



UNIVERSITY OF NORTH CAROLINA

SEA GRANT COLLEGE

NEWSLETTER

February, 1977

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Septic tanks: hope for the coast

It was a pleasant surprise for Eddie O'Neal to read one day that there are alternatives to conventional septic tank systems.

It was almost a relief.

About a year ago O'Neal began trying to get approval to develop a marina in Swan Quarter. But because his soil wasn't good enough for a conventional system—it wouldn't percolate—O'Neal was running into troubles with the permit-giving agencies.

"I talked to people in the state agencies and they said a septic tank won't work here. Well, I could see that. So I said, I know, but isn't there any other way? And they said 'No.'"

Then, O'Neal read a short article in the newspaper about a man at North Carolina State University named Dr. Bobby Carlile who is testing alternatives to conventional septic systems—alternatives that are especially geared for the problem soils of the coastal counties.

So the next time O'Neal spoke to the permit agencies he mentioned Carlile's work.

"I found it hard to believe, but they'd never heard of him," O'Neal said.

Undaunted, he called Carlile and explained his problem. Would O'Neal like to try an experimental alternative system? Of course, he replied.

"Dr. Carlile was looking for a place to try his system out: not strictly an experimental site, but one that would be in the real world and not

under a control test situation," O'Neal said. "So I was helping him out and he was helping me—probably he was helping me a whole lot more."

Through various negotiations, Carlile and O'Neal got permission to install an experimental mound system on O'Neal's property. Work will begin as soon as the weather "dries up." The state will be closely monitoring surrounding waters to see how well the alternative system works. And O'Neal is required to have a back-up system for his two rest rooms in case the mound fails: he's planning on trucking his sewage to another system if the need arises.

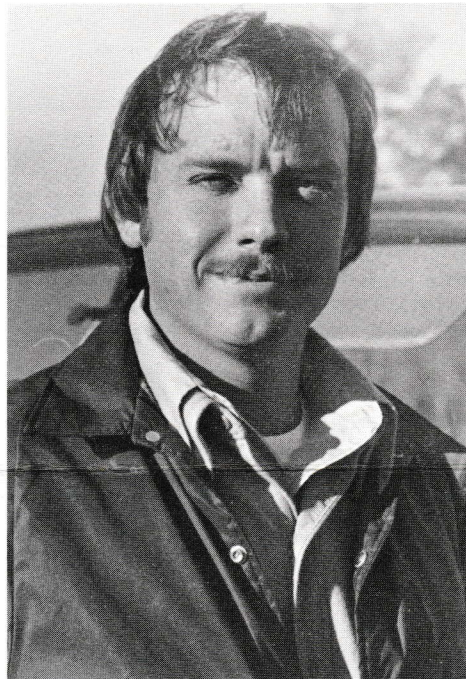
But despite the complications, he's convinced that testing alternatives is the way to go:

"We've got septic systems in these coastal counties that are not working. Every year more shellfishing waters are closed. But people are going to keep building. What we need is a more concerted effort at every level of government so each knows what the other one is doing and so they realize conventional systems are

already failing and we have to try something else.

"Why keep paddling down the same stream? Why say there are no alternatives and you can't do anything?"

"That will only make people frustrated and mad. And they'll try and sneak by. And that will hurt all of us."



Eddie O'Neal

The search. . .

Tight clayey soils that won't absorb water plus a high water table that brings ground water almost to the ground's surface equal lousy conditions for conventional septic tanks.

The lousy conditions prevail over much of North Carolina's coastal counties. In fact, a recent state study indicates that approximately 90 percent of the coastal area is unsuitable for conventional septic systems. The result is many failing septic systems which can pollute local wells and are implicated in the closing of much of the state's shellfish waters.

Almost one fifth of the state's shellfishing areas are closed due to pollution and less than a tenth of the pollution can be traced directly to sewage treatment plants. Septic tanks are usually blamed for the rest of the 400,000-plus polluted acreage. Other factors such as livestock runoff, migrating waterfowl and freshwater runoff also have an effect.

Failing septic systems can also create stinking messes and public health hazards. So health department officials responsible for approving small septic systems are leery of granting permits in areas with poor soil conditions.

"People have property they want to develop and lots of times we have to turn them down. We hate to do this but we'd be causing a health hazard by approving them," says Ed Pierce, head of the Pasquotank-Perquimans-Chowan-Camden District Health Department. "I don't know what we can do for relief. That's where Dr. (Bobby) Carlile comes in."

Carlile and Larry Stewart are soil scientists at North Carolina State University who—with the help of UNC Sea Grant and N.C. Agricultural Experiment Station funds—are testing alternatives to conventional septic systems. Their alternative systems are now being monitored in Perquimans and Washington counties. More test sites are being arranged for Hyde, Pender and Carteret counties.

