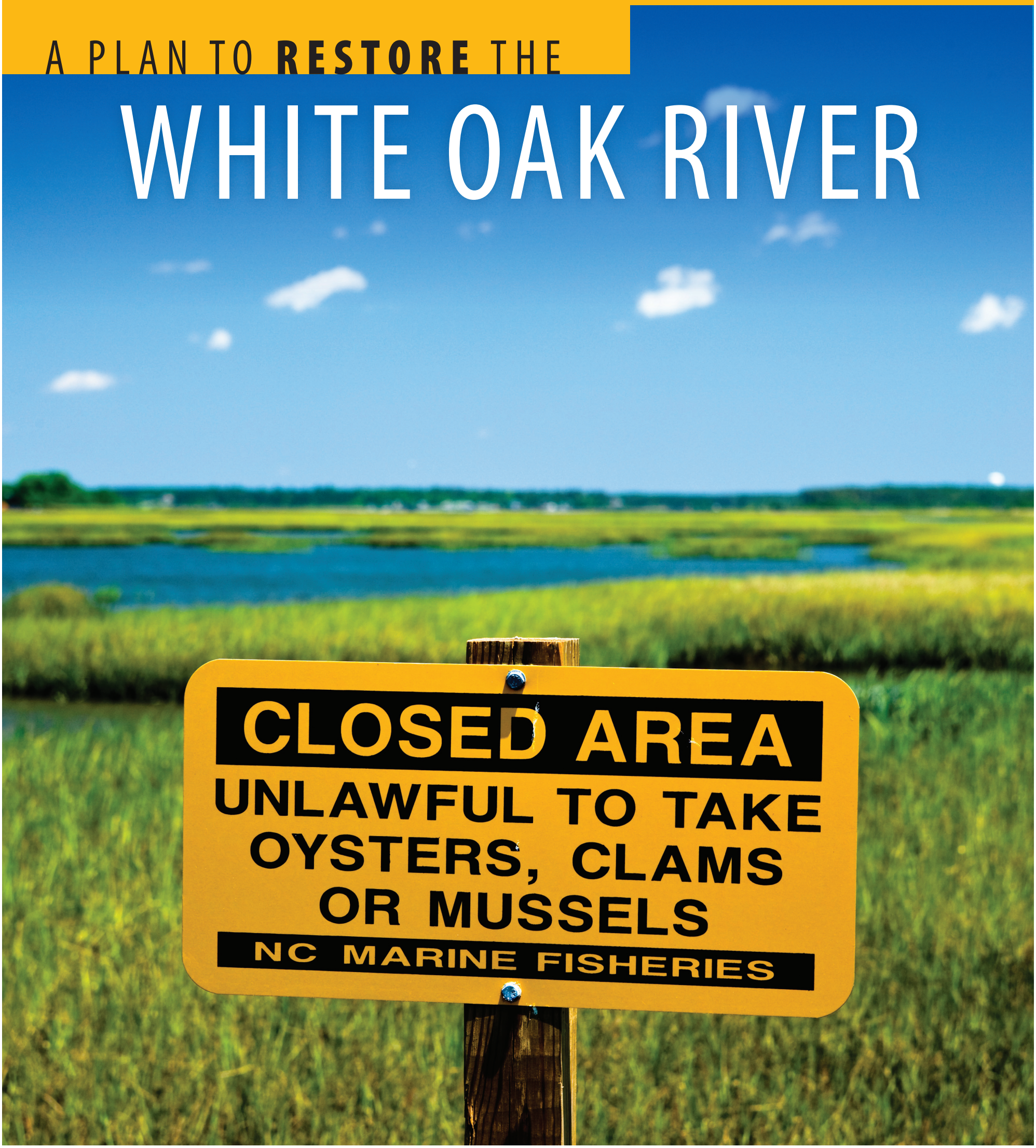
A PLAN TO **RESTORE** THE

WHITE OAK RIVER



Runoff Leads to High Bacteria Levels in White Oak

The White Oak River is in trouble, and polluted runoff from parking lots, driveways, rooftops and other hard, constructed surfaces is the primary culprit.

