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Advanced On-Site Wastewater Treatment and Management Market Study

Volume 2: State Reports

Technical Report

Advanced On-Site Wastewater Treatment and Management Market Study

Volume 2: State Reports

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REPORT SUMMARY

This report is comprised of summaries of the status of on-site and small community wastewater systems in each state in the U.S. The summaries provide an excellent general reference for further research into the status of each state's on-site wastewater systems.

Background

State Reports is the second volume of a two-volume project. The first volume, entitled *Assessment of Short-Term Opportunities and Long-Run Potential,* describes the three phases of the market study. The first phase describes the database used to compile state and regional risk maps concerning on-site disposal of wastewater and includes the maps. During the second phase, researchers analyzed the data derived from those maps as well as the information from the individual state reports. In the final phase, the researchers used that information, as well as other sources, to draw assessments. Volume 2 contains all the details the researchers were able to acquire about on-site systems within each state including:

- Quantitative information, such as how many onsite systems exist
- The present status of onsite conditions
- Anticipated changes in onsite regulation and management
- Use of, and interest in, alternative or advanced technologies.

Objective

The objective of this study was to examine changing federal, state, and trade responses to alternative on-site and small community wastewater systems, in assuring public health, clean surface water and groundwater, and in the protection of natural resources.

Approach

A seven-page questionnaire about on-site wastewater systems was developed and sent to over 150 regulators and experts across the nation. The results from these questionnaires were compiled into the reportorial format of Volume 2.

Results

Within a given state it is fairly easy to discern the degree of interest in, and need for, alternative on-site wastewater treatment systems. Based on the questionnaire results, interest seems to be highest in the coastal and Great Lakes, where the natural resources threatened by conventional septic systems are most in jeopardy. General conclusions of the study are described fully in Volume 1. Volume 2 can be used to determine within each state where specific on-site system problems are located and to assess the potential for new initiatives.

EPRI Perspective

EPRI's Municipal Water and Wastewater Program was created to help member utilities address the energy needs of the more than 60,000 water systems and 15,000 wastewater systems in the United States. These facilities are among the country's largest energy consumers, requiring an estimated 75 billion kWh nationally, about 3% of the annual U.S. electricity use. Surface water and groundwater may be in jeopardy in many states due to anticipated growth in housing in areas without sewers and due to antiquated technologies in older subdivisions. Interest in onsite wastewater treatment is increasing because of groundwater recharge and cost-effectiveness arguments. This report combines information about each state's on-site wastewater systems.

Keywords

Wastewater
Small systems
On-site wastewater treatment
Septic systems
On-site systems
Wastewater management

CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS

ATU	Aerobic Treatment Unit (also HAU)
ANSI-NSF	American National Standards Institute-National Sanitation Foundation
BAT	Best Available Technology
BOD	Biochemical Oxygen Demand (also CBOD)
BMP	Best Management Practices
BTG	Best Technical Guidance
CBOD	Chemical/Biological Oxygen Demand
CEUs	Continuing Education Units
CWA	Clean Water Act (federal)
DEM	Department of Environmental Management
DENR	Department of Environment and Natural Resources
DEQ	Department of Environmental Quality
DHE	Department of Health and Environment
DOH	Department of Health
DNR	Department of Natural Resources
DNREC	Department of Natural Resources and Environmental Control
DPH	Department of Public Health
eml	E-mail address
EPA	U.S. Environmental Protection Agency (also USEPA)
HAU	Home Aerobic Unit (also ATU)
HB	Health Board (also LHB, SHB)
I/A	Innovative/Alternative
I/M	Inspection/Monitoring; also, Inspection/Maintenance
ISDS	Individual Sewage Disposal System
ISTS	Individual Sewage Treatment System
LHB	Local Health Board (also HB, SHB)
LHD	Local Health Department
LPP	Low Pressure Pipe (absorption system)
NA	Not Available (or not provided, or not known)
NEIPCP	New England Interstate Pollution Control Project
NGO	Non-Governmental Organization
NIMBY	“Not In My Backyard”
NODP	National Onsite Demonstration Program
NOWRA	National Onsite Wastewater Recycling Association (also, -OWRA)
NPDES	National Pollution Discharge Elimination System
NSF	National Sanitation Foundation
NSFC	(EPA’s) National Small Flows Clearinghouse
OEH	Office of Environmental Health
O/M	Operation/Maintenance

OWRA	On-site Wastewater Recycling Association (often prefixed, e.g., NOWRA)
PB	Plumbing Board
PE	Professional Engineer (also RPE)
POTW	Publicly Owned Treatment Works
RLF	Revolving Loan Fund (also SRF)
RPE	Registered Professional Engineer (also PE)
RBC	Rotating Biological Contactor
SBR	Sequencing Batch Reactor
SDH	State Department of Health
SHB	State Health Board (also HB, LHB)
SPB	State Plumbing Board
SRF	State Revolving Fund (also RLF)
STEP	Septic Tank Effluent Pump (collection system)
tel	Telephone number
UPC	Unified Plumbing Code
USEPA	U.S. EPA, United States Environmental Protection Agency (also EPA)

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INTRODUCTION

Methodology

Introduction

This is Volume 2 of a two-volume project entitled *Advanced On-Site Wastewater Treatment and Management Market Study*. The fundamental purpose of the study was to examine changing federal, state, and trade responses to new, or emergent, paradigms on the permanent role of onsite and small community wastewater systems in assuring public health, clean surface- and groundwaters, and in the protection of natural resources. The predications of the study, its sponsorship, and its ultimate conclusions, are described fully in Volume 1, entitled *Assessment of Short-Term Opportunities and Long-Run Potential*. Volume 1 encompasses three phases of the study. First, it describes the database used to compile state and regional risk maps concerning onsite disposal of wastewater, and includes the maps. Second, it analyzes the data derived from those maps as well as the information from the individual state reports contained herein. Finally it uses that information, as well as that from other sources, to draw the assessments that it does.

The information contained in Volume 2 was voluminous enough to warrant binding it separately. It consists of individual state reports compiled chiefly from responses to a seven-page questionnaire sent to over 150 regulators and experts from around the nation. In one sense Volume 2 acts as an appendix to Volume 1. In another, however, it contains, state by state, all the detail we were able to acquire, thus will be a valuable aid in comparing states, as well as in determining where specific problems and initiatives are located, and how to find out more. The detail does vary from state to state. We could only report what was reported to us. What follows is a description of the methodology used to develop the questionnaire, and to develop the reports.

Questionnaire Development

Ultimately, the questionnaire underwent seven iterations. The first three revisions were developed by the project's authors; the fourth after consulting with the project's Board of Advisors; the fifth after testing it on about two dozen people from seven states; and the sixth and seventh after joint consultation with the project authors and the Board.

What emerged was a questionnaire that involved some "yes or no," questions, some "multiple-choice" questions, and some "essay" questions. Even in the former two categories, additional commentary was encouraged, and space was provided for it.

It was agreed early on that the project sought certain kinds of "hard" numerical information; e.g., "How many onsite systems exist in your state?" Sometimes, even these questions could be difficult or impossible for respondents to answer. Such information was not always systematically acquired or recorded by anyone. Moreover, even the simple questions could have political ramifications. The respondent might wonder: "Is a straight pipe or a pit privy a 'system'"? "If so, do I want to publicize how many I believe to exist?"

From the project's standpoint, and regardless of the analytical difficulties, we felt a fuller picture might emerge if we also sought impressions and opinions; questions were asked such as "Is code revision supported or resisted politically, and why?" While we were seeking informed opinions, some of the questions (or more accurately some of the answers) could reflect politically on the respondent. It was clear that we would have to permit anonymity and treat the reports as multi-source, "reportorial" accounts with no specific ascription by name.

The primary source of information for the state reports has been the respondents, typically one regulator (names drawn from NSFC or other directories), and one non-regulatory expert, such as an appropriate extension agent, soil scientist, or officer of an onsite trade association, e.g., the state chapter of the National On-site Wastewater Recycling Association (NOWRA). These names were drawn from several lists of attendees at various national conferences concerned with onsite research or policy. While respondents were permitted to remain anonymous, most often they chose to list their names as contacts.

Other sources were employed as well. Often, in replying to the questionnaires, respondents had included printed information such as brochures, reports, or sections of code or regulations. Such information has been utilized.

Aside from the respondents, much information has also been gathered from project participants, the project's Board of Advisors when reviewing reports, and personal communication with others conversant in the subject matter. Such information has been treated as still additional opinions or impressions, and included in the balance of what is reported.

Finally, a handful of published sources of information were used to flesh out the reports. These are listed in the references.

Questionnaire Packet

Questionnaire packets were sent out in priority mail, flat-rate envelopes, mostly over the course of 1997 and 1998. If responses weren't received within a few weeks, follow-up email and telephone requests were made. If several attempts at follow-up failed, we sought another contact, and reiterated the process. As a result, by far the majority of the reports are based on at least two responses, although a handful are based on a single report, supplemented by attempts to fill in missing information by other means or sources. For various reasons another handful of reports are based on three or more reports. It should be noted that returns could be either sparse in their information or generous, hasty or thoughtful, and so on; thus a single thoughtful response from one state could contain vastly more information than two or more responses from another state. The packet consisted of three elements:

- A cover letter,
- An informational package, and
- The questionnaire package.

The cover letter was stapled together with an excerpt from the project proposal, which identified the participants and purposes of the study. The letter itself was personalized, and emphasized that the respondent had been selected (from one list or another) and that a response was deemed "vital." It described the rest of the packet, and ended by saying that "if you are not the right person to answer the questionnaire, please pass the packet to the right person, but make sure it is to someone in your own institution." Many did just that.

The informational package was wrapped in a pamphlet entitled *Decentralized Community Wastewater Treatment: New Concepts and Methods for Water Quality Protection*, published by the (Massachusetts) Ad Hoc Task Force for Decentralized Wastewater Management. Inside was a copy of information on the state contained in the NSFC publication entitled *Summary of Onsite Systems in the United States*, as well as a copy of all three of this project's risk maps and a one-page description of them. Essentially, respondents were asked to assess and compare the Small Flows' and our project's data against their own sources.

The questionnaire package itself consisted of:

- A postpaid return envelope,
- An instruction sheet, with options for replying, how to mark the enclosed outline map, etc. Most replies were done by hand, a few by email (answers tagged to question numbers), and a handful by telephone interviews.
- The 7-pp questionnaire, and
- An outline map of the state, with instructions to annotate and mark it freely as a visual aid in either answering our questions, or in critiquing the project's risk assessment maps, which respondents were encouraged to do. These critiques appear in the "Comment" section of the reports; commentary marked on the outline map as an aid to answering questions has been included (along with geographic identifiers) in the body of the reports.

A listing of the questions is included here, although not in the original 7-pp format, which had allowed white space for commentary.

Drafts

In the cover letter, respondents were told that drafts of the reports would be returned to them for review. This was the case; about two-thirds of the respondents returned the drafts with commentary or changes.

The format of the reports clustered the questions in ways that could be handled as reportorial paragraphs. There were three difficulties that we encountered in interpreting results:

- Paucity of information,

- Meaning of terms, and
- Conflicts between reports, or among reports and printed sources of information that had also been utilized.

Many states simply did not have the information we requested. For example, they might not know how many new systems were installed each year, and simply estimated this number instead. Or they might have had data on that, but not on how many were replaced. Or, they might know how many were replaced (permit required), but not how many were repaired (permit not required); or permits might not distinguish between full replacements, upgrades, or repairs. We have indicated whether these figures are "hard," or estimated, and when estimated, the range of the estimates.

There was also a certain disparity in how questions were interpreted; thus there is a certain disparity in the answers. There is much variability in terminology. "Conventional," "alternative," and "advanced" do not have the same meaning to everyone, even though the questionnaire spelled out, by example, what the project implied by "conventional," "alternative," and "advanced." To the project, "conventional" denoted a septic tank and a gravity-fed leach field that has passed a perk test. To many respondents, "conventional" implied any system permitted for general use without special conditions attached. When the questionnaire asked for the cost of a "conventional" system, the ambiguity then carried to that question. (In any event, the cost data on both questions 1-i and 1-j is almost always a best guess.)

Respondents also interpreted or used the terms "innovative" and "enhanced" in various ways. "Failure" (by obsolescence or by obvious manifestations of pollution?), and "system" (includes non-systems such as straight pipes or not, or, for that matter, includes or doesn't include cesspools or other pre-regulatory systems?) were other terms variously interpreted. Some asked what we meant by "extensive," or "bounded," or "Best Available Technology." Even the term "demonstration project" meant different things to different respondents; for example, reports on their existence may or may not suggest that they are part of EPA's National Onsite Demonstration Program.

In some ways both the project authors and the respondents were caught off-guard by just how fast regulations and conventions are changing. We had expected that the context of the question, the explanation preceding a given set of questions, and the choices respondents were given for answers would lead them to the appropriate choice. But we, and they, were addressing moving targets. Still, we had also anticipated some fuzziness as a consequence of the open questionnaire format. For the most part, fairly clear overall pictures of the state do emerge. Nevertheless, the reader should keep in mind that not all respondents are describing the same thing. Whenever a respondent qualified an answer, we have retained the qualification in an attempt to preserve as much information as possible.

There were also problems due to conflicting information in questionnaire returns. In the first drafts, which were returned to respondents with a cover letter, we listed any conflicting items side-by-side, and embedded a tagged query of our own asking for clarification. Sometimes we got it. When we didn't, we used the common reportorial devices of showing a range or, if the difference or disparity was large, calling attention to it.

Summary

For the reasons listed above (varying number and quality of responses, varying interpretations of the questions or vocabulary, varying amounts of supplementary data, and emergent conflicts in the answers obtained) the reader is cautioned against taking any individual datum too literally, and against making overly detailed comparisons. This is why the project adopted a reportorial format, with its implication that some of the information is unconfirmed, and some is only estimated. A tabular format would have implied a tabular questionnaire, which is not what the project wanted, believing that impressions of experts would provide a deeper and broader, if "fuzzier," picture.

However fuzzy the data, clear patterns do emerge, both intra- and interstate, which ultimately was what we had hoped for. Within a given state, it is fairly easy to discern the degree of interest in, and need for, exploring new onsite paradigms. Answers are fairly self-consistent. Within a given state, it also emerges where the problems may lie, whether because of poor soils or topography, edge cities outside of central sewer services, or older waterfront or river developments switching from seasonal to year-round occupancy. Likewise, patterns emerge when one looks at the nation as a whole. Clearly, it is coastal and Great Lakes states where interest is highest. They are, of course, the most populous. But, it is also in these states that surface waters, and the resources that they contain, are most in jeopardy. These and other conclusions are discussed more fully in Volume 1.

The state reports are not a bible. They can, however, act as fairly good starting points for further inquiry into the circumstances within a given state. The reports provide the names of contacts (in as much detail as was supplied) and other information to aid such inquiries. The list of questions posed in the questionnaire follows, as does a list of the more important printed sources of information also employed.

Onsite Questionnaire Questions*

Please return your questionnaire and sketch map to Woods Hole Data Base, Inc., P.O. Box 712, Woods Hole, MA 02543, or fax 508-540-3273. If you have queries, or wish to respond in person, telephone 508-548-2743. Although you will be listed as a "contact" for you state (unless you request otherwise below), you will not be directly quoted for attribution, and readers will understand that the state reports have been compiled from several sources, both printed and verbal.

A draft report for your state will be returned to you for review and comment, and a copy of the final all-state study will be sent to you at no charge.

****

State:

Your name:

Title:

Organization:

Address:

telephone:

fax:

e-mail:

You may [], may not [] list me as a source of onsite information in my state.

Q1. NUMERICAL INFORMATION REGARDING ONSITE SYSTEMS

To the extent that you are able, please provide numerical or percentage answers to the questions that follow.

1(a) How many onsite systems exist in your state?

1(b) How many systems are installed each year?

1(c) How is onsite system failure defined in your state?

* Formatted differently, however, from the questionnaire form, which allowed, as appropriate, check boxes, lines, or white space for answers.

1(d) How many (total) of these systems are presently failing by your state's criteria?

1(e) How many systems are REPAIRED annually?

1(f) How many systems are REPLACED annually?

1(g) How many of the replacements involve ALTERNATIVE treatment technology (such as sand filters, mounds, pressure dosing, or home aerobic systems)? Please provide numerical breakdowns on these technologies if they are available.

1(h) How many of the replacements involve ADVANCED treatment technology (such as disinfection or nutrient removal)? Please provide numerical breakdowns on these technologies if they are available.

1(i) What is the current, average household cost of a conventional SEPTIC SYSTEM INSTALLATION?

1(j) What is the current, average household cost of a CENTRALIZED SEWER TIE-IN (INCLUDING ALL CONNECTION FEES AND CONSTRUCTION COST OF THE SEWER LATERAL)?

Q2. PRESENT STATUS OF ONSITE CONDITIONS, DEVELOPMENT PRESSURE, AND WATER QUALITY IN THE STATE

Many states (or localities) anticipate growth in housing, but not necessarily in areas that will be sewered. At the same time, cesspools, or other antiquated technologies in older subdivisions, are aging. In either situation, surface and groundwater can be in jeopardy; thus development may be curtailed or constrained. Please characterize the situation in your state (or particular localities within it) by answering the questions that follow WITH RESPECT TO UNSEWERED AREAS. Check all that apply, and expand, when helpful, with separate narrative answers or annotations on the enclosed map.

2(a) How extensive are these kinds of problems in your state?

- Not very extensive for any reason or region
- There are presently (check which one:) a few isolated [], some [], many or large [] problem areas because of ANTIQUATED SYSTEMS, SMALL LOTS, OR DENSE DEVELOPMENT
- There are presently (check which one:) a few isolated [], some [], many or large [] problem areas because of CRITICAL RESOURCE ISSUES; OR PHYSIOGRAPHIC OR HYDROLOGICAL CONDITIONS
- There are (check which one:) a few [], some [], many or large [] areas that will become problems with FUTURE DEVELOPMENT

2(b) What is the nature of the predominant water quality or natural resource problems in (2a) above?

2(c) Continuing from (2a) and (2b) above, are there very large, bounded areas that are thought to have water quality problems in part because of ANTIQUATED SYSTEMS, SMALL LOTS, OR DENSE DEVELOPMENT?

- No, or Yes, I've noted and described them on the map

2(d) Are there very large bounded areas of the state which are under development pressure that are unsuitable for conventional systems because of CRITICAL RESOURCE ISSUES, OR PHYSIOGRAPHIC OR HYDROLOGICAL CONDITIONS?

- No, or Yes, I've noted and described them on the map

2(e) Are there municipalities under enforcement actions or consent decrees concerning water pollution abatement?

- No, or Yes, I've noted them on the map

2(f) Generally, is the extension or creation of central facilities supported or resisted in the state?

Q3. ANTICIPATED CHANGES IN ONSITE REGULATION AND MANAGEMENT

In some states (or localities) where water quality problems are thought to be related to, or aggravated by, onsite systems, there are plans to address these problems through remediation which (if centralization is not an option) may require: (a) the use of alternative or advanced systems, and/or (b) stipulations for regular inspection, maintenance and oversight. Please characterize the situation in your state (or particular localities within it) by answering the questions that follow, expanding, when helpful, with separate narrative answers or annotations on the enclosed map.

3(a) When were onsite codes last revised?

3(b) Are new revisions in progress?

- Yes, or No

3(c) If yes, when is adoption targeted?

3(d) Under what circumstances is legislative adoption required? Is code-revision supported or resisted politically, and why? If the latter, could this interfere with adoption? (Please explain below.)

3(e) Does the state see any need, anywhere, either to systematically remediate older systems, or to systematically manage and maintain systems (whether aging, conventional, or advanced), through, e.g., SPECIAL REGULATION OR TARGETED ENFORCEMENT?

- No, or Yes, I've noted where on the map

3(f) Is there a need to place special ONSITE MANAGEMENT OR WASTEWATER PLANNING requirements on any of the following (please identify these areas on the enclosed map as well):

- New development: (Yes, or No)
- Older, densely developed areas: (Yes, or No)
- Critical resource areas: (Yes, or No)

3(g) Is/are (check which ones:) the state [], or particular counties [],or communities [] starting to require the creation of onsite wastewater MANAGEMENT DISTRICTS OR UTILITIES to provide assurance that onsite systems are functioning properly, by, e.g., issuing renewable operating permits with conditions attached to them?

- No, or
- Yes, here are their names and the reasons for their establishment (please locate them on the map as well):

3(h) What agency or agencies administer and enforce onsite code in the state?

Q4. ALTERNATIVE, ADVANCED AND BEST AVAILABLE TECHNOLOGIES

Interest in onsite wastewater treatment is increasing because of groundwater recharge and cost-effectiveness arguments. This is sometimes made possible only by alternative or advanced onsite technology. Please characterize the situation in your state (or particular localities within it) by answering the questions that follow, expanding, when helpful, with separate narrative answers.

4(a) Does the present code [] or will revised code [] ACCOMMODATE alternative or advanced systems in any particular areas or situations?

- No, or Yes (also check one or both boxes above)

4(b) Does the present code [] or will revised code [] SOMETIMES REQUIRE alternative or advanced systems in any particular areas or situations?

- No, or Yes (also check one or both boxes above)

4(c) Is [] or will [] development (be) permitted on sites that would otherwise be unsuitable for conventional systems when effective alternative technologies are employed?

- No, or Yes (also check one or both boxes above)

4(d) For (4a-4c) above, what level and manner of oversight and management is required of these technologies?

4(e) Have any particular alternative or advanced technologies been linked to particular environmental or physiographic niches in the state? (Please explain below.)

4(f) Are there [] or will there be [] requirements for the remediation of older systems with "Best Available Technology?"

- No, or Yes, (also check one or both boxes above)

4(g) Are there [] or will there be [] mechanisms to test and authorize new technologies at either state [] or county [] levels?

- No, or Yes, (also check the boxes above that apply)

4(h) If alternative or advanced technology were similar in cost to either conventional systems or central tie-ins, would state regulators be inclined to more widely specify or stipulate the use of such technologies in appropriate circumstances?

Q5. ONSITE FUNDING

5(a) Are there any types of betterment loan, or similar programs, in (check which one:) the state [] or localities within it [] to help homeowners repair or upgrade onsite systems?

- Yes, or No

5(b) Are there plans to make state or EPA funds available for onsite remediation or upgrades?

- Yes, or No

5(c) Does the political climate favor or hinder financial help for onsite remediation. (Please explain below.)

Q6. LEADERSHIP WITHIN THE STATE

Please detail any onsite initiatives in your state, including names and addresses.

6(a) What official STATE-LEVEL agencies or task forces are examining onsite issues, or considering revisions to law or code regarding onsite disposal?

6(b) What LOCAL governmental agencies or task forces are examining onsite issues, or considering revisions to law or code regarding onsite disposal?

6(c) Is there research within STATE AGENCIES on onsite technology or management?

- No, or Yes, details below:

6(d) Is there research within UNIVERSITIES on onsite technology or management?

- No, or Yes, details below (how involved are they?):

6(e) Are there (check which one/s:) state-level [] or local [] training and certification programs for onsite professionals (designers, contractors, inspectors, etc.)

- No, or Yes, details below:

6(f) Are there onsite demonstration projects in the state?

- No, or Yes, details below:

6(g) Are there citizen-action groups involved in onsite issues, or related matters such as water reuse or watershed planning?

- No, or Yes, details below:

6(h) Are there newsletters, bulletin board systems, listserves, websites, conferences, or forums within the state concerned with onsite issues?

- No, or Yes, details below:

ANY OTHER COMMENTS APPRECIATED:

****

[Additionally, when first drafts of the state reports were sent back to respondents for review, three more questions were posed to them in open form, and another postpaid envelope provided for their reply. Answers, when provided, were incorporated into the second draft of the reports.]

1. Is onsite **enforcement** of present code regarded as adequate or not (please explain)?

2. What role (large, medium or small) are **cluster systems and package plants** expected to play in the future?

3. Are **rural electric (or other) cooperatives** looking at the possibility of starting O/M programs for household sewage disposal?

List of References

A general note: The primary source of information for the state reports has been the respondents. Often, in replying to the questionnaires, respondents had included printed information such as brochures, reports, or sections of the code or regulations. Typically the purpose of such inclusions was to save the respondent time in answering a question. Occasionally such material has been made reference to in the reports themselves, but is not listed here. (See, e.g., "Wisconsin," which mentions a very complete Draft Environmental Impact Report on proposed changes to Wisconsin code and regulations.)

Aside from the respondents, much information has been gathered from project participants, the project's Board of Advisors who reviewed reports, and personal communication with others conversant in the subject matter. Again, such contacts have not been cited, the information having been treated as one more opinion or impression and included in the balance of what was reported.

Information contained in a handful of generally available printed documents has also been used in compiling the reports. Those documents are listed below. (NSFC is the abbreviation for the National Small Flows Clearinghouse, Morgantown, West Virginia.)

Consortium of Institutes for Decentralized Wastewater Management, 1998. *National Onsite Training Contact Directory*, 3pp unpublished list.

Nelson, Valerie, 1997. *Decentralized Community Wastewater Treatment: New Concepts and Methods for Water Quality Protection*, 10pp pamphlet. [Massachusetts] Ad Hoc Task Force for Decentralized Wastewater Management. [This pamphlet accompanied the questionnaire mailings.]

NSFC, 1995. *Inspections from the State Regulations*, 51pp.

NSFC, 1996. *A Guide to State-Level Onsite Regulations*, 68pp.

NSFC, 1996. *Summary of Onsite Systems in the United States, 1993*, 406pp. [The report actually includes information through July, 1996].

2
STATE REPORTS

Alabama

Summary

Alabama has about 750,000 onsite systems in the ground, installs about 25,000 systems annually, and repairs or replaces about 3500 annually. Problem areas are fairly widespread and aggravated by development outside sewered districts. Karst topography and slopes in the northern Appalachian area, low-permeability soils of a central "Black Belt," and coastal areas are all a focus of concern. Many kinds of alternatives are permitted, generally under variances that may stipulate special operational or management requirements; these allow development otherwise not possible. New code is expected to be more accommodating, with expanded state testing and approval procedures. The Department of Public Health must stay attuned to the mood of the Legislature, and there are no betterment loan programs for upgrades. Nevertheless, there is onsite research progressing at several universities, several demonstration projects, some degree of state training and certification, and fairly active private involvement in onsite issues.

Numerical Information

Total number of onsite systems: 750,000 approximately; roughly 47% of the state.

Number of new systems installed each year: Over 25,000 new systems are installed annually.

Failure definition: NA

Number or proportion of systems presently failing: 20%; failure numbers are especially high in Dale, Jefferson, Mobile and Tuscaloosa counties, where 200-1000 systems are replaced annually.

Number or proportion *repaired* annually: 3200-3700 repaired or replaced.

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): About 10%.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): About 5%.

Cost of a conventional *septic system* installation: $1500, range $750-$18,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $800-$1000; in some jurisdictions, none of this would accrue to the homeowner.

Present Onsite Status (Answers 2a-2f Summarized)

Throughout the state there are areas that presently have problems, or that with more development will have problems, particularly Autauga, Baldwin, Cullman, DeKalb, Elmore, Jefferson, Madison, Mobile, Shelby and St. Clair counties where dense development and/or rapid growth are increasingly a problem. Causes of failure include hydraulic overloading, poor maintenance, poor soils, age, and undersized leaching fields. It is reported that out-migration from the cities to rural areas beyond sewer mains appears to be a trend, with new development being forced onto poor sites. Regions under development pressure that are not well suited to onsite conditions, and which already have problems with failing systems, include the "Black Belt," because of poor soils, Appalachia because of topography, and coastal regions because of hydrology.

Water quality concerns in the coastal area include polluted runoff, sandy soils, and a high water table. The Black Belt is characterized by low-permeability soils. There, 60-70% of freshwater wells test positive for bacteriologicals. In Appalachia and the northern counties karst topography, fractured rock, and steep slopes are problems. Related resources in jeopardy include shellfish beds and beaches on the coast; and inland, freshwater fisheries.

Presently no communities are under enforcement actions. In Huntsville (Madison Co.) there is some resistance to the extension of centralized service. As the cost of advanced technology diminishes, the number of systems slated for replacement, as well as the proportion using advanced technology, could be expected to increase.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is made at state level and administered by counties.

Code was last revised in: 1992.

New revisions in progress? To be adopted when? Revisions in progress were expected to be adopted in the fall of 1997, according to NSFC reports.

Role of legislature, regulatory agency, and politics: Administrative code revisions have sometimes caused friction with the legislature.

Management Programs (Answers 3e-3g Summarized)

There is definitely a need to remediate older systems and to bring about better enforcement. Currently the DEM is looking at devising setback and separation criteria which are dependent on type of system and locale, and several demonstration projects have been established. Inspection is required at the time of construction, and may be required more often if warranted, as it is for I/A systems.

New Technology (Answers 4a-4h Summarized)

At present, there are individual rules and variances for I/A technologies under a Board Approval Process, in which experimental permits are granted for 1 year on conventional lots. I/A processes that are permitted under the regulations include sand filters, mound systems, drip and spray irrigation, chamber systems, aerobic systems, peat biofilters. constructed wetlands, low pressure pipe, shallow placement, alternating fields, and raised beds, as well as Pura-Flow and Infiltrator proprietary systems. Enhanced or advanced treatment is permitted on a case-by-case basis.

The developing code will further accommodate and at times require advanced or alternative technology, albeit with stricter management. It will be permitted on sites that are otherwise undevelopable, and there are expected to be expanded state testing and clearing procedures for alternative systems

Onsite Funding (Answers 5a-5c Summarized)

There are no plans for onsite betterment loan programs.

Leadership and Information

State-level agencies, task forces:

- Alabama Department of Public Health; (contact: Mr. Randall Farris, 334-613-5373).
- Alabama Dept of Environmental Management; (contact: Mr.Truman Green, 334-271-7800).
- Alabama Dept of Economic and Community Affairs.
- An interagency Alabama Onsite Sewage Management Planning Committee coordinates current code revision; the agencies listed above, as well as others, participate.

Local governmental agencies, task forces: NA

Research within governmental agencies: By arrangement with universities.

Research within universities:

- Various facets of design and monitoring of onsite performance are being carried out at Alabama A&M and Auburn universities, and the universities of Alabama–Birmingham, South Alabama, and West Alabama.

Onsite demonstration programs:

- Mobile and Tuscaloosa counties both operate demonstration sites, as do the following watershed programs: Sand Mountain/Lake Guntersville; Flint Creek; Weeks Bay; Pea River; and Choctawhatchee River. The Mobile project was recently funded by Congress as a National Community Decentralized Wastewater Demonstration Project.

Training or certification programs:

- There is a state training center and site evaluation course, resulting in certification for Public Health Environmentalists, and a voluntary certification course for system installers: Alabama Onsite Training Center, Univ West Alabama, West Alabama Environmental Service Center, Station 7, Livingston, AL 35470; (contact: Lesley Garner, Director, tel 205-652-3803; eml lcg@uwamail.westal.edu).

Citizen action, private groups:

- Various watershed steering committees and forums.

Newsletters, forums, other sources of information:

- Annual Onsite Sewage Conference, Auburn.
- Annual Nonpoint Source Seminar, Montgomery.
- Interstate Environmental Health Seminar.
- Alabama Environmental Health Association.
- Alabama Onsite Wastewater Association (which publishes a newsletter).

Alaska

Summary

About 35% of Alaskan households use onsite systems; absolute numbers were not available. Some 1200-1500 new systems go in every year, and it is reported that approximately 3000 systems are replaced or repaired annually. Problems are described as few and isolated; they can be associated with aging developments, or with permafrost and harsh winter conditions, where the use of alternatives is common. Currently such technologies are approved on a case-by-case basis directly by the Alaska Dept of Environmental Conservation (ADEC). Their use is not encouraged, but it is not discouraged if site conditions warrant. There are no plans for systematic remediation or management districts; nor are there loan programs for remediation or replacements. The state has overall wastewater authority, but has delegated it to the cities of Anchorage and Valdez. Currently code is undergoing major revision, expected to be complete in 2000. There is a certification program for installers, run by the University of Alaska. Alternative systems must be designed, and installation overseen, by registered engineers.

Numerical Information

Total number of onsite systems: 30-40% of households; further details NA.

Number of new systems installed each year: 1200-1500 estimated.

Failure definition: Improper disposal; sewage on the ground; lending institutions may require an “adequacy test” as well.

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: Approximately 3000.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Actual numbers NA; varies widely across the state, but alternatives are estimated to account for 15-20% of systems.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): (See above.)

Cost of a *septic system* installation: $3000-$4000 estimated for accessible areas, otherwise higher.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $10,000, but varies widely because of weather and accessibility considerations.

Present Onsite Status (Answers 2a-2f Summarized)

Alaska reports only few and isolated problems due to either dense development and antiquated systems, or because resources are in jeopardy. When concerns do exist they have to do with nitrate contamination of groundwater, and drinking water protection. The creation or extension of central facilities is generally resisted unless there is a well-documented pollution problem.

Anticipated Changes in Regulations

Who administers, enforces onsite code? The state has overall wastewater authority, and oversees or audits communities to whom authority is delegated. These include the municipalities of Anchorage and Valdez.

Code was last revised in: 1999 (phase 1 of planned revisions is completed, and awaits signature).

New revisions in progress? To be adopted when? 2000 (phase 2 will deal with new technologies, and other technical issues).

Role of legislature, regulatory agency, and politics: ADEC has authority to make rules without legislative clearance, but the potential for political interference exists.

Management Programs (Answers 3e-3g Summarized)

There are no reports of areas targeted for remediation, or for management programs. However, it is reported that several older communities might benefit from such an approach. Management of individual alternative systems is currently under regulatory review.

New Technology (Answers 4a-4h Summarized)

Present code accommodates alternative systems, and may require them depending on individual site conditions. Their use is permitted on sites where conventional systems are unsuitable. Failed systems are upgraded by the simplest system that meets design needs. ADEC only approves alternative systems on a case-by-case basis. They require design by a registered engineer, approval by ADEC, and a precover inspection. The plan submission must include documentation demonstrating that the proposed technology has a successful history of use in similar conditions, or has been certified by NSF. Their use can be common in areas with permafrost and harsh winters. Mechanisms are being established for both state and municipal testing of new technologies. The basic position of ADEC is that the simplest system which meets standards is best, but that systems requiring operation and maintenance will be permitted when conditions warrant.

Onsite Funding (Answers 5a-5c Summarized Below)

There are no loan programs for remediations, and none are planned.

Leadership and Information

State-level agencies, task forces:

- Alaska Dept of Environmental Conservation, 43335 Kalifornsky Beach Rd, Ste 11, Soldotna, AK 99669; (contact: David Johnson, Wastewater Program Coordinator, tel 907-262-5210 ext 238; fax 907-262-2294; eml DJohnson@envircon.state.ak.us).
- Under the proposed regulations ADEC will establish a Technical Review Committee to review new technologies.

Local governmental agencies, task forces:

- Technical Review Board of the municipality of Anchorage.
- Alaska Village Initiatives (Anchorage) has a Technical Review Board concerned with drinking waster and wastewater management.

Research within governmental agencies: Very little.

Research within universities: NA

Onsite demonstration programs:

- There are demonstration sites for intermittent sand filter, peat filter, and trickling filter systems; further details NA.

Training or certification programs:

- ADEC has a "Certified Installer" program contracted to University of Alaska; certification allows installation of small-scale, conventional systems.
- All other systems must be designed and installed under the oversight of registered engineers.

Citizen action, private groups: NA

Newsletters, forums, other sources of information:

- ADEC runs a website with information on onsite systems, a list of Certified Installers, etc.

Arizona

Summary

Arizona has approximately 325,000 systems in the ground, installs another 11,000-16,000 annually, and annually repairs or replaces an estimated 25,000, although not typically with alternative technology. Arizona's problems date to older subdivision rules that permitted small lot development along rivers, particularly the Colorado River, and along railroad rights-of-way. In such areas, antiquated systems and densely developed pockets jeopardize surface- and groundwaters. At the same time, very few areas in the state really have good site conditions, and rapid development compounds the situation. A number of communities face enforcement actions, and generally the state promotes gravity sewers as the solution. However, Arizona values its aquifers, and many alternative and advanced technologies are in widespread use for new development throughout the state. In many areas individual aquifer protection permits stipulate drinking water standards for nitrate discharges. Moreover, there is increasing recognition of the need for ongoing inspection of systems, both old and new, although overworked county health departments do not always have the resources for routine and effective enforcement. Although there is no state-level training or certification requirement, Northern Arizona University is establishing a research, development and training program, and there is an established Onsite Wastewater Association. Proactive onsite management is presently inadequate; however, there seems little question that alternative and advanced onsite technologies will play a big role in the state's future.

Numerical Information

Total number of onsite systems: About 325,000 (1990 U.S. census reports approx 283,000).

Number of new systems installed each year: About 11,000-16,000.

Failure definition: Surfacing on ground, long-term backup, direct discharge to surface water or groundwater which leads to a standards violation or direct public health problem.

Number or proportion of systems presently failing: About 0.5% (of which authorities are aware), but the figure could be as high as 1%; by another report, approximately 2000.

Number or proportion *repaired* annually: About 0.5%; by another report, approximately 5000.

Number or proportion *replaced* annually: About 0.25%; by another report, approximately 1000.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Virtually none by one report; about half (500) by another; and about 10% by still another; clearly the word "alternative" has been interpreted in different ways.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Virtually none by one report; about one-third by another; and about 5% by still another; clearly the word "advanced" has been interpreted in different ways.

Cost of a conventional *septic system* installation: $1200-$4000, perhaps $3000 on average, but up to $12,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $750-$5000; but up to $15,000 in difficult situations.

Present Onsite Status (Answers 2a-2f Summarized)

There are many and/or large problem areas due to antiquated systems, small lots or dense development, as well as many and/or large problem areas due to critical resource issues or physiographic conditions. Some areas are expected to become problems with future development. The problems in Arizona can be traced to the old subdivision rules and how subdivisions were approved. Along the Colorado River subdivisions with very small lots were permitted for the weekend fisherman or recreationist. Then, small lot subdivisions were created from land along the railroad corridors which were sold to capitalize the railroads. Arizona's population has rapidly increased over the last decade, especially in rural counties, compounding the problems.

All this is aggravated by the fact that the state has very few areas with adequate soil at all, or soils with very low permeability, thereby restricting percolation. Other areas have fast percolation rates, and/or shallow depth to groundwater; steep slopes; or limited soil depth above impermeable layers. Arizona does not take into account the treatment capabilities of soils; the permit system is based on disposal density, not on treatment conditions.

The entirety of the Colorado River corridor is problematic, especially the communities of Bullhead City, Golden Shores, Lake Havasu City, Buckskin area (Parker), Quartzsite, and Yuma. The problem, mostly nitrate contamination of aquifers, is a result of systems on small lots, highly permeable soils, and/or systems which utilize deep disposal trenches. The Buckskin area also has bacteriological problems. A large, central, multicounty area (running northwesterly) marks a high growth area with low-permeability shallow soils, and high groundwater. Maricopa County is marked by high growth and the use of deep disposal pits. Santa Cruz County has nitrate problems and soils with high permeability. Navajo County is problematic with many areas marked by shallow soils and rock. Coconino, Gila, Apache and Navajo counties experience high groundwater and/or seasonally saturated soils. Other areas with dense development problems and/or onsite issues include the Virgin River area, Pinetop-Lakeside, Alpine, Nogales, Prescott, Rio Rico, and Oak Creek Canyon.

Bullhead City, Quartzsite, and Buckskin are faced with enforcement actions. In addition, the following areas are subject to permit limitations: Lake Havasu City, Yuma, Pinetop-Lakeside, and Golden Shores. Most of Quartzsite has now converted to gravity sewer. There are also scattered areas or subdivisions around the state with very small lots which are difficult to deal with on an ongoing basis. A county-by-county description is appended.