"What we're trying to do is develop home sewage systems that can be used in marginal or unsuitable sites. We know we're not going to have central sewage treatment for all areas of the state anytime soon (and the cost at the coast would be considerable), so we have to develop some kind of systems that can be used on any site," Carlile says.

"What we're looking for is systems that will work and that an average home owner can afford and will use."

The economic and health liabilities of failed septic systems are a major reason for the search

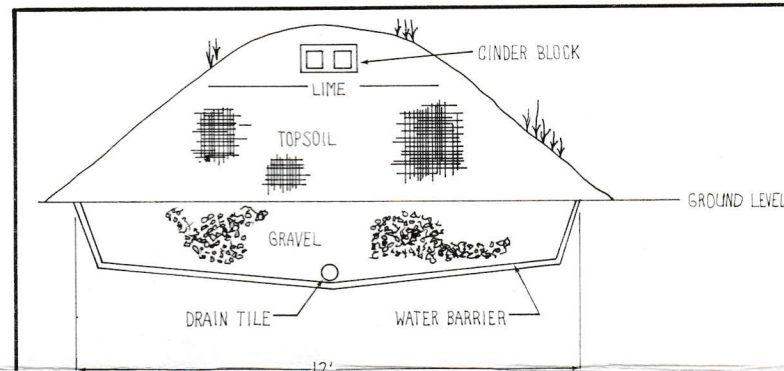
for alternatives. But Carlile and Stewart also are thinking of agriculture when they look for septic systems that will work on any land.

"To maintain prime agricultural land and leave it in production, you have to develop marginal land," Carlile explains. "Marginal farm land is also marginal for septic tanks, so you have to develop new systems that will work on this land."

If Carlile and Stewart are successful in finding septic systems that can work almost anywhere—and the scientists are optimistic since their alternatives already appear better than conventional systems—the implications are large. Development would be possible in areas where it is now practically impossible. And that's a lot of land considering state estimates that approximately 90 per cent of the coastal area is "unsuitable for conventional septic systems."

"Most of us are resigned to the fact that this area will develop some way or another," comments Dr. Charles McCants, head of the NCSU Soil Science Department. "What we're hoping is the results from this research will help the area develop in a manner which will do less environmental damage than the current way."

"There won't be any magic system to cure everything," Carlile adds. "Everything will have to be site specific and gradual improvement. But we can certainly do a much better job than is being done now."



Septic renovation levee: This test system serves two houses in Plymouth, N.C. It is three feet high and 50 feet long.

. . . Shows the alternatives do work

What are the alternatives to conventional septic systems?

Best bets

—The renovation levee, or mound, system is one of the most promising for very poor conditions because the mound bypasses the local soil completely. Sand and other material are trucked to the site and built into a mound. Sewage is pumped to the top of the mound through a pipe. Treatment takes place above ground within the mound and by the time the effluent reaches the native soil it is treated.

Carlile is testing a mound in Plymouth at the Tidewater Research Station and plans to test another in Swan Quarter this spring.

“We have enough data to say we can treat sewage with this system,” Carlile says. “Our system isn’t the optimum one yet; it needs improvements. But we think we know enough to do it better than it’s being done (conventionally).”

Wisconsin and Pennsylvania are also experimenting with the mound system and Pennsylvania has actually installed about 2,000 home systems while continuing research.

Carlile estimates the mound costs from 10 to 100 per cent more than a conventional system, depending on shipping costs. The mound cannot be used in some areas. It needs much less space than a conventional septic system, but the space occupied is above ground. Carlile is experimenting with using a 40-foot to 50-foot long and 20-foot wide mound for several, perhaps as many as 10, homes.

— The low pressure pipe system is a good possibility for marginal sites. It relies on native soils, and is a promising option in areas where local dirt is okay but the water table is high at certain times of the year or there is a bed of clay. Sewage effluent is distributed over a large area through a network of shallow perforated pipes. This system needs a pump to bring the effluent from the tank to the lines. But it is still comparable in price to a conventional system. Its main advantage is that effluent is not concentrated in one area as it is in a conventional septic system. When a conventional system fails—even temporarily—pollution occurs in one intensified spot. Failure of a low pressure pipe system would be much less dramatic.

Six low pressure systems have been installed and are being monitored at Holiday Island, a second home development in Perquimans County.