That's the conclusion of a three-year federally funded study that looked at the bacteria that are plaguing the river and closing its oyster and clam beds. The study found exceedingly high levels of fecal coliform bacteria in four watersheds in the lower White Oak. In the most extensive bacteria testing done on the river, more than 200 water samples were drawn from almost 70 scattered sites. Eighty-nine percent of the samples exceeded the federal health standard for shellfish waters. Of the 113 samples taken from the largest watershed, Boathouse Creek, all but three exceeded the standard. (See Page 4 for complete sample results.)

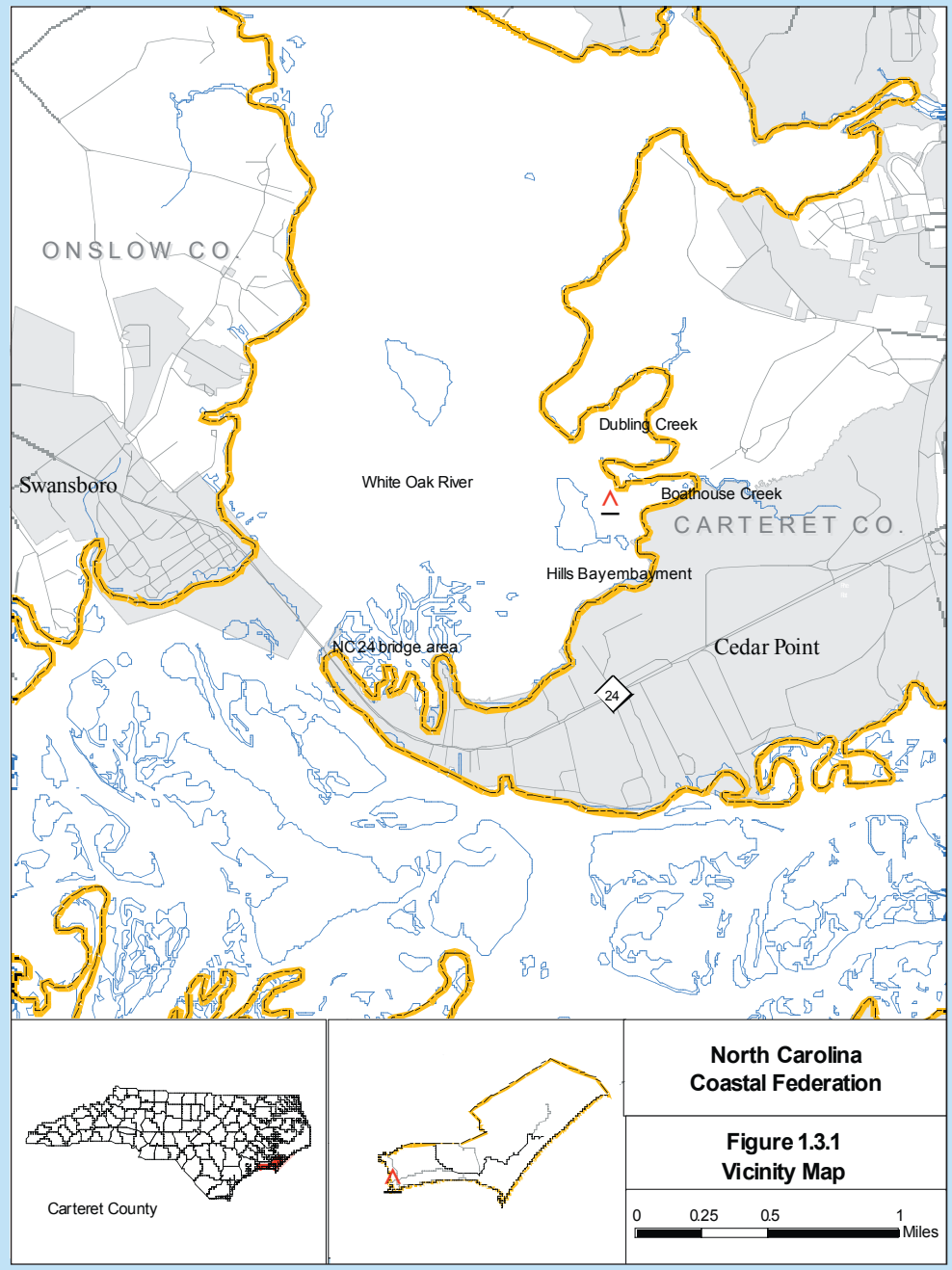
At many of the sites, the test results were hundreds of times higher than the standard. Bacteria levels in some of the samples drawn from ditches that drain N.C. Highway 24, the main road through the watersheds, were tens of thousands of times higher. The levels generally increased at all sample sites after a rain.

