Septic Tank Alternatives

A Report to the Alachua County Board of
County Commissioners

Prepared by the Environmental Protection Advisory Committee

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C O N T E N T S

ACRONYMS

ATU	Aerobic Treatment Unit
BMAP	Basin Management Action Plan
CBOD5	Carbonaceous Biochemical Oxygen Demand
DEP	Florida Department of Environmental Protection
DOH	Florida Department of Health
IFAS	Integrated fixed-film and suspended growth systems
OSTDS	On-site Sewage Treatment and Disposal System
PBTS	Performance Based Treatment System
PRB	Permanent Reactive Barrier
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorous
TSS	Total Suspended Solids

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Summary

In February 2013, the Alachua County Commission asked EPAC to "provide basic research and a summary report of the most promising alternatives for onsite sanitary waste disposal, including modifications to existing septic systems, including estimates of the costs and benefits."

The major septics problem in the county is nitrate pollution of the Lower Santa Fe River and its springs. Roughly 15-20 percent of the nitrate pollution of these waters is contributed by septic tanks, also known as on-site sewage treatment and disposal systems (OSTDS). In only one other water body in the County – Lake Wauberg – are septic systems documented to be a major source of nitrates.

There are nearly three million OSTDS in Florida, but only about 17,000 are classified as advanced systems – a designation which includes Aerobic Treatment Units (ATU), Performance-Based Treatment Systems (PBTS), and innovative systems. These various advanced systems are considerably more expensive to purchase, install, and maintain than conventional septic systems, with cost differences between conventional and advanced systems ranging from a few thousand dollars to tens of thousands of dollars. Some advanced systems (e.g. ATUs) are only slightly more efficient than conventional tanks in removing nitrogen from domestic waste, while many PBTSs are very efficient in this regard.

Modifying existing systems may be a cost-effective nitrogen-reduction strategy in some cases, but there is little experience in Florida with modifications up to PBTS-standards.

EPAC makes the following recommendations to the BoCC:

1. A $5 million Department of Health (DOH) pilot program may lead to more cost-effective nitrogen-reducing systems. The BOCC should defer County regulations mandating advanced septic treatments until the DOH program concludes in 2015.

2. Local health officials should assess septic systems in the most vulnerable areas of the Santa Fe springshed. If failing systems or systems which would benefit from movement to higher ground can be identified, the Commission should consider whether a funding source can be identified to correct these problems.

3. Over the next two years, there are several timely activities that the BoCC could assign to the Environmental Protection Department (EPD) in preparation for what will hopefully be a good result from the DOH program: (a) verification of the contribution that septics are making to various County watersheds; (b) analyses tying nitrogen reductions from septics to expected water quality improvements on the Santa Fe River and its springs; and (c) development of a detailed vulnerability map of the Santa Fe River basin.

4. BoCC should charge the County Manager with studying funding and management options for a septics authority, should the Commission decide at a later date to require installation of advanced septic systems in portions of the County.

The Board's Request for Information on Septic Tank Alternatives

On February 5, 2013, the Board of County Commissioners (BoCC) approved a motion by Commissioner Hutchinson to solicit information from four separate County entities on how changes in septic tank regulations might reduce nutrient pollution of local groundwater. Part #2 was directed to the Environmental Protection Advisory Committee:

> "(2) Referral to EPAC to provide basic research and a summary report of the most promising alternatives for onsite sanitary waste disposal, including modifications to existing septic systems, including estimates of the costs and benefits."

In responding to that request and preparing this report, EPAC met with Mr. Anthony Dennis, who as Director of the County's Division of Environmental Health has primary responsibility for septics regulation in Alachua County. We also had discussions with a number of other State and local officials concerned with public health and the environment (including senior State officials in Tallahassee with septics responsibilities) and reviewed relevant current literature on options for on-site sewage treatment and disposal systems (OSTDS). Much of this background information is posted on the County website at: http://www.alachuacounty.us/Depts/EPD/Pages/epac.aspx; references in this report refer to documents posted at that site.

On July 9, 2013, a quorum being present, EPAC approved this report by a 6-0 votes.

Where Are Septics A Serious Pollution Problem in Alachua County?