The state ADEQ continues to promote the conventional gravity sewer as the top choice for all areas, but doesn't often implement moratoria on additional ISDSs. There is insufficient funding to support construction and expansion of central sewers. Many communities are looking for alternatives due to the cost of centralization; and onsite systems, small cluster systems, and alternative collection systems will continue to increase over the years and play an important role in Arizona's future growth.

Anticipated Changes in Regulations

Who administers, enforces onsite code? The Arizona Department of Environmental Quality (ADEQ) is the statutory authority; it delegates the onsite programs to the fifteen county boards of health. Previously, nonconventional systems were permitted and overseen directly by ADEQ. However, beginning in 1996 ADEQ began delegating this responsibility to the counties, a process still underway. (ADEQ still oversees such systems in the least populated counties.) Enforcement is reported as problematical with only obvious public health nuisances being addressed.

Code was last revised in: September 1989.

New revisions in progress? To be adopted when? Yes; timing unknown, perhaps by 2000; rule changes already have been in progress for four years with no clear consensus yet. Arizona has no formally adopted onsite code; rather it relies on ADEQ's "Bulletin #12", which is considered to be the official set of "guidelines" for the counties to follow. Currently, revisions to Bulletin #12 are underway. The initial effort is focussed on conventional septic systems, but incorporates major refinements in terms of site suitability, soils evaluation, and soil treatment allowance for disposal in aerobic zones. Updating guidelines and rules for alternative systems come next. Another compounding factor is that the legislature recently adopted an Arizona Uniform Plumbing Code (the model will be the 1994 UPC), which will affect the content of Bulletin #12.

Role of legislature, regulatory agency, and politics: Some resistance to these revisions is expected, and could undermine the process; but generally it is recognized, by officials and professionals, that the time for revisions is overdue. In part this is because Bulletin #12 does not recognize several alternative systems known to be viable, and in part because it fails to sufficiently stipulate the necessary inspection and maintenance requirements for alternatives already in the code.

Management Programs (Answers 3e-3g Summarized)

The State lacks a program to systematically remediate or manage older systems, and is pushing for recognition of the need for ongoing inspection and maintenance in some areas. In fact, there is clearly a need for management programs in new and older developments, as well as in critical resource areas, although no O/M programs are currently in planning. Some counties, in particular Gila and Yavapai, require a renewable permit for alternative systems. The state as a whole requires site, construction and final inspections, as well as recommending inspections at the time of resale. No interest by utilities in O/M programs was reported.

New Technology (Answers 4a-4h Summarized)

Both present and the draft revisions accommodate and sometimes require alternative or advanced systems. Development currently is allowed with alternative technologies where conventional systems are not suitable or allowed.

Arizona classifies all aquifers as potential sources of drinking water; thus once a water quality standard is violated, the systems must meet stringent requirements if they are to be installed at all. The state classifies discharges as either qualifying for a *general* aquifer protection permit, or needing an *individual* aquifer protection permit. Onsite systems are classified under the general aquifer protection permit program most of the time. But this is not always the case. The Colorado River corridor has a large problem with nitrate contamination of aquifers. There are similar situations elsewhere, such as in the Oak Creek Canyon corridor. In such areas, systems must meet the drinking water standard for nitrate discharge. Other areas of the state must utilize higher technology due to lack of space, too quickly or slowly permeable soils, depth of soil, or depth to groundwater.

Particular technologies have been linked to particular areas. In Mohave County, the RUCK System and the OSI Trickle Filter are used in the nitrate-sensitive areas. In areas around the state with slowly permeable soils or shallow soil depth, mounds, intermittent sand filters, and aerobic plants are typically used. Other permitted systems include gravelless trench, low pressure, evapotranspiration, and wetlands. Remediation by best available technology is not the rule. Typically the ADEQ requires that an area be sewered once it is found to have groundwater contamination from onsite systems. BAT can be required in cases of failing systems.

There are, and will continue to be, mechanisms for adding and permitting alternative systems, which require annual inspections. In more progressive counties, it could be anticipated that as the cost of alternative technology diminished, it would be more widely prescribed. As it is, alternative systems are often prescribed, regardless of cost. Cluster systems and package plants play only a moderate role; however, there is a growing awareness of these systems as alternatives to sewering.

Onsite Funding (Answers 5a-5c Summarized)

There is no state loan program to assist individual homeowners, although some communities with extensive problems have local banks or lending institutions willing to help out with low-interest loans. The state has many “hot spots” with chronic problems, and there is a state loan program for qualifying communities.

Leadership and Information

State-level agencies, task forces:

- Arizona Department of Environmental Quality, 3033 North Central Avenue, Phoenix, AZ 85012; (contact Ed Swanson, tel 602-207-4440, or Jack Baletel 602-207-2254).

Local governmental agencies, task forces:

- The Arizona County Directors of Environmental Health Services Association (contact Dan Smith, 520-774-8941).
- Arizona Ad Hoc Task Force (contact Paul Miller, email: pfm@watermasters.com).

Research within governmental agencies:

- There is limited research within ADEQ by the program that reviews current technology and design.

Research within universities:

- Northern Arizona University received one million dollars over five years from ADEQ to do research, development, pilot projects and training at: Onsite Wastewater Demonstration Facility, College of Engineering and Technology, Northern Arizona University, Campus Box 15600, Flagstaff, AZ 86011 (contact: Paul Trotta, Ph.D., P.E.; tel 520-523-4330, eml paul.trotta@nau.edu).
- University of Arizona, Arid Studies Department, does some research; details NA.

Onsite demonstration programs:

- See above.
- Also: Mohave County Health Dept; further details NA.

Training or certification programs:

- State-certified operators must be retained by system owners; and all systems must be designed by PEs.
- OWAA (see below) in cooperation with Agricultural Extension at the Univ of Arizona, operates a training center at the Maricopa Agricultural Center in Maricopa; further details, NA.

Citizen action, private groups:

- Onsite Wastewater Association of Arizona (OWAA), PO Box 30745, Flagstaff, AZ 86003-0745; (contact Colin Bishop, see below).
- Arizona County Directors of Environmental Health Services Assn; (contact Dr. John Power, Maricopa Cty Dept of Environmental Services, 1001 N. Central Ave, Ste 150, Phoenix, AZ 85004).
- The Oak Creek Canyon Property Owners Association deals with planning issues along Oak Creek Canyon.
- Colin Bishop, R.S., 3300 S. Gila Dr #3, Flagstaff, AZ 86001; tel 520-226-0607, fax 520-226-0607; eml cbish@yahoo.com.

Newsletters, forums, other sources of information:

- Newsletter of the Onsite Wastewater Association of Arizona (see above).

Appendix: County-by-County Description

Apache: Areas with slowly permeable soils not suitable for conventional systems. Areas with high groundwater. Subdivisions with small lots or lots with little area suitable for conventional systems.

Coconino: Areas with slowly permeable soils not suitable for conventional systems. Areas with high groundwater. Areas with shallow, slowly permeable soils over rock. Subdivisions with small lots or lots with little area suitable for conventional systems. Subdivisions with shallow groundwater, slowly permeable soils, private wells, and small effective area. Lots along Oak Creek Canyon which must comply with strict discharge standards (systems with nutrient removal) due to the classification of Oak Creek as a unique watershed.

Gila: Areas with slowly permeable soils not suitable for conventional systems. Areas with high groundwater. Areas with shallow, slowly permeable soils over rock. Subdivisions with small lots or lots with little area suitable for conventional systems. Many rural areas with only weekend and/or summer occupancy—a problem with aerobic systems.

La Paz: Areas with nitrate contamination of aquifers along the Colorado River, which are a result of agricultural practices, systems on small lots, highly permeable soils, and/or systems that utilize deep disposal trenches.

Maricopa: Areas with slowly permeable soils not suitable for conventional systems. Areas with shallow, slowly permeable soils over rock. Subdivisions with small lots or lots with little area suitable for conventional systems. Heavy usage of deep disposal pits as the method of choice for disposal of septic tank effluent.

Mohave: Areas with nitrate contamination of aquifers along the Colorado and Virgin rivers, which are a result of systems on small lots (high density), highly permeable soils, and/or systems that utilize deep disposal trenches. Areas with slowly permeable soils not suitable for conventional systems. Areas with high groundwater. Areas with shallow, slowly permeable soils over rock. Subdivisions with small lots or lots with little area suitable for conventional systems.

Navajo: Areas with slowly permeable soils not suitable for conventional systems. Areas with shallow, slowly permeable soils over rock. Subdivisions with small lots or lots with little area suitable for conventional systems.

Pinal: Areas with slowly permeable soils not suitable for conventional systems. Areas with shallow, slowly permeable soils over rock. Subdivisions with small lots or lots with little area suitable for conventional systems

Santa Cruz: Areas with slowly permeable soils not suitable for conventional systems. Areas with high groundwater. Areas with shallow, slowly permeable soils over rock. Subdivisions with

small lots or lots with little area suitable for conventional systems. Areas with steep slopes leaving little area for system location. Areas with nitrate contamination of aquifers along the U.S.-Mexico border, which are a result of systems on small lots (high density), highly permeable soils, surface runoff from Mexico, and/or systems which utilize deep disposal trenches.

Yavapai: Areas with slowly permeable soils not suitable for conventional systems. Areas with high groundwater. Areas with shallow, slowly permeable soils over rock. Subdivisions with small lots or lots with little area suitable for conventional systems. Lots along Oak Creek Canyon that must comply with strict discharge standards (systems with nutrient removal) due to the classification of Oak Creek as a unique watershed. Many areas with only weekend occupancy—a problem for aerobic systems.

Yuma: Areas with nitrate contamination of aquifers along the Colorado and Gila rivers, which are a result of agricultural practices, systems on small lots, highly permeable soils, and/or systems that utilize deep disposal trenches. Subdivisions with small lots or lots with little area suitable for conventional systems.

Arkansas

Summary

Arkansas has about 400,000 onsite systems in the ground, and installs about 10,000 new systems yearly. No figures were available on the number of replacements or repairs. There are distinct and sizable areas of the state with problems or potential problems. The northwest quadrant of the state is marked by fractured rock and karst geomorphology; to the east, the Mississippi River watershed is prone to seasonal high groundwater and wetness. Problems in Arkansas are aggravated by population pressures, and by the fact that prior to 1977 there was no onsite wastewater regulation in the state (major revisions are expected by 1998-1999). New technologies are allowed, first by variance, and with experience, for general use. Their use is not strongly favored by the state, but enjoys support in localities that have problems. Cluster systems and effluent sewers are tightly managed, but individual systems are not. There are no loan programs, and no state certification of onsite professionals. However, the University of Arkansas runs a field-scale demonstration project of new technologies, and also provides educational opportunities for sanitarians and regulators.

Numerical Information

Total number of onsite systems: About 400,000; 1990 U.S. census reports about 380,000.

Number of new systems installed each year: 10,000 estimated.

Failure definition: Surface expression, backup into building, or contamination of groundwater.

Number or proportion of systems presently failing: NA (no state records are kept).

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): NA (see above).

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Very few, probably less than 1%, but see above.

Cost of a conventional *septic system* installation: $2750; range, $1200-$6000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): About $7000.

Present Onsite Status (Answers 2a-2f Summarized)

There are scattered areas, some large and distinctly bounded, that have problems because of dense development and antiquated systems, poor conditions, or jeopardization of resources. High-hydraulic-conductivity soils over fractured rock and karst geomorphology mark the northwest sector of the state; there is also rapid development in the very northwest corner, around Fayetteville. The Mississippi River watershed, marking the eastern half of the state (running north-south) is marked by low-conductivity soils and high seasonal (perched) groundwater. Groundwater (and surface water) pollution is aggravated by agricultural runoff from chicken and hog farms, as well as by herbicides and pesticides. Permits have been denied because of clayey or otherwise unsuitable soils, high water table, shallow depth to bedrock, and lots situated in the floodplain. Failures have been attributed to seasonally high water tables, insufficient size, hydraulic overloading, improper installation, and damage. The majority of failing systems were installed prior to 1977, when no regulations governed ISDSs, and many systems were installed in marginal areas with perched water tables, impermeable soils, or undersized lots.

Other areas in the state are expected to pose problems with future development. Many counties report population increases and migration to rural areas outside of central services. In particular, there are very high growth rates in the northwestern corner of the state around Fayetteville, as well as exurban sprawl from Memphis (Tennessee) in the northeast. The creation or extension of central services is strongly supported at the regulatory level, and in the wealthier municipalities; there are communities under enforcement orders. Still, centralization tends to be resisted in smaller communities and by property owner associations because of costs.

Anticipated Changes in Regulations

Who administers, enforces onsite code? The Arkansas Department of Health (ADH) makes regulations at state level. Administration and enforcement is left to county health departments. Enforcement varies from county to county, and person to person, as well as with interpretation of the code. It is reportedly inadequate in many locations.

Code was last revised in: The first code ever was in 1977; the last major revision was in 1987.

New revisions in progress? To be adopted when? Major revisions are made approximately every ten years; the next one is expected in 1999-2000.

Role of legislature, regulatory agency, and politics: Additions to the regulations, and to the Alternate Systems Manual, are controlled by the ADH. Code revision is given “lip service,” but is not politically popular. Current revisions would replace percolation tests with soil criteria and suitability analysis, but this is being resisted in hearings by developers and designers.

Management Programs (Answers 3e-3g Summarized)

The state is not pushing for systematic remediation in any particular localities. For new development there is clearly the need for better onsite planning and management, although at present no onsite programs are contemplated. Inspections are required on installation of new systems. There are no reports of utility interest in managing O/M programs.

New Technology (Answers 4a-4h Summarized)

Present code accommodates and sometimes requires the use of alternative technology, which may be used on sites where conventional systems are inadequate. Where conventional systems are adequate, alternative systems are prohibited. There can be requirements to use Best Available Technology for remediations.

I/A systems are covered in an Alternate Systems Manual; oversight of such systems resides with the ADH. With experience, such systems can be added to the current regulations as acceptable for general use. Permitted systems include sand filters, mounds, package plants, aerobic systems, rock plant filters, constructed wetlands, lagoons, and low pressure pipe. Sand-lined trenches are commonly used in the high conductivity conditions to the north, and there are other technologies identified with particular areas in the state.

There is no requirement for systematic oversight and management in the case of ISDSs, but strong requirements for cluster systems and effluent sewers. Aside from the I/A program, the state, itself, does not test new technologies, although the University of Arkansas does. Alternative technology is generally supported as an option for individual homes but, other than the "Ten-State Standard," does not enjoy much regulatory support for multiuser systems. Cluster systems and package plants are expected to play a moderate role in the future.

Onsite Funding (Answers 5a-5c Summarized)

There are no betterment loan programs for system upgrades, and none are anticipated.

Leadership and Information

State-level agencies, task forces:

- Arkansas Dept of Health, Div of Environmental Health Protection, 4815 W. Markham St, Slot 46, Little Rock, AR 72205 (contact Carl J. Graves or Terry Brumbelow, tel 501-661-2584; fax 501-661-2572).

(The Div of Environmental Health Protection deals with ISDSs; the Division of Engineering with subdivision effluent sewers, cluster systems and commercial systems; the Arkansas Dept of Pollution Control handles all surface discharging systems (including individual homes).

- The Individual Sewage Disposal Advisory Committee (to the ADH).
- The Technical Review Committee (to the ADH) for Onsite Regulations.

Local governmental agencies, task forces: None.

Research within governmental agencies: Through University of Arkansas (see below).

Research within universities:

- University of Arkansas runs an "Onsite Wastewater Renovation Project," which has field-scale (full size) experimental systems in place, and provides "technology transfer" education opportunities for sanitarians and regulators. The project is funded through a $5.00 fee from each onsite permit. University of Arkansas, 4190 Bell Engineering Center, Fayetteville, AR 72701; tel 501-575-8767; fax 501-575-7168; eml mag3@engr.uark.edu (contact, Mark Gross, Assoc. Prof. Civil Engineering).

Onsite demonstration programs: See above.

Training or certification programs: See above.

Citizen action, private groups: NA

Newsletters, forums, other sources of information:

- ADH publishes a newsletter.

Comments

"Alternative technology tends to be more supported locally than at state level, particularly for multiuser systems; there tends to be a lack of familiarity or interest in new technology, particularly at regulatory levels."

California

Summary

California has about 1.3 million systems in the ground, installs about 10,000 new systems annually, and repairs another 4000 (20-30% described as “alternative”). Septic system problems occur along the coast, and on the steep slopes of the Coast Range and the Sierra Nevada. Dense development on the outskirts of the cities also poses problems. In the southern interior, shallow aquifers are in jeopardy due to poor soils. Wastewater laws and regulations are made at county level, but subject to approval by the appropriate regional water quality control board. There is strong receptivity to alternative and advanced technology as well as to management entities, called “zones,” or “county service areas.” Although these had existed prior to 1978, California Senate Bill 430 (“the onsite wastewater disposal zone law”) discourages the creation or extension of sewers when suitable alternatives can be found; and it authorizes 17 types of governmental institutions to establish onsite management programs. Several of them, including Georgetown Divide, Stinson Beach, and Paradise have come to national attention. There is no statewide loan program for onsite betterments, although several counties have programs for households of limited means. In the past there had been active state, county and university research efforts; presently a research program is being developed at California State University/Chico. The Paradise Wastewater Management Zone does run a demonstration project. There is no training or certification at state level; programs and requirements among the counties vary. Many citizens groups are active in California and there is a California Onsite Wastewater Recycling Association.

Numerical Information

Total number of onsite systems: 1.2 to 1.3 million, estimated; 1990 U.S. census reports approximately 1.1 million.

Number of new systems installed each year: 5000-10,000, estimated.

Failure definition: Varies by county; but typically, the surfacing of effluent.

Number or proportion of systems presently failing: 10,000-50,000, estimated.

Number or proportion *repaired* annually: Approximately 3000-4000 are repaired or replaced annually.

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): It is estimated that 20-30% of repairs and replacements are alternative in some sense. Pressure dosing accounts for an estimated 16%, sand filters 8%, mounds, 5%, aerobic treatment, <2%.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Less than 1%.

Cost of a conventional *septic system* installation: Average, $3000-$5000; range $2000 to $30,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $2500-$8500, estimated.

Present Onsite Status (Answers 2a-2f Summarized)

There are large, sometimes well-bounded problem areas scattered throughout the state due to dense development and antiquated systems or poor onsite hydrology. Some of these presently, or will in the future, threaten resources. The chief concerns are nitrates in the groundwater, and fecal coliform contamination of surface waters. Onsite system permits have been denied because of high groundwater, slow percolation, steep slopes, poor soils, thin soils, and fractured rock. Some specifics: There is high-density coastal development in the Bay Area; coastal resources are in jeopardy. Mendocino and Marin counties both have undertaken special management measures. (The Stinson Beach program is located in Marin County.) There is also high-density development in the central area that includes Sacramento, which, along with the communities of Auburn and Chico, has identified wastewater problems. Special management measures are being taken in Chico. Further south in the valley nitrates are becoming a major issue, although the chief source is agriculture. On the coast, Malibu, Ventura and Santa Barbara counties have restrictive, expansive clays and shallow soils causing large numbers of failures. Malibu and Los Osos have taken special onsite management measures. In the very southern interior, the majority of systems are seepage pits or deep trench systems installed in alluvium; shallow aquifers are jeopardized.

Failures have been attributed to hydraulic overloading, poor maintenance, poor soils, inadequate design or construction, saturation of leach fields, and age. Most counties are experiencing continued population growth, with new development occurring in more marginal areas. Several communities are under enforcement orders. Central sewering is often not popular both because of the expense and its anticipated effects on development. Moreover, California's Senate Bill 470, passed in 1978, discourages the construction of sewers when suitable alternatives, including the creation of onsite wastewater management zones, exist. (See more below.)

Anticipated Changes in Regulations

Who administers, enforces onsite code? Although there is a model law, there are no state-level laws or regulations governing onsite sewage disposal in California. The job falls instead to the fifty-eight counties. However, county regulations must accord with the appropriate Regional Water Quality Control Board (nine total), which carry out state policy through the California State Water Resources Board. Thus, the effect is that there is some state control, if indirect. Counties rely on city or county health boards, or management entities, to administer and enforce county regulations.

Code was last revised in: See above; revisions are continual among the counties.

New revisions in progress? To be adopted when? An effort is being made to revise the state's model code, and the stage may now be set for EPA (Region 9), the state's Water Resources Board, the regional water quality control boards, and the counties to participate in these revisions, in the expectation that more uniform practices may follow.

Role of legislature, regulatory agency, and politics: See above.

Management Programs (Answers 3e-3g Summarized)

California has been a pioneer in the development of onsite wastewater management entities. For example, the Auburn Lake Trails Wastewater Management Zone, created in 1971 (and part of the Georgetown Divide Public Utility District of El Dorado County), is often credited with being the first fully comprehensive, "cradle-to-grave," management program in the U.S. The Stinson Beach Onsite Wastewater Program, in Marin County on the coast, is another oft-cited California program. Both programs oversee design, siting, construction, inspection, maintenance, repair and monitoring of systems and groundwater, much of the time with district personnel and services. These programs are each responsible for several hundred systems, many of them alternative. Eventually these isolated practices were codified by Senate Bill 430, the "onsite wastewater disposal zone law," which went into effect in 1978. The law specifically provides that central treatment plants will no longer be approved where existing onsite systems can be rehabilitated, or where less costly alternatives to centralization exist. It modified the powers of 17 types of institution previously authorized to operate central facilities, enabling them to alternatively establish special districts, called "zones," for onsite management programs. The agencies that manage these zones do so as wholly accountable public utilities operating under a permit or authority parallel to that of a point-of-discharge NPDES permit. The permits, which are issued by the regional water quality control boards, stipulate monitoring and reporting requirements, which can be tightened or loosened. Other management zones include Sea Ranch and Paradise. Entire counties have also enacted county-wide management measures; these include Mendocino, El Sonoma, Marin, Santa Cruz, and Nevada. Counties may also create "County Service Areas," of which there are several. Other communities where special management measures are in place include Chico in the densely developed north-central section of the state, and Los Osos and Malibu on the southern California coast.

New Technology (Answers 4a-4h Summarized)

The present county codes vary, but typically accommodate and sometimes require the use of alternative or advanced technology, which may then allow development on otherwise undevelopable sites. Best Available Technology is sometimes required of upgrades. Mechanisms for testing new technology mainly fall to the counties, who tend to initially permit a few experimental systems of a given type and, if satisfied by the body of experience, more generally permit them. Permitted systems among the counties include sand filters, mounds, aerobic, package plants, shallow trench, pressure distribution, evapotranspiration, "Cap-n-Fill," sand trenches and drip irrigation. Intermittent sand filters and mound systems are in fairly widespread use in areas with shallow soils and high groundwater. Management and maintenance requirements vary with county and type of system, and may be left to the homeowner, perhaps with suitable documentation, or may be delegated to management agencies or programs. Communal systems, for example, are permitted in some counties if a management and

maintenance entity is created. It is reported that the future viability of the "onsite paradigm" will depend on whether it can be demonstrated that alternative treatment and management provides outcomes at least as successful as that of central plants.

Onsite Funding (Answers 5a-5c Summarized)

There is no statewide program of any kind. Depending on the county, there can be limited funds for qualifying families. More widespread programs would probably not enjoy popular support.

Leadership and Information

State-level agencies, task forces:

- California State Water Resources Control Board.
- California Conference of the Directors of Environmental Health.
- Technical Advisory Committee for Onsite Sewage Disposal Systems.

Local governmental agencies, task forces:

- Regional water quality control boards.
- County departments of environmental health.
- As the text explains, there are several Wastewater Management Zones in California. The two listed below are among the oldest of them, and among the more comprehensive. The section on management programs mentions several other counties and zones that have adopted special management measures.

  Auburn Lake Trails Wastewater Management Zone, Georgetown Divide Public Utility District/El Dorado County, Box 4240, Georgetown, CA 95634 (contact: Marie E. Davis, General Manager, tel 916-333-4356).

  Stinson Beach Onsite Wastewater Management Program, Stinson Beach County Water District, 3765 Shoreline Hwy. Box 245, Stinson Beach, CA 94970 (contacts: Bonnie M. Jones, Program Manager, tel 415-868-1333; Richard Dinges, General Manager, tel is the same).

Research within governmental agencies: At present, very little.

Research within universities:

- In the past there had been an active program at the University of California at Davis, under the leadership of Prof. George Tchobanoglous.
- Presently a research initiative is underway at California State University/Chico; further details, NA; but see address below.

Onsite demonstration programs:

- Paradise Wastewater Management Zone runs a demonstration program; further details NA.

Training or certification programs:

- None at state level; some counties or districts have programs, e.g.:
- Northern California Wastewater Training and Research Center, California State University/Chico, Chico, CA 95929; (contact: Tibor Banathy, Director, tel 530-898-6027; eml tbanathy@csuchico.edu).

Citizen action, private groups:

- Integrated Systems and Control, Inc., 2045 Indian Trail, Cool, CA 95614; (contact: Bill Cagle, Division Manager/Wastewater Control, tel 916-663-3464, fax 916-663-2580, eml bcagle@quiknet.com).
- California Onsite Wastewater Recycling Association (COWRA).
- California Environmental Health Association (CEHA).
- Many citizen groups and homeowner associations with wastewater interests are active in California; further details, NA, except that one was specifically reported for Los Osos on the southern coast.

Newsletters, forums, other sources of information:

- Both COWRA and CEHA publish newsletters.

Colorado

Summary

Colorado has over 185,000 systems in the ground, and issues about 10,000 permits a year for either new systems or upgrades/repairs. Problems are described as isolated. Areas of shallow bedrock or high water tables are widespread, but have only caused problems in platted areas and older mining towns, both with very small lots. The chief concern in those circumstances is contamination of groundwater. Generally the state favors the extension of sewers, and has had a grant program specifically to encourage small community systems; nevertheless, much new constructions is happening outside of sewer service areas. Most control, aside from minimum standards specified by the State Board of Health (no updates are currently planned), is left with local entities. When the state board approves an alternative, it tends not to specify maintenance requirements, although local entities may stipulate them. Permits to install alternatives are issued locally, but are not particularly encouraged. Reportedly, several local districts or counties are looking at prospects for onsite management. There are no loan programs for remediations or replacements. Training and licensing requirements, when they exist, are set locally. The Tri-County Health Dept (including Denver) reportedly runs training programs. There are some fledgling research and demonstration efforts at the Colorado School of Mines, and at Colorado State University.

Numerical Information

Total number of onsite systems: NA; 1990 U.S. census reports about 185,000 systems in the ground.

Number of new systems installed each year: A total of 10,000 new and repair permits were issued last year.

Failure definition: NA

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: (See above.)

Number or proportion *replaced* annually: (See above.)

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): NA

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): NA, but “very few if any.”

Cost of a *septic system* installation: $3000-$7000; range, $1500-$18,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized)

Some areas of the state are reported to have problems because of antiquated development, site conditions, or jeopardy of resources. Shallow bedrock, fractured bedrock and shallow groundwater are fairly common occurrences. When these conditions exist in platted areas or mining towns with extremely small lots, there can be local contamination of groundwater. Permits have been denied because of lot size, adverse soil conditions, high water table, or location within a flood plain. Reasons cited for failure include age, poor maintenance, saturated leachfields, questionable percolation, small size, or change in use, and damage to leachfields by farm equipment. Rural construction is increasing, much of it outside of projected sewer extensions.

The state does not keep records, so the magnitude of such problems was NA. Generally the state supports centralization, and, in the past, has maintained a grant program directed specifically at small community wastewater systems.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Minimum standards are adopted by the State Board of Health. Local regulations are approved by county, municipal or multicounty boards of health or commissions. The state's involvement is minimal; all permitting, record-keeping, inspections, and enforcement are done locally. The state has no oversight role, and does not serve as an appellate body.

Code was last revised in: 1994.

New revisions in progress? To be adopted when? Approximately every 4-6 years, but revisions are not in progress at this time.

Role of legislature, regulatory agency, and politics: There is no legislative involvement in the minimum standards set by the State Board of Health.

Management Programs (Answers 3e-3g Summarized)

There is no state involvement in such programs. Reportedly, several counties are considering the establishment of management entities.

New Technology (Answers 4a-4h Summarized)

Alternatives are in use and the code does accommodate them, but their use is not meant to open up otherwise undevelopable land, nor are there are large sections of the state where their use predominates because of local conditions. Mounds and shallow drip systems are both used in cases of shallow bedrock, or high water tables. Other permitted technologies include evapotranspiration beds, aerobic units, gravelless systems, sand filters, chamber systems and wetlands. There are no requirements for the use of BAT in remediations. Alternatives are certified for use by the State Board of Health, generally by virtue of NSF certification. Once certified, they are not treated differently from any other system, unless there is surface

application of effluent. In that case, there are several discharge standards, and mandatory sampling programs. Permits for alternative systems are granted locally on a case-by-case basis. It is not thought that the use of alternatives would increase as costs came down.

Onsite Funding (Answers 5a-5c Summarized)

No loan programs for remediation or replacement exist.

Leadership and Information

State-level agencies, task forces:

- Colorado Dept of Public Health and Environment, 4300 Cherry Creek Drive South, Denver, Colorado; (contact: Tom Bennett, Environmental Protection Specialist, tel 303-692-3574, fax 303-782-0390, eml tom.bennett@state.co.us).
- There is a Technical Advisory Committee to the State Board of Health that reviews new products and technologies, and makes recommendations to the Board. The group also considers revisions to regulations.

Local governmental agencies, task forces:

- Regulations are made at county or municipal level; that is really where change is effected.

Research within governmental agencies: No.

Research within universities:

- Colorado School of Mines, Dept of Environmental Science and Engineering, Room 112, Coolaugh, Golden, CO 80401; (contact: Dr. Robert Siegrist, tel 303-273-3490, eml rsiegris@mines.edu).
- Colorado State University; (contact: Dr. Robert Ward).

Onsite demonstration programs: NA

Training or certification programs:

- The Tri-County Health Dept (which includes Denver) has done periodic training sessions; (contact: Warren Brown, tel 303-220-9200).
- Dr. Robert Siegrist (see above) is also listed as a training contact; further details, NA.

Citizen action, private groups:

- Clear Creek Watershed is looking at onsite issues (contact: Carl Norbeck, tel 303-692-3513).

Newsletters, forums, other sources of information: NA

Connecticut

Summary

Connecticut has approximately 400,000 systems in the ground. No information is available on how many systems are replaced, repaired or installed annually. The main septic system problem in Connecticut is along the coast, where at least four communities are under enforcement actions. The problem is aggravated by very dense pockets of development, and the conversion of household use from seasonal to year-round. Regulators strongly support the creation and extension of sewer lines, and do not permit alternative systems for individual households. (A handful of commercial or multiuser systems are permitted each year and regulated directly by the state.) Nevertheless, there are areas that cannot be sewered because of restrictions on outfalls into Long Island Sound. Several communities, under the guidance of local Wastewater Pollution Control Agencies, are developing "sewer avoidance plans," which will entail the creation of satisfactory management measures for conventional systems. Changes in code may more readily accommodate alternative technology when management measures and entities are in place. Their establishment may also result in the creation of betterment funds. Similarly, there are plans to begin local and regional testing of new technologies. The Department of Environmental Protection (DEP) s currently testing recirculating sand filters. The Department of Public Health (DPH) administers an onsite certification program. And there is a Connecticut Sewage Disposal Association.

Numerical Information

Total number of onsite systems: Approx 380,000 according to 1990 U.S. census.

Number of new systems installed each year: NA

Failure definition: Failure for small systems is defined as surfacing effluent. Larger systems, regulated by the DEP, are subject to NPDES limits.

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): At the present time the use of alternative or advanced systems is not permitted except for commercial or communal sites, and is regulated by the DEP rather than the DPH. However, certain technologies considered "alternative" in this document, are considered conventional under Connecticut code; those are under DPH jurisdiction.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): See above.

Cost of a conventional *septic system* installation: $4000-15,000; range $1000-30,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized)

There are large problem areas in Connecticut along densely developed, older beach front developments on Long Island Sound, with much of the housing being converted to year-round use. These areas can not be sewered because of restrictions on outfalls into Long Island Sound. The coastal zone is marked by a high water table with rapidly permeable soils; nitrogen reduction is a concern; and pathogen transfer may also be a problem. The coastal area with the greatest problems, aggravated by high-density development, is around New London and Groton. Dense or over-development around inland lakes has also posed problems. Permits have been denied because of unsuitable soils, seasonal high water, shallow water tables or ledges, and steep slopes. Onsite system failures have been attributed to age, high groundwater, poor soils, and poor construction or design.

Perhaps a dozen communities, including Saybrook, Westbrook, Madison, and Old Lyme are under enforcement actions, with the DEP favoring sewers where possible. Nevertheless, central facilities tend to be vehemently opposed by the public because they are thought to be growth inducing. The alternative to centralization is the creation of local Water Pollution Control Authorities acceptable to the state, and several communities are investigating this route.

New development is not thought to pose a large problem, given that most critical areas, particularly along the coast, are already highly developed.

Anticipated Changes in Regulations

Who administers, enforces onsite code? The Connecticut Department of Health regulates conventional, individual septic systems; regulations are administered by town or multi-town health departments. Larger systems, and alternative or innovative systems, are regulated by the Connecticut Department of Environmental Protection, and require operating permits and regular inspections and maintenance.

Code was last revised in: January, 1997.

New revisions in progress? To be adopted when? Updates can occur yearly, if needed. Major updates occur every 3-4 years.

Role of legislature, regulatory agency, and politics: NA

Management Programs (Answers 3e-3g Summarized)

There is a strong need in coastal communities, and on the banks of the Connecticut River, for systematic remediation. Local towns are passing ordinances requiring regular inspection and pumping as part of their “sewer avoidance plans,” which involve the creation of a local Water Pollution Control Authority. Several communities, including Old Saybrook, Essex, and Old

Lyme have established, or are in the process of establishing, such management entities to assure regular inspection and maintenance, chiefly through the issuance of operating permits and the demonstration of private management contracts. There is discussion of towns contracting with a single management entity. However, there is little experience with any of these approaches so far, and little sympathy at state level to accommodate alternative or advanced technology within the context of sewer avoidance plans. All new systems require inspection at the time of construction, as well as the recording of an "as built" plan.

New Technology (Answers 4a-4h Summarized)

Connecticut's policy is to require conventional systems whenever possible, and is opposed to the use of alternative systems except in commercial establishments or multiuser systems, although several different types of "conventional" systems are in general use. Currently 24 alternative systems serve small communities, schools, malls, developments or restaurants. They are permitted and regulated directly by the state's DEP. All are nonsurface discharging systems that remove nitrogen. Processes include activated sludge, RBCs, one SBR, Sycon, and many recirculating sand filters. The state reviews applications for 5 or 6 such systems per year, with 1 or 2 of them going into construction.

Nevertheless, it is anticipated that revised code may accommodate, or sometimes require, domestic alternative systems in limited situations, provided that suitable management protocols can be developed, which, at the least, will demand regular inspection and maintenance by a certified professional, with regulatory oversight, and penalties for violations. It is also anticipated that Best Available Technology will be required for the remediation of older systems. There are plans in development for local and regional testing of new technologies, and the DEP collects data on the large, alternative systems that it oversees.

Onsite Funding (Answers 5a-5c Summarized)

The state has supported funding for onsite repair in the past, although presently there isn't a program. It is anticipated that with approved management plans, loan funding for upgrades will again become available.

Leadership and Information

State-level agencies, task forces:

- The Connecticut Dept of Public Health regulates individual, conventional onsite systems: Connecticut Dept of Public Health, 410 Capital Avenue, MS #51 SEW, Hartford, CT 06134 (contact Mr. Bob Scully, tel 860-509-7296).
- There is also a Health Department Task Force that periodically meets to discuss proposed changes in state regulations.
- Larger systems as well as alternative technologies are regulated by the Dept of Environmental Protection: Connecticut Dept of Environmental Protection, Bureau of Water Management, 79 Elm St, Hartford, CT 06106 (contact Warren Herzig, Supervising Engineer, tel 860-424-3801).

Local governmental agencies, task forces:

- Local "Water Pollution Control Agencies" at town level are charged with developing and implementing sewer avoidance plans. See above.

Research within governmental agencies:

- The DEP is using 319 funding to test recirculating sand filters.

Research within universities:

- There had been a pioneering program at the University of Connecticut, but it is not presently active.

Onsite demonstration programs: No.

Training or certification programs:

- The DPH administers an onsite certification program to enforce codes from the local county health departments.
- Connecticut contracts with the University of Rhode Island's program for providing training and certification of other types of professionals: Univ Rhode Island Onsite Wastewater Training Center, 18 Woodward Hall, 9 East Alumni Ave, Ste 5, Kingston, RI 02881; (contact: George Loomis, Director, tel 401-874-4558, eml gloomis@uriacc.uri.edu).

Citizen action, private groups:

- Connecticut Sewage Disposal Association (CSDA), P.O. Box 366, Westbrook, CT 06498 (contact Stephen Dix, Technical Director, Infiltrator Systems, P.O. Box 768, Old Saybrook, CT 06475; tel 860-388-6639, fax 860-388-6810).

Newsletters, forums, other sources of information:

- CSDA (see above) publishes a newsletter.

Delaware

Summary

Delaware has about 90,000 systems in the ground, issues about 2400 permits annually, and repairs or replaces about 600 annually (over a third of which are alternative in some sense). It is coastal areas that are most in jeopardy, and much of the coast is aggressively protected. Centralization is the solution of choice in Delaware, and all communities of more than 500 are in fact serviced centrally. Delaware is in the process of completing a statewide comprehensive wastewater plan as part of its statewide development plan that steers growth toward particular (and largely sewered areas). However, alternative and advanced systems are permitted under the code, first experimentally and then, with experience, more generally. No particular areas of the state have been singled out for special treatment, but as part of the statewide plan all systems are to come under appropriate and enforced management measures. Toward this end, New Castle County is considering the establishment of onsite districts. There is a statewide betterment program for system upgrades. There is no university research at this time. However, the DNREC has installed elevated sand mounds and constructed wetlands as demonstration projects. Several classes of onsite professionals are tested and licensed at state level, and a community college is developing an onsite wastewater training center. There is also a Delaware Onsite Wastewater Recycling Association.

Numerical Information

Total number of onsite systems: Approximately 90,000; 1990 U.S. census reports approximately 75,000.

Number of new systems installed each year: Approx 2000.

Failure definition: Surfacing effluent, or inadequate renovation of effluent on reaching the water table.

Number or proportion of systems presently failing: NA, but it is thought that failing systems are now replaced promptly.

Number or proportion *repaired* annually: Approximately 200.

Number or proportion *replaced* annually: Approximately 400.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): In 1997: pressure-dosed systems, 607; elevated sand mounds, 216; Wisconsin-at-grade, 3; and subsurface micro-irrigation, 2; other alternative systems, 80 (all this is in contrast to 1514 conventional gravity systems). These numbers apply to both new installations and replacements.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Five rotating biological contactors were installed as replacement systems in 1997.

Cost of a conventional *septic system* installation: For a standard gravity system, $2500-$3500; for pressure dosing, $3500-$5000; for elevated sand mounds, $8000-$12,000; for advanced treatment, $12,000+.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA, varies greatly.

Present Onsite Status (Answers 2a-2f Summarized)

Various noncontiguous areas in the state have problems because of antiquated systems and/or dense development. Failures have been attributed to age, poor design or installation, and inadequate soils. A few of these areas may pose jeopardy to resources. Obviously, the coast and its estuaries are the resources most in need of protection. Much of the Delaware coast (except the northern portion of New Castle County) is protected as a resource area. Development cautions apply to much of Sussex County, much of which is also being incorporated into sewer districts. In northernmost New Castle County growth is encouraged in, and on the outskirts of, Wilmington; New Castle is considering the establishment of onsite wastewater management districts. Central Kent County has several towns on the outskirts of Dover with problems; nevertheless, growth is encouraged in and around Dover.