The primary sources of the bacteria are wildlife and pets, the study found. Those sources have always been present in the watersheds, but drainage ditches and hard, constructed surfaces, like roads and parking lots, have not, and they've increased the flow of stormwater to the river. Runoff carries a host of pollutants, including bacteria, with it.

The study also outlines a series of steps that can be taken to reduce the flow of stormwater into the river. They include reworking existing storm ditches to infiltrate more runoff into the ground before it reaches the river, educating people about the effects of stormwater and how to prevent their pets from contributing to bacteria pollution, and allowing developers to use more innovative techniques to control storm-water. (See Page 3 for the recommendations.)

Bacteria have been a problem on the White Oak for some time. The levels get so high, especially after moderate rains, that the state closes much of the lower river to shellfishing because the oysters and clams would be unsafe to eat. In fact, about 2,200 acres, or almost two-thirds of the lower White Oak, are now permanently closed to shellfishing or close temporarily after a moderate rain.

Under the federal Clean Water Act, the river is considered "impaired," and the state is obligated to take steps to restore water quality so that the river once again meets the bacteria standard for shellfishing.



In the first step toward restoration, the N.C. Division of Water Quality three years ago teamed up with the N.C. Coastal Federation, an environmental group headquartered in Carteret County; Cedar Point, a small town bordering the river in the western end of the county; and the N.C. Department of Transportation, which maintains N.C. 24. The partners received an EPA grant to determine the sources of the bacteria in four watersheds that border Cedar Point – Dubling and Boathouse creeks, Hills Bay and the area north of the N.C. 24 bridges to Swansboro – and come up with a plan to reduce them.

In the jargon of the Clean Water Act, the study's main goal was to devise TMDLs for the watersheds. That stands for total maximum daily load, which essentially is a computer calculation of the amount of pollutants that can be dumped into the water without violating water-quality standards and then assigning reductions to the various sources. The Clean Water Act considers a TMDL the first necessary step toward a clean-up plan. The study's partners contracted Baker Engineering of Raleigh to do the modeling.

Much of the first two years of the study were spent taking water samples. Twenty-five trained volunteers from Cedar Point, Cape Carteret and Emerald Isle sampled bays, creeks, storm drains, roadside ditches, boat ramps and mosquito canals for fecal coliform. That species of bacteria isn't generally harmful, but it's found only in the digestive tract of warm-blooded animals. If it's in the water, there's a good chance that harmful bacteria are there as well.

The samplers didn't find many obvious pollution sources. There are no sewer plants dumping into the watersheds and no industrial discharges. They didn't find illicit pipes, dog pens at the water's edge or failing septic tanks. Instead, they found a severely altered landscape – forests that have been cut down and replaced with parking lots, roads that have been widened, farm fields that have been replaced with rooftops and driveways. A maze of ditches, pipes, culverts and swales crisscrosses the land. They are designed to do one thing – quickly move runoff to the nearby creeks.

The University of North Carolina's Institute of Marine Sciences in Morehead City volunteered to do limited genetic testing on some of the bacteria samples. Those tests confirmed that the bacteria came from animals, not humans. They were always there. On a natural coastal landscape, they soaked into the ground with each rain. Now, they quickly wash through the pipes and down the ditches into the creeks.