Under a $100,000 grant, DOH recently completed a comprehensive assessment of OSTDS in Alachua County. Here are the results on numbers of County septic systems found in various categories:

Alachua County Total	30,411
County Total on < 5 Acres	21,434
Units Installed Pre-1983	16,985
In Stream-to-Sink Areas	15,007
In 25-Year Travel Zone	3,507
In City of High Springs	1,639
In City of Archer	368

Pollution from septic tank effluents is not a uniform problem across the County, and any regulation of OSTDS should be targeted so that pollutants are reduced in the most cost-effective way.

The major septics problem in the county is nitrate pollution of the Lower Santa Fe River and its springs – many of which exceed the target nitrate concentration[1] (0.35 mg/l) by a factor of five or more. A recent MACTEC study estimates that 15-20 percent of the nitrate pollution of these waters is contributed by septic systems (Lower Santa Fe Springs Revised Report, 2013)[2, 3]. In 2012, the Florida Department of Environmental Protection (DEP) approved a Basin Management Action Plan (BMAP) aimed at reducing nitrate concentrations in the Lower Santa Fe to the 0.35 mg/l standard; however, the Plan has no septics provisions, and given its heavy reliance on voluntary agricultural practices is unlikely to make a serious or timely dent in the problem.

The time it takes for pollution from OSTDS to reach the Santa Fe River springs varies widely across the springshed. When septic effluent is discharged near sinkholes or underground tunnels, it may reach the springs in a matter of days. On the other hand, travel times from the eastern springshed boundary in northern Alachua County are approximately 1,000 years. These varying transit times highlight the need for detailed maps showing areas of greatest vulnerability so that any septics regulations can be targeted appropriately.

In 2008, DEP approved a BMAP for the Orange Creek Basin, covering much of the eastern half of Alachua County. With one exception, nitrates from septic effluents were not deemed a serious concern in the basin. Septic tank nitrogen comprises less than two percent of the nitrogen entering Alachua Sink, Newnans Lake, and Orange Lake. The exception is the 35 percent contribution that septics make to the nitrate budget of Lake Wauberg.

The Florida Department of Health (DOH), which regulates septic systems in the County, has limited enforcement authority and can only require repairs to a system when there is a sanitary nuisance – basically, sewage or septage on the ground. As part of the Orange Creek BMAP, DOH was charged with evaluating septic systems along Hogtown, Sweetwater, and Tumbin Creeks for their contribution to high coliform levels, as well as those surrounding Lake Wauberg. The creek survey revealed one property which was discharging directly into the creek, and GRU was able to provide a sewer connection to that property. Many systems that were inspected were old but their overall contribution to the problem of coliforms in the creeks was judged to be minor, given the many other potential sources of bacterial contamination. DOH's inspection of units surrounding Lake Wauberg revealed no sanitary nuisances, so DOH was precluded from taking any action to reduce nitrate pollution of the lake contributed by septic systems.

[1] In 2008, the Florida Department of Environmental Protection adopted a nitrate Total Maximum Daily Load (TMDL) of 0.35 mg/l for the Santa Fe River Basin. A TMDL represents the maximum amount of a given pollutant that a water body can assimilate and still meet water quality standards.

[2] By comparison, septics contribute 26 percent of the nitrates to the Wekiva basin and will contribute roughly one-third of the nitrates to the Wakulla basin after the Tallahassee spray-field is phased out later in this decade.

[3] EPD has been awarded a Protect Florida Springs tag grant to evaluate nutrients in targeted areas in the Poe and Hornsby springsheds with one focus being the septic systems along the river directly upstream of Poe Springs Park.

In summary, discharge from septic tanks is a significant source of nitrates to the lower Santa Fe River and to Lake Wauberg, but not to other water resources in the County[4].

What Regulatory Options Are Open?

The third element in Commissioner Hutchinson's motion directed the County Attorney to "provide a brief on the County's regulatory authority, preemptions, or other legal issues to consider with respect to septic tanks". In his May 6 memorandum, David Wagner concluded that:

- The County may adopt septics rules in new developments, including a requirement for performance-based treatment systems (PBTS). However, only passive[5] PBTS may be mandated before mid-2015.