Much of the state could pose problems with future development, except for Delaware's planning efforts. Under the leadership of the Wastewater Facilities Advisory Council (established, 1995), Delaware is in the process of completing a comprehensive statewide wastewater facilities, needs, and financial assessment, for both sewered and unsewered communities. With one exception, all communities of over 500 dwellings are presently served by central facilities. Centralization is regarded as the optimal solution for densely developed areas in the state, and basically enjoys political support aside from homeowner resistance to fees associated with hookups. The trend to centralization is reinforced by Delaware's Growth and Development System, which essentially is a state comprehensive plan that directs growth away from, and toward, specific areas. (One goal of the plan is to encourage "revitalization of existing water and wastewater systems as well as the construction of new systems.")

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is set at state level by the Department of Natural Resources and Environmental Control. Administration and system permitting is handled by local DNREC offices, which review and approve site plans and designs. Enforcement is reported to be adequate.

Code was last revised in: 1985.

New revisions in progress? To be adopted when? Yes, 1998-1999.

Role of legislature, regulatory agency, and politics: Any regulatory changes require legislative approval, which is typically forthcoming when revision is properly justified.

Management Programs (Answers 3e-3g Summarized)

In one sense, no particular areas in the state are targeted for special regulatory, enforcement, or management measures; but in another sense, the entire state will be incorporated into a developing wastewater management plan. All individual systems are regarded as needing proper and effective management, starting with a pre-cover inspection and the filing of as-built plans. New Castle County is considering the establishment of onsite wastewater management districts to assure proper management. There are no reports of public utility interest in running O/M programs.

New Technology (Answers 4a-4h Summarized)

Present code accommodates and sometimes requires the use of alternative or advanced systems, and may thus allow development on otherwise undevelopable sites. I/A technologies are listed under subsections, and are continuously added through procedures and criteria specified in the "alternative design" section of the code. Permits for such systems are granted with varying provisions for installation, operation, maintenance, monitoring, sample collection, and laboratory testing. The systems may also be monitored directly by DNREC. Sand filters, aerobic and mound systems, RBCs, low pressure pipe, Wisconsin-at-grade, and subsurface micro-irrigation systems have all been permitted. The level and manner of oversight for these systems depends on the technology involved. No particular kinds of systems have been linked to particular physiographies in the state; nor is Best Available Technology automatically required of upgrades. Whether the use of alternative or advanced systems would be more widespread as costs diminished is reported as problematical (dependent on many other factors). Package plants and/or cluster systems are likely to be used only to remediate areas for which there is no other remedy.

Onsite Funding (Answers 5a-5c Summarized)

There is a state-funded betterment program for upgrades, and EPA SRF funds are employed to seed this effort. The interest rate on loans is 3-5%, and qualifying households can borrow as much $74,000. (Contact for this office is Mr. Tom Kosikowski, Financial Assistant, DNREC, tel 302-739-5081.)

Leadership and Information

State-level agencies, task forces:

- Dept of Natural Resources and Environmental Control (DNREC), Groundwater Discharges Section, 89 Kings Hwy, Dover, DE 19901; (contacts: Rodney L. Wyatt, Environmental Program Manager, tel 302-739-4762, fax 302-739-7764, rwyatt@state.de.us; or Dave Schepens, Environmental Control Supervisor, tel 302-739-4761, fax 302-739-3491, dschepens@dnrec.state.de.us).

- Wastewater Facilities Advisory Council (to the Governor, General Assembly and the DNREC), Box 1401, Dover, DE 19903.
- Cabinet Committee on State Planning Issues.

Local governmental agencies, task forces:

- New Castle County is considering a wastewater management district; further details, NA.

Research within governmental agencies:

- DNREC performs research with experimental systems (as outlined in the regulations); also, see below.

Research within universities: Not at present.

Onsite demonstration programs:

- DNREC installed an elevated sand mound as a demonstration for contractors, designers, and inspectors. It has also installed two alternative wetlands treatment facilities.

Training or certification programs:

- Several classes of professional (percolation testers, system designers, site evaluators, system contractors and waste haulers) are tested and licensed at state level. The Delaware Technical and Community College is developing an onsite wastewater training center.

Citizen action, private groups:

- Delaware On-Site Wastewater Recycling Association, DOWRA, founded 1996 (Box 1401, Dover, DE 19903; tel 302-739-4761, fax 302-739-3491; Rodney Wyatt, President, eml rwyatt@state.de.us).

Newsletters, forums, other sources of information:

- DNREC web site: www.dnrec.state.de.us.
- DOWRA publishes a newsletter.

Florida

Summary

Florida has over one and a half million septic systems in the ground. Some 25,000 are repaired or replaced annually. Florida's population continues to grow, but with few exceptions the counties have conditions that severely limit the use of conventional septic systems. Wetness, shallow bedrock, karst topography, and nutrient enrichment along the coast and in the Keys are all problems or potential problems. About a quarter of ISDS replacements involve some form of alternative technology, which are accommodated and sometimes required. Most require particularized operation and maintenance protocols. There are systematic procedures for testing and authorizing new technologies, research programs at several colleges or universities, several demonstration projects, and a broad training and certification program for several categories of professionals. Florida has revised state code to reflect performance-based standards. And it is considering systematic remediation and management programs in several areas of the state, where "Inspection/Maintenance Zones" can be enabled. These will likely encompass large areas of Charlotte and Monroe counties, including the Keys. Aggressively addressing onsite pollution has a strong legislative mandate. A revolving fund pool for system upgrades is under consideration.

Numerical Information

Total number of onsite systems: 1.6-2 million, estimated.

Number of new systems installed each year: About 40,000.

Failure definition: Conditions which prohibit the system from functioning in a sanitary manner, and which result in plumbing failure, or in the discharge of insufficiently treated water onto the ground, or into surface or ground waters.

Number or proportion of systems presently failing: NA, see below for annual estimates.

Number or proportion *repaired* annually: 20,000-30,000 indefinitely repaired or replaced annually; data are tracked well because all repairs require permits.

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Many types of alternative or advanced technology are employed, but no percentages were provided. As to leaching areas, over half the systems are either conventional trench or bed systems. However, fill systems account for 20%, mound systems for almost 25%, and gravelless systems for about 1.5% of current installations.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): No breakout was provided; see above.

Cost of a conventional *septic system* installation: $2500; range $2000-$25,000. About half the installations require mounds or fill; were this not the case, the typical cost would be more like $1500.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $3000 to $12,000.

Present Onsite Status (Answers 2a-2f Summarized)

Florida's population continues to grow, but with few exceptions its counties have conditions that significantly limit the use of ISDSs. Large areas of the state are unsuitable to conventional systems because of wetness, flooding, shallow bedrock, or slow permeability. These include the Central and South Florida Flatwoods, the Florida Everglades, and the North Florida Flatwoods, where wetness and related conditions are pervasive. The Central Florida Ridge and the Southern Coastal Plain also have wetness-related problems affecting a significant fraction of these areas; permeability is an additional problem in the Southern Coastal Plain. There are imminent problems in Monroe County and the Florida Keys because of failing systems, high coliform counts, and coastal nutrient enrichment (with the potential for eutrophication). An extensive study in Sarasota County determined enteric virus contamination. Barrier islands on the Gulf Coast have marginal conditions and strong development pressure.

The city of Hudson (in Pasco County) and Monroe County are under enforcement actions. Shellfish closures have prompted Suwanee River centralization. Seven counties (Charlotte, Dixie, St. Lucie, Monroe, Sarasota, Pasco, and Volusia) are considering the extension or creation of central facilities, with varying degrees of public resistance, mainly due to cost.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Law and code are made at state level and enforced at county level. County health departments are extensions of the state Department of Health. Enforcement is considered adequate; new and repaired systems are inspected, and electrical hookups require system approval; there are occasional complaints of unauthorized repairs.

Code was last revised in: 1996, 1997, 1998; the 1998 revisions use performance-based standards, Florida being one of a small handful of states exploring this avenue.

New revisions in progress? To be adopted when? As required.

Role of legislature, regulatory agency, and politics: The code revisions have been driven by statutory mandate.

Management Programs (Answers 3e-3g Summarized)

Florida is in the process of considering remediation and management programs in several areas throughout the state in connection with new performance-based standards. Aerobic and commercial units will all be inspected. Inspection/maintenance zones will be enabled, and are likely to include all or most of Monroe and Charlotte counties. At present, pre-cover inspections

are required of all construction or repair; any special system requiring an operating permit is inspected at least once during the term of the permit. Reportedly, rural utilities are considering the possibility of starting O/M programs.

New Technology (Answers 4a-4h Summarized)

Present and revised codes accommodate and sometimes require advanced or alternative systems, along with particularized I/M requirements. Such systems are and will be permitted on sites that are otherwise undevelopable. Aerobic systems, sand filters, mounds, chamber, and Infiltrator (proprietary) systems, as well as alternative distribution and drainfield systems (such as low pressure injection and drip irrigation), are handled as subsection amendments to the code. In Monroe County remediation of older systems will be by "best available technology." ANSI-NSF Standards 40 and 41 will apply in Monroe County. In the Florida Keys new development is highly regulated, and advanced wastewater treatment is mandatory. Cluster systems are permitted, and considered important, in areas with small lots. There are mechanisms to test and authorize new technology at regional levels. Demonstration sites and individuals may test innovative and experimental technologies under state-issued innovative system permits.

Onsite Funding (Answers 5a-5c Summarized)

The state is investigating the use of a revolving fund pool for upgrading systems that serve low-income households. There are no other betterment loan programs.

Leadership and Information

State-level agencies, task forces:

- Florida Dept of Health, Bureau of Onsite Sewage Programs, 1317 Winewood Blvd, Tallahassee, FL 32399; tel 850-488-4070.
- There is a statutorily designated Technical Review and Advisory Panel; contact Mr. Dale Holcomb or Ms. Shirley Kugler, as above.

Local governmental agencies, task forces: NA

Research within governmental agencies:

- The Dept of Health funds both university and several private research efforts (see below).

Research within universities:

- Currently there are research programs at University of Florida, Florida State University, and University of South Florida (Dept of Environmental and Occupational Health); also see the next heading.
- In addition, Ayers Associates, and ECT, Inc. are conducting research programs; Ayers is involved in both the projects cited below; further information on ECT, Inc. is NA.

Onsite demonstration programs:

- Big Pine Key: Florida Keys Onsite Wastewater Nutrient Reduction System Demonstration Project examines the effectiveness of alternative systems.
- The University of South Florida (in Tampa) is testing (and demonstrating) the capacity of fine, sandy soils to treat effluent through the use of an in-situ soil infiltration cell (lysimeter).

Training or certification programs:

- There are state-level training and certification programs for Septic Contractors (6 hr/yr), Master Septic Contractor (12 hr/yr), and Septic Inspectors (24 hr/2 yr); contact: Kevin Sherman, Florida Dept of Public Health, 2020 Capital Circle, SE, Bin #808, Tallahassee, Fl 32399; tel 850-488-3842.

Citizen action, private groups:

- Florida Septic Tank Association (FSTA, very active, but further information NA).
- Sarasota County, the Phillipi Creek Task Force; plus several active groups in the Florida Keys (further information NA).

Newsletters, forums, other sources of information:

- The Florida Dept of Health has a bulletin board system.
- There is also an FSTA newsletter, annual conference and trade show.

Georgia

Summary

Georgia has between 600,000 and 1 million onsite systems in the ground. About 9000 systems are repaired or replaced annually. Numbers were not available on how many new systems are installed yearly. Problems are scattered throughout the state, with many stream segments believed to be contaminated by sewage. Regulations are made and enforced at county level, although revisions to Georgia law in 1998 may stiffen maintenance and enforcement requirements statewide. New technology is accommodated through experimental protocols that may result in more general use. No management entities are contemplated, and no funding is available for onsite betterments. No research or demonstration programs are currently underway.

Numerical Information

Total number of onsite systems: At least 600,000; U.S. census data imply a number closer to 1 million.

Number of new systems installed each year: NA

Failure definition: Must constitute a public hazard.

Number or proportion of systems presently failing: Over 10,000.

Number or proportion *repaired* annually: 9000+ repairs or replacements.

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): NA

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): NA

Cost of a conventional *septic system* installation: $2500 (range $750-$10,000).

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized)

There are areas in the state where more development will lead to problems, and there are presently watersheds with known or imminent problems because of dense development, failing systems, or poor conditions, which include steep slopes, shallow rock ledges, high water tables or flood plains. Many stream segments are believed to be contaminated by fecal coliforms, some undoubtedly sewage-related. Reasons cited for failures include system age, undersized systems,

poor soils or sites, lack of maintenance, and seasonally high water tables. Most new development is outside centrally sewered areas; and, increasingly, it is situated in less suitable areas for onsite systems. Every county has at least one central sewer system, and it can be expected some of them will extend service areas, as can it be expected that new plants will be built, although public funding is increasingly a problem. Resistance to centralization is not centered on cost or principle, but reportedly on the "NIMBY" syndrome. There are probably enforcement actions in progress, but no state-level actions. Details of local actions were not reported.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Georgia has state-level onsite legislation, but does not have state-level onsite regulations, which are handled at county or municipal levels with some coordination through nineteen regional health districts. There are, however, state-level departments or agencies involved with environmental health who have some acquaintance with the onsite situation statewide. At state level, enforcement is considered inadequate due to lack of training and personnel shortages.

Code was last revised in: Onsite law (not county code) was last revised in 1997.

New revisions in progress? To be adopted when? Yes, proposed amendments to the law were released in 1998, and involve considerable overhaul of the old code.

Role of legislature, regulatory agency, and politics: There is support in the legislature; the current round of prospective amendments was the outgrowth of Act 280 of 1997.

Management Programs (Answers 3e-3g Summarized)

New legislation has mandated the management and maintenance of all systems more actively, although no critical areas have been designated, and no management entities are contemplated. There has been some talk of rural utility involvement in O/M programs, but nothing definitive.

New Technology (Answers 4a-4h Summarized)

Present and revised code (and law) will accommodate, and at times require, the use of alternative or advanced technology with periodic oversight or management, cleared by testing programs. Such systems will allow for development on presently undevelopable sites. Best Available Technology will be mandated for failing systems. Alternative systems currently in use include sand filters, mounds, aerobic treatment, emitter, chamber and drip systems, Infiltrator, aquatic treatment, and Wisconsin-at-grade. Cluster systems are expected to play a moderate role in the future; there is a trend among developers to install them.

Onsite Funding (Answers 5a-5c Summarized)

None.

Leadership and Information

State-level agencies, task forces: Georgia has state-level law, but does not have state-level onsite regulations; however, the following offices are useful sources of information:

- Mr. Ade Oke, Principal Engineer, Dept of Human Resources, Div of Environmental Health, 2 Peachtree St, 5th Floor Annex, Atlanta, GA 30334; tel 404-657-6534.
- Mr. Ernest Earn, Environmental Protection Division, Water Protection Branch, 1058 Floyd Towers E., 205 Butler St SE, Atlanta, GA 30334; tel 404-651-5495.

Local governmental agencies, task forces: NA

Research within governmental agencies: Not at present.

Research within universities: NA

Onsite demonstration programs: None.

Training or certification programs:

- Only private training (see below).

Citizen action, private groups:

- Georgia Onsite Wastewater Association, (contact: William Banks, President, tel 770-889-2708). The association provides training; further details, NA.

Newsletters, forums, other sources of information: NA

Hawaii

Summary

Hawaii has about 75,000 systems in the ground, installs another 1200 annually, but annually repairs or replaces only a few dozen, of which only a small number require alternative or advanced technology. The state Dept of Health directly administers onsite code. Many kinds of alternative technology are permitted under the code, the only major stipulation being that they are designed by a PE; they are allowed for use on otherwise undevelopable sites. There are isolated problem areas, chiefly on the coast, but the solution of choice is to sewer as soon as conditions warrant it. Onsite code revision is not popular, and is reflected in the limited resources provided to the Dept of Health. No betterment loan programs, targeted remediation efforts, management districts, state or university research, or onsite demonstration programs presently exist.

Numerical Information

Total number of onsite systems: 1990 U.S. census reports about 73,000.

Number of new systems installed each year: 1000-1200.

Failure definition: Improper construction, or wastewater overflow.

Number or proportion of systems presently failing: 15% to 35% estimated, including cesspools and other substandard systems.

Number or proportion *repaired* annually: 25.

Number or proportion *replaced* annually: 25; note, this does not count replacement of cesspools, all considered substandard.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Very few, probably less than 10/year.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Even fewer, probably less than 5 per year.

Cost of a conventional *septic system* installation: $6500; range, $5000-$8500.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $10,000 to $15,000.

Present Onsite Status (Answers 2a-2f Summarized)

Many unsewered areas have problems because of antiquated systems, dense development, unsuitable conditions or jeopardized ground- or coastal waters. Chiefly, these problems arise in very close, near-shore developments, and other areas with clayey soils and/or high groundwater. Cesspools are reportedly common, as are improper design or construction. Problems are reported to be greater on the islands of Oahu and Maui. There are municipalities under enforcement actions (further details NA). The extension or creation of central facilities is strongly supported by the state, but resisted locally because of costs.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is written and administered directly by the state Department of Health. With its limited resources, it is reported that there is "room for improvement" when it comes to enforcement.

Code was last revised in: 1991

New revisions in progress? To be adopted when? Updates occur about every 3-4 years; the next revisions are expected in 1998 or 1999.

Role of legislature, regulatory agency, and politics: Administrative rules do not require legislative adoption. Wastewater code revisions are typically not supported politically due to increased costs to owners. It has not been a major factor in rule revision, but it has been in terms of funding for DOH programs.

Management Programs (Answers 3e-3g Summarized)

There is a need for targeted, systematic remediation or enforcement, or special planning or management, but little political or fiscal support. No management districts are planned, and no interest from electric cooperatives or utilities in O/M management programs was reported.

New Technology (Answers 4a-4h Summarized)

Code does accommodate, but in no case requires, alternative technology. It does permit development on otherwise undevelopable sites; however, BAT is not required of remediations. I/A technologies are covered in the regulations by subsections that can be amended. Permitted technologies include evapotranspiration beds, aerobic treatment, sand filters, mounds, chamber systems and package plants. But no particular technologies have been linked to particular environmental conditions, although large package plants play a considerable role in Hawaii's small communities. So far, there is only limited interest in new technology. There are no state or university research programs dealing with onsite issues. The only management requirement of the rules is that systems (conventional and alternative) be designed by PEs and administratively reviewed. If costs of alternative systems were similar to that of conventional systems, it could be anticipated that the choice of system would be determined more by site conditions and less by cost than presently.

Onsite Funding (Answers 5a-5c Summarized)

There are no widespread betterment loan programs for remediation, and none are planned, although constituents would probably favor such programs. There is a limited loan program for native Hawaiians.

Leadership and Information

State-level agencies, task forces:

- Hawaii Dept of Health, Wastewater Branch, Environmental Management Div, 919 Ala Moana Blvd, Room 309, Honolulu, HI 96814 (contact Harold Yee, Supervisor, Planning and Design Section; tel 808-586-4294, fax 808-586-4370; eml hyee@eha.health.state.hi.us).

Local governmental agencies, task forces: None; the matter is left entirely to the state.

Research within governmental agencies: No

Research within universities: No

Onsite demonstration programs: No

Training or certification programs: Not at present, but they are being considered.

Citizen action, private groups:

- Bio-Microbics, Inc., 8271 Melrose, Lenexa, KS 66214 (contact: Bob Rebori, President, tel 800-753-3278, fax 913-492-0808, eml onsite@biomicrobics.com). Mr. Rebori has been involved in an effort to establish a Hawaii Onsite Association.

Newsletters, forums, other sources of information: No

Idaho

Summary

Idaho has about 145,000 systems in the ground, installs about 7000 new systems annually, and repairs or replaces about 1000 systems annually. While much of the state is rugged and marked by poor soils, population densities are sufficiently small that problems occur only in pockets. Nutrient and pathogen loading of lake shores is the biggest problem. Several communities are under enforcement actions. Central facilities are promoted, but obviously are not always feasible. Alternative technologies are added to the Technical Guidance Manual on the recommendation of the Technical Guidance Committee, and are in fairly common use (approximately 10%) to overcome site deficits. Several areas are contemplating the establishment of management entities, but so far only one county has an ordinance requiring the annual inspection of complex alternative systems. There are no betterment programs for upgrades, no demonstration programs, and no state or university research programs at this point. Installers are trained and licensed by local district health departments. Inspectors and Environmental Health Specialists are licensed by the Bureau of Occupational Licenses.

Numerical Information

Total number of onsite systems: 1990 U.S. census reports 143,000, said to be about 36% of households.

Number of new systems installed each year: 7000.

Failure definition: Any system that fails to accept black waste or wastewater, that discharges wastewater into ground- or surface waters, or that does not meet the intent of the regulations.

Number or proportion of systems presently failing: About 15%.

Number or proportion *repaired* annually: 5-15% of systems are either repaired or replaced annually.

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Approximately 10%.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Very few, if any.

Cost of a conventional *septic system* installation: $2000-2600 (range $1000-$20,000, the low applying only to drainfield replacement, the high to recirculating sand filters with pressure-dosed drainfields).

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $1000-$4000.

Present Onsite Status (Answers 2a-2f Summarized)

There are some areas of the state that have problems with antiquated systems, small lots, or dense development, and others where there are poor physiographic conditions, or where resources are threatened. A few areas are thought to pose problems with future development, particularly because population growth is mainly in rural areas not presently served by sewers.

The northern Panhandle, around Coeur d'Alene, contains a sole source aquifer in an area of projected high density. Just southwest of there, around Lewiston and Orofino, there are areas with tight clay soils and poor drainage. North of Boise is an area marked by high water tables.

Permits have been denied, or alternative systems stipulated, because of small lot sizes, soil type and depth, shallow groundwater and steep slopes. Chiefly, concern lies with nitrates released to groundwater, and nitrogen or pathogen loading on lakeshores. There are communities under enforcement actions, but there is ambivalence about the role of central facilities.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Regulations are made at state level by the Idaho Dept of Health and Welfare, and administered by seven district health departments. Enforcement of subsurface sewage regulations is reported to be adequate.

Code was last revised in: May, 1993.

New revisions in progress? To be adopted when? Revisions are done on an "as needed" basis, although new technologies can be added on the recommendation of a Technical Guidance Committee. Revisions are currently in progress, but no implementation date has been set.

Role of legislature, regulatory agency, and politics: The legislature has a strong role, approving the regulations afresh each year, and can modify them unilaterally.

Management Programs (Answers 3e-3g Summarized)

There is a need to place special onsite management or planning requirements in some new developments and critical resource areas. However, there are no programs that have targeted the systematic remediation of older systems, although there may be the need to do so. Blaine County (alone) has an ordinance requiring the annual inspection of complex alternative systems. Other areas in the state are considering the establishment of management entities. The contemplated model for their formation at this time is nonprofit corporations; and there is no reported public utility interest in O/M schemes. As part of an aquifer protection program, the Panhandle Health District has implemented ordinances and programs that go beyond state minimums.

New Technology (Answers 4a-4h Summarized)

Present code both accommodates and sometimes requires the use of alternative or advanced systems, enabling the development of otherwise undevelopable areas. Permits are based on the characteristics of the individual site, and may stipulate particular types of systems. For example,

sand mound or sand filters may be stipulated to address shallow groundwater, and recirculating sand filters may be required to reduce nitrogen loading. Other systems permitted include mound systems, extended treatment package systems, evapotranspiration, lagoon, gravelless trench, pressure distribution, and capping fills. Permits can be conditioned with maintenance requirements. Communal or package plants must be maintained by an authorized management entity, either governmental or private. Large soil absorption systems and extended treatment package plants are expected to play a small role in the future. Best available technology can be required for remediating failing systems. There is no systematic mechanism to test new technologies, but they may be added to the Technical Guidance Manual by the Technical Guidance Committee, based on research or reports from elsewhere.

Onsite Funding (Answers 5a-5c Summarized)

There are no financing programs for the remediation of failing systems.

Leadership and Information

State-level agencies, task forces:

- Idaho Dept of Health and Welfare, Div Environmental Quality, 1410 North Hilton, 2nd Fl, Boise, ID 83706 (contact: Barry N. Burnell, Watershed Protection Supervisor; tel 208-373-0502, fax 208-373-0576; eml bburnell@deq.state.id.us).
- Technical Guidance Committee for Individual and Subsurface Sewage Disposal (consisting of three staff from local health departments, an installer, a PE, and the state onsite coordinator); address c/o the DEQ.

Local governmental agencies, task forces: The following are independently examining onsite issues:

- Jerome County, County Courthouse, Jerome, ID (contact, Art Brown).
- Canyon County, County Courthouse, Caldwell, ID (contact, Larry Bledso).
- Blaine County already has an inspection ordinance.
- Panhandle Health District has also implemented local ordinances going beyond those required of the state as part of a large-scale aquifer protection program.

Research within governmental agencies: Not at present.

Research within universities: None.

Onsite demonstration programs: None.

Training or certification programs:

- Installers are trained and licensed by local district health departments; they must attend a training session sponsored or provided by the district health departments.
- Inspectors and Environmental Health Specialists are licensed by the Bureau of Occupational Licenses, but employed by local departments.

Citizen action, private groups:

- There are several Watershed Advisory Groups and Basin Advisory Groups; further information is not available.

Newsletters, forums, other sources of information: NA

Comments

Comments with respect to the Scoping Project maps: Lake front development, old and new, around Pend Oreille Lake in the northernmost Panhandle, should show higher density in terms of projected new development. Also, the area around Boise, in the southwest, should show higher density in terms of projected new development; this is a major growth area.

Illinois

Summary

Illinois has approximately 600,000 onsite systems in the ground, and installs about 13,000 more annually. Figures on repair or replacement were not available. Although conditions in much of the state are good, there are shallow bedrock areas in the northeast, which are also marked by the heaviest population density; in the south and southwest karst topography abounds. Alternative technology is readily accommodated through an experimental protocol and the recommendations of the Private Sewage Disposal Advisory Commission. The Governor's Rural Wastewater Treatment Needs Committee is also offering smaller communities the opportunity and incentives to build alternative central systems. Buried sand filters, lagoons, mounds, and, particularly, aerobic systems are in widespread use (accounting for up to 45% or more of new installations in some areas). Approved management programs are required for all multiuser systems, and several counties demand demonstrated maintenance contracts for aerobic systems, but no management entities are being considered. There are no betterment programs, and no government or university research programs at this time. Installers and pumpers are licensed by the state.

Numerical Information

Total number of onsite systems: 1990 U.S. census reports about 600,000.

Number of new systems installed each year: About 13,000 (1996).

Failure definition: NA

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): In 1996, more than 1200 buried sand filters, 250 lagoons, 125 mounds, and 4300 aerobic treatment plants were installed.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Another 3494 aerobic treatment plants with disinfection were installed in 1996.

Cost of a conventional *septic system* installation: $4000; range, $800-$20,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized)

There are some areas in state that currently have problems with dense development and/or antiquated systems; and other areas, some large or bounded, that have poor onsite conditions that jeopardize resources. Some specifics: there are areas in the north and northeast marked by shallow bedrock; in Lake County, e.g., mound systems are often installed. The southwest corner of the state is marked by karst topography and sinkholes. More generally, the southern area of the state, in particular, is marked by poor soils. Likewise, further development in some areas is expected to lead to future problems. Reasons given for onsite failures include age, improper maintenance, high water and poor soils. Present code both accommodates, and sometimes requires, alternative or advanced technology, including their potential application as BAT for remediation. Likewise, alternative systems can be used on sites unsuitable for conventional systems; aerobic systems, in particular, are in widespread use.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Minimum code is determined by the Illinois Dept of Public Health, and enforced by local city, county, or multi-county health departments. Some counties have stiffer codes.

Code was last revised in: 1996.

New revisions in progress? To be adopted when? Revisions occur every three years, so occur next in 1999. There could be major revisions as a result of the recent establishment of the Private Sewage Disposal Advisory Commission.

Role of legislature, regulatory agency, and politics: Revisions must be approved by the legislature's Joint Committee on Administrative Rules. New technologies can be added by amendments, based on successful outcomes with experimental systems. In 1997, a bill was passed creating the Private Sewage Disposal Advisory Commission to make recommendations, including rules changes, to the Dept of Public Health. The Commission was slated to be appointed in 1998.

Management Programs (Answers 3e-3g Summarized)

Under the code, all ISDSs require systematic management and maintenance. Approved management programs are mandatory for treatment systems used by more than one household. The state has not mandated any onsite management programs specific to particular communities or regions. However, several counties demand demonstrated maintenance of aerobic systems, although the responsibility lies with the homeowner.

New Technology (Answers 4a-4h Summarized)

I/A technologies are covered under an "experimental use" section of the code; approval is based on a two-year evaluation period. Well over half the systems in the southern portion of the state involve aerobic treatment, where there are also several hundred functioning lagoon systems. Over one hundred mound systems have been installed in Lake County. By one account, 43% of

all new systems installed in 1997 were aerobic. It is individual counties that determine the level and manner of oversight these systems require. Other systems employed include low pressure pipe, at-grade, gravelless/chamber, and oxidation or waste-stabilization ponds.

The Governor's Rural Affairs Council offered to support alternative collection/treatment demonstration facilities in rural communities, four of which embraced the idea, and have either participated or are planning to participate. Others, more cautious, or desirous of building conventional centralized facilities, are still waiting to take action. There are mechanisms at state level to test and authorize new technologies, but only within the I/A provisions of the code. These are seen as simply providing more options to communities as they plan. The lower the cost of alternatives, the more it might be expected that they would be opted.

Onsite Funding (Answers 5a-5c Summarized)

There are no loan or betterment programs for onsite remediation, and apparently no plans to initiate such a program.

Leadership and Information

State-level agencies, task forces:

- Illinois Dept of Public Health, 525 W Jefferson/3rd Fl, Springfield, IL 62761 (contact Douglas J. Ebelherr, Program Manager; tel 217-782-5830, fax 217-785-0253; eml debelher@idph.state.il.us).
- Private Sewage Disposal Advisory Commission.
- Rural Wastewater Treatment Needs Committee of the Governor's Rural Affairs Council.

Local governmental agencies, task forces: None.

Research within governmental agencies: No systematic research.

Research within universities: None.

Onsite demonstration programs: See text on Governor's program, further information NA.

Training or certification programs:

- Installers and pumpers are licensed by the state.
- Listed as a contact for onsite training: Chase Environmental Services, Inc., 3900 S. Mulford Rd, Rochelle, IL 61068 (contact: Paul Chase, President, tel 815-562-6783; eml CES9198@aol.com).

Citizen action, private groups: None.

Newsletters, forums, other sources of information:

- Periodically, the state conducts Northern-, Central-, and Southern Sewage conferences.

Comments

“Lasalle, Coles and North Cumberland counties should show higher density [than Scoping Project maps] in terms of projected new systems.”

Indiana

Summary

Indiana has about 800,000 onsite systems in the ground, and installs another 15,000 annually; figures were not available on the number of repairs or replacements, although Purdue University is starting a database to acquire this kind of information. Wide areas of the state have problems associated with dense development and straight pipes; this is compounded by wetness, seasonally high water tables, and any number of hydrologically poor soil types and geomorphologies. Code accommodates alternative systems, but not readily. Mounds, pressure dosing, and constructed wetlands (for new developments) are in fairly common use, but other alternative technologies are not. (Aerobic systems are no longer permitted.) Communal systems of any kind require management plans, but there are no maintenance requirements for ISDSs. Individual county commissions vary widely in their enforcement approaches; some are reportedly examining the question of management entities. Purdue University conducts research on experimental technologies. There are no betterment loan programs, and no statewide training or certification requirements.

Numerical Information

Total number of onsite systems: 800,000 estimated; 1990 U.S. census reports 700,000.

Number of new systems installed each year: 15,000, estimated.

Failure definition: From a practical standpoint, surfacing effluent or backed-up plumbing; the code definition includes contamination of surface or groundwater, as well as the absence of a system (many houses have straight pipes to ditches or field tiles).

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Hard numbers are not available; mounds and pressure dosing are routinely permitted; other technologies are permitted experimentally on a very limited basis.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Essentially, none; all residential systems must drain to an absorption field, and there are no requirements for nutrient reduction.

Cost of a conventional *septic system* installation: $3500-$4000; range, $1200-$20,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized)

There are many and/or large areas with problems because of dense development and antiquated systems, some of which presently impact resources. Other areas are anticipated to become problems with further development. A survey conducted by Purdue University indicated that 85% of counties listed a seasonally high water table as a primary limitation for onsite systems, and over 95% listed wetness problems as a major contributing factor in failures. Indiana also has a large number of homes with straight pipes. Specifics include a high growth area around South Bend with unconfined, shallow aquifers; a high growth area around Fort Wayne with very slowly permeable soils and seasonally high water table; a very high growth area around Indianapolis with slow permeability and seasonally high water table; and a high growth area around Madison with steep slopes, shallow bedrock, and fragipan soils. Karst topography marks southern portions of the state.

Reasons for permit denials include poor soils, steep slopes, floodplain situations, seasonally high water table, and bedrock. Well-bounded problematical areas exist; although sometimes it is difficult to separate out the groundwater problems related to agriculture. Critical resource areas include the northern lakes district, and the Ohio and Wabash rivers. Northern Indiana also has very sandy soils, and shallow, unconfined aquifers. Central Indiana has compact glacial till with low permeabilities. Southern Indiana has fragipan and karst topographies. If any municipalities are under enforcement actions, it was not reported. The extension or creation of central facilities is not supported in the smaller counties because of the associated costs, although it is probably the Indiana DEM's preferred solution.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Indiana State Department of Health regulates residential and commercial onsite systems which discharge to soil absorption fields. Administration is transferred to local county or city health departments. Enforcement is described as varying from excellent to barely adequate, depending on county capabilities.

Code was last revised in: 1990.

New revisions in progress? To be adopted when? Yes, 1999; the revision is for the purpose of clarifying and condensing the existing code, and updating load rate tables; technical specifications may be taken out of the code so that they can more easily be revised.

Role of legislature, regulatory agency, and politics: Revision occurs with some, but not overwhelming, resistance.

Management Programs (Answers 3e-3g Summarized)

Cluster systems require management plans. There is indeed a need to systematically remediate older individual systems. In fact, a good first step in Indiana would be to simply identify and correct straight pipe systems, but there appears to be little will to adopt such measures. Likewise, there is need to adopt special planning and management measures in critical resource areas and new developments. Individual county planning commissions vary enormously in their activity and interest. Some counties have been exploring the idea of management concepts, but none have been implemented. At this time, no utilities have expressed interest in system management.

New Technology (Answers 4a-4h Summarized)

With the exception of mound and pressure distribution, code does not readily accommodate or require alternative technology. One exception is constructed wetlands, which may be used for subdivisions. Aerobic units are permitted, but because they still require a normal-sized leach field are not widely used or recommended. Sand filters had been permitted, but are not allowed under current regulations. At-grade systems are considered experimental, and, as with all other experimental systems (including Wisconsin-at-grade), require a set-aside area in the event of their failure. Indiana has no maintenance requirements for onsite systems. If systems are failing, or nonexistent, they must be repaired with an approved, but not necessarily "best available," technology. However, there is no targeted program to accomplish such upgrades. No particular areas of the state are identified with particular types of alternative technologies. Purdue University has an evaluation and demonstration program for new technologies. Cluster systems and package plants are thought likely to play an increasingly important role.

Onsite Funding (Answers 5a-5c Summarized)

There is no program for individual homeowners, although some degree of SRF funding may become available for communities seeking to improve water quality through onsite remediation.

Leadership and Information

State-level agencies, task forces:

- Indiana Dept of Health, Div Sanitary Engineering, 1330 W. Michigan St, POB 1964, Indianapolis, IN 46206.

Local governmental agencies, task forces: NA

Research within governmental agencies: No, but there is a program at Purdue (see below).

Research within universities:

- Purdue University has short-term funding to assess experimental technologies and coordinate the installation and monitoring of several of them; Indiana DOH would be responsible for their long term monitoring. The Purdue group has also been building a database on onsite permitting data in Indiana. (Contact: Dr. Don Jones, Dept of Agricultural and Biological

Engineering, Purdue University, West Lafayette, IN 47907; tel 765-494-1178, fax 765-496-1356; eml jonesd@ecn.purdue.edu.)

Onsite demonstration programs: See above.

Training or certification programs: No.

Citizen action, private groups: NA

Newsletters, forums, other sources of information: NA

Iowa

Summary

Iowa has about 265,000 systems in the ground (over 100,000 predate any kind of permitting). An estimated 5000 new systems are installed annually; no figures were available on repairs or replacements. Septic problems are spotty and isolated, although poorly percolating clay soils in the southeast often favor alternative systems. Approval of I/A systems lies mainly with county sanitarians, and may be added to the code on recommendation of the same. About 10% of new systems (and a higher percentage of replacements) are reported to be alternative. Maintenance contracts and effluent monitoring are required of alternative systems, which are basically discouraged. Aside from new developments, there are no plans for special management measures although Scott County is considering the creation of management entities. Currently there is no research in government or academic institutions, no demonstration programs, and no betterment loan programs. Certification for septic haulers is required at state level. All other training and certification programs are local and voluntary.

Numerical Information

Total number of onsite systems: Estimated as 100,000 permitted and 100,000 that predate permitting; U.S. census reports 265,000.

Number of new systems installed each year: 5000 estimated.

Failure definition: For conventional systems, surfacing of effluent; for alternative systems, failure is based on effluent testing for CBOD.

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): The overall proportion of alternative systems is estimated at about 10%; this proportion could be higher for replacements, and is definitely higher for new systems.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Very few.

Cost of a conventional *septic system* installation: $3500-$4000; range, $1000-$12,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $8000 to $15,000; this figure is based on the per unit cost of a new system, not on the tie-in cost to an existing system.

Present Onsite Status (Answers 2a-2f Summarized)

Several urban areas in the state are thought to have problems with dense, antiquated systems, and there are other areas where resources are jeopardized. These problems are expected to increase with future development. The concern is chiefly with contamination of surface waters and public health threats. Moving east to west across the center of the state, areas around the cities of Davenport, Cedar Rapids, Iowa City and Des Moines are marked by high-density rural subdivisions without sewers. Southern parts of the state are marked by poor clay soils where alternative systems are commonly employed. Permits have been denied because of high groundwater, soil limitations, shallow bedrock, or floodplain situations. Failures have been attributed to poor or inadequate design or construction, and high water table. For the most part the problems are isolated, however, and no large areas in the state have been indicated as having severe problems. The creation or extension of sewers is generally supported by the state, but is not always technically or economically feasible; a lot of recent development is outside of sewer service areas.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is developed at state level, but enforced by county or city health departments or boards of health, which have considerable freedom. Enforcement is reported to be spotty, ranging from good to nonexistent, depending on the county.

Code was last revised in: 1997-98.

New revisions in progress? To be adopted when? New code having recently been revised, there is no anticipated date for further revisions.

Role of legislature, regulatory agency, and politics: The last round of revisions did not experience significant political resistance.

Management Programs (Answers 3e-3g Summarized)

There is need to systematically remediate systems in specific areas, and to possibly impose special management or planning requirements. For new developments, special planning measures are required. Scott County, and perhaps other counties as well, are considering management districts or utilities. Inspection at time of title transfer is often required by banks, and is also required by some counties. It is also reported that rural water associations have taken on O/M responsibilities in some locales; that this seems to be working; and that the number of such programs is likely to increase.

New Technology (Answers 4a-4h Summarized)

Present code accommodates, but does not in any circumstance require, the use of alternative technology, although it may be employed on otherwise undevelopable lots. Approval of I/A technology lies mainly with the county sanitarian. Addition of new technologies is authorized through amendment to the regulations on the recommendation of county sanitarians and approval

by the state. Likewise, allowances for enhanced treatment lie chiefly with the county sanitarians. The use of I/A technologies is not encouraged because maintenance and upkeep are difficult to ensure. Nevertheless, sand filters, mounds, pressure dosing and aerobic systems are all used in Iowa; such alternatives account for about 10% of ISDSs. Sand filters are in fairly widespread use in a southerly and easterly belt. Pressure dosing and aerobic systems are also becoming more common. Use of mound systems is minimal. Maintenance contracts and effluent monitoring are required of alternative systems. Best Available Technology may be but is not automatically required of upgrades. The role of package plants and particularly cluster systems is reported to be small but increasing, especially in small but unsewered communities with demonstrable problems.