The study's partners concluded that trying to reduce the sources – deer, raccoons or pets – was unreasonable. Instead, they turned their attention to the land. Fixing the land by mimicking natural drainage patterns and educating people about stormwater's effects would reduce the flow of pollution and offer a troubled river a chance.

CLEAN WATER ACT
Section 303(d)

(Summarized in plain English)

States must ***assess*** all waters and determine if they meet water-quality standards.

Waters that do not meet those standards and aren't likely to meet them under normal permitting standards must be ***added to the Impaired Waters List (the 303[d] list)***. The list is updated biannually.

States must ***conduct TMDL studies*** in order ***to set pollutant reduction goals*** needed to restore the impaired waters.

TO READ AND COMMENT

A public meeting to discuss the results of the study will be held on **March 2** from **7-9 p.m.** in the cafeteria of White Oak Elementary School in Cedar Point.

For more information about the meeting, contact Frank Tursi at 252-393-8185 or lookoutkeeper@nccoast.org.

To read the entire draft TMDL and accompanying implementation plan, see the Draft Total Maximum Daily Load for Fecal Coliform for Embayments in Southeast White Oak River in Carteret County, North Carolina, at http://h2o.enr.state.nc.us/tmdl or call 919-807-6305.

Written comments will be accepted until March 18, 2009. Send comments to adugna.kebede@ncmail.net or NCDWQ Planning Section, Attn: Adugna Kebede, 1617 Mail Service Center, Raleigh NC 27699.

ON THE COVER: Shellfish closure sign as seen from the Highway 24 causeway on the White Oak River. © George Mitchell, www.carolina-photo.com

POTENTIAL BEST MANAGEMENT PRACTICES (BMPS)

DUBLING CREEK WATERSHED

Potential BMP location	Comments
Walking trail, Cedar Pt. Natural Area	Pet waste disposal stations and signs explaining the problem
Wetland ditches, Croatan National Forest	Eliminate future maintenance of mosquito ditches so they are allowed to naturally fill in and re-vegetate
Mine pond, Holland Point Rd.	Engineer outlet structure to retain high flows and gradually release runoff. Open tree canopy to allow greater exposure to sunlight.
Forest, Croatan National Forest	Allow reforestation to occur following hurricanes. Also, tree plantings in select locations.
Mine site, Holland Point Rd.	Re-vegetate this area.
Roads, Cedar Pt. Natural Area	Look for areas where runoff from roads accumulates and becomes channelized. Correct these problems.
Pasture (DC_g)	Add a field edge buffer and possibly level spreader

BOATHOUSE CREEK WATERSHED

Potential BMP location	Comments
Western Park near entrance	Wetland feature currently present. Could install an outlet structure and expand basin to detain flow and enhance the wetland.
Western Park near tennis courts	An infiltration basin/trench could be constructed along the wood line.
Western Park swale at southwestern corner	The bacteria levels at this location are not very high but it could be a good future site if conditions change.
Western Park pet waste	Pet waste disposal stations and signs explaining the problem.
Ocean Spray septic systems	Further monitor this potential source. Set up an authority and seek grant funds to update systems in need of replacement.
Ocean Spray ditch near BC21	Could do a level spreader and filter strip or a terraced wetland. Would need to purchase undeveloped lot.
Ocean Spray ditch near BC22	Swale running through backyard of numerous properties. Difficult access, might access below from Western Park.
Ocean Spray ditch near BC23	Existing wetland feature could be enhanced. Difficult access and minimal space. Might consider site below that could be accessed through Western Park but would need to cross Boathouse Creek.
Cedar Point Town Hall	Room for a small infiltration basin or bioretention area. Install cisterns at town hall and at planned maintenance building.
NCDOT pipe outlet at BC11	Existing J-shaped open channel could be re-engineered to detain/infiltrate runoff discharged from pipe outlet. Pipe outlet and part of channel located on private property. May need to purchase additional land.
NCDOT outfall at BC26	This receiving channel is considered to be jurisdictional. Survey and engineering evaluation necessary to determine feasiblity of a conventional stormwater BMP which would be located on private property due to very limited public Right of Way. Alternatively, source control measures and/or filter-type treatment within the closed conveyance system may be implemented.
Boat ramp at mouth of Boathouse Creek	Good site to install a small BMP with educational signage.
USFS campground	Check the septic system here. Add pet waste disposal stations and educational signs.
Marsh Harbour	Recommend LID in third phase. Incorporate voluntary LID and homeowner education in existing phases. Purchase large waterfront buffer from existing undeveloped lots.
Stormwater ordinance	Town of Cedar Point plans to make Low Impact Development an option for developers.