- In late 2012, the County opted-out of an OSTDS inspection program because of the limited flexibility allowed by the State statute. The County could still opt back into the statute, but even then it could only require repair, modification, or replacement of a system where an evaluation identifies a "system failure" as defined by the statute. If a system failure is identified, the system owner may choose the least costly allowable remedial measure to fix the system.

The Attorney's memo did not deal with the issue of whether, under State law, the County has the authority to mandate modifications to *existing* OSTDS. For example, could the County set up an entity to fund replacement of old systems with newer technology and require residents to contribute funds to this authority? Would a County mandate to replace or upgrade existing systems be legal even if those systems were not sanitary nuisances? EPAC raised this question and in a separate correspondence, the Attorney indicated that:

> "Section 381.0065(4)(x), F.S. would seem to apply to existing systems … I don't believe the County could require the upgrade without a system failure and without allowing the owner to choose the least costly remedial measure to fix the system".

If the Commission should decide at a later date to consider upgrading existing systems through a septics authority, it should seek clarification of its authority to regulate in this regard.

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[4] There are probably other water bodies in the County where a nearby concentration of septic systems on small lots could constitute a significant nutrient problem. EPD staff members cite Santa Fe Lake, the east side of Lochloosa Lake, and Cross Creek as examples. However, the nutrient balance of these water bodies is not as well documented as it is for the two systems highlighted here.

[5] Defined by DOH as systems using reactive media for de-nitrification with no more than one effluent dosing pump.

Alternatives to Conventional Septic Systems

Any nitrogen removal from OSTDS occurs via a three-step process. First, bacteria convert organic nitrogen anaerobically into ammonia (ammonification). Secondly, aerobic bacteria convert ammonia into nitrite and then nitrate (nitrification). Finally, via de-nitrification, nitrate is converted into environmentally benign nitrogen gas – a process favored in saturated anaerobic soils with sufficient carbon content (> 1%).

In a conventional septic tank, raw sewage flows into the tank, where ammonification and some nitrification may occur. The septic effluent may become nitrified further once it is discharged into the drainfield and percolates through unsaturated soils. However, the third step – de-nitrification – is likely to be minimal in conventional OSTDS in Alachua County, for two reasons. First, in many areas of the County (particularly toward the west), the soil contains little carbon-rich organic matter and surface connections to the aquifer are fairly direct. Secondly, even in areas where there are organic soils which might allow for significant de-nitrification, those soils are generally removed during OSTDS installation to allow for more rapid downward movement of the effluent.

As a result, conventional septic systems, if properly maintained, do a good job of reducing pathogens and suspended solids, but do very little to lower nitrogen levels. A recent study in the Florida Panhandle (Wakulla County Septics Study, 2010) showed average nitrogen-removal rates of nine percent from conventional systems – a fairly typical figure seen in OSTDS studies nationwide.

Further treatment of the waste occurs in advanced treatment systems, all of which are considerably more expensive to purchase, install, and maintain than conventional septic systems. The simplest advanced systems are Aerobic Treatment Units (ATUs); in these, ammonia flows into a treatment chamber where a blower or aerator creates an aerobic environment which promotes higher rates of nitrification. ATUs are not terribly effective in reducing nitrate levels in effluent released to the environment; as we will see later, nitrate reduction rates of about one-third are typical of these units.

In PBTS[6], there is additional treatment which allows the effluent to meet specific performance-based standards – e.g. reducing nitrate or phosphorous levels by 70 percent. PBTS designs differ but all are engineered so the wastewater is exposed sequentially to aerobic and anaerobic conditions to allow for nitrification and de-nitrification. Further de-nitrification can be achieved by having a portion of the pumped effluent directed back to the pre-treatment chamber. An excellent discussion of various types of PBTS may be found in "Septics – OSTDS Options for Wakulla" (2011), which distinguishes:

[6] PBTS may be defined as a specialized OSTDS designed by a licensed professional engineer using sound engineering principles to achieve specified levels of carbonaceous biochemical oxygen demand (CBOD5), total suspended solids (TSS), total nitrogen (TN), total phosphorous (TP), and fecal coliform found in domestic sewage waste, to a specific and measurable established performance standard. This term also includes a category of "innovative systems".