Onsite Funding (Answers 5a-5c Summarized)

There are no widespread betterment loan programs for septic system upgrades, except through rural assistance programs. It is reported that financial assistance programs for "sewer avoidance" upgrades would be attractive.

Leadership and Information

State-level agencies, task forces:

- Iowa Dept of Natural Resources, Water Supply Section, 502 E 9th St, Des Moines, IA 50319 (contact: Brent Parker, Environmental Engineer; tel 515-281-7814, fax 515-281-8895; eml bparker@max.state.ia.us).
- Midwest Assistance Program, P.O. Box 261, Fort Madison, IA 52627 (contact: H.B. Calvert, Rural Development Specialist; tel 319-372-1898, fax 319-372-0850; eml hcalvert@interl.net).

Local governmental agencies, task forces:

- Some counties, Scott County in particular, are looking at the possibility of management entities.

Research within governmental agencies: None.

Research within universities: None.

Onsite demonstration programs:

- In the past there have been demonstrations of sand filters, mounds, and constructed wetlands; whether there are current programs was NA.

Training or certification programs:

- There are voluntary training programs for sanitarians at community colleges and at the annual meeting of the Iowa Environmental Health Association.
- Certification is required at state level for septic haulers.

Citizen action, private groups:

- Yes, “several and significant;” further details NA.

Newsletters, forums, other sources of information: NA

Comments

“Follow-up mandates need to be incorporated into onsite programs. No matter what type of system is used, there must be the means of assuring proper O & M, as well as educational material to teach residents how to care for their systems. Water conservation measures are too often overlooked as well.”

Kansas

Summary

Kansas has over 200,000 systems in the ground, installs about 5000 new systems annually, and repairs or replaces about 2500 systems annually. About 10% of the latter involve alternative technology, but very few involve advanced technology. There are many and large problem areas, often associated with the widespread distribution of cesspools, and much current development is occurring outside of sewer districts. Poor onsite conditions include floodplains, shallow water table, tight soils, steep slopes, and shallow bedrock. Several communities are under enforcement actions. Generally the state supports the creation or extension of sewers when problems develop. There are limited provisions for I/A technologies in the code, and they can be used on otherwise undevelopable sites. They are treated as variances, and variously conditioned locally. While there is a need to systematically remediate onsite systems in some areas, any initiatives to do so would need to come locally, and, in fact, several jurisdictions are considering the establishment of onsite districts, or at the least a requirement for renewable operating permits. There is not a well developed protocol for testing and authorizing new technologies, although Kansas State University is conducting demonstration and research projects with constructed wetlands, sand filters and aerobic units. Training is offered, but not required, by the state, although several counties require training and certification. A small flows professional association was formed in 1998.

Numerical Information

Total number of onsite systems: About 250,000, 1990 U.S. Census reports about 195,000.

Number of new systems installed each year: About 5000.

Failure definition: Surface expression of wastewater, nuisance conditions, failure to meet separation distances.

Number or proportion of systems presently failing: For systems installed before 1980, probably 75%; systems installed since then probably have a failure rate of 10-15%. Failure rates are highest in the east, and lowest in the west.

Number or proportion *repaired* annually: About 2000.

Number or proportion *replaced* annually: About 1000.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): 10%.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Less than 1%.

Cost of a conventional *septic system* installation: $3500; range, $850-$15,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $7000-$15,000.

Present Onsite Status (Answers 2a-2f Summarized)

There are many scattered and sometimes large problem areas due to antiquated systems (including many cesspools) or dense development, and several problem areas where there are poor soils or critical resource issues. Some of these areas are fairly well bounded geographically. Small lake developments have posed problems. Future development is expected to aggravate the problems, as most growth is occurring outside of sewered areas. Some specifics: In the western two-thirds of the state, there are groundwater quality problems. In the eastern third, surface water quality is the problem. On the eastern border, the area surrounding Kansas City is marked by development pressure and has poor soils and surface water problems. To the south, development pressure, with groundwater problems and a high portion of private wells, marks the surrounds of Wichita.

Reasons for failing systems include cesspools, small lots, age, high groundwater, improper construction or size, and poor maintenance. Reasons for denying permits include tight soils, high water tables, shallow bedrock, and floodplains. Chief concerns include bacteria, nitrate levels in groundwater, and vulnerable surface- and groundwater resources. These are aggravated by wet weather and flooding. There are several communities under enforcement actions (further details NA); and generally the extension or creation of central facilities is supported by the Kansas Department of Health and Environment (KDHE). Onsite systems are not permitted if sewer tie-ins are available. However, costs in problem areas tend to be relatively high; and many remaining unsewered communities have low income and low property values.

Anticipated Changes in Regulations

Who administers, enforces onsite code? The state sets minimum onsite standards, which are codified and enforced by city, city/county, or multi-county health departments. Some counties have no health departments, in which case the KDHE assumes responsibility for enforcement. Counties, as well as smaller communities, have the option to adopt more stringent regulations. In general, enforcement is reported to be inadequate, but variable, depending on county.

Code was last revised in: March, 1997 (minimum state standards, not a full code).

New revisions in progress? To be adopted when? There is no set time frame for revision, but further state revisions are expected in the year 2000. Several counties are presently working on code revisions.

Role of legislature, regulatory agency, and politics: KDHE makes minimum standards for the state; counties, through sanitary codes, do most of the permitting, inspecting and enforcing. Legislative approval is required of state revisions; but stricter minimum standards do not enjoy widespread legislative support. At county level, affluent counties are more supportive of code upgrades than rural counties with declining populations.

Management Programs (Answers 3e-3g Summarized)

In most counties, construction inspection and inspections at title transfer are required. While the state sees the need to systematically remediate older systems in some areas, there is presently no active effort to so. Likewise, there clearly is a need for better wastewater planning and/or active onsite management in certain older, densely developed areas, critical resource areas, and new developments. However, such initiatives would have to come locally. Some jurisdictions are considering the establishment of management districts, or, at the least, requiring annual operating permits for alternative systems, but no such provisions have yet been established. There is, reportedly, some interest on the part of electric cooperatives or other utilities in managing O/M programs.

New Technology (Answers 4a-4h Summarized)

Present code accommodates, but only in the future may sometimes require, the use of alternative systems. There are currently no requirements to use Best Available Technology for remediations. Alternative or advanced systems may be used on otherwise undevelopable sites through limited provision for I/A technologies in county codes, which are treated as variances to be approved locally. Sand filters, mound systems, aerobic systems, lagoons, chambered systems, constructed wetlands, low-pressure pipe, and stabilization ponds have all been permitted locally. At present there is no systematic method to test and approve new technologies, although that may come with revisions to the code. There is a state review committee that provides guidance for the counties, but most sanitarians and contractors are not experienced with alternatives. Package plants and cluster systems have only a limited role, but it is thought that they will play a larger role in the future.

Onsite Funding (Answers 5a-5c Summarized)

There is limited support through EPA nonpoint pollution control funds, but no betterment programs per se. Some nonpoint funding also flows through the state's Conservation Commission to county conservation districts.

Leadership and Information

State-level agencies, task forces:

- Kansas Dept of Health and Environment, Bureau of Water, Forbes Field, Bldg 283, Topeka, KS 66620 (contact Debra Baker, Environmental Scientist; tel 785-296-1683, fax 785-296-5509; eml dbaker@kdhe.state.ks.us).
- The Kansas Small Flows Association advises the state and counties.
- Kansas Water Office.
- Kansas State Conservation Commission.

Local governmental agencies, task forces: NA

Research within governmental agencies: Through university and county contracts.

Research within universities:

- Kansas State University is conducting demonstration and research projects with constructed wetlands, sand filters, and aerobic units: Kansas State University, Biological and Agricultural Engineering, 237 Seaton Hall, Manhattan, KS 66506; (contact: Barbara Dallemand, Assistant Extension Specialist/Onsite Wastewater, tel 785-532-2934, fax 785-532-6944, eml bdallem@bae.ksu.edu).

Onsite demonstration programs: See above.

- Also, a few counties have built specific demonstration and pilot projects.

Training or certification programs:

- There are no specific state requirements for training or certification, although training is offered by the state. Some counties require training through continuing education courses and proficiency exams.
- Kansas State University provides training (contact Barbara Dallemand, see above).

Citizen action, private groups:

- Kansas Association of Sanitarians (KAS).
- Kansas Small Flows Association (KSFA).

Newsletters, forums, other sources of information:

- KDHE publishes a water quality newsletter that covers nonpoint pollution, and also has a website that covers onsite issues.
- KAS publishes a newsletter.
- KSFA publishes a newsletter.
- Several counties publish newsletters concerning onsite issues, further information, NA.

Kentucky

Summary

Kentucky has about 720,000 systems in the ground, and installs another 20,000 per year, perhaps 15-20% unpermitted. No numbers were available on repairs or replacements. Poor physiographic conditions are scattered throughout the state and include mountainous terrain, karst topography, clayey soils, and shallow water tables. Many systems predate permitting requirements. While no communities are under enforcement actions, there is a need for systematic remediation or special management measures in some areas, and a few jurisdictions have begun to consider such steps. Alternative technology is permitted under tight variances granted directly by the state, and requires a management plan. It accounts for less than 5% of systems, and its use is not widely promoted. There are limited loan programs for onsite upgrades, research programs at three colleges or universities, at least two demonstration projects, and a Kentucky Onsite Wastewater Association. The state runs a certification program for installers and inspectors.

Numerical Information

Total number of onsite systems: About 720,000, some 44% of the state; 1990 U.S. census reports 600,000 systems.

Number of new systems installed each year: 16,000-17,000 (and perhaps as much as another 15-20% that are unpermitted).

Failure definition: Surfacing sewage, groundwater contamination, or noxious odor.

Number or proportion of systems presently failing: NA, but there are many unapproved systems, including straight pipes.

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Less than 5%, mostly wetlands or drip irrigation; there are a few (of the order of 100/yr) mound and aerobic systems.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Very few, essentially zero.

Cost of a conventional *septic system* installation: $2500-$3500; range, $1500-$10,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $5000-$7000, but highly variable, in the full range of $1000-$10,000.

Present Onsite Status (Answers 2a-2f Summarized)

There are many, occasionally large or bounded, areas posing problems due to dense development and antiquated systems, and more areas are expected to become problematical with future development. (Most counties report population increases outside of sewered areas.) Much of southwestern Kentucky is marked by a shallow water table, as well as by small lots. Central and north-central areas of the state are marked by karst topography, tight soils, or shallow fragipan clays. Steep slopes, shallow rock, and many antiquated or unapproved systems mark the eastern Appalachian area. Permits have been denied because of excessive slopes, high water tables, and floodplain situations. Failures have been attributed to clogged leach fields, age, damage, poor design or construction, and wet weather. No municipalities are currently under enforcement actions. Generally, the extension or creation of central facilities is supported; when it is opposed, it is because of annexation/taxation fears.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is created at state level by the Kentucky Dept. for Public Health, and enforced by local county, city or district health departments.

Code was last revised in: Last major revision was in 1989; in 1992 farmstead exemptions for onsite systems were discontinued; the last minor revisions were in 1995.

New revisions in progress? To be adopted when? Yes, in 1999; strong leadership for significant change is expected at state level; reaction at local levels could be more problematical and mixed.

Role of legislature, regulatory agency, and politics: Major changes require legislative review; the legislature is thought to support revisions to present code.

Management Programs (Answers 3e-3g Summarized)

Presently enforcement is complaint driven, with cases rather routinely dismissed; enforcement is not considered to be adequate. It is thought that there is a need for special onsite planning and management in certain older developments as well as in new ones where conditions are poor. At present, however, there are no firm plans to systematically remediate older systems in any location, or to establish management districts or utilities for ISDS systems. However, these ideas have been discussed in several communities. In particular, there is an emerging program in the Appalachian area of eastern Kentucky to address the unique problems there. Cluster systems do require a management plan, but neither they, nor package plants, are expected to play a large future role. At this time, all onsite systems installed, constructed, altered or repaired shall be inspected by a Certified Inspector. All new construction requires an approved onsite plan and system inspection before the building is electrically powered.

New Technology (Answers 4a-4h Summarized)

Present code accommodates, and sometimes requires, alternative technology, which can be used on otherwise undevelopable lots. Alternative technology is approved at state level; and when employed is granted variances on a case-by-case basis. Such systems are tracked and evaluated periodically. Some types of systems require maintenance contracts. Experimental permits are also allowed, and with a successful track record may be allowed for more general use; their employment requires a management plan. Best Available Technology is not necessarily required of remediations, but may be. The most common alternatives are drip irrigation and constructed wetlands; but leaching chambers, mounds, gravelless pipe, evapotranspiration lagoons, package plants and aerobic systems have also been employed. Alternative technology is not widely promoted because of the higher degree of expertise required to install and maintain such systems, but as its cost and complexity diminishes, it could be expected to see more widespread use because of development pressure in areas not well suited to conventional treatment.

Onsite Funding (Answers 5a-5c Summarized)

There are limited loan programs for system remediation, but which don't tap SRF funds. It is not clear if the political climate favors the expansion of such programs.

Leadership and Information

State-level agencies, task forces:

- Kentucky Dept for Public Health, Division of Public Health and Safety, Environmental Management Branch, 600 Hopkinsville St, Princeton, KY 42445. (Presently the Health Inspection Program is being reorganized, further information NA.)
- Environmental Quality Commission.

Local governmental agencies, task forces:

- Some counties are beginning to systematically gather data on the performance of experimental systems, further information NA.

Research within governmental agencies: See below.

Research within universities:

- Wetlands studies are in progress at Kentucky State University, the University of Kentucky, and Morehead State University.

Onsite demonstration programs:

- Letcher County, in eastern Kentucky, hosts a demonstration program.
- Money has been appropriated for KOWA (see below) to build a demonstration site.

Training or certification programs:

- The state provides certification programs for installers and inspectors.
- Kentucky technical vocational schools provide CEUs for Certified Installers.
- KOWA (see below) runs the Kentucky Onsite Training Center; contact: Harry Nurse, Education Chairman/KOWA, 10409 Watterson Trail, Louisville, KY 40299; tel 502-267-1222, fax 502-267--8801; eml hnurse@zabel.com.

Citizen action, private groups:

- Kentucky Onsite Wastewater Association (KOWA); contact: Wes Combs, President, tel 502-564-4856, fax 502-564-6533.
- Matthew E. Byers, Onsite Research/Development Manager, Zoeller Pump Company, POB 16347, Louisville, KY; tel 800-928-7867 x163, fax 502-774-3624m eml mattb@zoeller.com.

Newsletters, forums, other sources of information:

- KOWA publishes a newsletter.

Louisiana

Summary

Louisiana has about 440,000 systems in the ground, about half of which are thought to be unpermitted cesspools or straight pipes. Some 18,000 new systems are installed annually, and some 15,000 are repaired or replaced annually. Problems are widespread due to the low elevation of much of the state, and corresponding wetness and high water tables. Contamination of both surface and ground waters is of concern, and several communities are under enforcement actions. Alternative technology is in widespread use (following NSF standards), and may account for up to 95% of replacement systems. All alternatives require management plans; communal systems are overseen directly by the state. Several parishes have provisions for periodic inspection of all systems. There are no loan programs for upgrades, and no government or academic research, or demonstration projects at this time. Installers are required to attend a one-day training course every five years.

Numerical Information

Total number of onsite systems: 200,000 permitted systems, an unknown number of unpermitted systems; 1990 U.S. census reports 440,000 systems or cesspools.

Number of new systems installed each year: 18,000.

Failure definition: Dependent on type of system.

Number or proportion of systems presently failing: Virtually all of the unapproved systems; information NA for approved systems.

Number or proportion *repaired* annually: About 5500.

Number or proportion *replaced* annually: About 9000.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Estimated to be 95%.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Very few.

Cost of a conventional *septic system* installation: $1500-$2500; range, $1000-$5000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized)

There are presently many and/or large problem areas associated with dense development and antiquated systems, some of which are affecting the quality of surface- and groundwater, and some of which are physiographically well-bounded, although no map was provided. More areas are expected to become problematical because much new development is outside of sewer service areas. Permits have been denied because of poor soils, poor drainage, and flood zone situations. In addition to failure by definition (cesspools or straight pipes), failures have been attributed to high water tables, age, improper design or construction, and poor soils. Several municipalities are under enforcement actions, further details NA. Generally, the state supports the creation or extension of central services when feasible.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is created at state level, and voluntarily adopted by parish health departments, or by local offices of the state Department of Health and Hospitals (DHH). Individual parishes have considerable latitude to strengthen state minimum code. Enforcement is reported to be adequate in only those parishes which have enacted a permit system requiring precover inspections.

Code was last revised in: 1996.

New revisions in progress? To be adopted when? Revisions are made as needed, the next round was expected in 1998.

Role of legislature, regulatory agency, and politics: Legislative adoption of code is required.

Management Programs (Answers 3e-3g Summarized)

The state does not perceive of the need to systematically remediate systems, or to impose special planning or management requirements, in any locale. Parish rules vary, but most have an ordinance requiring that a permit be secured from the local offices of the state DHH. Some parishes have periodic inspection requirements for all systems. There is no reported interest on the part of utilities for running O/M programs.

New Technology (Answers 4a-4h Summarized)

Present code accommodates, and may require, alternative or advanced systems in particular situations; and development may be permitted on otherwise unsuitable sites when effective alternatives are employed. No areas in the state are linked to particular technologies. I/A technologies are treated as “mechanical systems.” They, as well as communal systems, require a management program. The latter are overseen directly by the state DHH. Alternative, or advanced, systems must meet NSF standards. Systems in use include sand filters, mounds, package plants, aerobic systems, oxidation ponds, rock reed filters and lagoons. There is no requirement to remediate failing systems using Best Available Technology. There are mechanisms to test and authorize new technologies, further details NA. The use of I/A technologies is not discouraged provided applicable provisions of the state sanitary code are met;

thus, it could be expected that as their cost diminishes, their employment will grow. Package plants and cluster systems reportedly play a large role in the state because of historically small lot sizes, soil conditions, and high ground water.

Onsite Funding (Answers 5a-5c Summarized)

There are no local or state-level loan programs for remediation, and it appears there are few prospects for such programs because of a very limited state budget.

Leadership and Information

State-level agencies, task forces:

- Louisiana Dept of Health and Hospitals, Office of Public Health, Sanitarian Services, 106 Canal Blvd, Thibodaux, LA 70301 (contact: Teda Boudreaux, Sanitarian Program Administrator; tel 504-449-5007, fax 504-449-5011).
- Governor's Task Force, a committee of industry and public health officials; further information NA.

Local governmental agencies, task forces: NA

Research within governmental agencies: None.

Research within universities: NA

Onsite demonstration programs: None.

Training or certification programs:

- State-level rules require installers to attend an 8-hr training course given by the Office of Public Health and the University of Southwestern Louisiana; this course must be repeated every five years.

Citizen action, private groups:

- Barataria Estuary Program in association with Nicholls State University.

Newsletters, forums, other sources of information: NA.

Maine

Summary

Data were somewhat sparse for Maine, and few conclusions could be drawn. No areas of the state are thought to require targeted remediations or special management measures. Code accommodates several types of alternative systems, but they require state approval on a case-by-case basis, as well as backup designs and space. There are state funds available to towns to establish remediation loan programs if they wish. There is little in the way of state or academic research, and no demonstration projects. State certification is required of site evaluators, designers, inspectors and pumpers. This year a voluntary program training and certification will be established for installers. There is also a Maine Association of Site Evaluators, and Maine participates in the Northern New England Wastewater Training Center.

Numerical Information

Total number of onsite systems: 500,000+.

Number of new systems installed each year: About 35,000 (there is some question about the accuracy of this figure).

Failure definition: Effluent outbreak, ponding, plumbing backup; contamination of nearby wells.

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): NA

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Very few, <1%.

Cost of a conventional *septic system* installation: $6000-$10,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized)

A 1993 study of the performance of subsurface systems indicates that the maximum projected life of all systems installed in Maine is 65-70 years, with about half of them failing in the first 50 years. Stone bed systems fare slightly better than chamber systems, which are installed in

more difficult situations involving shallow bedrock or poorly drained soils. The use of chamber-type systems has increased to 35-40% of new installations, perhaps reflecting the diminution of more suitable sites. Little additional statewide information is available on Maine. But problems are reported as scattered and not large in areal extent.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Maine Dept of Human Services, Division of Health Engineering (DHE) promulgates regulations, which are enforced by municipally appointed plumbing inspectors. Enforcement is reported to be variable, with some communities doing an excellent job; others are lax with respect to violations, if not permitting. The state is undertaking a program to follow up on municipal performance with respect to regulations.

Code was last revised in: 1998.

New revisions in progress? To be adopted when? The state holds public hearings every year to determine whether updates or revisions need to be made. 1998's revisions went into effect in May.

Role of legislature, regulatory agency, and politics: NA

Management Programs (Answers 3e-3g Summarized)

At present systems are inspected at the time of construction. It is reported that there may be need for special management measures in both old and new developments. Nevertheless, no such measures are presently contemplated. No management districts are being considered, and there are no reports of utility or rural cooperative interest in O/M management.

New Technology (Answers 4a-4h Summarized)

Present code accommodates, but does not ever require, alternative systems. Alternative or I/A designs require DHE approval, and typically require backup designs and space. They are approved on a case-by-case basis and, if approved, are listed as experimental systems while a body of experience with them grows. Operation and maintenance stipulations are made. Depending on the information collected, such systems may be upgraded to general use. No alternatives have been linked to physiographic provinces in the state, and BAT is not required of upgrades. If the cost of alternative systems diminished, their use could be expected to increase. Cluster systems and package plants play only a small role, but that role is expected to increase in order to replace dense areas of malfunctioning systems or overboard discharges, particularly along the coast where the idea is to reopen closed clam flats, etc.

Onsite Funding (Answers 5a-5c Summarized)

Maine DEP provides funds to towns for the purpose of setting up remediation loan programs as they see fit.

Leadership and Information

State-level agencies, task forces:

- Maine Dept of Human Services, Bureau of Health, Division of Health Engineering (DHE) (contact: James A. Jacobsen, Program Manager, Wastewater and Plumbing Control; tel 207-287-5695, fax 207-287-4172; eml james.jacobsen@state.me.us).
- Maine Land Use Regulation Commission; tel 207-287-2631.
- Maine Dept of Environmental Protection (DEP).

Local governmental agencies, task forces: NA

Research within governmental agencies: None.

Research within universities: None.

Onsite demonstration programs: None.

Training or certification programs:

- DHE licenses Site Evaluators (system designers).
- DHE and the State Planning Office certify Local Plumbing Inspectors.
- Certification is also required of pumpers.
- A voluntary program to train and certify installers is slated to be started in cooperation with the Maine DEP.
- The Maine Joint Environmental Coordinating Committee (JETCC) offers continuing education in cooperation with the Northern New England Wastewater Training Center (see Vermont). Locally: JETCC, 2 Fort Rd, South Portland, ME 04106.

Citizen action, private groups:

- There are numerous lake associations throughout the state, further information NA.
- Maine Association of Site Evaluators (MASE); (contact Mark Cenci, President, Sweet Associates, 155 Gray Rd, Falmouth, ME 04105).
- Albert Frick Associates, Inc., Soil scientists, site engineers, 95A County Rd Gorham, ME 04038; (contact: Albert Frick, tel 207-839-5563, fax 207-839-5563, eml albertfrick@worldnet.att.net).

Newsletters, forums, other sources of information:

- DHE web site: www.state.me.us/dhs/boh.
- There is a MASE newsletter (see above).

Comments

"Much of the information requested in this survey is not systematically tracked, thus was not available, or is only estimated." [Editor's comment: presumably for the same reason, Maine did not respond to the Small Flows survey either.]

A comment with respect to the Scoping Project maps: "the low density (1-5, 5-10, and 10-15) projected new septic systems depictions are very inaccurate if housing starts are equated with septic systems. Better information could be obtained from the Maine Land Use Regulation Commission."

Maryland

Summary

Maryland has about 350,000 onsite systems in the ground, installs some 7500 annually, and repairs or replaces about 5000 systems annually, of which up to 50% are alternative. However, alternative technologies are permitted only on a case-by-case basis, and must have management plans. Isolated areas have reported problems with elevated nitrogen in private wells, but the resource most in jeopardy in Maryland is the Chesapeake Bay and its shellfish beds. Here special management measures, such as targeted remediation, have been introduced. State policies attempt to control sprawl and steer new development where infrastructure, including sewers, is in place or planned. Management entities or utilities are required of cluster systems, the Mayo Water Reclamation Subdistrict (Anne Arundel County) being one that has received national attention. There is limited funding available to help owners with upgrades. There is a nebulous state program for testing new technologies, but no university research. Anne Arundel County participates in a National Demonstration Project. Installers of mound systems, and other alternatives, are state-certified, and the state runs training programs for soil and site evaluation, design and construction.

Numerical Information

Total number of onsite systems: About 350,000 (1990 U.S. census reports About 343,000).

Number of new systems installed each year: About 7000-8000.

Failure definition: Effluent surfacing, or contaminating drinking water supplies or surface water.

Number or proportion of systems presently failing: About 3000-4000.

Number or proportion *repaired* annually: About 2000-3000.

Number or proportion *replaced* annually: About 2000-3000.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Approximately 50%; (20% sand filters, or recirculating sand filters; 20% sand mounds, fewer than 10% drip irrigation systems).

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): None required.

Cost of a conventional *septic system* installation: $3000-5000 for a conventional drainfield system, up to $10,000 for a mound system.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): About $10,000.

Present Onsite Status (Answers 2a-2f Summarized)

There are isolated areas in the state where nitrate levels in private wells are high because of older systems in densely developed areas. There are other areas, particularly around Chesapeake Bay, where shellfish beds are in jeopardy, or where nitrogen loading is a problem. The Bay, and particularly shellfish harvesting areas within it, are being targeted for a higher level of inspection and enforcement. In general, state policy is attempting to control sprawl by concentrating development in areas with existing infrastructure. In areas designated for growth, the creation or extension of central facilities is supported. It isn't anticipated that future growth will cause problems with onsite systems because they wouldn't be permitted in this circumstance.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is made at state level; county health departments enforce state onsite regulations; and may make tighter regulations, as, e.g., has Anne Arundel County, on Chesapeake Bay. The City of Baltimore has its own Health Department.

Code was last revised in: October, 1992; the last major revision was in 1985.

New revisions in progress? To be adopted when? Revisions occur every few years on no set time schedule. At this time the perception is that the code is adequate.

Role of legislature, regulatory agency, and politics: See above**.**

Management Programs (Answers 3e-3g Summarized)

There are resource areas where systematic remediation is required, and where special management or planning requirements are in place. In particular, shellfish harvesting areas are being targeted for a higher level of inspection and enforcement. Management entities or utilities are required of cluster systems, the Mayo Water Reclamation Subdistrict (on Mayo Peninsula in Anne Arundel County) being one that has received national attention.

New Technology (Answers 4a-4h Summarized)

Alternative technologies may be permitted on an individual basis, chiefly for repairs or replacements to failing systems, but occasionally for sites unsuitable for conventional systems. In all such cases, more involved site evaluation, design review and construction inspections are required. These systems are also monitored. Alternative systems include mounds, aerobic systems, bermed infiltration ponds, drip irrigation, constructed wetlands, low pressure distribution, and Infiltrator. Currently the state is considering requiring Best Available Technology for system remediation. There is a nebulous state program for testing new technologies. Alternative technologies might be more widely recommended as the cost comes down.

Onsite Funding (Answers 5a-5c Summarized)

There is limited state funding available to assist owners in replacing failing systems; so far, EPA funds are not involved.

Leadership and Information

State-level agencies, task forces:

- Maryland Dept of Environment, Water Management Administration, 2500 Broening Hwy, Baltimore, MD 21224 (Contact: Mr. Jay Prager, Chief, Onsite Sewerage & Water Supply; tel 410-631-3780, fax 410-631-3163).
- State Water Quality Action Committee's Onsite Wastewater Disposal Subcommittee.
- Maryland Citizens *Pfiesteria* Action Commission.

Local governmental agencies, task forces:

- Anne Arundel County contains the Mayo Water Reclamation Subdistrict on Mayo Peninsula, a much-cited management entity; the county also participates in the National Onsite Demonstration Project (contacts: Richard Piluk, Anne Arundel County Health Dept; Robert Kraft, Mayo Peninsula Project).

Research within governmental agencies:

- The state monitors performance of alternative systems, further information NA, except that Jay Prager (see above) had done a study of existing LPP system performance.

Research within universities: None.

Onsite demonstration programs:

- Anne Arundel County is part of the National Onsite Demonstration Project, and is evaluating a number of new technologies; see contact above.

Training or certification programs:

- There is a state-run program to certify installers of mound systems, and there are training programs for soil evaluation, site evaluation, design and construction.

Citizen action, private groups: NA

Newsletters, forums, other sources of information:

- The Maryland Dept of Environment conducts an annual groundwater symposium.

Comments

An obvious first step in improving onsite performance would be to require truly watertight tanks, a simple problem and simple solution that don't receive enough attention. Were this done, the difference in cost between "conventional" and "alternative" systems would diminish anyway.

Massachusetts

Summary

Massachusetts has about 660,000 systems in the ground, of which as many as 25% can be considered "failing" by current code. Information was not available on the annual number of new systems, or repairs and replacements. Dense development and antiquated systems pose problems in urban areas outside the sewer lines. Of particular concern are the coast, Cape Cod, and the islands of Martha's Vineyard and Nantucket, where shellfish beds have been closed, and where nitrogen loading may be a problem. Code accommodates alternative systems under a 3-tiered process of increasing generality, and in some circumstances requires denitrifying systems in coastal areas. However, alternatives are not in widespread use. Each type of system has management and maintenance provisions attached to the permit. A number of communities are under enforcement actions, the preferred solution still being that of centralization. However, there are several institutional possibilities for establishing onsite districts or utilities, and their creation is being planned in a handful of communities. Several small, limited-purpose districts already exist. There are several types of betterment and loan programs available to the towns, some research at the University of Massachusetts, and several demonstration projects in the state. The state certifies system inspectors, and contracts for soil evaluation courses through UMass. Several citizens groups, or NGOs, are also involved in onsite issues.

Numerical Information

Total number of onsite systems: About a third of dwellings; 1990 U.S. census reports about 660,000.

Number of new systems installed each year: NA

Failure definition: Failure to protect the public health and safety, or the environment.

Number or proportion of systems presently failing: About 25%, many "by definition" because they do not meet current code requirements.

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): This information is not systematically collected, but it is thought that relatively few alternative systems are employed.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Relatively few.

Cost of a conventional *septic system* installation: $7000, but ranging from $4750 to $15,000; broadest range, $1500-$80,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized)

There are isolated areas in the state where dense development and older systems pose public health problems such as shellfish bed closures, particularly in coastal, or other, vacation areas where summer homes are being converted to year-round use. There are also large bounded areas, particularly Cape Anne, Cape Cod, and the islands of Martha's Vineyard and Nantucket, where there are incipient nitrogen loading problems that could threaten estuaries with eutrophication. Among the cities to the north and west of Boston, sewering is ongoing in Chelmsford; Tewksbury may be sewering. However, in most of these towns there is much new residential development that is likely to happen without sewering.

Generally, it is thought these problems have been brought under control by new (1995) onsite regulations, and by enforcement actions. Permits have been denied because of poor soils, high ground water, inadequate setbacks, coastal proximity, wetlands, shallow ledges, poor drainage, poor design. Failures have been attributed to poor design, age, cesspools, straight pipes, high groundwater, improper installation, damage, and saturated absorption fields. A number of communities are under enforcement actions, including the coastal city of Gloucester on the North Shore, and the towns of Tisbury and Oak Bluffs on Martha's Vineyard. The creation of wholly new, large-scale central wastewater treatment systems is thought to be problematical. Nevertheless, sewer extensions and community-scale package plants are regarded as viable options for communities. Boston and its suburbs are in the middle of an extensive refurbishment of sewage treatment and outfall extension.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is made at state level, with enforcement left to city, town or district health departments or boards of health. Local communities may adopt stricter regulations. Enforcement is reported to be adequate for the most part.

Code was last revised in: 1995.

New revisions in progress? To be adopted when? There is no set time frame for code updates; minor revisions (mainly pertaining to tax relief for upgrades) are expected in 1998.

Role of legislature, regulatory agency, and politics: Legislative influence on rule-making has tended in the direction of making code somewhat more lenient. Legislative influence has also slowed the process of code revision. However, it is legislative action that has made loan money, and tax relief, available for upgrades.

Management Programs (Answers 3e-3g Summarized)

All systems require plan review and construction inspections; preexisting systems are inspected at time of title transfer, and, if failing, require demonstrated repairs or replacements. Communal systems require annual inspections. There are several institutional possibilities for establishing wastewater management districts in the state, and several communities are considering

management programs in lieu of centralization. One such district, the Tri-Town Groundwater Protection District on Cape Cod, already exists albeit in weakly constructed form. (Basically, it simply calls for municipal inspection and pumping at periodic intervals.) The town of Wayland is in the process of forming a management district. The towns of Tisbury and Oak Bluffs (under enforcement action) are examining the district concept. The town of Barnstable, on Cape Cod, manages the Red Lily Pond Development communal system. The City of Gloucester is developing a comprehensive wastewater plan which will include city-run STEP systems, city-run inspection of ISDSs, and the stipulation in some areas for advanced technology. There are not reports of interest on the part of utilities to run O/M programs.

New Technology (Answers 4a-4h Summarized)

Present code accommodates alternative technologies, and in coastal areas requires nitrogen-reducing technologies in some circumstances. In fact, nitrogen-sensitive areas may be more extensively developed if nitrogen-reducing systems, chiefly sand filters and RUCK technology, are employed. I/A technologies are covered under a three-tiered process of increasing generality: piloting (experimental), provisional, and general use. In addition, certain technologies are allowed for remediation. Each system, and tier, has operation, management and maintenance provisions attached to it. Several general use technologies are covered under individual sections of the code; these include aerobic units, recirculating sand filters, drip irrigation, mounds and chamber systems. Other permitted systems include package plants, Eljen in-drain, Bioclere, peat filter, and Eko-Fin. Through the tiered process described above, new technologies may be added to the code. Best Available Technology may be required of some upgrades. Package plants and cluster systems will reportedly play only a small to moderate role in the future.

Onsite Funding (Answers 5a-5c Summarized)

There are several types of betterment loan programs for upgrading septic systems available to towns; some SRF funds are indirectly available to seed these programs. Tax relief legislation for upgrades is also expected in 1998.

Leadership and Information

State-level agencies, task forces:

- Division of Water Pollution Control, Massachusetts Dept of Environmental Protection, One Winter St, 8th Floor, Boston, MA 02108 (contact: John Viveiros, Regional Planner; tel 617-292-5837, fax 617-292-5696).
- Massachusetts also participates in the New England Interstate Water Pollution Control Commission’s Onsite Task Force.

Local governmental agencies, task forces:

- Several boards of health or city health departments are active in onsite discussions (see above for towns considering inspection or management programs).
- The Cape Cod Commission and the Martha's Vineyard Commission both participate in regional wastewater planning discussions involving the individual towns of the Cape and Islands.

Research within governmental agencies:

- See below, under demonstration sites.

Research within universities:

- There is a program at University of Massachusetts, Amherst (Dept of Soil and Plant Science); further details NA.
- University of Massachusetts, Amherst has also completed, under contract with the Mass DEP, a technology guide: *Innovative and Alternative On-Site Wastewater Treatment Technologies Handbook*, by Eric Winkler.

Onsite demonstration programs:

- Barnstable County Health Dept (in conjunction with the Massachusetts DEP) runs an onsite test and demonstration program at the Massachusetts Military Reservation on Cape Cod (contact: George Huefelder, Superior Courthouse, Rt 6A, Barnstable, MA 02630; tel 508-362-2511).
- City of Gloucester has an onsite demonstration program (contact: Gloucester Engineering Dept, 9 Dale Ave, Gloucester, MA 01930; tel 978-281-9773, fax 978-281-9725).
- Waquoit Bay National Estuarine Research Reserve participates in an onsite demonstration program (contact: Christine Gault, Director, WBNERR, Rt 28, Waquoit, MA 02536; tel 508-457-0495, fax 617-727-5537).

Training or certification programs:

- The state administers onsite certification for system inspectors.
- Soil Evaluator courses are contracted through the University of Massachusetts.

Citizen action, private groups:

- The Ad Hoc Task Force for Decentralized Wastewater Management (a non-profit, non-governmental consortium working for better wastewater planning and management programs). Contact through: Marine Studies Consortium, 400 Heath St, Chestnut Hill, MA 02167; tel 617-566-8600, fax 617-566-5231.
- Coalition for Alternative Wastewater Treatment (originally formed to address the problems in Gloucester, but now focused on state and national issues as well). Contact: Valerie Nelson, Ph.D., POB 7041, Gloucester, MA 01930; tel 978-283-7569, fax 978-283-3567.

Newsletters, forums, other sources of information:

- The Ad Hoc Task Force publishes a newsletter for members and interested others (see above).
- Barnstable County publishes a wastewater newsletter.
- The Mass DEP publishes a newsletter and hosts a web site.

Comments

"The risk failure maps in this survey are misleading. Properly designed, installed, and maintained septic systems are neutral with respect to soil type. Using USDA soils data as a basis for assigning septic system risk is an inappropriate use of that information."

Michigan

Summary

Michigan reports about 1,100,000 systems in the ground. About 40,000 new systems are installed annually; information was not available on the annual number of replacements or repairs. There are scattered areas with problems either because of dense development, antiquated systems (including straight pipes and cesspools), or because of unsuitable soils or hydrology. Code for small systems is developed at county level, and most accommodate alternatives, albeit with varying management provisions. Several local health departments have initiated mandatory evaluation programs. There are no state-supported loan programs for upgrades, nor research within government agencies. However, Michigan State University has a research program, and is conducting two demonstration projects. There are several kinds of training programs, but no state-level certification for onsite professionals.

Numerical Information

Total number of onsite systems: 1,000,000 estimated; 1990 U.S. census reports 1,100,000.

Number of new systems installed each year: 40,000, estimated, including repairs.

Failure definition: Varies as per county regulations.

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: See above.

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): NA

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): NA

Cost of a conventional *septic system* installation: $2000-$5000; range, $1000-$15,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized Below)

It is reported that there are some, and sometimes large or well bounded, areas that pose problems because of dense, antiquated systems or unsuitable soils; and that some of these situations jeopardize resources. Other areas will become problematical with future development, much of the growth being in rural areas. The main concerns are a large number of straight pipes or

cesspools; nutrient loading of surface waters; and elevated nitrogen levels in several aquifers. Fast-developing areas include Grand Traverse Bay and Battle Creek, both with already high ISDS densities. This is also true of older cities including Detroit, Ann Arbor, and Pontiac. Lakeshore areas around Grand Rapids have historical problems due to dense development and small lots. Several east-central and southeastern areas have generally unsuitable soils.

Permits have been denied because of high water tables, clay soils, shallow bedrock and floodplain situations. Failures have been attributed to high water table; poor soils; and inadequate design, construction, or maintenance. Information on enforcement actions was not available. It is reported that the creation or extension of sewers is supported in fast-developing areas.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code for single and two-family homes is developed and administered by local county and district health departments, with support/advice from the state's department of Land Division and Local Health Department Support. For larger soil absorption systems, state rules apply, with enforcement left to local health departments as authorized by the Michigan Department of Environmental Quality.

Code was last revised in: Depends on the district or county.

New revisions in progress? To be adopted when? Ongoing, but jurisdiction by jurisdiction.

Role of legislature, regulatory agency, and politics: Legislative adoption is always required, but at the local level.