HILLS BAY EMBAYMENT WATERSHED

Potential BMP location	Comments
NCDOT pipe outlet off Bluff Rd.	Pipe outlet located on private property (church). Depth to seasonal high water table may influence BMP selection. Survey and engineering evaluation necessary in order to identify canidate BMPs due to site constraints. Little elevation difference between pipe and receiving channel inverts. Significant amounts of excavation may be required depending on BMP selection. Flow splitter will be required due to high runoff volumes. Alternatively, source control measures and/or filter-type treatment within the closed conveyance system may be implemented
Swale draining Octagon House property	Work with Masons to ensure they develop property with water protection as a primary goal, use LID techniques. Or install a level spreader and filter strip if site is not developed.
Swale draining land adjacent to Octagon	Install a level spreader and filter strip above the drainage to the tidal creek.
Swale draining Jones property	Install a level spreader and filter strip above the drainage to the tidal creek.
Church off of Bluff Rd.	Install level spreader and filter strip.
Bluff Rd across from church.	Install at bioretention area where this runoff concentrates.
NC 24 border in sws 201	Install a level spreader and filter strip above existing pond.
Septic systems	Might seek to upgrade these systems.

BRIDGES WATERSHED

Potential BMP location	Comments
Septic systems (BR_a)	Limited available space, soils, and proximity to the shellfish waters suggest that optimum systems are needed here.
Backyard rain gardens (BR_b)	Teach homeowners how to construct rain gardens to treat runoff from their property. Install neighborhood rain gardens as demonstration project.
Education (BR_c)	Educational campaign to inform limited number of residences bordering shellfish waters about pet waste, septic systems, and rain gardens.

STUDY OFFERS REASONABLE STEPS TO RESTORE WATER QUALITY

The chart outlines some of the initial steps that can be taken to begin restoring water quality in the four watersheds that were part of the White Oak study.

You'll find an eclectic mix:

- Construction projects to fix what the sampling showed to be bacterial hotspots, like the drainage ditches in Western Park or those that carry runoff from N.C. 24.
- Educational initiatives that teach people about the effects of pet waste on water quality and encourage them to pick up after their pets.
- Policy recommendations that would allow developers to more easily use innovative stormwater controls.
- More monitoring to determine if septic tanks in the Ocean Spray subdivision are contributing to bacterial pollution.
- Doing nothing. The study recommends in the case of Dubling Creek to allow nature to fix itself.

All of the recommendations are designed to do one thing: Stanch the flow of stormwater into the river. Most of these types of studies attempt to reduce the actual sources of bacteria. That's an attainable goal if the sources are obvious, such as a sewer plant. It can be an exercise in futility, however, if the sources are as ubiquitous as white-tail deer or Fido and Fifi. Instead of focusing on where the bacteria are coming from, the study's recommendations attempt to stop them from getting into the water. That means better ways to control stormwater, such as low-impact development (LID) techniques. Those methods attempt to mimic natural drainage patterns and have been very successful in other parts of the country.

Keep in mind that all the recommendations are voluntary. There are no federal or state laws that require that any of these steps be taken.

If nothing's done, the White Oak will continue its slow decline. The steps outlined in this chart offer something else – a reasonable chance of recovery.