- *Fixed-film systems* – on a medium of sand, gravel, or other substrate, bacterial biofilms de-nitrify some of the nitrate

- *Suspended growth-activated sludge systems* – use similar bacteria as fixed-film systems, but here the bacteria and solids remain in suspension within an aeration tank

- *Integrated fixed-film and suspended growth systems (IFAS)*

- *Passive carbon feed with pre-treatment systems* – additional carbon is supplied to enhance de-nitrification

- *Groundwater treatment/permeable reactive barrier (PRB)* – de-nitrifying media are installed in groundwater to intercept and remove nitrates – a useful technology, for instance, near point sources such as sprayfields

- *Sulfur de-nitrification systems* – sulfur is converted to soluble sulfate to allow conversion of nitrate to nitrogen gas.

DOH is pilot-testing a sulfur de-nitrification technology as part of a $5 million, multi-year State-funded program. The goal of this program is to develop systems that complement conventional OSTDS, are affordable and ecologically protective, and have reduced engineering and installation costs. The focus is on passive systems, defined as systems using reactive media for de-nitrification with no more than one effluent dosing pump[7]. Results of the program are expected to be non-proprietary; presumably at its conclusion in 2015, DOH will disseminate data and specifications which can be utilized by any entity, public or private, to develop and market cost-effective, nitrogen-removing OSTDS.

About 17,000 advanced treatment systems have been installed in Florida, the vast majority of which are ATUs ("Septics – Assessment of Advanced Systems", 2013). Over 60 percent of the advanced systems in Florida are located in Monroe, Charlotte, Brevard, Franklin, and Lee Counties. Only 1300 are PBTS units; as of 2010, 200 PBTSs had been permitted in Wakulla County as a result of a 2006 ordinance requiring their installation in new developments. Advanced treatment is also required for permanent OSTDS installed in the Florida Keys, as well as Collier County and a coastal area of Franklin County[8]. DOH surveys have revealed many problems with compliance, high operating costs, and improper installation ("Septics – Assessment of Advanced Systems", 2013). Up to 30 percent of the units may be inoperative, mostly because of power-related issues[9].

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[7] DOH has excluded aeration pumps – only pumps that move the effluent are allowed – because many of the mechanical issues with non-passive technologies are attributable to aeration pumps.

[8] Seven ATU units have been installed to date in Alachua County, all apparently in response to County mandates. Four of the seven are in Bristol Harbor, two are near Lake Santa Fe, and one installation allowed the owner to utilize a smaller drainfield. Only one PBTS has been installed in the County, in a residence near Poe Springs.

[9] Some of the "power issues" may simply be due to homeowners saving on their utility bills by turning off the system.

It should be noted that there are nitrogen-reducing techniques that do not involve advanced technology. For example, over the past 30 years, State regulations have raised the required distance between the bottom of a drain field and the seasonal high water table from 6" to 24". However, when older systems are replaced, the new system may be installed at the "grandfathered" standard of 6". Ensuring that systems are above the wet season water table – either by eliminating the grand-fathering exemption or moving existing conventional systems to a raised mound – would in many cases reduce nitrogen pollution[10]. Another non-technological suggestion is to make use of the spodic layer rather than removing it from under septic installations as is currently required. Leaving the spodic layer in place could increase the likelihood of effluent pooling on the surface but its carbonaceous, anaerobic characteristics would help greatly with de-nitrification under the surface.

Modifications to Existing Septic Systems

Given that installation and operating costs for advanced OSTDS are considerably higher than for conventional systems, to what extent is it possible to modify existing conventional systems to achieve more efficient removal of nutrients, particularly nitrogen? Discussions with DOH personnel suggest that such system modifications, although possible in limited circumstances, are relatively rare in Florida – probably because in most cases, it would be as effective from cost and performance perspectives to replace rather than modify a sub-standard conventional system.