Management Programs (Answers 3e-3g Summarized)

The state itself perceives the need for systematic management of alternative systems, and a need for special planning or management in old and new developments, as well as critical resource areas. But unless the areas are owned by the state, there are no mechanisms, except advisory, to implement such programs. Several local health departments have initiated mandatory evaluation programs. As part of the Rouge River Watershed Project, a mandatory inspection program is also being proposed.

New Technology (Answers 4a-4h Summarized)

Most county codes accommodate, and may in some circumstances require, alternative technologies, as well as allowing the development of otherwise undevelopable lots with their use. The level and manner of their oversight varies from county to county. Sand filter technology is increasingly in use in areas with slowly permeable soils. Mounds, package plants, aerobic, gravelless, pressure, chamber, Infiltrator, and lagoon systems have all been permitted. Some counties may require the use of Best Available Technology for remediations, but further information is NA. Most counties have some kind of mechanism to test and authorize new technologies. Their use is generally supported when properly applied, so that if costs diminished, more widespread use could be expected. Cluster systems, typically serving 30 homes or less, are gaining popularity in some new developments, and are increasingly used to address existing

problems such as historically developed lakefronts. If there is electric utility interest in O/M programs, it wasn't reported.

Onsite Funding (Answers 5a-5c Summarized)

There are no state-supported programs; information on the individual counties was NA.

Leadership and Information

State-level agencies, task forces:

- Michigan Dept of Environmental Quality, POB 30630, Lansing, MI 48909-8130 (contact: Richard A. Falardeau, P.E., Chief, Land Division and Local Health Dept Support; tel 517-335-8284, fax 517-335-9033; eml falardeauR@state.mi.us).
- Onsite Sewage Treatment Technical Advisory Council.

Local governmental agencies, task forces:

- Local jurisdictions control onsite regulation, and thus are really the centers of activity.

Research within governmental agencies: None.

Research within universities:

- Michigan State University; (contact Dr. Ted Louden, see below).

Onsite demonstration programs:

- Two programs (Benzie County and Rose Hill) are conducted by Michigan State University, further details NA.

Training or certification programs:

- Michigan Training Center, Michigan State Univ, Farrall Hall, East Lansing, MI 448824; (contact: Ted Louden, Extension Agricultural Engr; tel 517-353-3741; eml loudon@eng.msu.edu).
- MDEQ provides soils training for local health departments.
- There are training programs at the local level for contractors.

Citizen action, private groups:

- Michigan Onsite Wastewater Recycling Association (MOWRA) (contact: Del Mokma, President, c/o Dept Crop and Soil Sciences, Michigan State Univ, East Lansing, MI 48824; tel 517-353-9010, fax 517-353-5174; eml mokma%faculty%cssdept@ban).
- Several watershed groups are in existence, further details NA.

Newsletters, forums, other sources of information: NA

Minnesota

Summary

Minnesota has about 500,000 onsite systems in the ground, by broad criteria more than half of them failing. It adds about 20,000 new systems per year, and another 6000 are repaired or replaced annually. There are many areas throughout the state that have problems with high groundwater, karst topography, and poor soils. New development, particularly in wellhead protection zones and lake shores, requires special wastewater planning. The northern lakes area suffers from potentially degrading surface water. Several communities are under requirements to inspect and upgrade systems upon title transfer. In response to the need for upgraded and managed systems, some communities have responded by creating or proposing the creation of "Environmental Subordinate Service Districts." There are presently several such districts, with services provided by rural electric cooperatives. Minnesota code accommodates, and can require, alternative and advanced technology, including remediation by BAT. Permits for new technologies require flow meters, monitoring and remediation plans. There is a loan program for system upgrades. There are mechanisms to test new technology at state and county levels. University of Minnesota is also involved in research (including that of creating onsite service districts), demonstration programs, and training, which it provides on contract with the state. Private parties are also active in the state.

Numerical Information

Total number of onsite systems: About 500,000; 1990 U.S. Census reports about 468,000—about 27% of housing units; this includes residential systems of all kinds, including cesspools.

Number of new systems installed each year: Approximately 16,000.

Failure definition: Any cesspool or seepage pit; any surfacing sewage; any system with less than 2 feet separation (3 feet in some circumstances) from saturated soil or bedrock; any tank leaking to groundwater.

Number or proportion of systems presently failing: Approximately 50%.

Number or proportion *repaired* annually: About 3000.

Number or proportion *replaced* annually: About 3000.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): 40-50% as the question is worded; however, mounds, pressure dosing and aerobic systems are classified as standard systems; mounds may account for 30-35% of new systems.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Only systems that discharge to surface waters; not many.

Cost of a conventional *septic system* installation: $5000, mid-range; $3000-$7000, wide-range $1800-$15,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $7650-$12,000.

Present Onsite Status (Answers 2a-2f Summarized)

There are areas in the state (some large) that pose problems because of dense development, antiquated systems, or resource or physiographic limitations. Most older lakefront developments are problematical. There are scattered areas with high groundwater, and others with poor soils. A few areas could become problems with more development. Phosphorous loading of surface waters and pathogens are concerns. Some specifics: Areas in the northwest and the northeast are marked by heavy soils, shallow saturation levels, or high bedrock. The north-central lakes area is in need of surface water protection. Karst topography marks the southeast corner of the state. Minneapolis/St. Paul and surrounds are marked by high population and system densities.

A few communities are under enforcement actions. Current funding options favor central sewering; in general this has public support, except for the cost, and varies with locality.

Anticipated Changes in Regulations

Who administers, enforces onsite code? The Minnesota Pollution Control Agency creates minimum code, and manages and enforces licensing requirements. City-, county-, or multi-county health departments voluntarily adopt and enforce that code, or a local one. Enforcement is reported to be lax, and it is thought that state code (now under revision) should become the mandatory minimum.

Code was last revised in: 1996.

New revisions in progress? To be adopted when? Yes, 1999; major revisions are expected.

Role of legislature, regulatory agency, and politics: Code changes have been driven by statutory changes; rules are expected to change significantly and could cause controversy. New code will include performance standards, and more power is being shifted to the counties.

Management Programs (Answers 3e-3g Summarized)

In general there is felt to be a need to assure wastewater planning and onsite management for new development, wellhead protection areas, and lake shores. New development requires special planning in some areas. The state is not directly involved in promoting wastewater management districts or utilities, but has enabled them. Several counties, faced with nonconforming systems, have created, or are creating, “Environmental Subordinate Service Districts,” for collector/ communal systems. The first was in Cass County, where a contract with Crow Wing Power and Light (a Rural Electric Cooperative) assures inspection, maintenance, billing and record keeping. Several of these districts are using interesting new technologies.

New Technology (Answers 4a-4h Summarized)

Present code accommodates alternative, experimental and advanced systems, and may require it in individual cases. Remediation can require Best Available Technology. Alternative systems may be used on lots unsuited to conventional systems depending on the county. In such cases, the experimental section of the code requires a flow meter, and a monitoring and mitigation plan.

No particular technology has been linked to particular areas, except in the Northern Lake Ecoregion, where nonconforming systems have been tied to communal leach fields. There are both state and county mechanisms to test new technologies. Systems permitted include sand filters, mound-, at-grade, and aerobic systems; package plants; and constructed wetlands. It is not thought that, even if the cost of alternative or advanced systems diminished to that of conventional costs, that such systems would be pushed—provided conventional systems were up to the job. Package plants and cluster systems are reported to play a small to moderate role in future planning.

Onsite Funding (Answers 5a-5c Summarized)

There are betterment loan programs for onsite remediation that apparently involve EPA funds. It is regarded as an important issue in many communities, and has widespread political support.

Leadership and Information

State-level agencies, task forces:

- Minnesota Pollution Control Agency, Policy and Planning Div, Community and Area-wide Programs Section; 520 Lafayette St, St. Paul, MN 55155; tel 651-296-8762, fax 651-297-8674; (contacts: Mark Wespetal, email mark.wespetal@pcs.state.mn.us; Vicky Cook; or Lori Frekot).
- Minnesota Dept of Natural Resources—Shoreland Region.

Local governmental agencies, task forces:

- Information on the Cass County utility may be obtained from: Bridget I. Chard, Resource Consultant, Red River Ox Cart Trail, Rte 1, Box 1187, Pillager, MN 56734; tel 218-825-0528.
- Other involved communities include McLeod, Rice, and St. Louis counties, and the city of Corcoran.

Research within governmental agencies: NA, but see below.

Research within universities:

- University of Minnesota is involved in a number of projects, including one to create onsite districts, and another to study them; (contact Paul Jacobs, MBA, Center for Rural Technology and Cooperative Development, Univ Minnesota, 125 Architecture, 89 Church St, SE, Minneapolis, MN 55455; tel 612-498-7688, fax 612-498-7410).

Onsite demonstration programs:

- Yes, at Univ Minnesota, including a cold regions project, see above for contact. (contact: David Gustafsen, Extension Specialist, O.W.T., Univ Minnesota Biosystems Engineering, 1390 Eckles Ave, St. Paul, MN 55108; tel 612-625-1774; fax 612-624-3005).

Training or certification programs:

- Provided for the state on contract with Univ Minnesota, and its extension services: the Minnesota Onsite Training Program (see Gustafsen, above).

Citizen action, private groups:

- There are several lake associations, such as the Association of Cass County Lakes; there is also a "Statewide Lake Association," further information NA.
- Minnesota Onsite Sewage Treatment Contractors' Association (MOSTCA).

Newsletters, forums, other sources of information:

- Minnesota PCA publishes a quarterly ISTS report, and hosts a website: www.pca.state.mn.us.

Comments

"Under the new law and code, more power is being placed in the counties, all of which must be covered by new ordinances. It is felt that the program will work better when facilitated by strong county involvement."

"My experience has led me to believe that quick, effective, efficient, consistent enforcement is the way to move the onsite industry forward. Enforcement is the key by which education can be highlighted, the effectiveness of systems can be identified, and the industry can become professionalized."

Mississippi

Summary

Mississippi has about 425,000 systems in the ground, and annually installs another 5000. Figures for repairs and replacements were not available, but failure rates in some areas are reportedly very high. Many areas of the state, particularly the coast and the Mississippi River flood plain and delta, are marked by wet conditions and high groundwater. Restricted, poorly-drained soils mark the south-central portion of the state. In terms of code and regulations, receptivity to alternative systems is strong, and in some areas alternative systems dominate, although cost is an issue. The use of alternatives is reportedly not well-controlled. No management programs are envisioned, and there is little in the way of research, demonstrations, or training. No loan programs are available for onsite upgrades. However, installers, manufacturers, and consultants must be licensed by the state.

Numerical Information

Total number of onsite systems: Approximately 425,000; about 40% of housing is not connected to sewers; 1990 U.S. census reports about 390,000 systems.

Number of new systems installed each year: 5000 estimated.

Failure definition: Surfacing of effluent, or effluent leaving the property of the generator.

Number or proportion of systems presently failing: NA, but aerobic pretreatment is employed at a rate of greater than 60% in areas with restrictive soils, suggesting that failure rates for conventional systems can be high.

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Alternative systems are used in a majority of installations in some locales.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Local knowledge has resulted in scattered application of advanced systems, but hard data are NA.

Cost of a *septic system* installation: typically $1500-$5000; range, $1000-$10,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized)

Restrictive, poorly drained soils extend from Alabama to Texas, and dominate south-central Mississippi. The southern Mississippi River Delta region is marked by high population densities, silty soils and poor drainage. The southern coastal area is faced with onsite failures that contribute to degradation of water quality and fishery resources in coastal estuaries. A similar situation exists along the Mississippi River floodplain, where high groundwater limits the effectiveness of conventional onsite systems, and where the gaming industry has resulted in population surges in unsewered areas. A majority of counties report population growth. Onsite system permits have been denied because of undersized lots, topography, and high water tables. Failures have been attributed to poor soils, change in flow, undersizing, unapproved installations, poor installation or maintenance, and excessive rainfall.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Minimum state code is administered by county or multicounty health departments. Enforcement is reported to be adequate.

Code was last revised in: 1996.

New revisions in progress? To be adopted when? Changes are episodic, no information was available on the next update.

Role of legislature, regulatory agency, and politics: NA

Management Programs (Answers 3e-3g Summarized)

The presence of rural electric cooperatives reportedly could lead to the creation of management districts, particularly around rapidly growing gaming areas along unsewered stretches of the Mississippi River, but no formal discussions are underway.

New Technology (Answers 4a-4h Summarized)

I/A technologies are listed under subsections of the regulations, and are added as supplements. Home aeration systems are very common, and reportedly account for up to 60% of installations in some regions. Gravel trench systems are also common. Cluster intermittent sand filter systems are in limited use, but fall under control of the DEQ rather than the Health Department. Other permitted systems include mounds, drip irrigation, rock/plant filters, lagoons, spray irrigation, and constructed wetlands. There is reportedly a ready market for alternative systems if manufacturers will accept rock-bottom prices. Turnkey systems and alternative sewers are also thought to have a potential market, but, again, the limitation is cost. After a two-year warranty period, oversight of alternative systems is voluntary. Likewise, pre-cover inspections are voluntary, although local sanitarians will make such inspections if requested to do so.

Onsite Funding (Answers 5a-5c Summarized)

No loan programs targeting onsite systems were reported.

Leadership and Information

State-level agencies, task forces:

- Mississippi State Dept of Health, General Environmental Services, Onsite Program, 2423 North State St, Jackson, MS 39215; (contact: Mr. Ralph Turnbo Jr., tel 601-576-7695).

Local governmental agencies, task forces: NA

Research within governmental agencies: None.

Research within universities: None.

Onsite demonstration programs: There is a 3-year grant to demonstrate the repair of failing systems; further information NA.

Training or certification programs:

- There is an onsite certification program for system installers and wastewater environmentalists; manufacturers and consultants must also be state-licensed.

Citizen action, private groups: NA

Newsletters, forums, other sources of information: NA

Missouri

Summary

Missouri has about 600,000 systems in the ground, adding another 4500 yearly; an estimated 4500 are also repaired or replaced annually. Almost a third of the systems are deemed to be failing, because prior to 1996 there was no state code governing their use or installation, and many county codes were weak or nonexistent. In consequence, there are problem areas throughout the state, especially along lakes, where surface waters are in jeopardy. At least one community is under an enforcement action; the creation or extension of sewers is generally supported as the solution of choice if population density warrants it. For new subdivisions, the state determines if central facilities are required. Numerous I/A technologies are permitted, albeit on a case-by-case basis; maintenance contracts may be imposed. In some counties they are in widespread use, up to 50%. Drip irrigation has been popular in areas with heavy clay or thin soils. Several counties or communities have established onsite districts with varying provisions. Aside from a limited FHA program, loan money is not available for upgrades. University of Missouri conducts some research and runs an onsite demonstration project. Installers are registered statewide. There is a Missouri small flows organization.

Numerical Information

Total number of onsite systems: 600,000 estimated; 1990 U.S. census reports about 530,000 systems.

Number of new systems installed each year: 4500.

Failure definition: Surface breakout, backup into building, nuisance, or contamination of surface- or groundwater.

Number or proportion of systems presently failing: 180,000 estimated, in some counties, 50% or even higher.

Number or proportion *repaired* annually: 4500 combined.

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): No easily obtained data. Note that aerobic units are not viewed as “alternative.” For Boone County, the estimate is 50%.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): NA

Cost of a conventional *septic system* installation: $3500-$4000; range, $300-$18,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $350-$2000.

Present Onsite Status (Answers 2a-2f Summarized)

There are many and large areas of the state, some well bounded, that have problems because of some combination of antiquated systems, dense development, poor conditions, or jeopardy to natural resources. These problems are expected to be aggravated by future development, with many counties reporting growth in unsewered areas. Prior to 1996 (when 1995 code went into effect), there were no statewide requirements for onsite septic systems. In consequence, a lot of poorly designed systems were installed, and a lot of properties were developed with little consideration for wastewater disposal. Many systems were owner-installed, and do not meet any design standard. Numerous trailer parks had, and have, inadequate systems. Sites in resort areas are particularly problematic because of their small lot sizes, steep slopes, shallow soils and karst geology. Some specifics: Crystal Lake, Lake Viking, and Lake of the Oaks are all characterized by dense development and antiquated systems. At both Table Rock Lake and Lake of the Ozarks resources are currently in jeopardy because of dense development, antiquated systems, and poor soil conditions. The city of Commerce is under enforcement action. The creation or extension of sewers is generally supported by the state, and by the public in areas of high density and relative affluence. For new subdivisions, the Department of Natural Resources makes the determination of whether the area requires centralized treatment.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Minimum code is developed by the Missouri Department of Health, which is also the administrative agency in areas without local ordinances. In areas with local ordinances, administration is through city, county, city-county, or multi-county health departments, with some tasks falling to public works or other local agencies. Enforcement is reported to be adequate, in the sense that all complaints and calls for inspections can be responded to.

Code was last revised in: October, 1995 (not a revision, this was the first code).

New revisions in progress? To be adopted when? Yes, adoption is expected in 1998.

Role of legislature, regulatory agency, and politics: Code is state rule, not state law, and can be amended by the MDH. Revision is strongly supported politically.

Management Programs (Answers 3e-3g Summarized)

The state, and local health departments, do see the need to systematically target remediation in some areas, and to place special onsite management or planning restrictions on others, including older, densely developed areas, areas where resources are in jeopardy, and new developments. Particular counties or communities have already instituted onsite wastewater districts or utilities. These include Taney County Regional Sewer District, Pulaski County Sewer District No. 1, Camden County, and the Four Seasons and Goose Creek subdivisions. Several utilities are reportedly in an “exploratory stage” in terms of their interest in managing O/M programs.

New Technology (Answers 4a-4h Summarized)

Present code permits numerous I/A technologies such as land application, low pressure pipe, aerobic units, drip irrigation, mounds, chamber systems, gravelless, Infiltrator, sand-lined trench, recirculating sand filters, package plants, lagoons, wetlands; and enhanced (advanced) treatment systems—all under a clause which allows their use on a case-by-case basis. Drip irrigation, in particular, has been used for sites with heavy clay or thin soils. New code will more generally permit some of these technologies, and in some cases require them. The systems do permit the development of otherwise undevelopable sites. Best Available Technology may be required for remediation, but only for complaint abatement. When systems are permitted under variances, maintenance contracts may be imposed. Otherwise, there are no state requirements for routine inspection or maintenance, although several counties or districts have more stringent requirements. At present, there is no state-level program to test and authorize new technologies. Site conditions, not the cost of alternatives, will determine which technologies are permissible during design and construction review, but the more widespread use of alternatives awaits better education of citizens and installers. The future role of cluster systems with sand filters is reported to be moderate.

Onsite Funding (Answers 5a-5c Summarized)

Aside from FHA's Rural Development "504" program, there is no loan program for septic system betterments. The need is recognized, but the resources are not available.

Leadership and Information

State-level agencies, task forces:

- Missouri Dept of Health, POB 570, Jefferson City, MO 65102-0570; (Contact: Stanley R. Cowan, Environmental Public Health Specialist; tel 573-751-6095, fax 573-526-7377; eml scowan@mail.state.mo.us).

Local governmental agencies, task forces:

- Lake Drew Task Force, further information NA.
- Columbia/Boone County Health Dept, 600 E Broadway, POB N, Columbia, MO 65255 (Contact Gerald Worley, Chief, Bureau of Environmental Health; tel 573-874-7345, fax 573-875-5910).
- See management entities mentioned in the text, on which further information is NA.

Research within governmental agencies:

- On contract (see below).

Research within universities:

- There is a research program, and onsite demonstration project, at University of Missouri-Columbia; (contact: Dennis Sievers, see below).

Onsite demonstration programs:

- See above (and below).
- There are reportedly other agencies or organizations conducting demonstrations including the Watershed Committee of the Ozarks, and the city of Springfield; further details NA.

Training or certification programs:

- The MDH registers installers statewide, but Christian, Newton and St. Louis counties register their own installers.
- Missouri Small Wastewater Flows Education and Research Center, Rm 252, Biological and Agricultural Engng Dept, Univ Missouri-Columbia, Columbia, MO 65211; (contact: Dennis Sievers, Training Center Coordinator, tel 573-882-7855, sieversd@missouri.edu).

Citizen action, private groups:

- There is a Missouri Small Flows organization, which publishes a newsletter; further details NA.
- Watershed Committee of the Ozarks.

Newsletters, forums, other sources of information: See above.

Comments

For Boone County: both current and projected densities are higher than shown on the Scoping Project map.

Montana

Summary

Montana has somewhere between 150,000 and 300,000 onsite systems in the ground. No data are available on how many new systems are installed each year, or how many are repaired or replaced. The varied hydrology and physiography of the state results in pockets, or strips along floodplains, that have, or could have, problems, although little has been documented. As population density comes to warrant it, sewers are regarded as the solution of choice, even if resisted by homeowners. While certain alternative technologies are approved for use, namely those acknowledged by the National Sanitation Foundation code, only a handful of new or replacement systems involve their use. Operation, inspection and maintenance requirements are attached to their use, but enforcement is left to local agencies for whom this may not always be a priority. There are no loan programs for onsite remediation; there is some political ambivalence to code tightening, and no perceived need for systematic remediation or wastewater management entities. However, several individual counties require examinations for site evaluators. Also, Montana State University offers professional development courses, and is doing research on groundwater impacts and nitrogen-removing systems, but at this point no research has been translated into policy.

Numerical Information

Total number of onsite systems: About 300,000(?); 1990 U.S. census reports about 135,000.

Number of new systems installed each year: NA

Failure definition: Only by gross hydraulic failure; beyond that, it is not defined.

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): A very small number, probably fewer than 100 per year.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Probably no more than 5 per year.

Cost of a conventional *septic system* installation: $2000-$3500; range, $1500-$12,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized)

There are few data to assess how widespread are septic system problems, particularly if attempts are made to link them to demonstrable water quality problems. There are, however, a few areas with potential problems. Every possible geologic and physiographic condition is represented in Montana. System failures have been attributed to restrictive soils; cesspools; improper size, construction, or installation; and steep drainfields. Permits have been denied because of poor soils, high groundwater, and floodplain situation. To the extent there is concern, it is with nitrates and pathogens. When possible, connection of older systems to city sewers has been promoted, but can be resisted by the public. Much new growth is outside of sewered areas. By 2015, counties east of the Continental Divide are anticipated to grow by about 5%, and counties west of the divide by about 15%. (The Divide follows the trend of the western margin of the state, but is about 75 miles eastward of the state line.)

Anticipated Changes in Regulations

Who administers, enforces onsite code? The state DEQ promulgates the rules. Enforcement is delegated to city, county, or city/county health departments if they demonstrate the ability and desire to perform it. Eight of 56 counties have this authority; for the others, administration and enforcement is left to the DEQ. In some areas, enforcement is reported to be inadequate.

Code was last revised in: 1995.

New revisions in progress? To be adopted when? Yes, 1998.

Role of legislature, regulatory agency, and politics: There is political ambivalence about code tightening, but legislative approval is not required.

Management Programs (Answers 3e-3g Summarized)

The state is not targeting systematic remediation in any area. There is the need for special onsite management or planning in certain small areas, and, reportedly, local water quality districts are looking into the possibilities of O/M programs.

New Technology (Answers 4a-4h Summarized)

Present code accommodates, and in some circumstances requires, alternative systems, which may be used on sites otherwise undevelopable. I/A technologies are added to the code based on National Sanitation Foundation guidelines. Site reviews are conducted by the state, while the county inspects construction and does the permitting. Alternatives include sand filters, mounds, and package plants, the latter discouraged by state policy. For these systems, maintenance (by the homeowner) and quarterly effluent monitoring are often required for two years. Best Available Technology is not generally required in cases of remediation. There are no state mechanisms to test and authorize new technology; and its more widespread use is probably not chiefly inhibited by the cost, but by lack of knowledge of the utility of such systems. Cluster systems are thought to “make sense,” but the issue is unresolved.

Onsite Funding (Answers 5a-5c Summarized)

There are no betterment loan programs, and no apparent interest in establishing such programs.

Leadership and Information

State-level agencies, task forces:

- Montana Dept of Environmental Quality, Water Quality Division, POB 200901, Helena, MT 59620; tel 406-444-5344, fax 406-444-1374.
- MDEQ's Non-degradation Task Force.

Local governmental agencies, task forces: NA

Research within governmental agencies: None.

Research within universities:

- Montana State University (MSU) is doing research on groundwater impacts, alternative systems and nitrogen removal. (Contact: Gretchen Rupp, Extension Engineer, Montana State University, Taylor Hall, Bozeman, MT 59717; tel 406-994-1748.)

Onsite demonstration programs: None.

Training or certification programs:

- MSU's Extension Service offers twice-yearly professional development courses on such subjects as soil and site assessment, offering certificates and CEU credits.
- Several individual counties require site evaluators to pass a local examination.
- Montana DEQ is listed in the National Onsite Training Directory as a training contact.

Citizen action, private groups:

- There are many watershed groups throughout the state, further information is NA.

Newsletters, forums, other sources of information:

- The MDEQ holds an annual site evaluators' conference.

Comments

"The Scoping Project map is misleading because it doesn't account for large areas of federal and state land."

Nebraska

Summary

Nebraska has about 175,000 systems in the ground, adding about 7500 annually. While figures were not available on annual numbers of repairs or replacements, up to 40% are reported to be failing by current standards. In addition to problems with antiquated technology, the heaviest populations occur along river courses which all converge to the low-lying southeast corner of the state. Nebraska is concerned with both surface and groundwater contamination. Nevertheless, the problems aren't regarded as severe, and no communities are under enforcement actions. Several communities are considering actions to deal with antiquated systems, but nothing as systematic as a district or utility. I/A technologies are permitted case by case, with management requirements outlined in the permit; they are not in widespread use. There are no loan programs for upgrades. Limited research on new technology is conducted by the University of Nebraska. There are no certification or training programs.

Numerical Information

Total number of onsite systems: 150,000-200,000; 1990 U.S. census reports about 120,000.

Number of new systems installed each year: 5000-10,000.

Failure definition: Any system that doesn't meet all current standards, endangers water quality, or does not provide adequate treatment.

Number or proportion of systems presently failing: 40%.

Number or proportion *repaired* annually: About 6% are repaired or replaced annually.

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Less than 1%.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Very few.

Cost of a conventional *septic system* installation: $2500-$5000; range, $2000-$9000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $3000-$6000, varies.

Present Onsite Status (Answers 2a-2f Summarized)

There are problem areas because of dense development and antiquated systems, some which jeopardize resources; in particular, rivers and groundwater. Nitrogen contamination of groundwater is the main concern. Other areas are expected to become problems with future development. Many systems in older developments are nonconforming. Mainly the regions of concern include the low-lying and densely developed counties surrounding Omaha, in the southeastern corner of the state; as well as the courses of the Missouri, Elkhorn, Loup, and Platte rivers and their tributaries, which also converge in the southeastern corner of the state. Reasons given for onsite failures include groundwater problems, age, size, and improper design or construction. No municipalities are reported as being under enforcement actions. Towns generally support central sewering, but are hindered by its cost.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Regulations are made at state level, and enforced either by the state, or by county and city health departments where they exist. Local governments can make regulations more stringent than those of the state. Enforcement is based on complaints, and reported to be slow and cumbersome.

Code was last revised in: 1994; the last major revision was made in 1987.

New revisions in progress? To be adopted when? There is no set time frame for revisions; the next update was planned for 1999.

Role of legislature, regulatory agency, and politics: Regulatory changes are made in conjunction with the state Environmental Council.

Management Programs (Answers 3e-3g Summarized)

At the state level, there are not plans, and no perceived need, to target enforcement, or to require special planning or management in any identified regions. Some local health departments are considering special management requirements in older developments, but nothing as comprehensive as a management district or utility.

New Technology (Answers 4a-4h Summarized)

I/A technologies are covered under current regulations and are permitted on a case-by-case basis. Depending on the site, they may sometimes be required, and their use can be permitted on otherwise undevelopable sites. There are procedures for the approval of new technologies. Sand filters, mounds, aerobic systems, package plants, evapotranspiration beds, wetlands, gravelless chamber, and community-based drip irrigation systems have all been approved. Enhanced treatment systems may also be permitted case by case. Individual management requirements depend on the technology. Best Available Technology is not stipulated for the repair of failing systems. Package plants and cluster systems are reported not to be of much interest.

Onsite Funding (Answers 5a-5c Summarized)

There are no betterment loan programs for system upgrades; none are planned; and it is reported that the political climate would not favor such programs.

Leadership and Information

State-level agencies, task forces:

- Ground Water Section, Nebraska Dept of Environmental Quality, POB 98922, Lincoln, NE 68509-8922 (contact: Mr. Steve Goans, Environmental Engineer; tel 402-471-2580, fax 402-471-2909).

Local governmental agencies, task forces: NA

Research within governmental agencies:

- Yes, in conjunction with University of Nebraska, and the state Dept of Roads, which deploys and monitors alternative technologies at some of the highway rest stops.

Research within universities:

- University of Nebraska; further details NA.

Onsite demonstration programs: Only as described above.

Training or certification programs: None.

Citizen action, private groups: NA

Newsletters, forums, other sources of information: NA

Nevada

Summary

Information on the number of onsite systems, annual installations, repairs, and proportion of alternative technologies was not available. The large cities are sewered, and sewering is the solution of choice for developing areas. No communities are under enforcement actions. There are scattered pockets with onsite problems, chiefly in old mining towns where small lots and antiquated technologies had been the rule. I/A technologies are permitted case-by-case directly by the state, and may require service contracts. Failures attributed to high groundwater are often replaced with mound systems. No onsite districts are contemplated, but Lyon County is considering a requirement to install denitrifying systems, which are also being tested by the state. There are no loan programs for upgrades, and no academic research underway. Training is through the Nevada boards of RPEs and Contractors.

Numerical Information

Total number of onsite systems: NA (there are no mechanisms in place to acquire this kind of information at state level).

Number of new systems installed each year: NA

Failure definition: Surfaced effluent and/or backed-up plumbing.

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Most failures are replaced with standard gravel trench systems; failures due to high groundwater are generally replaced with mound systems; but figures are NA.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Virtually none.

Cost of a conventional *septic system* installation: $3000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $4500.

Present Onsite Status (Answers 2a-2f)

A few isolated towns in the state have septic system problems because of dense development and antiquated systems, leading to concerns about nitrogen contamination of groundwater. Typically these are old mining towns, such as Silver City, Gold Hill, and Varbidge, that had had extremely small lots (1/10 acre or less), but do not presently have large enough populations to sustain a central plant. Where populations are large enough, centralization is supported both by the state and by the population. ISDS permits will not be issued within designated sewer service areas, as established by the state's Public Service Commission. No municipalities are under enforcement actions.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Regulations are made at state level and enforced (for residential systems) directly by the state in rural counties; or otherwise by county health districts or building departments.

Code was last revised in: 1992.

New revisions in progress? To be adopted when? There is no set time frame for updating the code, which is based on the Uniform Plumbing Code and the EPA "design manual." However, revisions are slated for 1999.

Role of legislature, regulatory agency, and politics: Major revisions require legislative adoption; code revision is supported politically.

Management Programs (Answers 3e-3g Summarized)

With the exception of new development, there is no perceived need for special onsite management or planning requirements linked to particular regions or situations. Presently, pre-cover inspections are required of new systems. No onsite districts or utilities are contemplated. However, Lyon County is considering a requirement for denitrifying systems in new developments. It, and neighboring counties along the western border, are marked by many old mining towns with dense development and associated problems.

New Technology (Answers 4a-4h Summarized)

Code accommodates, and may sometimes require, alternative systems, which may be used on sites unsuitable to conventional systems. There are systematic means to test and add new technology to the code, through new subsections. Nevada State Health Division directly approves I/A technologies, including enhanced systems, on a case-by-case basis. Such systems must be designed by a Registered Professional Engineer; and may require demonstration of a service contract. Mound systems are used in areas with high water tables. Best Available Technology is not automatically required of upgrades. It is thought that as alternative systems diminish in cost, more widespread deployment could be expected.

Onsite Funding (Answers 5a-5c Summarized)

There are no loan programs for system remediation; none are contemplated.

Leadership and Information

State-level agencies, task forces:

- Nevada State Health Division, Bureau of Health Protection Services, 1179 Fairview Dr/Suite 101, Carson City, NV 89701-5405; tel 702-687-6615.
- Nevada State Division of Environmental Protection (NDEP).

Local governmental agencies, task forces:

- Lyon County (see text).

Research within governmental agencies:

- NDEP is testing denitrifying systems; further information NA.

Research within universities: None.

Onsite demonstration programs: See above, under research.

Training or certification programs:

- State of Nevada Board of Registered Professional Engineers.
- State of Nevada Contractors' Board.

Citizen action, private groups: NA

Newsletters, forums, other sources of information: NA

New Hampshire

Summary

New Hampshire has about 250,000 systems in the ground, installs another 3700 annually, and repairs about 500 annually. Several areas in the state, chiefly along river and lake fronts developed before subdivision regulations were in place, have problems with dense development and older systems. In fact, twelve communities are under varying forms of enforcement actions, most of which will be dealt with by centralization. In any event, no onsite districts or utilities are contemplated. Code accommodates alternative technologies, but they are not in widespread use, and there is little in the way of their stipulated management. Even so, in much of this mountainous state, with low densities in many areas, onsite systems are perceived to be permanent. Often, permitted technologies have been vetted by the New England Interstate Pollution Control Project (NEIPCP). There are no betterment loan programs for upgrades. There is limited research in progress at the University of New Hampshire. Designers, installers, and inspectors are state-certified and -licensed. There is also an onsite association, Granite State Designers and Installers.

Numerical Information

Total number of onsite systems: About 38,000 have been installed since 1986 (since adequate records have been kept); 1990 U.S. census reports about 250,000 systems total.

Number of new systems installed each year: 3300-4000.

Failure definition: Hydraulic failure of leach field, or plumbing backup.

Number or proportion of systems presently failing: Less than 5%.

Number or proportion *repaired* annually: About 500.

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Very few.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Almost none, perhaps fewer than 10/year.

Cost of a conventional *septic system* installation: $6000; range $1000-$20,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $1200, not counting tie-in fees, which are set locally and vary.

Present Onsite Status (Answers 2a-2f Summarized)

There are a few areas in the state where dense development and antiquated systems have led to problems. These conditions go back to days before subdivisions were first regulated (in the 1960s), and have resulted in overdevelopment along lake fronts and rivers. Soils are highly variable on short spatial scales in New Hampshire. The best soils actually exist in areas where sewer service is widespread. Low permeability soils are addressed by using lower loading rates. Permits have been denied because of inadequate soil, depth to water table, and steep slopes. Failures have been attributed to age, overload, abuse, poor design or construction, and high water tables. Twelve communities are under varying forms of enforcement actions. Sewering is generally supported as an environmental improvement, although cost is a cause of resistance. Mandating centralization at state or federal level can also result in resistance because of the very fact of the mandate.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is made at state level; enforcement is left to state Regional Inspectors, city health departments, or town health officers. Towns may adopt stricter measures than the state. It is reported that improvement in enforcement would be welcomed by all.

Code was last revised in: 1995.

New revisions in progress? To be adopted when? Yes, 1998; revisions are made frequently, if not annually.

Role of legislature, regulatory agency, and politics: Legislative adoption is always required; political support depends on the issues at hand. Any proposal that costs the state or homeowners money can expect resistance. Individual property rights are very important in New Hampshire.

Management Programs (Answers 3e-3g Summarized)

The need is perceived to undertake special management measures in several older, densely developed areas, although this is likely to take the form of creating or extending sewers. Aside from that, there is no perceived need to undertake special measures or planning outside of the regulatory structure in place. No onsite districts are under consideration, nor are utilities reported to have an interest in onsite management.

New Technology (Answers 4a-4h Summarized)

Present code accommodates, but never requires, the use of I/A technologies, and they are not permitted on sites not suitable for conventional systems. New technologies are added by addenda to the regulations. Review by the NEIPCP is considered favorably, when available. Enhanced systems may be permitted on a case-by-case basis. Permitted technologies include sand filters, mound systems, package plants, and aerobic systems; however, none are in widespread use, or have been identified with particular physiographic conditions or areas within the state. There is little in the way of stipulated management of such systems, as there are no mechanisms for

enforcement or backup. Best Available Technology is not required of upgrades. The role of cluster systems and package plants is presently small, but expected to grow.

Onsite Funding (Answers 5a-5c Summarized)

There are no betterment loan programs for system upgrades, and none are under consideration.

Leadership and Information

State-level agencies, task forces:

- New Hampshire Dept of Environmental Services, Bureau of Wastewater Treatment, 6 Hazen Dr, Concord, NH 03302-0095 (contact: Robert P. Minicucci II, Civil Engineer; tel 603-271-2941, fax 603-271-6683; eml RPM2@des.state.nh.us).
- The Office of State Planning compiles data and provides advice as well.

Local governmental agencies, task forces: None.

Research within governmental agencies:

- None, although New Hampshire is part of the New England Interstate Water Pollution Control Commission.

Research within universities:

- A University of New Hampshire Environmental Research Group is doing some work in this field; further details, NA.

Onsite demonstration programs: Not as such.

Training or certification programs:

- Designers, installers and inspectors are required to pass separate onsite licensing programs administered by the state, and which involve both field and book testing. (Individual homeowners can design and install their own systems, but they must comply with all regulations.)
- New Hampshire also participates in the Northern New England Wastewater Training Center, c/o Vermont Technical College, POB 500, Randolph Center, VT 05061; (contact: Dick Perez, Director, tel 802-234-9279, eml newtc@sover.net).

Citizen action, private groups:

- There are active watershed associations.
- Granite State Designers and Installers (GSDI), a trade association.

Newsletters, forums, other sources of information:

- GSDI publishes a newsletter, and also holds an annual conference.

Comments

"Where does the concept of onsite systems being temporary come from? New Hampshire does not think of them that way."

A comment with respect to the Scoping Project map: "Septic systems per square mile in the southeastern corner of the state are often too low. The 'projected new systems' appear to be based on population growth data, but most of these high projected rates are in regions where sewers are employed. The risk maps for soil type are limited in their utility, because soil type changes on very short spatial scales."

New Jersey

Summary

New Jersey has about 360,000 systems in the ground, and installs another 2200 annually. No figures were available on repairs or replacements. Isolated areas in the state have problems, particularly along the coast, and in the lake and mountain areas in the northwest. In the south-central New Jersey Pinelands, nitrogen restrictions are in place. Centralization is supported and funded whenever possible. I/A technologies are permitted case-by-case, and with experience come to be recognized as standard; their use by individual households is not encouraged, with the exception of in the Pinelands, where recirculating sand filters and RUCK systems are widely permitted. New Jersey had had enabling legislation in place for onsite management districts, which was later repealed. It has, instead, now opted for a universal education and notification system. There are loan programs for upgrades. The state's Office of Innovative Technology has started getting involved in onsite research, but there is not an academic program. The state provides training, but not certification, for onsite professionals.

Numerical Information

Total number of onsite systems: 1990 U.S. census reports about 360,000 systems.

Number of new systems installed each year: About 2200 (ten-year average).

Failure definition: Hydraulic failure (ponding), backup or seepage into the house, coliform contamination of domestic well water.

Number or proportion of systems presently failing: NA (although N.J. is beginning to systematically collect this kind of information).

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Very few.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Very few.

Cost of a conventional *septic system* installation: $8000-$17,500; range, $4000-$50,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $5000-$10,000.

Present Onsite Status (Answers 2a-2f Summarized)

Isolated areas of the state are reported to have problems because of dense development and aging systems, or because resources are in jeopardy. Surface water, coastal or inland, is the critical receptor. Areas in northern New Jersey are marked by shallow bedrock, as well as the potential for eutrophication near densely developed lake communities. The coast is marked by the potential for eutrophication of inlets, flooding, and sandy, fast-percolating soils. To the south, the New Jersey Pinelands already have nitrogen restrictions on ISDS discharges. Permits have been denied because of high water table and rock ledges. Failures have been attributed to age, code deficiencies, high water table, clogging, misuse, hydraulic overloading and poor construction or design. Centralization is supported and funded whenever possible, especially in the densely developed areas of the state.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is made at state level, and administered by city, county, town or district health departments.