Other options

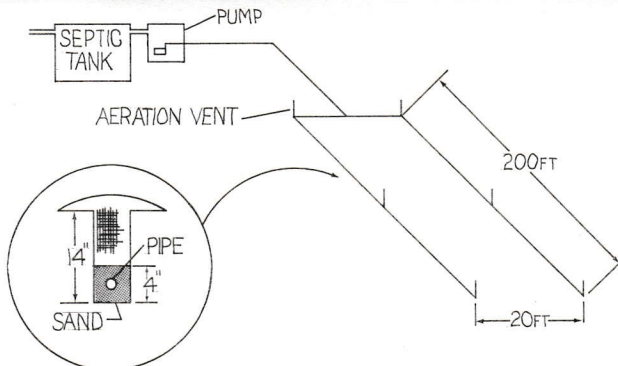
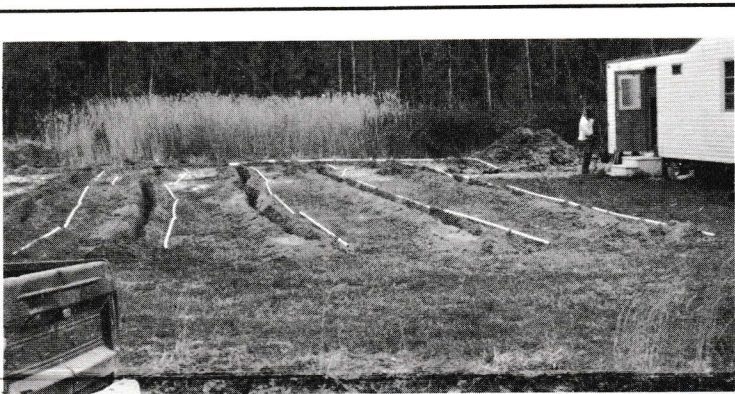
— A shallow conventional system can work in areas with high water tables. A shallow conventional v-system has the added advantage of v-shaped walls which give about 40 per cent more surface area for absorption than the normal square walls.

Three shallow conventional systems are working now at Holiday Island.

— The dual field system is another modification of a conventional system. Two fields are installed and back each other up. If one field begins to fail it can be switched off for a rest while the second field takes over. And vice versa.

(Please see “We’re,” page 4)

The University of North Carolina Sea Grant College Newsletter is published monthly by the University of North Carolina Sea Grant College Program, 1235 Burlington Laboratories, Yarborough Drive, North Carolina State University, Raleigh, North Carolina 27607. Vol. 4, No. 2, February, 1977. Dr. B.J. Copeland, director. Written and edited by Karen Jurgensen and Johanna Seltz. Second-class postage paid at Raleigh, N.C. 27611.



Low pressure pipe system: These one-inch perforated pipes are on a test site at Holiday Island, N.C.

'We're definitely optimistic'

(Continued from page 3)

— The recirculating sand filter has gotten considerable attention in Illinois. This system uses a conventional setup plus an extra tank with a sand filter. The effluent moves from the first tank to the second tank, going through the sand filter and is circulated over and over, with fresh effluent being mixed with the semi-treated material. The final discharged material is supposed to be fully treated.

The sand filter system is an estimated two to three times more costly than a conventional system. There have also been problems with polluted discharges.

— Aerobic systems are like small sewage treatment plants. Treatment takes place in the air instead of underground in a tank. But the effluent must still be discharged underground. This system can be two to three times as expensive as a conventional system and requires more maintenance. It may have applications for systems that have occasional failures, according to Carlile.

— Composting toilets are already manufactured and sold. They separate commode "black water" from the "grey water" of sinks, dishwashers, showers, washing machines and other water-using appliances. The composting toilet reduces the amount of water going into a septic system by an estimated 45 per cent, reducing the problem. Toilet wastes are treated separately in a self-contained unit.

— Evapotranspiration beds are another alternative—one best suited for dry climates. A very large sand bed is built, covered with topsoil and vegetated. Sewage is then introduced and, according to the theory, dissipated by evapotranspiration. A test bed is now operating in Wake

County, North Carolina, but it's experiencing problems, according to Carlile.

"We're not really enthused with this system for this area (North Carolina)," Carlile adds. "It's got some tremendous problems where rainfall exceeds the amount of evapotranspiration."

— The case system which uses a cinder block distribution system is being tested at Plymouth but doesn't look good for areas with a high water table, Carlile says.

"I don't think we're ready to take the alternative systems and start putting them in everywhere there's a failing system," Carlile concluded. "But we feel confident enough to put them in with control conditions. And we can go to any site and make recommendations on modifications that can be made to improve the site."

"We're a long way from an optimum system, but I think we're definitely optimistic," Carlile continued, adding that North Carolina is the only place he knows where people are actively working toward solutions to the coast's unique septic tank problems. "We've made improvements. We know our alternatives will work better than conventional systems. Now it's just a matter of making more improvements."

Want to know more about your present septic system? Sea Grant has produced a booklet "Your Home Septic System, Success or Failure?" that tells how to recognize and avoid problems. For your copy, write: UNC Sea Grant College, Box 5001, Raleigh, North Carolina 27607.

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