However, there may be instances when retrofit makes sense. Dr. Eberhard Roeder writes the following in "Septics – Cost-effective Strategies for Wekiva" (2007):

> "Repair costs for a complete repair (tank and drainfield) were very similar to costs for new systems, and thus the cost-effectiveness numbers are roughly the same. Two special cases of partial repairs/upgrades will be discussed here. In the case of a drainfield failure in … poorly drained soils, Anderson has suggested making upgrades to old systems in the water table a priority … the overall cost-effectiveness is best for the new mound. A further option exists for systems for which the tank is structurally sound and the drainfield is either gravity fed or dosed from a pump tank. In such a case a retrofit kit may be inserted into the tank. At this time, only one such kit has obtained an innovative system permit in Florida, for which testing has shown 50% nitrogen-reduction. [Under some scenarios], retrofitting is somewhat more cost-effective than a system replacement."

Roeder's paper does not indicate how many retrofits have been installed in Florida. However, more retrofits may be possible in the future if the DOH project proves out. Ms. Elke Ursin (DOH) has confirmed that the sulfur de-nitrification system currently being pilot-tested is

[10] DOH's Anthony Dennis briefed EPAC on July 9, 2013 on new State regulations governing grand-fathering. His preliminary interpretation of the new rule is that major property renovations (e.g. adding a bedroom) will require a 6" septic to be raised to 24". However, those at 12" will be allowed to remain at 12". Vero Beach is expected to consider an ordinance requiring septic tanks that are replaced to comply with the 24" standard.

based on supplementing a conventional septic tank with two additional tanks which perform sequential aerobic and anaerobic steps. Further analysis and product development will presumably show whether the DOH design will be more cost-effective in a free-standing new system or in a retrofit. One factor in this cost assessment will be whether the design of any additional tanks will require modification of plumbing in the existing conventional system.

Costs

"Septic System Prices Quotes" (2006) were compiled for conventional and advanced systems by DOH. At that time – seven years ago – advanced systems cost $3,500 - $6,000 more than conventional systems ($5,375-$11,350 vs. $1,875-$5,375). Quotes for advanced systems were based on meeting a nitrogen effluent standard of 10 mg/l. Variations in cost were largely due to variations in seasonal high water table height, soil type, and whether the system utilized low-pressure irrigation, drip irrigation, or gravity feed.

Similar but somewhat higher costs are reported in "Septics – Cost-Effective Strategies for Wekiva" (2007). Figure 7 of that study shows installed costs of $4-6 K for conventional septic, $10-14 K for ATUs, and $12-14 K for both 20 mg/l PBTS and 10 mg/l PBTS. As can be seen from these figures, the incremental costs to go beyond an ATU standard to a performance standard of 20 mg/l or 10 mg/l is low.

More detailed cost figures are shown on Table 3-1 of "Septics – OSTDS Options for Wakulla Springs Watershed" (2011). Capital costs for various systems are as follows:

No Nitrogen Treatment/Capital Costs

Conventional Septic	*$ 2,500 - $ 3,500*

Advanced Secondary Treatment/Capital Costs (Nitrogen removal to 10 mg/l or 20 mg/l)

Advanced – Suspended Growth	*$ 6,800 - $ 8,600*
IFAS	*$ 7,000 - $ 8,800*
Fixed Film	*$ 8,000 - $12,000*

Advanced Wastewater Treatment/Capital Costs (Nitrogen removal to 3 mg/l)

Carbon Feed and Pre-Treatment	*$17,800 - $21,000*

The value of Table 3-1, compared to other references cited in this section, is that it also shows life-cycle costs for these various technologies. For advanced systems in Florida, yearly DOH inspections are mandated, as are semi-annual inspections by a maintenance entity. This raises the life-cycle costs for advanced systems significantly, as can be seen from these figures:

No Nitrogen Treatment/Life-Cycle Costs

Conventional Septic	*$ 3,101 - $ 4,186*

Advanced Secondary Treatment/Life-Cycle Costs (Nitrogen removal to 10 mg/l or 20 mg/l)

Advanced – Suspended Growth	*$ 18,268 - $ 22,699*

IFAS	*$ 18,468 - $ 22,899*
Fixed Film	*$ 16,339 - $ 22,227*
<u>*Advanced Wastewater Treatment/Life-Cycle Costs (Nitrogen removal to 3 mg/l)*</u>	
Carbon Feed and Pre-Treatment	*$ 26,139 - $ 31,227*
<u>*Cluster Systems/Life Cycle Costs*</u>	
Low estimate	*$ 16,339 - $ 22,227*
High estimate	*$ 26,139 - $ 31,227*

These figures clearly demonstrate both the significant expense involved in upgrading a conventional septic system and the rationale for the State's program to develop a more cost-effective technology for removing nitrogen from OSTDS.