SAMPLE RESULTS BY WATERSHED

BRIDGES WATERSHED

Sample Site	Sample Date	Rainfall Amount*	Bacteria Count**
BR1	13-3-07	0	<2
BR2	13-3-07	0	<2
BR3	13-3-07	0	<2
BR4	13-3-07	0	Est 5
BR5	13-3-07	0	Est 5
BR6	13-3-07	0	18
BR7	18-5-07	0.97	40
BR7	10-9-07	1.12	Est 18
BR8	9-3-07	0	3
BR8	18-5-07	0.97	Est 13
BR8	10-9-07	1.12	Est 11

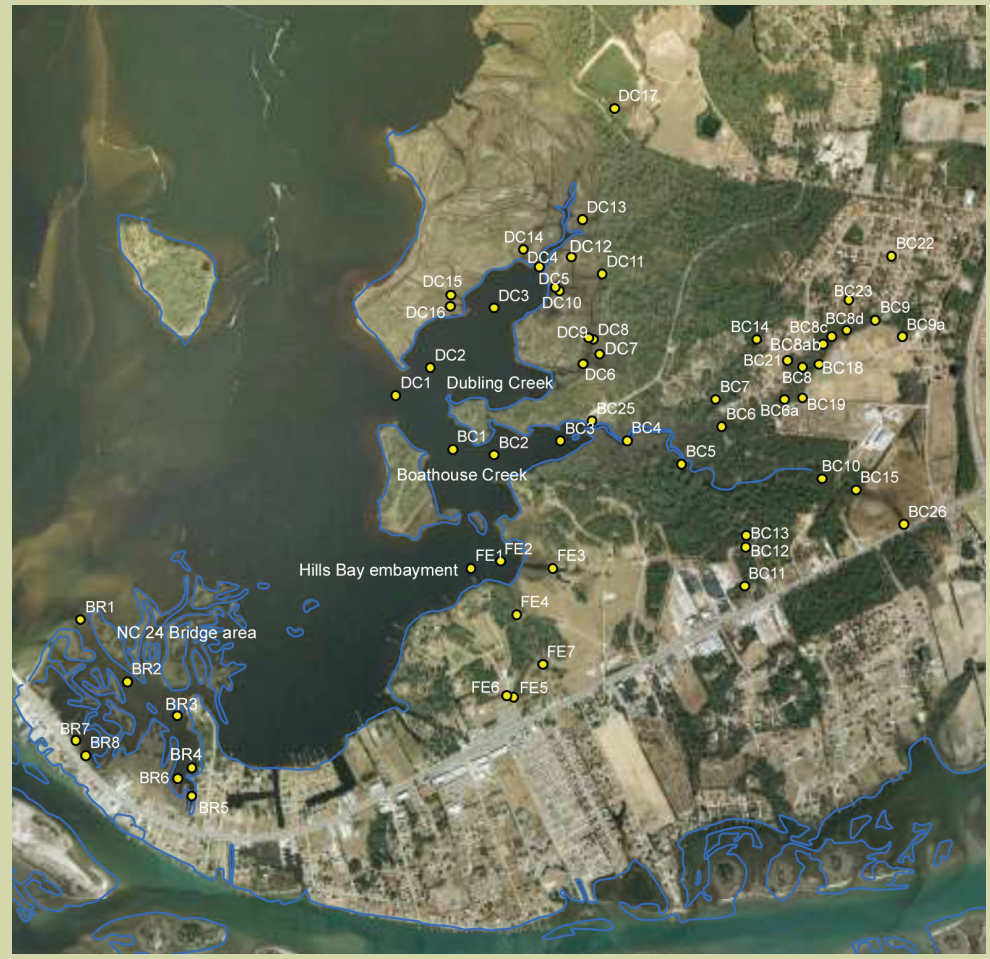
HILLS BAY

Sample Site	Sample Date	Rainfall Amount*	Bacteria Count**
FE1	30-5-07	0	Est 8
FE1	10-9-07	1.12	26
FE1	27-9-07	0.51	<5
FE1	27-9-07	0.51	<5
FE1	17-12-07	3.51	72
FE2	30-5-07	0	Est 28
FE2	10-9-07	1.12	57
FE2	27-9-07	0.51	<5
FE2	27-9-07	0.51	<5
FE2	17-12-07	3.51	123
FE3	14-3-07	0	274
FE3	4-6-07	0.57	586
FE3	4-6-07	0.57	580
FE3	10-9-07	1.12	786
FE3	17-12-07	3.51	1221
FE4	14-3-07	0	>1510
FE4	4-6-07	0.57	>1950
FE4	4-6-07	0.57	>1950
FE4	10-9-07	1.12	>1140
FE4	17-12-07	3.51	>2000
FE5	18-5-07	0.97	>6170
FE5	4-6-07	0.57	>1690
FE5	4-6-07	0.57	>1690
FE5	10-9-07	1.12	>18400
FE5	17-12-07	3.51	2400
FE6	3/14/07	0	Est 8
FE6	6/4/07	0.57	414
FE6	6/4/07	0.57	428
FE6	9/10/07	1.12	> 1030
FE6	12/17/07	3.51	145

BOATHOUSE CREEK

Sample Site	Sample Date	Rainfall Amount*	Bacteria Count**
BC1	22-3-07	0	Est 33
BC1	10-7-07	1.15	Est 49
BC1	27-9-07	0.51	Est 14
BC1	27-9-07	0.51	Est 16
BC2	22-3-07	0	46
BC2	10-7-07	1.15	412
BC2	27-9-07	0.51	<5
BC2	27-9-07	0.51	<5
BC3	8-3-07	0	36
BC3	4-6-07	0.57	>1210
BC3	28-8-07	0.89	386
BC3	28-8-07	0.89	408
BC3	10-9-07	1.12	>1160
BC3	19-2-08	1.2	857
BC4	8-3-07	0	>242
BC4	4-6-07	0.57	>2870

*** measured in Inches**
**** colonies/100 mL of water;**
the shellfish standard is 14 colonies/100 mL



BC4	28-8-07	0.89	1300
BC4	28-8-07	0.89	1311
BC4	10-9-07	1.12	>5440
BC4	19-2-08	1.2	3600
BC5	8-3-07	0	>733
BC5	4-6-07	0.57	>2650
BC5	28-8-07	0.89	3400
BC5	28-8-07	0.89	3290
BC5	10-9-07	1.12	>6760
BC5	19-2-08	1.2	3500
BC6	9-3-07	0	729
BC6	3-5-07	0	>2960
BC6	4-6-07	0.57	>3520