Code was last revised in: 1994.

New revisions in progress? To be adopted when? Updates are made as needed; revisions are currently in progress, but it isn't known when they will be ready for adoption.

Role of legislature, regulatory agency, and politics: Only changes in law require legislative adoption. Regulations are proposed, adopted and amended under administrative provisions.

Management Programs (Answers 3e-3g Summarized)

New Jersey had adopted a law enabling the establishment of onsite wastewater districts that was later overturned. Since 1994, with the last code revision, it has, instead, adopted a universal education and notification system for proper operation and maintenance of systems. In the New Jersey Pinelands nitrogen restrictions on septic discharges are in place.

New Technology (Answers 4a-4h Summarized)

There is a provision in the regulations for experimental systems. However, I/A technologies are permitted directly by the state DEP strictly on a case-by-case basis. In time they come to be incorporated as "standard." Permitted systems have included sand filters, aerobics systems, mounds, package plants, pressure dosing, RUCK, and pressure distribution. Recirculating sand filters (RUCK systems) are widely permitted in the New Jersey Pinelands where nitrogen discharge restrictions are in place. There are no requirements for upgrades to use Best Available Technology. Basically the residential use of systems that require intensive operation and maintenance is discouraged.

Onsite Funding (Answers 5a-5c Summarized)

There are loan programs for qualified homeowners; further details NA.

Leadership and Information

State-level agencies, task forces:

- N.J. Dept of Environmental Protection (DEP), Division of Water Quality, Bureau of Operational Groundwater Permits, Box CN029, Trenton, NJ 08625-0029 (contact: Mr. John Roe, Supervising Geologist; tel 609-292-0407, fax 609-984-2147; eml jroe@state.nj.us).
- New Jersey Clean Water Council.
- New Jersey participates in the National Environmental Performance Partnership System; further details, NA.

Local governmental agencies, task forces:

- Local health departments are varyingly active, depending on their situation.

Research within governmental agencies:

- New Jersey's Office of Innovative Technology is starting to become involved with onsite systems.

Research within universities: NA

Onsite demonstration programs: None.

Training or certification programs:

- All systems must be designed and certified by a licensed PE. The state DEP provides training, but not certification, for onsite professionals.

Citizen action, private groups: NA

Newsletters, forums, other sources of information: NA

New Mexico

Summary

New Mexico has 194,000 systems in the ground, and installs another 8000 and repairs 1600 annually. About 20% of systems are estimated to be failing. Problems are chiefly historical, relating to dense development mostly along river valleys, but aggravated by continuing development in these same areas. Nitrate contamination of wells is the chief concern. There are well-established mechanisms for bringing new technology into general use; up to 25% of replacements involve its use, chiefly mounds, sand filters, and peat biofilters. Given the physiography and demography of the state, onsite systems will continue to play a large role in development. Bernalillo County has instituted a special onsite management program. There are no loan programs for system upgrades. New Mexico State University is involved in onsite research and demonstration projects. There is no state-level certification for onsite professionals, except that systems must be designed by a PE.

Numerical Information

Total number of onsite systems: Estimated at 194,000; 1990 U.S. census reports about 160,000 systems.

Number of new systems installed each year: Approx 8000.

Failure definition: Surfacing sewage.

Number or proportion of systems presently failing: 20%.

Number or proportion *repaired* annually: About 1600 p.a. are repaired or replaced.

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Mounds and sand filters are in common use; in recent years sand filters have accounted for about 10-15% of replacements; the use of peat biofilters is also increasing.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Surface applications require disinfection, and about 500 p.a. are installed; nitrate reduction may account for 50 systems per year.

Cost of a conventional *septic system* installation: $1600; range, $500-$15,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized)

There are large areas, often well-bounded, within the state that have problems with dense development and/or antiquated systems, some of which pose potential threats to surface or groundwater resources. Some other areas are likely to pose problems with future development. The chief concern is with nitrate groundwater contamination in high-density areas. Permits have been denied because of high groundwater, shallow bedrock, small lots, and poor design or construction. Failures have been attributed to age, poor soils, poor siting, small size, poor construction and damage. Most health districts are experiencing hefty population growth, mostly along river valleys, aggravating the density problem. The physiography of the state does not lend itself to centralized sewering, and thus, aside from in a few big cities, this is not an option.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is set at state level by the New Mexico Environment Department, and overseen generally by its Field Operations Division. Administration falls to one of four health districts. (Some districts are divided into subdistricts called sections.) There is federal control of Indian lands.

Code was last revised in: 1997.

New revisions in progress? To be adopted when? There is no set time frame for revisions, but some revisions are expected in 1998.

Role of legislature, regulatory agency, and politics: Legislative adoption is required for any change in departmental powers, but code revision is managed by the Environmental Improvement Board (EIB). Changes that restrict lot size or subdivision options are resisted.

Management Programs (Answers 3e-3g Summarized)

There is one central area in the state under special regulation or targeted enforcement, namely Bernalillo County, which includes Albuquerque. This high-density area, with limited physiographic potential, has adopted special rules, but further information NA. Aside from Bernalillo County, no areas are targeted for special onsite management or wastewater planning.

New Technology (Answers 4a-4h Summarized)

Present code accommodates, and sometimes requires, alternative systems. Development can be permitted on otherwise undevelopable sites when alternative technology is employed. Aside from sponsored testing programs, there are other mechanisms to bring new technologies on board. I/A technologies are initially handled as variances granted directly by the state's Environment Department. As experience is acquired (as stipulated by the state, and executed by the owner), the technologies may be more systematically included through regulation subsections. All alternative and advanced systems must be designed and installation approved by a licensed engineer. The next round of code revision is expected to clarify these procedures more fully. Permits have been granted for sand filters, aerobic systems, mounds, peat biofilters, package plants, wetlands, irrigation, and evapotranspiration. Peat biofilters have been found

useful in areas of shallow bedrock or high groundwater. There are no requirements for Best Available Technology for remediations. It is thought that given the physiography of the state a greater number of alternatives at lower cost would be readily employed throughout the state.

Onsite Funding (Answers 5a-5c Summarized)

There are no loan programs for onsite upgrades. Information was NA on whether any are contemplated.

Leadership and Information

State-level agencies, task forces:

- New Mexico Environment Dept, Drinking Water and Community Services Bureau, Liquid Waste Program, 525 El Camino De Los Marquez/ Ste #4, Santa Fe, NM 87502 (contact: Mr. Bob Chacey, Water Resources Specialist; tel 505-827-7541, fax 505-827-7545).
- There is a State Liquid Waste Task Force, the makeup of which was NA.

Local governmental agencies, task forces:

- Bernalillo County Health Dept, with the cooperation of the N.M. Environment Department has established a management program; further details, NA.

Research within governmental agencies: NA

Research within universities:

- New Mexico State University is involved with alternative technology research.

Onsite demonstration programs:

- There is a peat biofilter demonstration for the northern portion of the state, and a nitrogen/nitrate reduction demonstration for the southern half; further information NA.

Training or certification programs: Not for onsite systems.

Citizen action, private groups: NA

Newsletters, forums, other sources information: NA

New York

Summary

New York has about 1.45 million systems in the ground; an estimated 50,000 are repaired or replaced annually; figures for annual new installations were not available. Many areas throughout the state are potentially jeopardized by dense development and old systems, particularly along river and lake shores. And several communities are under enforcement actions. Sewer service is generally supported by the state as the alternative of choice. Alternative technologies are added to the code after vetting by the Six-State Interstate Technology Pilot Project, with varying management plans stipulated for their use. Their use for remediations is supported, where they account for 25% of such work; but their use for new systems is not encouraged. New York has several enabling alternatives for jurisdictions wanting to establish management districts. Several counties are exploring their use. The Keuka Watershed Improvement Cooperative runs an eight-municipality district surrounding Lake Keuka; others may follow. Skaneateles Lake was recently funded for a national demonstration project. New York City, in an agreement with the state and surrounding counties, runs a systematic inspection, pumpout, and remediation program for onsite systems within NYC's reservoir watersheds. There are various loan programs for system upgrades; and, in the NYC jurisdiction, upgrades are supported by outright grants. At least two colleges support research and demonstration programs, and SUNY–Morrisville is developing a training program for designers, contractors, and inspectors.

Numerical Information

Total number of onsite systems: About 1.3 million residential systems; 1990 U.S. census reports about 1.45 million systems.

Number of new systems installed each year: NA

Failure definition: Wastewater backup, surface flow, contamination of water courses or water supplies. Local health departments, and the New York City Dept of Environmental Protection, may have stricter definitions, as can larger systems which are regulated by the Dept of Conservation rather than the Dept of Health.

Number or proportion of systems presently failing: 50,000 (4%) estimated yearly.

Number or proportion *repaired* annually: 40,000 estimated.

Number or proportion *replaced* annually: 10,000 estimated.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Alternatives are fairly commonly employed for failing systems, perhaps as much as 10-15% for residences, and as high as 25% for commercial establishments.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Replacements only very infrequently involve advanced systems, particularly for residences; there are a few installed for commercial establishments; within the NYC watershed, microfiltration for surface discharge is required.

Cost of a conventional *septic system* installation: $3500-$4000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $2000-$2500 on average, but costs vary widely.

Present Onsite Status (Answers 2a-2f Summarized)

Some areas are marked by antiquated systems and dense development, and/or by inadequate hydrological conditions; surface water quality is jeopardized in some locations. A few areas could become problems in the future. Reasons cited for problems include poor soils, fast percolation rates, seasonally high groundwater, bedrock or hardpan impervious layers. Areas within 100 feet of watercourses are subject to stricter regulation concerning their leaching characteristics.

There are municipalities under enforcement actions, but further information NA; the extension or creation of sewer service is generally supported by the state, but not necessarily by homeowners, who are concerned about cost as well as the effect on growth. New technology does not have much greater support, as citizens are concerned about its impact on growth rates as well.

Anticipated Changes in Regulations

Who administers, enforces onsite code? New York state's departments of Health, Environmental Conservation, and State all have some role in administering onsite codes. The Department of Health regulates small systems; the Department of Conservation regulates flows over 1000 gpd, as well as those involving surface discharges; and the Department of State makes system reviews at the time of title transfers. Enforcement is left to county or municipal departments of health (if they exist) through code enforcement officers; otherwise the state DOH takes jurisdictional oversight. New York City's Department of Environmental Protection effectively regulates onsite systems for the watershed that serves it, mostly west of the Hudson River.

Code was last revised in: Dept of Health, 1990; NYC Dept of Environmental Protection, 1997.

New revisions in progress? To be adopted when? Regulations are "updated as needed," but no revisions are in the works at the present time, at least at state level.

Role of legislature, regulatory agency, and politics: New rules can be promulgated by the state DOH, but often await legislative initiatives to do so.

Management Programs (Answers 3e-3g Summarized)

Replacement of all failing systems is to be done in accordance with current regulations, or as close as possible within reason, which may be shy of Best Available Technology. There is definitely a need for onsite planning and management, and onsite planning or management entities are enabled by the state. However, their creation is left to local units of government.

This has been happening. The Keuka Watershed Improvement Cooperative was created in 1994 by intermunicipal agreement among eight municipalities on Lake Keuka's shores. There, a model watershed law provides for revocable permits to operate, zones of special concern (namely within 200 feet of the water), design standards, BAT when appropriate for remediations, periodic inspections and maintenance, and firm enforcement policies.

Most importantly, Skaneateles Lake has been funded for a National Community Decentralized Wastewater Treatment Demonstration Project. In 1997, New York City signed an historic memorandum of agreement with the state, the EPA, and the eight counties and 79 municipalities that fall within the city's watershed, a watershed that contains 19 reservoirs and 3 controlled lakes that provide water for the city. A key element of the agreement is the funding of Watershed Partnership and Protection programs administered by the nonprofit Catskill Watershed Corporation. The corporation in turn delegates administration to various towns, counties, and soil and water conservation districts as appropriate. These programs provide systematic inspection, pumpout, remediation, and financial aid when replacements are required. The first phase is the Septic Notice of Violation Priority Program pertaining to systems presently known to be failing. They are to be immediately repaired or replaced at no cost to the homeowner. In the circumstance, many homeowners have been much more willing to report their systems as failing.

New Technology (Answers 4a-4h Summarized)

Present code accommodates, and sometimes requires (in order to meet site criteria), alternative or advanced technology, and it can permit development on otherwise undevelopable sites. Onsite systems are not permitted where sewer tie-ins are feasible, and some areas may only be developed with sewers. The level and manner of onsite management depends on the technology. Mound and sand filters are commonly used where vertical separation distances are inadequate, and for slowly percolating soils. Other alternative technologies include aerobic units and fill systems. Management programs, typically meaning service contracts, are required for some of these technologies. There are both state and local mechanisms to test and authorize new technology, but alternative technology is not promoted for new systems, but only for remediation. The state does permit pilot projects on a case-by-case basis. The NYC DEP does not allow certain new technologies regardless of state policy, but does have BAT stipulations for remediation within the watershed. Diminishing cost is not expected to result in the more widespread deployment of new technology.

Onsite Funding (Answers 5a-5c Summarized)

There are local programs for loans or outright grants to upgrade septic systems, and these enjoy citizen support if not that of a fiscally conservative government. New York City's DEP provides upgrades and replacements for failing systems at no cost to the homeowner whatsoever.

Leadership and Information

State-level agencies, task forces:

- The NY State Dept of Health regulates small systems (those over 1000 gpd are regulated by the Dept of Conservation). Contact: Bureau of Community Sanitation and Food Protection, New York State Dept of Health, 2 University Place/ Rm 204, Albany, NY 12203; tel 518-458-6706, fax 518-458-6732.
- New York State Dept of Environmental Conservation, Bureau of Watershed Programs, 50 Wolf Rd, Albany, NY 12203; (contact: Tom Boekelo).
- N.Y. Department of State (system review at the time of title transfer).
- N.Y. Soil and Water Conservation Committee.
- N.Y. Nonpoint Source Coordinating Committee.

Local governmental agencies, task forces:

- New York City Dept of Environmental Protection; its watershed protection program (see text) is carried out by: Catskill Watershed Corporation, POB 569, Margaretville, NY 12455; tel 914-586-1400.
- Oswego and Cayuga (contact, Don Bowen) county health departments are looking at onsite issues; further information NA.
- Keuka Watershed Improvement Cooperative (see text), 110 Court St, Penn Yan, NY 14527; (contact James C. Smith, Watershed Manager, tel 315-536-5110).

Research within governmental agencies:

- DOH staff review technical reports on treatment systems as part of a Six-State Interstate Technology Pilot Project; further information, NA.
- N.Y. Dept of Agriculture and Markets, further information NA.
- N.Y. City DEP has an extensive research program involving septic systems.

Research within universities:

- Cornell Cooperative Extension Program has done research on nitrates, further information NA.
- SUNY College of Environmental Science and Forestry at Syracuse is conducting a Galley System (seepage pit device) study for the New York City's DEP, as a way to protect the New York City public water supply.

Onsite demonstration programs: Skaneateles Lake was recently funded by Congress as a National Community Decentralized Wastewater Demonstration Project.

Training or certification programs:

- Cayuga County Health Dept runs a training program for inspectors.
- SUNY College of Agriculture and Technology, Morrisville, is developing a training center for designers, contractors and inspectors: SUNY-Morrisville Environmental Training Center, Galbreath Hall, Morrisville, NY 13408; (contact: Douglas J. Nelson, Director, tel 315-684-6191; eml nelsondj@morrisville.edu).

Citizen action, private groups:

- Hudson River Keeper.
- Keuka Lake Association.
- The New York Onsite Wastewater Association (NYOWA. formed 1997) is looking into alternative and innovative systems, and their prospects for statewide use, as well as into mechanisms to professionalize training and certification: NYOWA, POB 97, Bovina Center, NY 13740; (contact Walt Bray, President, tel 607-746-4383).
- Kaaterskill Engineering Associates, P.C., HC-1, Box 50-M, Cairo, NY 12413; (contact Ewald Schwarzenegger, Principal Engineer, tel 518-622-9667, fax 518-622-9047, eml keaeng@aol.com).

Newsletters, forums, other sources of information:

- NYOWA publishes a newsletter (Inside New York Onsite).
- Cornell Cooperative Extension has a newsletter, videos, education programs and a website.
- N.Y. Water Resources Research Institute has a website; it also has had education and research projects related to onsite issues.

Comments

[With respect to the Scoping Project maps:] “Oneida County’s filtration failure rate is not as high as shown; it should be in the 10-25% range. Hamilton County’s hydraulic failure rate is displayed with a density that is too high. Also, of the counties presently displayed as projecting less than 1 new system per square mile, 1990-2015, this is only true of Hamilton. The other lowest growth counties should be projected as expecting at least 1-15 new systems per square mile by 2015. Warren County’s hydraulic failure rate is displayed with a density that is too low.”

North Carolina

Summary

North Carolina has about 1.3 million systems in the ground and installs another 40,000 systems per year; an estimated 15-20% are failing, and large numbers are repaired or replaced annually. The state has a very large rural population which continues to grow, and siting conditions are often less than ideal. Poorly drained clayey soils, shallow rock ledges, swamps, marshes and coastal inlets mark much of a state which is under strong development pressure. Several communities have adopted or are considering adopting septic system moratoriums; other are under pressure to extend central sewer service. Nevertheless, North Carolina has become, with strong support from the legislature, a leader in the development of alternative and advanced onsite technologies. Code accommodates and sometimes requires them, while also requiring their systematic management through a demonstrated contract with a private certified operator, or any of twelve onsite public management entities acceptable to, and enabled by, the state. One of the oldest, the Pasquotank-Perquimans-Camden-Chowan (PPCC) Health District, offers management services to nine low-lying counties surrounding Albemarle Sound; currently it is responsible for about 1000 systems. The state is considering a tax credit for those upgrading or replacing failing systems. There is extensive research and training at North Carolina State University, and at other universities throughout the state. There are also several demonstration programs in the state, and an active onsite professional association.

Numerical Information

Total number of onsite systems: About 1,350,000 (1990 U.S. census).

Number of new systems installed each year: 30,000-45,000 new systems are installed each year.

Failure definition: NA

Number or proportion of systems presently failing: See below.

Number or proportion *repaired* annually: 15-20%, repaired or replaced indefinitely.

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): NA

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): NA

Cost of a conventional *septic system* installation: About $1800-2000, range is $800-3000, but in exceptional cases up to $10,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $10,000-40,000.

Present Onsite Status (Answers 2a-2f Summarized)

The state has one of the largest rural non-farm populations in the country. Siting conditions are often less than ideal, and include poorly-drained clayey soils, shallow rock ledges, and swamps or marshes whose margins have high water tables. In particular, the central area of the state, including Charlotte and Greensboro, is marked by high development pressure and clayey, slowly permeable soils. Several communities within this area are considering the extension of central service. The coast, too, is marked by high development pressure and sandy barrier islands, extremely small lots, and a high water table. Onsite failures are attributed to age, soil conditions, high water tables (sometimes seasonal), hydraulic overload, poor design or installation, and improper maintenance. In consequence, there are both present and future problem areas in the state including water quality threats (fecal and nitrogen) from existing systems and dense development, as well as development pressure in regions that are outside sewer service areas but which contain unsuitable soils. Over 80% of health departments participating in the Small Flows survey reported population growth. Systematic action on water quality problems awaits clearer definition of the threats and clearer delineation of areas within the watersheds that are especially critical. To deal with growth, North Carolina has been a leader in developing alternative technologies, which do, however, require regular inspection and maintenance. Related resources that are potentially threatened include rivers, shellfish beds, and certain sounds within the state (such as Albemarle Sound, see below) that are restricted from flushing action by the Outer Banks. A few inland piedmont communities have recently adopted (or are planning to adopt) septic system moratoriums. Several communities are considering the extension of centralized service areas.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Health departments at county or regional level are responsible for enforcing North Carolina's code.

Code was last revised in: The last major revision was in 1993.

New revisions in progress? To be adopted when? Minor revisions are made frequently, practically every year.

Role of legislature, regulatory agency, and politics: There is legislative support for facilitating new technologies that widen the potential for development, but not as much support for renewable permits or similar management measures. Still, North Carolina is one of the few states that has established enabling legislation for onsite management entities.

Management Programs (Answers 3e-3g Summarized)

The state recognizes the need in some locations for systematic remediation, as well as for management entities. In 1993 the state began a program requiring that homeowners who install several types of alternative technologies, or who install large onsite systems of any type,

establish a contract with a private certified operator or a public management entity. (Twelve management entities or agencies are acceptable to the state, including public utilities or departments, districts, and private certified operators.) One of the oldest, the PPCC District Health Department, offers management services for a particular system technology (sand-lined trenches) in nine low-lying northeastern counties surrounding Albemarle Sound. Currently, the district is responsible for the oversight of about 1000 systems. All new systems in the state require a pre-cover inspection.

New Technology (Answers 4a-4h Summarized)

Code accommodates and sometimes requires alternative or advanced technology, while also requiring its management. Permissible technologies include sand filters, mound systems, aerobic systems, low pressure pipe, drip or spray irrigation, prefabricated panel block, Infiltrator, and large diameter pipe. Such devices have facilitated development in otherwise undevelopable areas. When failures are extreme (sewage outbreaks), remediation requires the use of Best Available Technology. There are mechanisms in the code to allow innovative and experimental systems on the part of individuals, albeit with many restrictions and controls.

Onsite Funding (Answers 5a-5c Summarized)

The focus of EPA funding has been on the extension of sewer service areas. However, there is a unique initiative in the legislature to allow a state tax credit for upgrades or system improvement. It currently looks as if the initiative will not be enacted this year, but instead referred to a study committee.

Leadership and Information

State-level agencies, task forces:

- Steve Steinbeck, North Carolina Dept of Environment, Health, and Natural Resources, Div of Environmental Health, Onsite Wastewater Section, P.O. Box 27687, Raleigh, NC 27611; tel 919-733-2895.
- Onsite Sewage Program Advisory Committee (to NC DEHNR).

Local governmental agencies, task forces:

- PPCC District Health Dept, Box 189, Elizabeth City, NC 27907 (see text).

Research within governmental agencies: On contract, see below.

Research within universities:

- There is extensive research and training at North Carolina State University (NCSU), as well as less comprehensive programs at other universities throughout the state. Contact: Dr. Michael Hoover, Soil Science Dept, North Carolina State Univ, Box 7619, Raleigh, NC 27695; tel 919-515-7305; fax 919-515-7494; eml mike_hoover@ncsu.edu.

Onsite demonstration programs:

- Craven County Demonstration Project conducted by the local health department, state DEHNR, and NCSU.
- Chatham County Demonstration Project conducted by NCSU.
- The are also four Onsite Training [and demonstration] Centers in the state, two large ones run by NCSU, and two small ones run jointly by local health departments and NCSU.

Training or certification programs:

- See immediately above. NCSU has operated, on behalf of the state, a National Training Center for Land-based Technology and Watershed Protection; a Subsurface System Operator Training School since rule changes in 1993 that required certified operators for certain systems; and a training program for Environmental Health Interns (rookie sanitarians). (Contact information: see above.)

Citizen action, private groups:

- North Carolina Septic Tank Association (NCSTA), further information NA.

Newsletters, forums, other sources of information:

- NCSTA has a newsletter, and also has run an Annual Exhibition, since about 1991.
- Annual Onsite Wastewater Treatment Conference, conducted by NCSU and the state, now in its twelfth year.

North Dakota

Summary

North Dakota has about 65,000 systems in the ground, adds about 600, and repairs or replaces about 1600 annually. About a third of the systems are failing by current standards. Some of the older subdivisions, chiefly on the banks of rivers, have problems; other areas of the state are marked by clayey soils. In general, subdivisions today are often located on poor soils unsuited to agriculture. Still, water quality is not a large concern. In towns and cities which are growing, extension of sewers is the preferred alternative for handling growth; but many towns and counties are losing population. Code accommodates alternatives, and mounds and communal systems are in fairly widespread use; overall, however, alternatives are not regarded as cost effective. Maintenance contracts might be required for their use. There are no betterment loan programs for upgrades, and at present, no research or demonstration projects. Certification is left to local government, although North Dakota State University Extension holds seminars for installers and local sanitarians.

Numerical Information

Total number of onsite systems: 1990 U.S. census reports about 65,000 systems.

Number of new systems installed each year: About 600.

Failure definition: Backup into house, or surfacing effluent.

Number or proportion of systems presently failing: About 18,000.

Number or proportion *repaired* annually: About 1000.

Number or proportion *replaced* annually: About 600.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Mounds and communal systems (oversizing) are used, but, in general, very few alternatives are accepted by installers as cost-efficient to take on.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Virtually none.

Cost of a conventional *septic system* installation: About $4000; range, $1500-$9000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): About $5000; range, $6000-$7000; housing developments connecting to municipal sewers have lower costs than rural central sewers.

Present Onsite Status (Answers 2a-2f Summarized)

Some areas of the state have problems because of dense development, small lots and aging systems. Old subdivisions with lots of less than 40,000 sq ft have been built along river banks. A few of these may jeopardize resources. Other areas of the state have clayey soils. Some areas are prone to flooding or have high water tables.

Except for isolated household cases, water quality is not regarded as a large problem. Problem areas, such as mobile home parks, have been connected to central facilities. System failures have been attributed to age, high ground water, hydraulic overloading, improper design or installation, surface flooding and drainfield saturation.

North Dakota is a large state with few towns, and small, often shrinking, populations within them. In general, population density in North Dakota diminishes from east to west. The west is marked by a very sparse population with any additional development totally dependent on the prospects for oil discovery and recovery. Still, some areas of the state could have problems with future development, in part because subdivisions tend to be located on poor soils unsuited to agriculture; and, in part, because some towns grow at the expense of others (as people retire, or retire from farming), leaving a pool-pocket configuration. Counties along I-94 (running east-west in the lower half of the state) from Fargo to Dickinson (and particularly between Fargo and Bismarck) are expected to be growth areas for the next 25 years; many new onsite systems can be expected. This is also true of the area around Minot, and it is true in the east along I-29 (running north-south) from Wahpeton to Grand Forks, just west of the Red River. The whole Red River valley has high-clay-content soils that often require mound systems, or similar alternatives, called “NODAK” (North Dakota) systems. Aside from these areas, the rest of the state is expected to lose population. In the cities central sewering is supported; but in rural areas it is not often practicable, except on very small scales, and on any scale would most likely face resistance because of costs.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is developed by the North Dakota State Plumbing Board (as part of the plumbing code) with administration left to “Health Units,” typically at county or multicounty level. The health units are responsible to the State Health Department. Several counties have no environmental health programs, with administration then passing to township governments or other willing agencies. Some health units contract with other counties or municipalities to provide administration. There are also areas of the state with no regulation of onsite systems. North Dakota is reported to be short on the resources required to fully address onsite problems. At the same time, counties or townships may write more restrictive code than the state.

Code was last revised in: 1996.

New revisions in progress? To be adopted when? No, not at state level, although district codes are being revised.

Role of legislature, regulatory agency, and politics: Adoption of new plumbing code requires public hearings but not legislative approval; however, no adoptions are currently planned. (Adoptions tend to be based on one of the national uniform guides.) Local health unit codes are subject to political scrutiny by county commissioners and local health boards.

Management Programs (Answers 3e-3g Summarized)

No areas of the state have been targeted for systematic inspections or upgrades, although virtually all new subdivisions must submit wastewater plans. And there is no reported interest in rural cooperatives, or other entities, in establishing O/M programs.

New Technology (Answers 4a-4h Summarized)

Present code accommodates, but at no time requires, alternative and advanced technologies. I/A technologies are adopted into the regulations by a review process; after approval, they are listed in separate chapters of the regulations. Permitted systems include sand filters, mounds, aerobic, at-grade pressurized trench and bed, Infiltrator, and SB-2. Best available technology is not required of upgrades. Mound and NODAK systems are in fairly widespread use in areas marked by high-clay-content soils or a propensity for flooding. Development may be permitted on otherwise undevelopable sites, approval coming from the local health unit. Warranties or maintenance contracts might be required. More widespread deployment of alternative technologies might be expected if costs were to diminish, but initiatives in their use would come from local health units, not from the state. Package plants and cluster systems do not play a large role, and are not expected to except when there no other alternatives.

Onsite Funding (Answers 5a-5c Summarized)

There are no betterment loan programs for system upgrades; declining rural populations and a "no new taxes" political climate make their institution problematical.

Leadership and Information

State-level agencies, task forces:

- North Dakota State Plumbing Board (NDSPB), 204 W. Thayer Ave, Bismarck, ND 58501; tel 701-328-9977.
- North Dakota State Health Department (NDSHD), Division of Municipal Facilities, 1200 Missouri Avenue, Box 5520, Bismarck, ND 58502.
- North Dakota Environmental Health Association (NDEHA) has an ad hoc committee which advises the plumbing board.

Local governmental agencies, task forces:

- Custer District Health Unit, 210 2nd Ave NW, Mandan, ND 58554 (contact: Dick Bechtel, R.S., Environmental Health Practitioner; tel 701-667-3370, fax 701-667-3371; eml cdhu@btigate.com).

Research within governmental agencies: None.

Research within universities:

- North Dakota State University Extension Office is seeking funding for onsite research. (Contact: Thomas F. Scherer, Extension Agricultural Engineer, North Dakota State Univ Extension Service (NDSUES), Box 5626, Fargo, ND 58105-5625; tel 701-231-7239, fax 701-231-1008; eml tscherer@ndsuext.nodak.edu.)

Onsite demonstration programs: None.

Training or certification programs:

- Some local health units administer onsite certification programs for plumbers, installers, inspectors, and journeymen.
- Seminars conducted jointly by the NDEHA (see below), NDSDH, NDSUES and NDSPB are held in several different cities every year for installers.

Citizen action, private groups:

- North Dakota Environmental Health Association (NDEHA) is a professional organization for all the local environmental health units.
- Garrison (Diversion) Conservancy District, and others like it exist within the state.

Newsletters, forums, other sources of information: NA

Comments

"Mercer (west-central) and Rolette (north-central) counties are depicted incorrectly on Scoping Project maps; they both have very low population densities, and contain Indian reservations; it seems unlikely the number of projected new systems is as shown."

However, another commentator writes: "These populations are stable, but not really sparse. Mercer County has coal and energy industry. Rollette County has a nice lake development. The Indian Health Service usually designs the systems for Native Americans, and there is currently a building boomlet due to efforts to catch up with housing needs that have lagged for the past 25 years."

Ohio

Summary

Ohio reports 1.2 million systems in the ground, 11,000 new systems, and 5000 repairs or replacements per year. A quarter to a third of older systems are thought to be failing by current criteria. There is statewide concern about the contamination of surface- and groundwaters, many low-lying areas, and other areas with poor soils. A number of communities are under enforcement actions. But, there is much ambivalence of the issue of sewers, and growing pressure for the approval of alternatives. Code accommodates experimental technologies, which with experience may be more generally permitted, although at present they are not in particularly widespread use. Expanded testing and technological review is expected in the future. There are betterment loan programs in place for upgrades, and several counties have been exploring the onsite district concept. Ohio State University conducts some research, and is planning a broader demonstration project. There is no state-level training or certification.

Numerical Information

Total number of onsite systems: 1.2 million; 1990 U.S. census reports about 950,000.

Number of new systems installed each year: 10,000-12,000.

Failure definition: Plumbing backup or breakout of effluent.

Number or proportion of systems presently failing: 25-30%.

Number or proportion *repaired* annually: 2000-3000.

Number or proportion *replaced* annually: 2000+.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Hard numbers are NA, but it is reported that most replacements are conventional, with some use of aerobic systems.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Very few if any.

Cost of a conventional *septic system* installation: $6000, range; $1500-$20,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $3000-$15,000.

Present Onsite Status (Answers 2a-2f Summarized)

There are large areas throughout the state, some well-bounded, that are causing problems because of dense development and aging systems; and additional areas are expected to become problems in the future because most health departments report population growth, much of it in unsewered, rural areas. There is statewide concern regarding contamination of surface and groundwater. Onsite system permits have been denied because of poor drainage, floodplains, poor soils, steep slopes, high water table, bedrock, wetlands and quicksand. Failures have been attributed to improper design or construction, lack of maintenance, age, damage, small size, and spent leachfields. Poor design criteria in the 1950s and 1960s are also said to account for many current failures. Some communities are under enforcement actions, although further details were NA. There is ambivalence on the issue of creating or extending sewer lines, and pressure for approval of alternatives is reportedly growing. Some health departments have been more receptive to this approach than others.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is set at state level, but administered by city, county or district health departments. Counties may (and some have) set more stringent rules than the state's minimum standards. Enforcement is reported to be inadequate because of the awkward court procedures involved.

Code was last revised in: 1977.

New revisions in progress? To be adopted when? Revisions do not follow any set time schedule, but are expected in 1999 or 2000. The current thrust is to increase oversight, assist with enforcement, and to increase fees to strengthen the state program.

Role of legislature, regulatory agency, and politics: Legislative approval of the major changes proposed is required, but the outcome is problematical.

Management Programs (Answers 3e-3g Summarized)

Special regulation and targeted enforcement is reported as being needed in communities throughout the state for new development, older densely developed areas, and critical resource areas. How, specifically, these needs are addressed awaits the outcome of code revisions now in progress. Some counties are investigating the concept of onsite wastewater management utilities. Presently all new systems require pre-cover inspections. It is reported that some utility interest in managing O/M programs may exist, but details NA.

New Technology (Answers 4a-4h Summarized)

Present code accommodates, and sometimes requires, the use of alternative technology, which can allow for development on otherwise undevelopable sites. Regulations allow for experimental I/A technologies, which, as experience is acquired, are then more generally permitted. Experimental systems are permitted directly by the state, and must be monitored by local health departments. Systems more generally permitted now include sand filters, mounds, package plants, and aerobic units, as well as evapotranspiration, pressure dosing, and constructed wetlands. With new regulations there is expected to be a requirement for the use of BAT for upgrades, at least in some circumstances. Expanded mechanisms to test and approve new technology are also expected. It is thought that as alternatives diminish in cost, they would be more widely stipulated, and that there is definitely a place for them in Ohio's wastewater planning. Cluster systems and package plants are not expected to play a large role in the near future because of the state's reluctance to grant operating permits to non-governmental entities.

Onsite Funding (Answers 5a-5c Summarized)

There are betterment loan programs within the state, which do involve some EPA/SRF seeding. But the political climate does not favor expanding these efforts, state taxes currently being a hot political issue. There are also loan programs within several local health departments.

Leadership and Information

State-level agencies, task forces:

- Ohio Dept of Health (ODH), 246 N. High St, Columbus, OH 43266 (contact: Mr. Tom Grigsby, Program Specialist; tel 614-466-1390, fax 614-466-4556; eml tgrigsby@gw.odh.state.oh.us).
- Ad Hoc Sewage Committee of the ODH.

Local governmental agencies, task forces:

- Some counties are more active than others in terms of onsite management and alternatives, but further details, NA.

Research within governmental agencies: None.

Research within universities:

- Ohio State University is doing some field work with sand filters and constructed wetlands, and is planning a broader demonstration program.

Onsite demonstration programs: See above.

Training or certification programs:

- There are local (and variable) county programs, but not at state level.

Citizen action, private groups:

- Watershed associations, further details, NA.

Newsletters, forums, other sources of information: NA

Comments

A comment with respect to the Scoping Project maps: septic system problems are more aggravated in the northeast corner of the state than depicted.

Oklahoma

Summary

Oklahoma has about 270,000 systems in the ground, installs about 4000, and repairs or replaces about 1000 annually. There are areas throughout the state with problems due to antiquated systems; the chief concerns are with nitrates, phosphates, and complaints. Several communities are under enforcement actions, and although the state looks favorably on centralization this often is not possible. Oklahoma's population is growing, and new subdivisions are going into areas with marginal soils. These subdivisions require wastewater plans, and often rely totally on aerobic treatment and land application. There are well-established mechanisms to bring new technology into general use. Many replacements involve aerobic units, but there is also growing interest in rock/reed plant filters. Communal systems, land application of effluent, and many alternative systems require maintenance contracts for the life of the system. The state perceives an expanding role for alternative, onsite options. There are no loan programs for remediation, but Oklahoma just completed a 319 grant program which replaced or repaired 40 failing systems; this program will continue if grant funds remain available. Several aerobic and evapotranspiration systems have been installed as demonstration projects, but currently there is no state or academic research program. The state runs a certified installer program, but on a voluntary basis.

Numerical Information

Total number of onsite systems: Reportedly about 270,000, although the 1990 U.S. census reports approximately 370,000 systems. Oklahoma is currently attempting to get a firmer grasp of these numbers.

Number of new systems installed each year: Approximately 4000; by another report, 20,000-30,000.

Failure definition: Backup, surfacing, or discharging off the property.

Number or proportion of systems presently failing: 5-10%; up to 20% in wet months; by another report, 5000-10,000.

Number or proportion *repaired* annually: 400-600; by another report, 2000-3000.

Number or proportion *replaced* annually: 300-500; by another report, 1000-2000.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Estimates varied, but a significant percentage of replacements are either aerobic units (90% of alternatives) or evapotranspiration systems using rock/reed plant filters (10% of alternatives).

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): About 700 are on file.

Cost of a conventional *septic system* installation: $3000; range, $900-$6000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $1350-$2000, estimated.

Present Onsite Status (Answers 2a-2f Summarized)

Presently there are localized areas throughout the state that pose problems because of dense, aging systems or poor conditions. Problem areas include scenic river and lake developments. In the northeast fractured rock soils allow effluent to contaminate groundwater. Chief concerns are with nitrates, phosphates and complaints. Permits have been denied because of impervious soils and steep slopes. Failures have been attributed to undersizing, age, poor maintenance, improper design or construction and seasonally high water tables. Several communities are under enforcement actions, but further details were NA. Centralization is supported by the DEQ, but often resisted by developers and homeowners because of cost. Most counties have reported population growth. In the future, large areas might be expected to become problems because the land becoming available for residential development is increasingly marginal with respect to site conditions. However, steps are being taken to deal with this.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is made at state level by the DEQ, and administered by local DEQ offices.

Code was last revised in: 1997.

New revisions in progress? To be adopted when? Generally regulations are updated approximately every two years; revisions are expected in 1999.

Role of legislature, regulatory agency, and politics: Statutory changes require legislative approval; most (but not all) rule changes do not. Reportedly there is good political support for code revision.

Management Programs (Answers 3e-3g Summarized)

There is a need for special planning and management measures to be taken in several older, densely developed areas, as well as new development. Although the establishment of districts or utilities is not contemplated in quite such a comprehensive way, the residential development planning process requires wastewater plans. In some areas, aerobic treatment or other alternatives are now mandatory. Some developments are wholly aerobic, with land application of effluent. These systems require licensed operators and contractual maintenance and monitoring.

New Technology (Answers 4a-4h Summarized)

Present code accommodates, and sometimes requires, alternative or advanced technology, and in individual cases the possible use of BAT, for remediations. Their use may permit development on sites unsuitable for conventional systems. Lot and setback requirements can be waived when

employing certain alternatives. I/A technologies are listed in code subchapters subject to ongoing updates. Acceptance and addition to the regulations is done on a technology-by-technology basis, after sufficient experience has warranted more general application than that provided by individual variances. Permitted alternatives included aerobic systems, and rock/reed evapotranspiration systems. Aerobic systems, in particular, have been put to use in every county in areas where system failures are abnormally high. Sand filters, mounds and pressure dosing are reportedly not in use. There is no set management protocol for alternative systems. However, individuals are required to have ongoing service contracts with licensed service providers, which prescribe maintenance and monitoring procedures. It is reported that demand for alternatives would definitely increase as their cost diminished; and that there is a clear role for them in opening land to development.

Onsite Funding (Answers 5a-5c Summarized)

There is a statewide loan program for qualifying individuals, which enjoys continued favor in the legislature. Oklahoma also just completed a 319 grant program which replaced or repaired 40 failing systems; this program will continue if grant funds remain available.