Benefits – How much Nitrogen Can Be Reduced by Advanced Systems?

The first and simplest step in minimizing nutrient pollution from septics is appropriate land planning, including sensible regulations on lot size and density of OSTDS units, as well as provision of protective distances from down-gradient groundwater and surface water. Under some local land-use codes in Florida, deployment of advanced nitrogen-removal technology allows for denser developments or larger homes on smaller plots – concessions which can defeat the purpose of the advanced technology.

"Septics – Assessment of Advanced Systems" (2013) documents influent and effluent nutrient concentrations from tests of over 300 systems in Florida. Typical removal rates of the advanced treatment units are 93% for cBOD5, 72% for TSS, 34% for TN, and 10% for TP. The 34 percent average removal rate for nitrogen is low because the vast majority of the units[11] tested were ATUs, which as explained earlier are not efficient at de-nitrification. "Septics – Cost-Effective Strategies for Wekiva" (2007) reports a similar nitrogen-removal efficiency – 25 to 33 percent – for single-pass extended ATUs.

Varying rates of nitrogen-removal by PBTS have been reported but most exceed the 34 percent ATU rate by a significant margin. Rates of 40% to 70% for re-circulating media filters and 85% with carbon addition are reported in "Septics – Assessment of Advanced Systems" (2013). "Wakulla County Septic Study" (2010) reported that PBTS remove about 50-60 percent of influent nitrogen when properly maintained. The 2006 County ordinance stated that "only performance-based septic systems that *can* produce a treatment standard of 10 mg/l nitrogen shall be installed in new construction and as replacements when older systems fail". In practice, PBTS only dropped nitrogen concentrations to about 30 mg/l. The approved PBTS systems are probably capable of reducing nitrogen to 10 mg/l if influent nitrogen concentrations are relatively low, but under actual working conditions and higher influent concentrations, the 10 mg/l standard proved to be unattainable.

[11] Of the units tested, 76% were ATUs, 8% were PBTS, and 15% had unknown technology.

Table 2.1 in "Septics – Options for Wakulla Springs Watershed" (2011) shows estimated effluent quality from Florida-approved advanced systems, based on an influent load of 60mg/l. Most of the removal rates shown for fixed-film, suspended growth, and IFAS are in the 60-70 percent range. Passive carbon feed (Nitrex) and sulfur de-nitrification systems are capable of much higher removal rates – perhaps as high as 95 percent. These systems are not in wide use, however. According to the 2011 Wakulla report, only one Nitrex system is permitted in the entire State.

DOH's website has a detailed summary of test results from many PBTS systems at: http://www.myfloridaeh.com/ostds/pdfiles/forms/PBTS_components.pdf . Nitrogen-removal efficiencies for most of these products are in the 55-75 percent range, although in many cases nitrogen concentrations in the influent may be lower than in the real world.

DOH has reported nitrogen-removal efficiencies of over 95 percent in lab-scale testing of its non-proprietary sulfur de-nitrification technology. Field testing at several locations across the State is now underway. Research should be complete by early 2015, and a final report is expected by mid-2015. If the preliminary results hold up in field testing, DOH's work could result in wide availability within a few years of reasonably priced, highly efficient advanced septic systems.

Management Options

The BoCC did not ask EPAC to provide suggestions for management or financing options that might be used to implement an ordinance mandating advanced septic systems. However, many of the documents posted on the County website deal with these matters, so a short synopsis seems appropriate.

"Septics – Cost-Effective Strategies for Wekiva" (2006) has a description of a program in Maryland designed to address nitrogen pollution in the Chesapeake Bay. All households are assessed $30/year. For households served by central sewer, this money is used to fund upgrades to wastewater treatment plants. Money from OSTDS owners is collected by counties, with 60% allocated to treatment system upgrades and 40% to implement an agricultural management practice of cover crops. Treatment system funding can be awarded for upgrades, repairs of individual failing systems, and individual upgrades to at least 50% N-reduction.