BC6	25-7-07	0	8200
BC6	28-8-07	0.89	>12600
BC6	10-9-07	1.12	>8840
BC6	17-12-07	3.51	5900
BC6	13-2-08	1.16	>10800
BC6A	25-7-07	0	10400
BC6A	28-8-07	0.89	32200
BC7	9-3-07	0	225
BC7	3-5-07	0	>2430
BC7	4-6-07	0.57	>2660
BC7	10-9-07	1.12	>8520
BC7	17-12-07	3.51	2300
BC7	13-2-08	1.16	>8590
BC8	14-3-07	0	Est 844
BC8	27-3-07	0	>2160
BC8	4-6-07	0.57	>2070
BC8	25-7-07	0	9000
BC8	6-8-07	0	>18600
BC8	28-8-07	0.89	4700
BC8	17-12-07	3.51	2000
BC8	13-2-08	1.16	>6090
BC8A	6-8-07	0	>9300
BC8A	28-8-07	0.89	6000
BC8B	6-8-07	0	>3600
BC8B	28-8-07	0.89	1260
BC8C	6-8-07	0	>1640
BC8D	6-8-07	0	>843
BC9	14-3-07	0	>1240
BC9	27-3-07	0	843
BC9	4-6-07	0.57	>1780
BC9	25-7-07	0	71
BC9	17-12-07	3.51	743
BC9	13-2-08	1.16	3000
BC9A	25-7-07	0	743
BC10	5-5-07	0	486
BC10	18-5-07	0.97	514
BC10	4-6-07	0.57	278
BC10	17-12-07	3.51	357
BC10	19-2-08	1.2	Est 25
BC11	9-7-07	0.65	>20200
BC11	24-10-07	0.67	18600
BC11	25-10-07	0.5	>45700
BC11	11-1-08	0.5	4200
BC11	17-1-08	0.57	514
BC11	13-2-08	1.16	543
BC11	22-2-08	1.06	793
BC12	9-7-07	0.65	>19100
BC12	24-10-07	0.67	20100
BC12	25-10-07	0.5	>24700
BC12	11-1-08	0.5	4600
BC12	17-1-08	0.57	4100
BC12	13-2-08	1.16	>1730
BC12	22-2-08	1.06	>17000
BC13	9-7-07	0.65	>13400
BC13	24-10-07	0.67	30500
BC13	25-10-07	0.5	>24200
BC13	11-1-08	0.5	2900
BC13	17-1-08	0.57	2800
BC13	13-2-08	1.16	>1540
BC13	22-2-08	1.06	>13200
BC15	22-5-07	0	614
BC15	4-6-07	0.57	99
BC15	17-12-07	3.51	293
BC15	19-2-08	1.2	120
BC18	11-1-08	0.5	Est 1200
BC18	17-1-08	0.5	400
BC18	13-2-08	1.16	2100
BC18	22-2-08	1.06	>850
BC19	17-1-08	0.5	<5
BC19	13-2-08	1.16	Est 5
BC20	13-2-08	1.16	Est 175
BC20	22-2-08	1.06	Est 32
BC21	22-5-07	0	Est 2
BC21	21-6-07	0.65	>1960
BC21	28-8-07	0.89	175
BC21	13-2-08	1.16	357
BC21	19-2-08	1.2	Est 11
BC23	13-2-08	1.16	>8480
BC23	22-2-08	1.06	>936
BC26	22-5-07	0	289
BC26	4-6-07	0.57	548
BC26	17-12-07	3.51	Est 82
BC26	19-2-08	1.2	Est 5