Leadership and Information

State-level agencies, task forces:

- Oklahoma Dept of Environmental Quality (DEQ), Water Quality Division, 707 N. Robinson, Oklahoma City, OK 73101 (contact: Mr. Bill Warden, Regional Director, Small Systems Coordinator, tel 405-702-6161 fax 405-702-6223).
- There is a “Scenic Rivers” task force: Contact Bob Bates, Oklahoma DEQ/Roland Office, P.O. Box 597, Roland, OK 74954; tel 918-427-6941.

Local governmental agencies, task forces:

- Oklahoma Municipal League; further details NA.
- Various Lake Conservancy districts.

Research within governmental agencies:

- The state has created and maintains a database concerning failing systems, and performance data for alternative systems.

Research within universities: None.

Onsite demonstration programs:

- Several aerobic units and rock/reed plant filters have been installed as demonstrations; further information, NA.

Training or certification programs:

- The DEQ runs a Certified Installer Program on a voluntary basis; over 300 installers have been certified. It also certifies sanitarians, environmental specialists, and soil scientists.

Citizen action, private groups:

- Richard L. Landes, P.E., Landes Engineering, 903 East 35th, P.O. Box 1032, Shawnee, OK 74801; tel 405-275-5388; fax 405-775-9047.
- Sierra Club.

Newsletters, forums, other sources of information: NA

Oregon

Summary

Oregon has up to half a million onsite systems in the ground, installs about 6000 new systems a year, and repairs or replaces about half that number annually. Septic system problem areas are fairly numerous, particularly in the western portion of the state and along the coast. Some of these areas fall under "geographic rules" pertaining to more careful onsite system management, and alternative or advanced technology may be required for either new construction or remediations. The DEQ has rather broad autonomy to revise rules, and there are systematic mechanisms to authorize new technologies, many of which carry special stipulations on their operation, inspection and maintenance. The DEQ is coming to recognize the sometime necessity or desirability of onsite alternatives, and there are fledgling training programs and other efforts underway. While there is little in the way of academic research, private entities such as the Oregon Onsite Wastewater Association are fairly active and involved.

Numerical Information

Total number of onsite systems: 500,000 estimated; 1990 U.S. census reports 350,000 systems.

Number of new systems installed each year: 6000.

Failure definition: Any system that discharges untreated or incompletely treated sewage or septic tank effluent directly or indirectly onto the ground surface or into public waters.

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: 2700 repairs, including some replacements.

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): The repair or replacement of systems requires the system to meet new construction standards as closely as reasonably possible. Alternative treatment technologies are required at sites not meeting criteria for the standard drainfield system. Numerical data on the technologies involved are not reported by field officers, but virtually all replacements are sand filter systems.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Disinfection is not required of any soil absorption system. Nutrient reductions are obtained with the use of sand filter treatment units. In areas with rapidly drained soils and/or areas where groundwater quality may be impacted, sand filters, pressurized distribution, or other more advanced systems may be required.

Cost of a conventional *septic system* installation: $3500-$4000; range $2000-$14,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): Charges range from $2000-$4000, but actual costs are $15,000-$30,000 per home.

Present Onsite Status (Answers a-f Summarized)

There are isolated, sometimes well-bounded or large, areas throughout the state that have septic problems related to antiquated systems, small lots, poor soil or hydrological conditions, or jeopardized resources, particularly groundwater. Some details: Clatsop Plains, on the very northwest coast, has a shallow aquifer in dunal sands, and has required by "geographic rule" various alternative technologies to protect groundwater. East of there, East Multnomah County has many cesspools; it is under order to construct sewage collection system and other treatment works, and to remove cesspools from service. Also on the coast, the Alsea dunal coastal strip is marked by high-density development and a shallow aquifer; and Clear Lake is marked by small lots in dunal sands, and again "geographic rule" limits the types of systems permitted. The Santa Clara–River Road area is marked by a shallow aquifer, and is under orders to construct a sewer system. The Upper Basin of Deschutes River is marked by a shallow aquifer, rapidly drained soils, high lot density due to creation of subdivisions prior to statewide land-use laws; currently an effort is underway to develop a plan to protect ground- and surface water quality in conjunction with federal funding for a National Decentralized Wastewater Demonstration Project in La Pine.

Permits have been denied, or special systems required, because of poor drainage, thin soils, steep slopes, high water tables and wet conditions. Bacterial contamination has only rarely been reported, but in some areas nitrogen concentrations are predicted to rise to unacceptable levels as buildout continues. At least half of all new development is outside of sewered areas.

Generally the public resists the extension of central facilities because of anticipated cost as well as annexation to municipalities; and the state is coming to recognize that central facilities are not always the best or most affordable solution.

Anticipated Changes in Regulations

Who administers, enforces onsite code? The state DEQ administers and enforces onsite code, although local government entities may administer specific and limited aspects of the program under agreement with the DEQ. Even then, the DEQ provides administrative oversight to the field agents, and field offices are periodically audited for performance. (Twenty-two Oregon counties have such agreements, the remaining 14 being serviced directly by the DEQ.) Major updates in regulations occur approximately every ten years; although minor changes are made ad lib. New technologies are added to the regulations after an experimental time period, followed by technical review. Onsite enforcement is reported to be inadequate at present, but there is work going on to improve it.

Code was last revised in: June, 1997 (last major revision in 1994).

New revisions in progress? Yes, for adoption in the fall of 1998.

Role of legislature, regulatory agency, and politics: The Oregon Legislature has granted the DEQ (through the Environmental Quality Commission) broad authority to adopt administrative rules necessary to protect the environment and public health. The Oregon Onsite Wastewater Association has been working with both the Legislature and the DEQ to recognize a fuller role for alternatives to central sewering.

Management Programs (Answers 3e-3g Summarized)

Presently all new or repaired systems require pre-cover inspections. While management utilities or districts are not yet employed, the DEQ may impose performance, operation and maintenance requirements in geographic areas thought to be in jeopardy for whatever reason. Such systems require operation permits and are regularly monitored, with reports submitted periodically to the DEQ. All larger systems, and those with high waste strength, fall under this regimen. Sand filters have been so successful that only large systems had required monitoring and maintenance, although the new regulations will require monitoring and maintenance of all such systems. For this reason, discussions of onsite management districts have started in many locations. Oregon recently started discussions with the rural electric cooperatives on managing O/M programs.

New Technology (Answers 4a-4h Summarized)

Present code accommodates and sometimes demands the use of alternative or advanced technologies, which require a renewable operational permit, and are conditioned with operation, maintenance and reporting requirements. In particular, sand filters, recirculating gravel filters, and similar systems, may be required in locations where rapidly draining soils are present. Other permitted systems include mounds, package plants, aerobic systems, capping fill, tile dewatering, pressurized distribution, evapotranspiration, and gravelless systems. Best Available Technology may be stipulated for the remediation of older systems if they are clearly failing. There are mechanisms to authorize new technologies, but they must build a sufficient history under experimental permits to clearly demonstrate their performance, which is reviewed by a technical oversight committee. There is no protocol to test totally unproven technologies. Advanced technologies might be more widely stipulated if costs came down, but onsite systems are prohibited if connection to public sewerage is possible. Cluster systems using STEP and recirculating sand filters have played a large role for several years, and are expected to increase. Package plants have not played such a role.

Onsite Funding (Answers 5a-5c Summarized)

Historically, the political climate has not been favorable to offering betterment type loans for system remediation. Proposals in the Legislature have been rejected or allowed to die. However, the matter is under continuing discussion, and could change.

Leadership and Information

State-level agencies, task forces:

- Oregon Dept of Environmental Quality, Water Quality Division, 811 SW 6th Ave, Portland, OR 97204-1390; tel 503-229-6443, fax 503-229-6037 (contact: Mr. Sherman Olson).
- The DEQ's Technical Review Committee.

Local governmental agencies, task forces:

- Local governmental representatives participate in advisory committees formed by the DEQ.

Research within governmental agencies: None.

Research within universities:

- There is limited research at Oregon State University, further details NA.

Onsite demonstration programs:

- La Pine region of Deschutes County will become a National Decentralized Wastewater Demonstration Project; it will concentrate on I/A technologies, nitrate reducing systems, onsite management, and groundwater/contaminant monitoring.

Training or certification programs:

- The state has instituted an onsite training and certification program for septic system installers; it is in progress and subject to further development: Oregon Onsite Wastewater Training Center, POB 967, 1140 College Rd, Roseburg, OR 97470; (contact: Tom Rogers, tel 541-440-4683, eml rogerst@umpqua.cc.or.us).
- The Oregon Onsite Wastewater Association has also developed a training center, and offers workshops to license holders and others at Umpqua Community College, Umpqua.

Citizen action, private groups:

- Oregon Onsite Wastewater Association.
- There are Watershed Councils throughout the state.
- Orenco Systems, 2826 Colonial Road, Roseburg, OR 97470 (contact: Harold Ball, President; tel 541-459-4449, fax 541-459-2884; eml HBall@Orenco.com).

Newsletters, forums, other sources of information:

- The DEQ issues bulletins, maintains a website, and coordinates regional workshops throughout the state.

Pennsylvania

Summary

Pennsylvania has about 1.3 million systems in the ground; annually, another 12,000 are newly installed. About 4000 are repaired or replaced annually. Problems are widespread throughout the state, due to older developments with antiquated systems, mountainous terrain, and poor soils. Several communities are under enforcement actions, and the state favors the development of sewers when feasible, although this is changing. In any event, alternatives are in widespread deployment, particularly for upgrades, and there are established mechanisms for bringing new technology into general use. Many of the alternatives require annual inspection and performance evaluation. Initially the state strongly promoted management districts, but this has not been popular. However, one township is assuming ownership and operation of ISDSs, and another has a management program in place for recirculating sand filters. The Pennsylvania Rural Electric Association is looking at a possible role in onsite management. There are established loan programs for qualifying owners to upgrade systems. The DEP itself tests and authorizes new technology, or contracts testing out. There are research and demonstration programs at two colleges. The state trains and certifies Sewage Enforcement Officers (inspectors).

Numerical Information

Total number of onsite systems: About 1.3 million estimated; 1990 U.S. Census reports 1.2 million.

Number of new systems installed each year: About 12,000; one source reports 20,000; there are over 2000 permitting entities in the state, which may contribute to the uncertainty in the numbers here and above.

Failure definition: Discharge to surface, backup, or contamination of ground- or surface water.

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: About 4000 are repaired or replaced annually (some 25% of permits issued).

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): From a regulatory perspective, many so-called alternative technologies are now considered conventional. In any event, the newer technologies are employed in system upgrades or repairs; permits are generally issued with varying conditions attached to them.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Less than 2%.

Cost of a conventional *septic system* installation: $2500-$20,000, depending on system type and location within the state.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $2500-$10,000, depending on location and other variables.

Present Onsite Status (Answers 2a-2f Summarized)

There are many, and widespread, problem areas in the state because of antiquated systems, small lots, dense development, steep slopes and poor soils. Dense development is concentrated in the southeastern portion of the state (near Philadelphia), and in the southwest (surrounding, and west and southwest of, Pittsburgh), as well as in small towns throughout the state. Both areas have soil and hydrological limitations. In fact, poor soils are widely distributed, while good soils occur only in pockets, chiefly in valleys. Soil problems (shallow soils and shale) are worse north of I-80 (roughly the northern third of the state), and in the Poconos in the east. The southwest including Pittsburgh; and the southeast including Bethlehem, Harrisburg and Philadelphia, are under development pressure with a large percentage of onsite systems, and often with nitrate problems associated with limestone soils. Centre County, along I-80, also faces development pressure.

Several townships are presently under enforcement actions. Generally the extension or creation of central facilities is reported to be the solution of choice to the DEP, particularly in the larger townships, although this may be changing. Centralization is the solution of last resort to the townships themselves. In any event, much of the population increase is happening in rural areas. Central facilities are required for certain new developments. Resistance from residents is in proportion to anticipated costs.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Individual municipal and local agencies in most cases (2000 townships), although five county health departments have the responsibility for an additional 500 townships. The state promulgates regulations, and trains, tests, and certifies Sewage Enforcement Officers (SEOs). Every municipality or local agency must hire or contract with at least one SEO, who evaluates sites and makes stipulations to the builder with respect to design. Enforcement is reported to be inconsistent from local agency to local agency.

Code was last revised in: November, 1997.

New revisions in progress? To be adopted when? Minor revisions, and the addition of newly permitted technologies, are episodic, but no major revisions are currently in progress.

Role of legislature, regulatory agency, and politics: Regulations undergo major revision only in response to new state law. The 1997 regulations followed from new law in 1994. New technologies may be episodically added to the regulations through amendments. Generally the legislature is aware of the wastewater problems.

Management Programs (Answers 3e-3g Summarized)

Presently, the SEO evaluates sites, carries out inspections during construction and prior to covering, and issues permits. SEOs also investigate complaints, take enforcement actions, and review development proposals for their consistency with municipal sewage facilities plans. There is definitely a need for onsite management. Initially the state had taken a firm approach to compel management programs, but has backed off in the face of public reaction. This plan, for the most part not adopted locally, called for pumpout and evaluation every three years. If a district is established, all homeowners must participate. Also, Broad Top Township, Bedford County, has a large federal subsidy to assume ownership and operation/maintenance responsibility for onsite systems. Carroll Valley Borough has a management program for recirculating sand filters. Finally, the Pennsylvania Rural Electric Association is looking at a possible role in onsite management.

New Technology (Answers 4a-4h Summarized)

Present code accommodates, and sometimes requires, both alternate and advanced technologies, and can require the use of Best Available Technology (called Best Technical Guidance) for difficult remediations. Non-conventional systems in use include sand filters, mound systems, package plants, aerobic systems, and spray irrigation. The DEP tests and authorizes new technologies, or contracts to have it done. Private companies can also obtain permits to test and prove proprietary technologies. Alternative or advanced technologies are permitted on sites that can not support conventional systems. Technologies may be tied to particular site conditions. For example, Bio-Microbic's FAST system may be required for denitrification, and Ecoflo's peat-based filter may be required for shallow soils. Certain technologies require annual inspection and performance evaluations. State regulators require an alternatives analysis for developments and municipalities which would include new technologies, but they, and their cost, would need to be justified. As the cost of advanced treatment diminishes, it could be expected that it would be more widely stipulated. Cluster (or community) systems have been allowed since 1973; the potential for more widespread use is there, but it depends on municipal acceptance, and changes in subdivision and zoning regulations; these are not assured.

Onsite Funding (Answers 5a-5c Summarized)

For several years, there has been a state low-interest loan program (PENNVEST), partially funded by EPA, for individual system repairs to low-income households. One problem is that repair costs may exceed property value or homeowners' equity; another is the limited budget of the program.

Leadership and Information

State-level agencies, task forces:

- Dept of Environmental Protection (DEP), Bureau of Water Quality Protection, Division of Wastewater Management, 400 Market Street, 11th Fl, Harrisburg, PA 17101-2301; tel: 717-787-8184.

- There is, reportedly, a Citizens Advisory Council to the DEP's Water Quality/Sewage Advisory Committee, and PASEO (see below) advises the DEP as well; further details, NA.

Local governmental agencies, task forces:

- Broad Top Township, and Carroll Valley Borough (see text).

Research within governmental agencies:

- DEP funds onsite research.
- DEP and the Department of Conservation and Natural Resources together locate and monitor experimental technologies in state parks.

Research within universities:

- Delaware Valley College has a contract with the DEP for an onsite demonstration project and research program.
- Pennsylvania State University, Wilkes College, and University of Pittsburgh also have research programs.

Onsite demonstration programs: See above.

Training or certification programs:

- DEP requires pre-certification training for Sewage Enforcement Officers (3 days); and continuing education after certification (averaging about a day per year). PSMA (see below) offers certification courses.
- Pennsylvania State Extension also runs educational and outreach programs.
- PASEO (see below) runs periodic training courses and field trips to demonstration sites.

Citizen action, private groups:

- The Pennsylvania Association of Sewage Enforcement Officers (PASEO), a professional association, has an internal task force which advises the DEP's Water Quality/Sewage Advisory Committee: P. O. Box 7096, Mechanicsburg, PA 17055; tel: 717-761-8648; eml: paseos@aol.com (G.L. Longwell, Jr., Administrator).
- Pennsylvania Septage Management Association (PSMA), is a very active trade organization.
- The Pennsylvania Rural Electric Association is looking at a possible role in the management of onsite systems.
- Alliance for Chesapeake Bay.
- Audubon Society.
- Sierra Club.

Newsletters, forums, other sources of information:

- PASEO publishes a newsletter, and holds an annual conference.
- DEP's web page: www.dep.state.pa.us.

Rhode Island

Summary

Rhode Island has about 150,000 systems in the ground (90,000 estimated to be cesspools), and repairs or replaces 2000 annually. Figures on new installations were not available. Problems are fairly widespread due to aging developments, the many lakes and ponds, and the sinuous coastline, marked by several closed shellfish beds. Mechanisms exist to authorize alternative systems on a case-by-case basis with management controls on them, but their widespread use is regarded as problematical because of the potential for permitting still denser development in sensitive areas. There are presently attempts to grapple with the standards and conditions of their use. Added onsite wastewater controls are already in place in several communities, and the DEM has also undertaken targeted enforcement measures. The state has had enabling legislation for onsite districts since the late 1970s. Several communities are considering their establishment, but it hasn't happened yet. Several state and city loan/grant programs for upgrades are in existence. The DEM has undertaken several research initiatives, sometimes in cooperation with the University of Rhode Island, which also runs an onsite training and demonstration center. Rhode Island currently licenses installers and inspectors, and is soon expected to license designers and soil evaluators.

Numerical Information

Total number of onsite systems: 150,000, of which approximately 90,000 are cesspools; 1994 U.S. census reports about 120,000 systems.

Number of new systems installed each year: NA

Failure definition: NA

Number or proportion of systems presently failing: Approximately 25%, with some estimates higher.

Number or proportion *repaired* annually: Approximately 1% (1500-2000) repaired or replaced.

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): So far, only a handful have involved new (alternative or advanced) technology, but it is estimated that approximately 10% would benefit from its use.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): See above.

Cost of a conventional *septic system* installation: $5000-$9000, but up to $20,000 on problematic sites with severe constraints.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $2000-$10,000.

Present Onsite Status (Answers 2a-2f Summarized)

There are problem areas within the state related to dense development, failing systems (age, substandard design, inadequate maintenance), or both. Although new development pressure in this small, already heavily developed, state is not the greatest concern (in part because much of the state now has 2-5 acre zoning), the conversion of vacation homes to year-round use is causing problems around inland lakes and ponds. Problems on the coast stem from aging dense developments, seasonal to year-round conversions, and high fecal levels in embayments used for shellfishing, as well as nitrate loading in coastal ponds. Shellfish bed closures are estimated to have cost $4 million in annual losses. Coastal areas in jeopardy include Narrow River, Bristol Harbor, Greenwich Bay, Portsmouth's Island Park, Green Hill and Ninigret ponds, and Point Judith's Great Salt Pond.

There are also inland areas marked by concern over nitrate levels in private wells. The Scituate Reservoir Watershed, marked by dense tills and a high water table, will not meet code. Added wastewater controls are already in place to protect the reservoir, which supplies drinking water for 90% of the state. The Wood-Pawcatuck River Watershed has generally good water quality, but future pressures and problems are expected. North Kingston is marked by densely developed areas with water quality and failure problems; the city is considering building a central treatment facility, but there is resistance to those plans. Soils around Newport and Middletown are dense basal tills, with slow permeability and high failure rates. Block Island has a sole source aquifer, and is instituting a watershed-based management program. Still, while there are several enforcement actions underway related to POTWs and NPDES discharges, there are none concerned specifically with onsite problems.

Bringing cost to parity with conventional systems would probably have little effect on repair or replacement rate; however, if using alternative technology could effect a repair, rather than the total replacement, of a conventional system, and if that alternative was less costly, it might increase repair rate markedly, in spite of maintenance-related costs and inconvenience.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Rhode Island does not have local health departments. All septic system permitting and inspection is conducted by the Department of Environmental Management (DEM).

Code was last revised in: 1997.

New revisions in progress? To be adopted when? Revisions are constantly in progress by way of amendments; one concern at present is to establish a better defined niche for alternative and advanced technology, and to specify the standards and conditions of its use.

Role of legislature, regulatory agency, and politics: The most recent round of revisions was driven by legislatively mandated licensing and training of onsite personnel. Past history has shown a basically supportive legislature.

Management Programs (Answers 3e-3g Summarized)

There are areas in Rhode Island where systems need to be systematically remediated, and critical resource areas (such as shellfish beds) where special technological or management requirements should probably be emplaced. The issue is complicated and controversial, however. Critical resource areas may already be sufficiently protected by other land use tools that discourage or limit development. Advanced technology may permit denser development than otherwise, bringing with it other nonpoint impacts which could negate or exceed the added benefit of special onsite technology.

Rhode Island passed enabling legislation for municipalities to establish onsite wastewater management districts in 1985, and several towns are presently considering their establishment—Charlestown and Westerly out of concern for coastal pond quality, South Kingston out of concern for overdevelopment, and Block Island out of concern for nitrate loading of its sole-source aquifer. Block Island's watershed-based plan, carried out with federal funding, calls for treatment standards, and inspection, monitoring, maintenance, and evaluation, after which alternative, denitrifying systems may be required for "hot spots." Similar measures are being considered for the Green Hill Pond watershed. Charlestown has already enacted a strong management ordinance, but has been hampered by lack of funding. However, a voluntary inspection and pumping program has been started. Tiverton, too, has already enacted a tight onsite ordinance to protect Stafford Pond, a public drinking water supply.

New Technology (Answers 4a-4h Summarized)

There are mechanisms to test and authorize new technology at state level. Present code accommodates alternative and advanced systems, albeit with periodic oversight. New code may require advanced or alternative systems for critical resource areas, whether because of poor soils, high water table, private well contamination, or nitrogen-sensitive waters (but see the paragraphs above as well). At present, remediation does not require Best Available Technology. This may change, but cost may mitigate against achieving widespread compliance if standards are too strict. Over eighteen types of I/A technology have been approved, including Bioclere, Indrain, Infiltrator, Norweco, Orenco, Waterloo Biofilter, RUCK, mound, intermittent and recirculating sand filters, and pressure dosing. They are presently permitted under a variance procedure on a case-by-case basis. If alternative technology is put into widespread use, the town involved would need to establish a management district, for otherwise jurisdictional responsibility for onsite systems falls directly with the Rhode Island DEM, which, at present, does not have a legislative mandate to establish management programs of its own.

Onsite Funding (Answers 5a-5c Summarized)

EPA funds are used for a State Revolving Fund that will provide $1 million per year to communities with onsite management programs. For several years the city of Warwick has operated a 60/40 loan/grant program for the upgrade or replacement of single family onsite systems.

Leadership and Information

State-level agencies, task forces:

- R.I. DEM has undertaken several initiatives, sometimes jointly with URI (see below). These include targeted enforcement projects in sensitive areas; establishment of a policy forum; establishment of a loan program to finance upgrades; funding of seed initiatives to establish onsite districts, development of an inspection manual; and coordination and funding of research and training programs. (Contact Mr. Russell Chateauneuf, Div Groundwater and ISDS, ISDS Section, 291 Promenade St, Providence, RI 02908.)
- Technical Review Committee (Contact c/o Trystan Jones, R.I. DEM)

Local governmental agencies, task forces:

- See text and map for communities that have started special programs.

Research within governmental agencies: On contract, see below.

Research within universities:

- URI Cooperative Extension (contacts below) has done research on denitrifying systems.

Onsite demonstration programs:

- R.I. DEM has funded several demonstration projects including recirculating sand filters, waterloo biofilters, shallow drip irrigation systems, and a community STEP system. Some research has also been locally or privately funded.
- The Block Island and Green Hill Pond watershed management plans both will contain demonstration components.

Training or certification programs:

- R.I. currently licenses septic system installers and inspectors; as of 1998 it will begin licensing designers and soil evaluators.
- URI Onsite Training Center (training and, in the future, certification for alternative technology): URI Cooperative Extension-Water Quality, Natural Resource Science, 135 Woodward Hall, 9 East Alumni Ave, Suite 5, Kingston, RI 02881; (Contact George Loomis/David Dow, tel 401-874-5950, fax 401-874-4561, eml dbdow@uriacc.uri.edu).

Citizen action, private groups:

- Ocean Ridge Civic Association (Green Hill Pond Watershed).
- Several other communities have groups working on onsite issues, further details, NA.

Newsletters, forums, other sources of information:

- URI Cooperative Extension runs a series of workshops for a variety of clientele.
- R.I. DEM's Policy Forum, which publishes a newsletter.
- See the towns mentioned in the text that have created, or are considering, management districts.

South Carolina

Summary

South Carolina has about 750,000 systems in the ground. How many are repaired or replaced each year is not known, but about 21,000 per year are installed. Problem areas are generally found in the middle of the state (poor permeability), and along the coast (wetness and shallow water table being particular problems). However, South Carolina's focus is on the totality of nonpoint pollution control, with septic systems believed to contribute only 5% to the total load. For permitted alternative systems periodic maintenance or oversight are not required under the code. Notwithstanding the above, several individual communities are considering local ordinances that will require periodic inspection and maintenance, or even the establishment of onsite maintenance entities. Generally, when density warrants it, the state prefers the creation or extension of sewer service, and absent maintenance entities does not favor the widespread use of new technology. There are limited local loan programs for low-income households, but not much support at state level for expanding them. All professionals who evaluate sites and approve permits undergo state-level certification. At present, there is little in the way of state or university research, although two sites are being sought to demonstrate peat filtration techniques.

Numerical Information

Total number of onsite systems: 750,000; 1990 U.S. census reports about 578,000 systems.

Number of new systems installed each year: Approximately 21,000.

Failure definition: Surface breakout, residential backup, or contamination of wells or surface water near the site.

Number or proportion of systems presently failing: Conventional systems that have been in operation for more than 5-6 years fail at a rate of about 6-7%, while the failure rates for various alternative systems range from 3-22%. Common reasons cited for failure were high water table, poor permeability, shallow soils. Not all failures are due to hydraulics or siting; one survey indicated that physical damage to systems (vehicle overpasses, broken components) accounted for more than half the failures. It is estimated that during a cold, wet winter and spring 10-20% of all systems will fail, that percentage dropping with warmer, drier weather.

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): NA

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Less than 1%.

Cost of a conventional *septic system* installation: $1200-$2000; range $650-$12,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): Rates range from $500 to $12,000 per tap, averaging $750-$1500. Monthly fees average $25 or $30.

Present Onsite Status (Answers 2a-2f Summarized)

It is reported that by this time most cesspools have been replaced with septic systems or central sewers. There are, however, problem areas with aging septic systems installed prior to current standards. And there are areas under development pressure that can aggravate the problem. Over 90% of health departments replying to the Small Flows survey reported population increases, with much of the growth on the coast, and/or in non-sewered areas. Problem areas are generally found in the middle portion of the state, and on the coastal plain. South Carolina's focus is on understanding and controlling all sources of nonpoint pollution, of which septic systems are believed to contribute only 5% of the total load. As regards septic systems, the contaminant of most interest is fecal coliform, although concerns about nitrogen loading are increasing. Resource concerns include drinking water supplies as well as commercial and recreational use of fresh and coastal waters.

Most public management entities are "probably" considering the extension or creation of sewer service in areas not currently served. Resistance is variable, dependent on such factors as cost and location, but it is certain that some residents oppose extending public sewers because of its facilitation of increased development. There are various local enforcement actions in progress, but details were not reported.

Whether alternative technology would be more widely employed as cost diminished would depend on the management and maintenance scenario. It is not believed that homeowners, on their own, can be expected to manage advanced technology. Were such technologies promoted or demanded by a management entity that also saw to their regular oversight, that would lower overall cost in itself, as well as create demand.

Anticipated Changes in Regulations

Who administers, enforces onsite code? State regulations (Dept of Health and Environmental Control, DHEC) are implemented by county health departments. The health departments are extensions of the state agency, and enforcement is regarded as both adequate and uniform across the state.

Code was last revised in: 1986.

New revisions in progress? To be adopted when? A review is in progress, the process (except for legislative action) is expected to be completed by January 2000. Review and comment on proposed changes are held in a public forum, and licensed contractors and septage haulers are notified by memo or newsletter as required.

Role of legislature, regulatory agency, and politics: It is the general reaction of the public to resist new legislation that increases public or private costs. There is no predicting how the General Assembly will react to proposed changes.

Management Programs (Answers 3e-3g Summarized)

Throughout the state there is some degree of need to remediate older systems, but not necessarily systematically, and there is a statewide effort to educate the public to the need for regular maintenance. A few coastal communities, on their own, are considering local ordinances to require periodic maintenance or establish management entities; their discussions are encouraged by the state. The political climate is such that local initiatives may have the greater chance of success. No DHEC conclusions regarding management entities have yet been drawn; ultimately the outcome will rest on the support of local governments, the public, and the General Assembly. The same holds for the prospective designation of critical areas requiring more stringent standards. There are no reports of interest by utilities in operating O/M programs.

New Technology (Answers 4a-4h Summarized)

Alternative systems are required for sites that are unsuitable for conventional systems, although not all sites are suitable even with approved alternatives. For alternative systems that have been permitted, periodic maintenance or oversight is not required under current regulations. There are no provisions in the code for advanced treatment. Current regulations require that failing systems be repaired, even if the measures taken do not conform to current standards. This is not the same thing, however, as expecting every family to purchase "Best Available Technology"; more typically the local board will do "the best that it can," given the site and the resources of the household. Package plants are discouraged for residential subdivisions; information on the use of cluster systems was NA.

Onsite Funding (Answers 5a-5c Summarized)

Widespread onsite funding and loan programs are not anticipated; there is some feeling that public money would be better spent on extending sewer service. In limited circumstances, public money has been made available to low-income families in need of repairs or replacement of failing systems.

Leadership and Information

State-level agencies, task forces:

- The Dept of Health and Environmental Control periodically re-examines its requirements relative to onsite systems. (Contact: Mr. Richard Hatfield, S.C. Dept of Health and Environmental Control, Div of Onsite Wastewater Mgmt, Bureau of Environmental Health, 2600 Bull St., Columbia, SC 29201; tel 803-935-7835.)

Local governmental agencies, task forces: NA

Research within governmental agencies: Some; further details NA.

Research within universities:

- The University of South Carolina has conducted limited research at various times in the past.

Onsite demonstration programs:

- Two constructed wetland systems were installed several years ago, but have not been properly maintained by their owners. Presently two sites are being sought for the demonstration of peat filtration technology.

Training or certification programs:

- All persons responsible for evaluating sites, and approving permits undergo department certification. There is also a program in development at state level to ensure continued program competency and consistency in practice.

Citizen action, private groups:

- The Beaufort County Clean Water Task Force continues to examine the onsite issue, and may be advocating adoption of a county ordinance more restrictive than state regulation. A few other groups and individuals have expressed interest in its activity.

Newsletters, forums, other sources of information:

- There is a DHEC newsletter associated with the public review of onsite regulations presently in progress.

South Dakota

Summary

South Dakota has about 80,000 systems in the ground. Figures on new installations, repairs and replacements were not available. The cities are sewered; elsewhere populations are sparse. Alternative systems are permitted case by case by the state. Mound systems are permitted to deal with high water tables or shallow bedrock, but their use is not widespread; and problems with onsite discharges are not thought to be serious anywhere. There are no loan programs for upgrades. No special management measures are contemplated; there are no research or demonstration projects. There are training and certification programs, but details were not available.

Numerical Information

Total number of onsite systems: 1990 U.S. census reports about 80,000 systems.

Number of new systems installed each year: NA

Failure definition: Backup, surfacing of effluent, pollution of ground- or surface water.

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Very few alternative systems are in use other than mounds, and those are rare as well; DENR (which reviews all alternative systems) only sees about ten applications per year for mound systems.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): None.

Cost of a conventional *septic system* installation: $2500-$3000; range $1800-$8000; higher for mounds and other alternatives.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $500 and up.

Present Onsite Status (Answers 2a-2f Summarized)

Problems with onsite systems are described as not extensive, few and isolated. Problems that do arise are related to high groundwater (especially in the eastern half of the state), poor soils, and shallow bedrock or steep slopes in the Black Hills; however, in general, it is the western area of

the state, particularly the southwest, that is growing, especially along I-90. For much of the state, water tables are deeper than 100 feet. No communities are reported as being under enforcement actions. Sewering is supported in the cities, but most of the state is sparsely enough populated that sewering is not an option. Onsite wastewater treatment is reported not to be a pressing concern.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is made at state level, and in some cases administered by county or city health departments; otherwise, oversight falls to the DENR. Alternative systems are reviewed by the state DENR. Enforcement is reported to be adequate, but variable.

Code was last revised in: 1997 (minor revisions).

New revisions in progress? To be adopted when? Regulations are updated on an "as needed" basis; no revisions are currently planned.

Role of legislature, regulatory agency, and politics: Legislative adoption is required for major changes, which would be supported if well justified. But no changes are currently before the legislature.

Management Programs (Answers 3e-3g Summarized)

Only commercial or multifamily installations presently require plan review. Remediations may require Best Available Technology. At state level, no areas or types of development are targeted for special measures, and no onsite management entities are contemplated. Nevertheless, new development and some densely developed older areas might benefit from such measures, and several counties (at least Pennington, Meade, and Lawrence counties) are looking at such options. There is no current interest in managing O/M districts on the part of electric cooperatives or utilities. A central water cooperative had attempted such a program, but "without much luck"; further details, NA.

New Technology (Answers 4a-4h Summarized)

Code accommodates I/A technologies as experimental systems, which are approved directly by the state. Their use can enable development not otherwise possible. Nevertheless, such systems are not in widespread use. Permitted alternatives include mound and gravelless systems. It is thought that there is not much need or demand for I/A technologies, although mound systems are coming into some use in areas with high water tables, or shallow bedrock, e.g., in the Black Hills (western South Dakota). Package plants and cluster systems play only a moderate role, but any new dense subdivision requires central sewage treatment, so the role of package plants can be expected to grow.

Onsite Funding (Answers 5a-5c Summarized)

There are no state level betterment loan programs for upgrades, and none are contemplated. Individual counties sometimes have programs for qualifying homeowners; they are viewed favorably.

Leadership and Information

State-level agencies, task forces:

- South Dakota Dept of Environment and Natural Resources, Div Environmental Services, Joe Foss Bldg, 523 E Capital, Pierre, SD 57501 (contact: Richard A. Hanson, Environmental Program Scientist, tel 605-773-3351, eml richh@denr.state.sd.us).

Local governmental agencies, task forces:

- Meade County is considering onsite management protocols: Meade County, 1425 Sherman St, Sturgis, SD 57785; contact: Arvid Meland, Septic Inspector and Soil Scientist, tel 605-347-3818.
- Pennington and Lawrence counties are reportedly examining onsite issues; further details NA.

Research within governmental agencies: None.

Research within universities:

- No research, although South Dakota State University has sponsored onsite system workshops, and prepared written materials for system owners.

Onsite demonstration programs: None.

Training or certification programs:

- See above (South Dakota State University).

Citizen action, private groups:

- Various groups are involved in watershed planning, further details NA.

Newsletters, forums, other sources of information:

- The South Dakota State University Extension Program publishes bulletins.

Comments

A comment with respect to the Scoping Project map, “Future Density...” The higher density area in the southwest should all be hashered to at least the same level; a portion of it following I-90 from Rapid City west, and U.S. highways 16, 18 and 385 will have higher densities than depicted.

Tennessee

Summary

Tennessee has about 780,000 systems in the ground. Figures on new installations were not available. About 6000 repairs or replacements are made annually. With many nonconforming systems, mountainous terrain, shallow bedrock, and karst topography, problems with contamination of surface and groundwaters are widespread, if small in scale. Code accommodates alternative systems, but they are not in widespread use. There are no loan programs for upgrades. No special management measures are contemplated; there are no research or demonstration projects. Installers require certification by the state.

Numerical Information

Total number of onsite systems: From 1990 U.S. census, approximately 780,000.

Number of new systems installed each year: NA

Failure definition: Overt surface discharge, backup into residence, or clear public health hazard.

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: About 6000 repaired or replaced.

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): A small percentage involve alternatives such as low pressure pipe, mounds, and gravelless trenches, but most will be replaced by conventional ISDSs.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): NA

Cost of a conventional *septic system* installation: About $2000; range $1000-$10,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): Estimated at $1000-$2000(?).

Present Onsite Status (Answers 2a-2f Summarized)

There are presently many “pockets” of problem areas in the state. For years systems were blasted into solid rock. While the practice is no longer permitted, existing systems have caused groundwater contamination in several areas. There are also extensive areas in Tennessee with steep slopes, poor or shallow soils, and karst topography. Reasons cited for failure include age, poor condition or small size, damage, wet weather, poor or shallow soils, steep slopes, and

sinkholes. Likewise, there are areas under development pressure with similar conditions. Eastern Tennessee is marked by many small systems, often substandard. In the Smoky Mountain area in particular, there is an attempt to balance growth with environmental and resource conservation, but the mountains make sewering costly and onsite systems more attractive in spite of poor onsite conditions. Over 90% of health departments replying to the Small Flows survey reported population growth. This is particularly the case in central Tennessee in the counties surrounding Nashville where percolation problems and very high growth rates could stifle economic development. Many rural areas are also shy on expertise and funding. There are municipalities considering the extension or creation of centralized sewer service, but it can be politically controversial because of costs, effects on home values and tax rates, and jurisdictional (annexation) disputes. Whether any communities are under enforcement actions was NA. Little change in policy would be anticipated even if the cost of alternative technology diminished.

Anticipated Changes in Regulations

Who administers, enforces onsite code? City and county health departments enforce statewide regulations in Tennessee.

Code was last revised in: 1997.

New revisions in progress? To be adopted when? Generally there are revisions approximately every year, but none are currently in progress. 1997 revisions brought several additional alternative technologies online.

Role of legislature, regulatory agency, and politics: Political support or its absence would depend on the terms of any future code revisions.

Management Programs (Answers 3e-3g Summarized)

There are clearly areas that should require special technological or management mandates. However, there are presently no systematic remediation or management programs in the state.

New Technology (Answers 4a-4h Summarized)

The present code accommodates alternative and innovative systems under a state-level testing and certification program. Alternatives presently employed include aerobic treatment, effluent filters, sand filters, recirculating gravel filters, mound systems, and low pressure pipe. No systems presently require systematic oversight or management, and there are no areas requiring upgrades to Best Available Technology. There is no written provision for advanced or enhanced treatment, but it may be allowed on a case-by-case basis.

Onsite Funding (Answers 5a-5c Summarized)

None.

Leadership and Information

State-level agencies, task forces:

- Division of Ground Water Protection, Tennessee Dept of Environment and Conservation, Tenth Floor L&C Tower, 401 Church St, Nashville, TN 37243. (Contact: Mr. Steve Morse, tel 615-532-0761.)
- For I/A technologies: Contact, Mr. Ernie Taubert, at the address above; tel 615-432-4015.
- Tennessee Valley Authority, 6001 Trotwood Ave, Columbia, TN 38401. (Contact: Ms. Leanne Whitehead, Water/wastewater Specialist, tel 931-380-8032, fax 931-380-8008; eml lawhiteh@tva.com).

Local governmental agencies, task forces: NA

Research within governmental agencies: Not at present.

Research within universities: NA

Onsite demonstration programs: None.

Training or certification programs:

- Onsite installers require certification by the state.
- The Tennessee Onsite Wastewater Training Center is run by TOWA; see below.

Citizen action, private groups:

- Tennessee Onsite Wastewater Assn (TOWA), Tennessee Environmental Assistance Center, 3000 Morgan Rd, Joelton, TN 37080 (contact Tom Petty, President, tel 615-299-9725).

Newsletters, forums, other sources of information:

- "Yes"; further information NA.