The same paper discussed funding mechanisms for the most cost-effective nitrogen-reduction projects in Wekiva, including source trading (auctions) and a grant program for advanced treatment systems funded by a yearly nitrogen discharge fee. The grant program could be targeted at upgrades undertaken as part of repairs or as a program that aims to upgrade every system to higher technology within a set period of time – say 10 years. Either option would be funded through regular contributions by OSTDS owners to an entity that provides infrastructure upgrade grants. The entity could be a regulated private wastewater management utility, a county health department, a local government, or an insurance program.

Besides advanced OSTDS, of course, there are many situations where sewer hook-ups or cluster[12] systems are options that should be evaluated for their cost-effectiveness. There may even be locations where groundwater treatment would be viable.

A comprehensive discussion of management and financing options is also provided in "Septics – OSTDS Options for Wakulla Springs Watershed" (2011). The appendix to Part 2 of this report provides links to advanced technology programs in Maryland, Rhode Island, and Massachusetts. With its grants program, the Maryland Department of the Environment has upgraded over 2,000 septic systems to nitrogen-removing Best Available Technology. Rhode Island requires systems to achieve TN less than 10 mg/l in sensitive coastal areas.

The Wakulla study also describes in detail a number of public and private management institutions and a variety of possible financing programs including conventional municipal financing, Federal and State grants, and community-wide or service-area charges. Interestingly, the report also suggests a hierarchy of management options based on the environmental vulnerability of specific areas of the watershed.

Recommendations

(1) DOH's pilot-program offers great potential for fostering nitrogen-reducing systems more cost-effective than those currently available on the market. Given the extremely high life-cycle costs of current systems, the BOCC should defer consideration of County regulations mandating advanced septic treatments until the DOH program concludes in 2015.

(2) In the interim and with the somewhat limited authorities available to them, local health officials should assess septic systems in the most vulnerable areas of the Santa Fe springshed. If failing systems or systems which would benefit from movement to higher ground can be identified, the Commission should consider whether a funding source can be identified to correct these problems.

(3) In the interim, there are several timely activities that the BoCC could assign to the County's Environmental Protection Department (EPD) in preparation for what will hopefully be a good result from the DOH program: (a) EPD should determine or in some cases verify the relative contribution that septics are making to various County watersheds; (b) EPD should begin analyses which tie projected rates of septics nitrogen reduction to expected water quality improvements on the Santa Fe River and its springs (c) EPD should develop a detailed vulnerability map of the Santa Fe River basin so that any septics regulations which might be implemented at a later date could be targeted quickly, accurately, and cost-effectively. EPD can look to vulnerability maps and zones

[12] Cluster wastewater systems can serve a small to large number of connections (two to hundreds of structures). Smaller cluster systems serving a few structures resemble onsite systems, while large cluster systems serving hundreds of structures tend to resemble centralized systems. Cluster systems generally disperse wastewater in subsurface dispersal systems, although surface discharge or water reuse is also practiced. Cluster systems may or may not treat the wastewater after it leaves the septic tank but before it is dispersed.

that have been developed in other jurisdictions (e.g "Septics –OSTDS Options for Wakulla Springs Watershed", 2011 and "Final Draft OSTDS Wakulla Report", 2011)[13].

(4) BoCC should charge the County Manager with studying funding and management options for a septics authority, in preparation for the possibility that the Commission decides at a later date to require installation of advanced septic systems in portions of the County.

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[13] It is true that in 2005, under contract from EPD, the Florida Geological Survey (FGS) completed an aquifer vulnerability assessment for Alachua County: http://www.alachuacounty.us/Depts/EPD/WaterResources/GroundwaterAndSprings/Reports%20and%20Maps%20Documents/Alachua_County_Aquifer_Vulnerability_Assessment.pdf.

However, in this recommendation, EPAC is suggesting something more comprehensive – namely that EPD should overlay the FGS map with maps of other relevant variables, like septics distribution and dates of installation, location of sewer lines, soil types, future land use, and income distributions, as was done for Wakulla Springs. See Figure 35 of "Final Draft OSTDS Wakulla Report" for a good example of how these overlays can help delineate priority areas for septic upgrades or for introduction of cluster or sewer systems.