DUBLING CREEK

Sample Site	Sample Date	Rainfall Amount*	Bacteria Count**
DC1	22-3-07	0	16
DC1	10-7-07	1.15	50
DC1	27-9-07	0.51	<5
DC1	27-9-07	0.51	<5
DC1	16-11-07	0.52	Est 5
DC2	22-3-07	0	Est17
DC2	10-7-07	1.15	0
DC2	27-9-07	0.51	<5
DC2	27-9-07	0.51	<5
DC2	16-11-07	0.52	Est 5
DC3	22-3-07	0	Est 10
DC3	10-7-07	1.15	32
DC3	27-9-07	0.51	<5
DC3	27-9-07	0.51	<5
DC3	16-11-07	0.52	Est 19
DC4	22-3-07	0	Est 60
DC4	10-7-07	1.15	79
DC4	16-11-07	0.52	Est 44
DC5	9-3-07	0	68
DC5	21-6-07	0.65	771
DC5	28-8-07	0.89	125
DC5	16-11-07	0.52	657
DC5	16-11-07	0.52	692
DC5A	2-10-07	0	10500
DC6	9-3-07	0	Est 8
DC6	21-6-07	0.65	103
DC6	28-8-07	0.89	71
DC6	16-11-07	0.52	417
DC6	16-11-07	0.52	429
DC8	19-6-08	0	100
DC8	11-8-08	1.76	3900
DC9	19-6-08	0	Est 78
DC9	11-8-08	1.76	4100
DC10	19-6-08	0	145
DC10	11-8-08	1.76	Est 1210
DC11	19-6-08	0	400
DC11	11-8-08	1.76	2100
DC12	19-6-08	0	Est 45
DC12	11-8-08	1.76	>7800
DC13	14-8-08	0.98	291
DC14	14-8-08	0.98	43
DC15	14-8-08	0.98	18
DC16	14-8-08	0.98	32
DC16	14-8-08	0.98	Est 68

North Carolina Coastal Federation

FOR MORE INFORMATION:

Contact Frank Tursi at the North Carolina Coastal Federation: (252) 393-8185 or lookoutkeeper@nccoast.org