Texas

Summary

Texas has about 1.3 million systems in the ground, and installs another 45,000 per year. Figures for annual replacements or repairs were not available, although a database is being developed to track such information. While no communities are under enforcement actions, there are problem areas scattered throughout the state. East Texas is low, wet and marked by clayey soils. Outside of the sewered cities, coastal areas and the Rio Grande Valley are marked by small lots, antiquated systems and marginal soils. Code accommodates ANSI-NSF certified alternative systems, each permitted with specific limitations and criteria for testing and monitoring, as well as a maintenance contract. Aerobic systems are in widespread use in east Texas, and in areas around Austin aerobic systems combined with drip irrigation are common. Alternatives could account for 30% of new installations, and a higher portion of replacements. Several counties are considering the creation of management utilities or districts. There are limited loan programs for upgrades. Site evaluators, installers and inspectors are certified by the state. State research is funded through an Onsite Wastewater Treatment Research Council; there are research and demonstration programs at two universities; and there is a Texas Onsite Wastewater Association.

Numerical Information

Total number of onsite systems: 1990 U.S. census reports 1.27 million.

Number of new systems installed each year: 45,000.

Failure definition: Hydraulic failure (surfacing effluent) or inadequate treatment resulting in contamination of surface- or groundwater.

Number or proportion of systems presently failing: 10-15% estimated.

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: NA

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Efforts are underway to collect this sort of information, but at present it is not systematically available. In east Texas, marked by tight clayey soils, 20-30% of new systems are reported to be alternative; the percentage could be higher for replacement systems.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Again, systematic information is NA, but aerobic systems and spray irrigation systems with disinfection are reported to be commonly used in some areas.

Cost of a conventional *septic system* installation: $1200-$4000, range $1000-$24,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized)

Water quality from a bacteriological standpoint is said to be fairly good throughout the state; from a chemical standpoint, it varies from region to region. The state has significant variability in climatic conditions, ranging from very dry to very wet, and from year-round semitropical to severely "temperate". This obviously has implications for the types of systems likely to be most successful. Generally, areas most threatened by physiographic or hydrological conditions are located in the eastern portion of the state where poor soils predominate. These problems are expected to worsen with development pressure outside of sewered areas. Some specifics: the northeast, including Dallas/Fort Worth, is marked by clay soils and heavy rainfall. Aerobic systems are in widespread use. The Gulf coast, including Houston, is marked by increasing development, small lots, marginal soils, and above-average rainfall. The southwest, along and north of the Chihuahua and Rio Grande rivers, is marked by historically small lots, few water and sewer hookups, and a wide variety of soils.

Reasons cited for failures include poor soils, neglect, seasonal wetness and heavy rains; the main reason, however, is antiquated systems and cesspools. Under new code, focus in the state is on assuring that soil and hydraulic conditions are adequate to handle the proposed system. No municipalities are under enforcement actions. Generally the extension or creation of central facilities is supported by regulators and the public, when and if conditions so warrant; but with urban sprawl more attention needs to be paid to onsite alternatives.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is made at the state level by the Texas Natural Resource Conservation Commission, and administered by designated local authorities, which may include county, city, or district health departments, or river authorities. Generally enforcement is regarded as inadequate; the industry organization, TOWA, is pressing for stiffer enforcement.

Code was last revised in: 1997; an extensive revision then provided for better enforcement, categories of professional certification and training by the state, as well as the creation of a Research Council and Training Center. Updates are not on a regular schedule.

New revisions in progress? To be adopted when? No.

Role of legislature, regulatory agency, and politics: While rules are created by the Texas Natural Resource Conservation Commission, lately the legislature is reported as having a more active role in the process.

Management Programs (Answers 3e-3g Summarized)

Under the new rules, all designs are to be site- and condition specific, and all systems have maintenance requirements. Alternative systems receive operating permits with specific maintenance conditions. Enforcement is left to demonstrated homeowners' contracts with

licensed installers; inspections are required at the time of title transfer. At the same time, adequate enforcement is reported to be problematic. Presently, no management entities are contemplated at state level, but one or more counties are considering administrative mechanisms for systematic inspection and maintenance of particular kinds of systems such as spray irrigation.

New Technology (Answers 4a-4h Summarized)

Code accommodates and may require alternative systems in order to meet minimum criteria, or to permit development on otherwise unsuitable sites. All alternatives certified by an ANSI-NSF accredited laboratory are permitted. Each I/A technology is permitted with specific limitations or design criteria, and specific requirements for testing and monitoring of use. Permitted systems include sand filters, mounds, package plants, aerobic systems, evapotranspiration beds, leaching chambers, low pressure dosing, constructed wetlands, subsurface drip distribution, gravelless pipe, chamber and spray distribution. Remediation does not require BAT, but must, given soil and flow conditions, meet minimum criteria. Alternative systems require a maintenance contract and, depending on type, may require effluent monitoring. Aerobic systems are in widespread use in east Texas. In areas around Austin, with little topsoil, aerobic systems and drip distribution are widely used. Reportedly, 32,000 of 47,000 permits issued in 1998 were for aerobic systems. Cluster systems are in use, but ownership problems associated with them, and operational costs associated with package plants, result in these not being popular choices. There are both state and local mechanisms to evaluate new technologies.

Onsite Funding (Answers 5a-5c Summarized)

There are limited loan programs (Texas Housing Authority and Texas Water Development Board) to help low-income homeowners with repair and upgrade of onsite systems, but SRF funds are not involved. Expansion of these programs would compete with other programs in a climate not favoring increased governmental expenditures.

Leadership and Information

State-level agencies, task forces:

- Texas Natural Resource Conservation Commission (TNRCC), MC-178, POB 13087, Austin, TX 78711; tel 512-239-4775.

Local governmental agencies, task forces: As reported: “New approaches are needed to address wastewater treatment needs. Many agencies and local organizations are meeting to consider the options.” Some examples:

- Johnson County is reportedly discussing ideas akin to maintenance entities; further information, NA.
- The Houston-Galveston Area Council of Governments has organized an advisory group to educate decision-makers on their options; they also conduct educational site visits.

Research within governmental agencies:

- $10.00 of every septic system permit issued goes to the governor-appointed Texas Onsite Wastewater Treatment Research Council. The Council decides what projects to fund; presently the emphasis is on training.

Research within universities:

- Texas A&M has a research program which currently is looking at constructed wetlands, subsurface drip distribution, as well as nutrient and pathogen removal; (contact: Bruce Lesikar, Texas Agricultural Ext Service, 205 Scoates Hall, College Station, TX 77843; tel 409-845-7451, fax 409-847-8828, eml b-lesikar@tamu.edu.)
- Baylor University has a research program; (contact: Dudley Burton Chair, Dept Environmental Studies, Baylor University, POB 97266, Waco, TX 76798; tel 254-710-3405; eml dudley_burton@baylor.edu.)

Onsite demonstration programs:

- The USEPA 319(h) program has been used to fund demonstration systems located at individual residences throughout the state.

Training or certification programs:

- The following certifications are administered by the TNRCC: Apprentice, Site Evaluator, Installer I and II, and Designated Representative. These programs were implemented in 1997; an 8-hr per year continuing education requirement is being implemented for license renewal in August of 1999. Several “hands-on” training/demonstration centers exist, including:
- South Texas International Onsite Wastewater Treatment Training Center, 2515 E. Hwy 83, Weslaco, TX, 78596; contact: John Drawe, tel 956-968-5585.
- Intl Wastewater Treatment Training Center, Texas Agricultural Extension Service, 1030 North Azragosa, Ste A, El Paso, TX 79907; contact: Raymond Bader, tel 915-859-7725.
- Texas Onsite Wastewater Treatment Training Center, Texas Agricultural Extension Service, 205 Scoates Hall, Texas A&M, College Station, TX 77843; contact: Bruce Lesikar, tel 409-845-7453.

Citizen action, private groups:

- Texas Onsite Wastewater Association (TOWA).

Newsletters, forums, other sources of information:

- “Texas Onsite Insight” is published by the Texas Onsite Wastewater Treatment Research Council, and is also on the web: http//: towtrc.tamu.edu.
- The Council also holds an annual conference.
- TOWA publishes a quarterly newsletter, the “TOWA Insider.”

- Texas Agricultural Extension Service has developed a variety of fact sheets on various onsite technologies, which can be obtained through their website as well.

Comments

Frustration with the questionnaire was expressed, one respondent "failing to see the points of many of the questions."

Utah

Summary

Utah has about 75,000 systems in the ground, installs another 3400 per year, and repairs or replaces about 150 annually. Sewer extensions are supported in the cities; no communities are under enforcement actions, and there are very few problem areas. However, there is concern that future development in unsewered areas will bring problems. Alternative technologies are allowed on a case-by-case basis, with conditioned permits. They are not in widespread use. It is thought, however, that there may be a place for them in new subdivisions. A few counties are examining the concept of management districts. There is a limited loan program for upgrades. There are no state research or demonstration projects, but a fledgling research, data acquisition, and training program is underway at Utah State's Water Research Laboratory.

Numerical Information

Total number of onsite systems: 85,000+; 1990 U.S. census reports 65,000.

Number of new systems installed each year: 3300-3500.

Failure definition: surface expression of effluent, overflow from components, backup, systems not complying with discharge standards.

Number or proportion of systems presently failing: several hundred estimated (per annum).

Number or proportion *repaired* annually: 70 estimated.

Number or proportion *replaced* annually: 30-150 estimated.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Virtually none.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Virtually none.

Cost of a conventional *septic system* installation: $2000-$3000, range $1200-$6000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $5000.

Present Onsite Status (Answers 2a-2f Summarized)

Presently there are only a few problem areas (albeit some of them large) due to dense development and failing systems. Counties most at risk include Weber, Summit, Wasatch and Washington. Unsuitable or thin soils and high groundwater, as they may relate to nitrate or other chemical pollution of surface- or groundwater, are the main concerns.

Failures have been attributed to high groundwater, age, inadequate maintenance, poor installation, poor soils, and undersizing or overloading. However, there are many more potentially critical resource areas with unsuitable hydrology or soils that with future development (much of it outside of sewer districts) could become problems. System permits have been denied because of high water tables, impermeable soils, steep slopes, and shallow bedrock or rock ledges. No communities are under enforcement actions; generally the state supports the extension or creation of central sewers when density comes to warrant it.

Anticipated Changes in Regulations

Who administers, enforces onsite code? The state prescribes minimum code; administration and enforcement is left to local (city, county, or multi-county) health departments for systems smaller than 5000 gpd, as well as alternative systems. Larger systems are overseen directly by the state DEQ. Utah Soil Conservation Districts are reported to feel that enforcement is sometimes inadequate.

Code was last revised in: 1996.

New revisions in progress? To be adopted when? Amendments are ongoing.

Role of legislature, regulatory agency, and politics: Major changes must be approved by the legislature, but rules can be amended without legislative approval. In general, the legislature is in favor of assuring onsite protection, but not necessarily of paying for it at state level.

Management Programs (Answers 3e-3g Summarized)

Renewable permits are not required or being considered by the state with the exception of case-by-case I/A technologies. Such systems are managed and monitored through their own state-level administrative program. Inspections of new systems are unusually complete, involving one pre-cover inspection of the tank, and two of the leachfield. Tanks may also be tested at the site for leakage. Several individual counties are presently looking into management districts; further information NA. There are no indications of interest in O/M programs by electric cooperatives or other utilities.

New Technology (Answers 4a-4h Summarized)

Particular heed is paid to new development, especially in critical areas. It is in this context that alternative systems are most likely to be deployed, not in remediation programs. The code accommodates and may sometimes require such systems through design standards. Mounds are inspected at 6-month intervals; at-grade and fill systems are inspected at 6-month to one-year intervals. Sand filters and package plants are permitted as experimental systems. The only mechanisms that exist for testing and approving new technology are protocols for the use of experimental systems. Alternative technology is not expected to play a large role in sewage disposal, even if the cost did come down, in part because of inadequate regulatory resources. At present cluster systems and package plants play only a slight role; it is thought that this could change as development pressure opens up sites with less suitable soils.

Onsite Funding (Answers 5a-5c Summarized)

There are limited local loan programs for qualifying individuals, but not much demonstrated legislative interest at state level.

Leadership and Information

State-level agencies, task forces:

- Dept Environmental Quality, Div Water Quality, POB 144870, Salt Lake City, UT 84114; (contacts Richard Jex, tel 801-538-9153, fax 801-538-6016, eml rjex@deq.state.ut.us; or Kiran Bhayani, tel 801-538-6080, fax 801-538-6016, eml kbhayani@deq.state.ut.us).
- DEQ/DWQ's Wastewater Disposal Technical Review Committee; (contact: Mr. Richard Jex, see above).

Local governmental agencies, task forces:

- Bear River Health Department, 655 E 1300 N, Logan, UT 84321; (contact Joel B. Hoyt, tel 435-753-5135, fax 435-750-0396, eml hllogan.jhoyt@email.state.ut.us).
- Several counties are involved in wastewater and management district issues; further information NA.

Research within governmental agencies: None.

Research within universities:

- A fledgling program is getting underway at Utah State University's (USU) Water Research Laboratory, which also set up a training program in 1998: Utah Water Research Lab, Utah State University, 8200 Old Main Hall, Logan, UT 84322; (contact Steve Iverson, Associate Director, tel 435-797-3159, eml siverson@cc.usu.edu).

Onsite demonstration programs: None.

Training or certification programs:

- Utah Onsite Wastewater Treatment Training Center, (contact: Steve Iverson, see above).

Citizen action, private groups: NA

Newsletters, forums, other sources of information:

- The USU Training Center publishes a newsletter.

Vermont

Summary

Numbers were not available on the number of systems in the ground. Annually, about 3000 new systems are installed and 1500 repaired or replaced. Large areas of the state have problems with aging and nonconforming systems, as well as with the mountainous terrain, and other soil or hydrological conditions. Large numbers of onsite systems are still unregulated. Several communities are under enforcement actions. Alternative technologies are permitted on very restrictive bases, and are not widely deployed. Two towns with high failure rates are looking into the formation of onsite districts. There are no loan programs for upgrades, and no state or academic research. There is an onsite training center, and site technicians are certified through the state.

Numerical Information

Total number of onsite systems: Numbers NA; reportedly about 50% of the state uses onsite systems.

Number of new systems installed each year: 3000 estimated.

Failure definition: Plumbing backup, surfacing effluent, or discharge to waters of the state.

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: Approximately 1500 are repaired or replaced p.a.

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Mounds have been in use since 1982 and sand filters since 1997. About 100 of each are installed each year, as new or replacement systems.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Very few, if any.

Cost of a conventional *septic system* installation: Conventional, $2000-$4000; with curtain drain, $3500-$6500; sand filter, $8000-$15,000; mound, $7000-$20,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized)

There are large areas of the state that have problems due to combinations of dense development, antiquated systems, poor septic system hydrology, or jeopardy of water resources. Vermont's

geology runs north-south. The western sector is marked by poorly percolating clayey soils. The northwest corner, along I-89, skirting Lake Champlain, and which includes Burlington, is under development pressure. A central mountainous spine is marked by shallow soils, ledges, bedrock, and steep slopes. The eastern sector is marked by glacial tills. In sum, about half of the mountainous state is marked by upland soils with shallow ledges and basil tills, and another quarter is marked by poorly percolating, lacustrine clay soils. Most of the Vermont Aquifer recharge area is linked by a single spring-perched water table. At present, about half the state falls under no minimum standards for single-family onsite treatment on lots larger than 10 acres. The creation or extension of central facilities is generally resisted; moreover, it is thought that additional surface discharges to state waters may not be allowed. Nevertheless, several communities scattered throughout the state are under enforcement actions, including Pownal, Shoreham, St. Johnsbury and Cabot.

Anticipated Changes in Regulations

Who administers, enforces onsite code? The state only regulates new lots of less than ten acres. Regulating old lots of less than ten acres with single-family systems, or any lots of more than ten acres, is left to local (town) health departments. This is done under a hodgepodge of ordinances (old and new), and many towns have no sewage regulations at all. Reportedly, enforcement is mainly confined to initial permitting steps, after which there is little follow-up.

Code was last revised in: 1996 (minor changes).

New revisions in progress? To be adopted when? There is no set schedule for code revisions, and no date has been set for revisions.

Role of legislature, regulatory agency, and politics: Currently there is a bill in the legislature to require statewide minimum standards for old and new lots of any size. This effort is strongly opposed by a lobby called the Property Rights Group.

Management Programs (Answers 3e-3g Summarized)

The town of Warren will be starting an NODP management district in the spring of 1999. Two other towns, marked by high population density and high failure rates, are starting to develop onsite management programs; these are Jericho and Colchester. There are no reports of rural cooperative or public utility interest in O/M programs.

New Technology (Answers 4a-4h Summarized)

Present code accommodates the use of alternative technologies, but only on sites that would meet minimum site conditions in a normal approval. I/A technologies are covered in the code in either general sections or in an I/A innovative (experimental) section, but with very restrictive provisions. Enhanced treatment is permitted but rarely employed. The most common alternative systems are mounds and sand filters, about 100 of each being installed each year. Mounds have no management requirements attached to them. Sand filters must be inspected annually for the first two years. There are no requirements for employing Best Available Technology for remediations, and little in the way of developed mechanisms (or regulatory interest) in bringing

new technologies on line, although cluster systems are expected to play an increasing role as solutions to community problems and mobile home parks.

Onsite Funding (Answers 5a-5c Summarized)

No such programs exist, or are thought likely to develop.

Leadership and Information

State-level agencies, task forces:

- Vermont Agency of Natural Resources and Department of Environmental Protection (ANRDEC), Wastewater Management Division, 103 S. Main St, Sewing Bldg, Waterbury, VT 05671 (contact: Mr. Roger Thompson, tel 802-241-3027).
- ANRDEC's Onsite Sewage Committee (task force).

Local governmental agencies, task forces:

- As mentioned, the town of Warren is establishing, and the towns of Jericho and Colchester are considering, onsite management programs. Because of enforcement actions on them, the towns of Pownal, Shoreham, St. Johnsbury and Cabot are looking at onsite issues as well.

Research within governmental agencies: None.

Research within universities: None.

Onsite demonstration programs:

- The town of Warren has received federal NODP funding for a combined community system and onsite district; work was to begin in the spring of 1999.

Training or certification programs:

- Site technicians are certified through the Vermont ANRDEC.
- Northern New England Wastewater Training Center, c/o Vermont Technical College, POB 500, Randolph Center, VT 05061; (contact: Dick Perez, Director, tel 802-234-9279, fax 802-728-1390, eml newtc@sover.net). The Center works in cooperation with several other New England states.

Citizen action, private groups:

- Wastewater Technologies, Inc., Box 80, Saxtons River, VT 05154 (contact: David H. Cotton, President, tel 802-869-3219, fax 802-869-3219, eml cotton@vermontel.com).

Newsletters, forums, other sources of information: NA

Comments

"The biggest problem in Vermont is the large number of unregulated systems to which no minimum standards apply."

Virginia

Summary

Virginia has about 925,000 systems in the ground; it annually installs another 23,000 and repairs or replaces over 4000. Many areas of the state are reported to be without problems, and the creation or extension of sewers is supported in the cities. No communities are under enforcement actions. Nevertheless, the Washington D.C. suburbs and exurbs, the Norfolk–Virginia Beach metropolitan area, and the Chesapeake Bay shore are rapidly growing outside service areas; the Appalachians are marked by thin soils, bedrock, and steep slopes; clayey soils, shrink-swell soils, and variable soils mark the piedmont; and shallow water tables and wetlands mark much of the coast, where many shellfish beds have been closed. Throughout rural areas of the state, pit privies, cesspools and straight pipes are common. Present code readily accommodates new technologies under an innovative, experimental permit program, and new technology is in fairly widespread use. Varying operation and maintenance conditions apply, typically handled by the private sector. A number of counties have inspection and maintenance protocols in place, and critical zones along the Chesapeake are subject to special measures. Several central utilities are also looking into onsite management as part of their charge. The state's current thrust is to develop a strategic plan for remediations that will focus on better O/M. Hardship grants and loans are available for upgrades. Several universities as well as the state have research programs. Environmental Health Specialists are trained by the state, and there is a Virginia Onsite Wastewater Recycling Association.

Numerical Information

Total number of onsite systems: 850,000-1 million, estimated; 1990 U.S. census reports 700,000.

Number of new systems installed each year: 20,000-25,000.

Failure definition: Sewage backup to house, or surface expression of effluent.

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: 2000+.

Number or proportion *replaced* annually: 2000+.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Less than 10% of either repairs or replacements involve either alternative or advanced technology.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): See above.

Cost of a conventional *septic system* installation: $2000-$5000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $800-$10,000, highly variable; in some areas fees are kept high to discourage growth.

Present Onsite Status (Answers 2a-2f Summarized)

There are large areas of the state without problems, but many smaller areas that sometimes have severe problems, often aggravated by older systems and dense development. The Norfolk-Virginia Beach metropolitan area and the Chesapeake Bay area are rapidly growing. Indeed any area accessible to I-81 or I-95, and within (ever longer) commuting distance of Washington, D.C., is under development pressure. On the eastern shore there are large numbers of failing systems, privies, and straight pipes. In the southwest pit privies and straight discharge pipes still exist. Karst topography, thin soils, shallow/fractured bedrock, steep slopes, and ledges mark the Appalachian area; clayey soils, shrink/swell clays, and highly variable soils with unpredictable behavior mark the piedmont; and swamps and high water tables mark the lowlands. The Chesapeake Bay and other coastal areas are cited with respect to problems or potential problems. Depending on the area, concerns can be related to pathogens, phosphorous, or nitrogen as a drinking water or coastal contaminant. Shellfish areas in Chesapeake Bay have been closed down because of high coliform counts and/or agricultural runoff. Because nutrient inputs are a major concern for the bay, determining and correcting onsite system input in certain critical areas is a likely future need, regardless of the agricultural contribution. Studies underway will help distinguish between these two sources.

No communities are currently under enforcement actions. The creation or extension of sewers is generally supported by citizens and regulators, but not without ambivalence with respect to their impacts on growth and their incapacity to recharge aquifers. (Saltwater intrusion is of concern to several cities now looking at the possibility for wastewater recycling.) If the cost of alternatives diminishes, it might be expected that more of them would be deployed. But the issue is complex; when they require operation and maintenance there are insufficient mechanisms to assure this is done properly, and the potential costs of O/M are not well understood. Also, some localities view permit denials of conventional systems as a means of “growth control.”

Anticipated Changes in Regulations

Who administers, enforces onsite code? Minimum code is made at state level, and administered by municipal, county or district health departments. Local codes can be more stringent than state code, sometimes addressing valid concerns or O/M, but it often translates to the disallowance of various alternatives, forcing de facto zoning through minimum space requirements, or percolation requirements, of conventional systems. Enforcement of code is regarded as adequate in some areas, not so in others, partly because of budget/staff limitations, and partially because of the lack of civil penalties, which often makes agency personnel reluctant to take enforcement action unless the problem is very serious.

Code was last revised in: The last major revision was in 1982, the last minor one in 1989.

New revisions in progress? To be adopted when? A major revision process started in 1996, and was expected to be completed before 1999. The state (and, independently, several counties within it) is presently attempting to develop a strategic plan with respect to onsite systems that

will center on operation and maintenance. But it needs careful justification, will require considerable overhaul of code as well as consensus building, and is still in formation. The problems are recognized, but how to solve them technically, economically and politically is not straightforward.

Role of legislature, regulatory agency, and politics: The General Assembly has a strong role in code language. Major overhauls have had, and can be expected to have, controversy associated with them. For example, developers are pushing for less stringent code, including a reduction in depth to groundwater, and manufacturers may exert pressure to favor the use of their products. Several interest groups are concerned about potential economic impacts; and a strong property rights ethic prevails as well. The environmental lobby, while having admirable goals, sometimes does not understand the scientific and management issues. In short, if enforcement methods are changed, legislative approval is required, and resistance can be expected.

Management Programs (Answers 3e-3g Summarized)

Generally the private sector handles monitoring and maintenance of individual systems. There is definitely a need in the state for systematic remediation in some areas and management/planning protocols in others. But most of the initiatives, so far, have come from local government. Many communities in the Washington, D.C. metropolitan area suburbs and exurbs have realized a need for inspection and remediation for expansions and at the time of title transfers. In less affluent areas there is more reluctance to adopt such programs, and such areas may be overwhelmed with more pressing needs such as the eradication of straight pipes. Still, there are quite a few county initiatives that move in the direction of a management protocol, from simple education and I/M programs to a willingness to experiment with more advanced systems, environmental monitoring, database management, etc. Examples include West Tidewater (Suffolk) Health District, and Chesterfield, Fairfax, and Loudon counties. Critical zones along the Chesapeake Bay are subject to special requirements, including regular pumpouts, the designation of reserve leachfields, and the use of effluent filters. Hampton Roads Sanitation District, which operates several central facilities, is looking into the management of septic systems as part of its charge. Several other Public Service Districts, but not specifically electric utilities, have expressed some interest in onsite management.

New Technology (Answers 4a-4h Summarized)

Present code or guidance policy accommodates many alternative systems, classified at four levels, but which include low pressure pipe, recirculating sand filters, other media filters, aerobic systems, mound systems, drip and spray irrigation, package plants, artificial wetlands, and shallow absorption systems. Use of such systems is permitted on lots otherwise undevelopable. New technologies come to be authorized through review of existing research or performance data and regulatory experiences in other states; or, if these data are partially supporting, through an experimental protocol under which up to 16 permits (up to 500 by variance through an innovative experimental program) may be granted among the state's four physiographic provinces. Such systems carry specific monitoring and reporting requirements. Proprietary system experimentation is encouraged. After three years of review a decision is made as to whether the system can be authorized for general use through a "Guidance Memoranda and Policy" bulletin. No alternative or advanced systems would actually be mandated except on a

case-by-case basis by the local Environmental Health Specialist who, after site review, is required to list for the owner or builder any and all systems deemed sufficient. Provided the proposal meets criteria (PE-designed, appropriate monitoring), experimental system permits can be obtained from local authorities, with review from Richmond. Sometimes, individual experimental systems of this type are not encouraged by the local office because of lack of sufficient staff oversight time. In theory, all systems require monitoring and maintenance, but enforcement is lax, often because of staff/budget constraints. For alternative systems, operating permits carry varying operation and maintenance conditions which are system- or process specific. Operating permits are perpetual, thus limiting incentive for proper O/M. The state does carry out training and limited research. The private sector has been responsible for training on its own proprietary systems.

It is reported that cluster systems would provide solutions for many small-lot older communities where sewering is unlikely. Another issue is the great number of large new commercial systems springing up outside sewer districts. “The biggest hurdle is that the size of these flows tends to put them in a regulatory ‘black hole,’ too big to be dealt with by simple onsite regulations, but too small for point-source agencies to worry about.”

Onsite Funding (Answers 5a-5c Summarized)

In a pilot program, some of the state’s revolving fund is allocated to the repair of malfunctioning or inadequate onsite systems. Hardship grants, via the Department of Housing and Community Development, are also available to use in conjunction with the RLF program. Every septic system installation in Virginia requires a $10 payment to a “state indemnification fund.” Presently, these funds are used for training Authorized Onsite Evaluators. Some 319 nonpoint funds and coastal zone funds are being used for onsite wastewater research or implementation projects. A new fund, created by the state legislature to remediate water quality problems, is available for system repair, alternative systems, and operation and maintenance, as well as a variety of other nonpoint source projects.

Leadership and Information

State-level agencies, task forces:

- Virginia Dept of Health, Onsite Sewage and Water Services, Main Street Station, Suite 117, POB 2448 Richmond, VA 23218; division tel 804-786-1750; (contacts: Don Alexander at eml dalexander@rdh.state.va.us; Allen Knapp and Roger Cooley).
- Virginia Dept of Conservation and Recreation, Soil and Water Conservation Division, 203 Governor St, Ste 206, Richmond 23219; division tel: 804-786-2064; (contacts: Stu Wilson, or Patricia Miller, tel 804-786-3199, eml pam@dcr.state.va.us).
- Virginia Dept of Environmental Quality, Coastal Zone Management Div (contact: Laura McKay, tel 804-698-4323).
- For work on Chesapeake Bay counties: Chesapeake Bay Local Assistance Dept, contact Scott Grafton, tel 804-371-7503.
- There is also state advisory committee to the onsite program. (Contact Bob Mayer, tel 800-345-3132.)

Local governmental agencies, task forces:

- See text for counties working on onsite solutions.

Research within governmental agencies: Yes, within DOH.

Research within universities:

- Virginia Tech is the lead research institution for onsite research; contact professors Ray Reneau (system performance) or Charles Hagedorn (pathogen transport). Further information NA.
- Old Dominion University and Ferrum College have also conducted research on onsite pollutants; as have George Mason Univ, Virginia Inst of Marine Sciences at Univ Virginia, and James Madison Univ. Further information NA.

Onsite demonstration programs:

- Through the experimental protocol; there are also several grant-funded demonstrations, further information NA.

Training or certification programs:

- Environmental Health Specialists who work for the DOH undergo four weeks of training at DOH; advanced professional courses are also offered by the DOH.
- Under provisions for experimental technologies, manufacturers must offer training sessions to state staff.
- The Health Dept is developing regulations for "Authorized Onsite Evaluators" who will eventually need a training program.

Citizen action, private groups:

- Virginia Onsite Wastewater Recycling Association (VOWRA); c/o American Manufacturing Co, Inc, POB 549 Manassas, VA 20108 (contact Robert B. Mayer, P.E., President, tel 703-754-0077, fax 703-754-0058, eml topvacat@aol.com).
- Virginia Assoc of Professional Soil Scientists; (contact Sue Brown, tel 540-231-5741).
- Virginia Environmental Health Assoc; (contact Chuck Jackson, tel 540-347-6363).
- Tidewater Environmental Health Assoc; (contact Pat Duttrey, tel 804-725-7131).

Newsletters, forums, other sources of information:

- VOWRA publishes a newsletter
- Virginia Dept of Health has a website.
- Virginia Dept of Health, along with the Extension Service, Loudon County, the Virginia Water Resources Research Center, and others have produced education materials, workshops, etc.

Comments

"A big issue is that although failed or inadequate onsite systems are a nonpoint pollution source, their remediation is really an infrastructure issue...Spending nonpoint water quality funds on onsite projects is good for awareness, demonstration, and data acquisition, but really cannot be counted on to ever make much of a dent in remediating inadequate systems...we could spend all of Virginia's nonpoint grants on onsite, and barely scratch the surface of the problem...[and at the same time] onsite is at a disadvantage when cost/benefits are compared with things like agricultural BMPs, [even though, for example] potential transmission of pathogens via contaminated shellfish can be an immediate, deadly risk to public health...."

Washington

Summary

Washington has about 700,000 systems in the ground, of which up to a third may be failing by current standards. About 3500 are repaired or replaced annually; numbers on new installations were not available. Large areas of the state are without problems, but the densely populated Puget Sound Basin has had shellfish bed closures, and is presently subject to aggressive management measures. No communities are under enforcement actions. Present development policies concentrate growth in designated areas, which tends to favor the extension of sewer lines. However, onsite systems are common, and conditions often bad. Well-established mechanisms exist to bring new technologies into general use, and half or more of replacements (as well as many new installations) employ some degree of alternative design. All have stipulated monitoring and maintenance protocols. By the year 2000 all onsite systems in the state must come under some form of compliance monitoring, meaning some form of management program. Several such programs already exist. Several loan fund options are available for upgrades. Certification of onsite professional is done through the counties. There is research at Washington State University and University of Washington. A Northwest Onsite Wastewater Training Center runs a demonstration project. There is also a Washington Onsite Sewage Association.

Numerical Information

Total number of onsite systems: Approximately 700,000.

Number of new systems installed each year: Approximately 25,000.

Failure definition: To be defined as failing, the system must pose a clear public health hazard or nuisance; direct or indirect contact between sewage and the public.

Number or proportion of systems presently failing: 120,000-375,000; by another account, up to a third of systems are failing; by still another, 3-5%; these estimates clearly involve different interpretations of “failing.”

Number or proportion *repaired* annually: Some 1-4% per annum; 3000-4000 repaired or replaced annually; by another account, about 0.5% annually. Note however, these numbers pertain to systems reported and repaired with permits—many are not reported, and instead are repaired by the homeowner or other non-licensed parties.

Number or proportion *replaced* annually: The above number includes upgrades.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): About 30-60% involve some sort of advance over standard septic tank/drainfield arrangements. Other reports suggest this figure is lower. East of the Cascades conventional systems are the norm.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): About 1-2% of those replaced will be highly advanced.

Cost of a conventional *septic system* installation: $1800-$4500, typically in the range of $2000-$4000; the alternative systems range $8000-$16,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $10,000-$20,000.

Present Onsite Status (Answers 2a-2f Summarized)

There are present and anticipated problem areas in the state, all west of the Cascade Mountain divide, particularly within the Puget Sound Basin where most of the state's population resides. Causes of failure include overloading, age, poor maintenance; and inappropriate design, placement, construction or soils. Permits have been denied because of inadequate separation, shallow groundwater, steep slopes, wetlands, saturated soils, and poor soils. Almost all sites with suitable soils have already been developed, forcing more widespread use of alternative technology. There is an aggressive water- and shellfish monitoring program, through which systems have been identified that are failing because of very poor site conditions, age and neglect. There have been several shellfish bed closures within the sound. While not all of the closures are attributable to septic systems (agricultural runoff and dairy farms are a big problem), the closure at the south end of Hood Canal is clearly due to failing systems. In general, the concern for the Sound's waters is twofold: fecal coliforms and nitrogen loading. East of the Cascade Divide there are elevated nitrogen levels in wells because of agricultural runoff.

Respondents could not report whether (or how many) municipalities were actively considering new or extended central sewering, but it appears to be a common assumption that centralization is the answer when densities warrant it. A Washington growth management act mandates the establishment of boundaries for each urban area, and does not allow planning authorities to approve parcels smaller than one acre outside such boundaries until urban densities are obtained within them—a situation that favors centralization. Respondents were not aware of any current enforcement actions, referring instead to the chilling effect of several challenging lawsuits, and to current efforts to coordinate agency activity in order to bring about effective enforcement actions.

With respect to the more widespread use of alternatives, the key would be to get the cost lower than that of a centralized hookup, where a centralized hookup was the only other option.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Law and code are made at state level, with enforcement left to county or municipal boards of health. Counties can, however, write more stringent code. Enforcement is reported to be generally adequate; two inspections accompany all new and repaired systems; a state designer licensing is in progress. One barrier is that enforcement proceedings require action of local prosecutors, and can receive low priority.

Code was last revised in: 1995.

New revisions in progress? To be adopted when?

Revisions are always in progress, but no specific package is currently under proposal. The revision process involves stakeholder participation, public hearings, and ongoing evaluation.

Role of legislature, regulatory agency, and politics: Revisions enjoy legislative support (see below).

Management Programs (Answers 3e-3g Summarized)

Presently, pre-cover inspections are the minimum required of all systems. However, under new Washington state law, by the year 2000 all septic systems are to come under some form of "compliance monitoring," defined as "actions taken or coordinated by a local health jurisdiction to assure that owners of onsite systems are properly operating and maintaining them." These management programs involve design and operational permitting, as well as inspection and enforcement activity. They may designate critical areas requiring advanced technology and/or more stringent management. Several such programs are already in place; e.g. Thurston County started such a program in the mid-1970s. (See contact below.) Utility companies are empowered under state law to operate O/M programs, but only in Callum County has this option been employed. Further details NA.

New Technology (Answers 4a-4h Summarized)

A state protocol to evaluate and bring alternative technology online has been in place since 1985. When conventional systems can not be used, alternatives meeting specific treatment standards defined in the regulations must be used. Their permitting is accompanied by monitoring and maintenance stipulations and other tailor-made guidelines. The main use of alternative technology in Washington is on sites that otherwise could not be developed. Where preexisting failing systems exist, "Best (Demonstrated) Available Technology" may be specified. Alternatives include sand filters, mound and aerobic systems, gravelless drainfields, pressure distribution, and the proprietary Glendon Biofilter. The use of single-family aerobic units, as well as cluster systems and package plants, is on the increase, although the two latter play minor roles.

Onsite Funding (Answers 5a-5c Summarized)

Yes, state revolving funds are available to onsite remediation programs; in addition, other local betterment programs are in existence.

Leadership and Information

State-level agencies, task forces:

- Washington State Dept of Health, Community Environmental Health Programs, Bldg 2, Airdustrial Center, Box 47826, Olympia, WA 98504-7826. (Contact: Tom Long or Mark Soltman, Washington State Dept of Health; tel. 360-286-3040.)

- Technical Review Committee (answers to the state Dept of Health). (Contact Wayne Turnberg, tel 206-522-1032).
- A governor-appointed "Certification Workgroup" will be recommending how to license all onsite practitioners; a separate Task Force is working on a licensing procedure for designers.
- Puget Sound Water Quality Action Team, POB 40900, Olympia, WA, 09504; (contact: Krag Unsoeld, tel 360-407-7325; fax 360-407-7333; eml kunsoeld@psat.wa.gov).

Local governmental agencies, task forces:

- Thurston County Environmental Health (see text); contact Art Starry, tel 360-754-3341.
- Several other local health departments have technical advisory committees.

Research within governmental agencies:

- Systems that have been developed and tested elsewhere are tested in-state, under experimental protocols. Current projects include drip irrigation and constructed wetlands.

Research within universities:

- Washington State Univ (contact Craig Cogger, tel 253-445-4512).

Onsite demonstration programs:

- Washington On-Site Sewage Association (WOSSA, the training center cited below) runs a National Onsite Demonstration, Phase II, site; and also was awarded an EPA Small Flows grant to help solve wastewater problems in the town of Burnett through the installation of alternative technologies in use elsewhere around the U.S.

Training or certification programs:

- An onsite certification program administered by the local health departments is required, but see the Certification Workgroup entry above.
- WOSSA (see below) conducts training at the Northwest Onsite Wastewater Training Center, located on the Washington State University extension campus, in Puyallup; contact Dave Lenning, Director, tel 360-455-8880.
- University of Washington runs a "Northwest Onsite Short Course" about every three years.
- See also, the Certification Workgroup entry above.

Citizen action, private groups:

- Washington On-Site Sewage Association (WOSSA), c/o Debbie Powell, POB 544, South Prairie, WA 98385, tel 360-857-2246.
- Stonebridge Construction Co., Inc. 3329 S. E. Harbor Rd Langley, WA 98260; contact: Jerry Stonebridge, President, tel 360-321-1454, fax 360-730-4905.

Newsletters, forums, other sources of information:

- WOSSA holds work shops and conferences, and publishes a newsletter as well.
- The state Dept of Health has a website (in its infancy): www.doh.wa.gov.
- Puget Sound Water Quality Authority (now the Puget Sound Action Team) runs periodic workshops, tel 360-407-7325.

Comments

States and counties need to track repairs by type of system being repaired, date installed, what the replacement entails, and most importantly, the reason why it failed. (Don't fix it until you know what caused the failure.)

West Virginia

Summary

West Virginia has about 320,000 systems in the ground, installs another 9000 annually, and annually repairs or replaces large numbers of them. Almost two thirds of systems are failing by current standards; many of these are pit privies, straight pipes, or cesspools. Many streamwater segments in the mountainous terrain are polluted, and there is a statewide push to replace failing systems with disinfecting home aerobic units that discharge to streams. Code accommodates other alternatives as well, generally requiring maintenance programs. There are plans underway to start at least one public onsite utility. No loan programs are presently available. One EPA demonstration project exists, and the National Small Flows Clearinghouse is located at the University of West Virginia. The state administers a certification program for installers.

Numerical Information

Total number of onsite systems: Reportedly about 500,000; 1990 U.S. census reports about 320,000.

Number of new systems installed each year: About 9000.

Failure definition: Backup, and discharge of sewage to surface or groundwaters.

Number or proportion of systems presently failing: 60%.

Number or proportion *repaired* annually: 10%.

Number or proportion *replaced* annually: 7%.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Home Aerobic Unit (HAU) surface discharging systems are supported in the state for remediations. Less commonly used alternatives include low pressure pipe, mounds, and sand filters. Numbers or ratios NA.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Disinfection is required of the HAUs.

Cost of a conventional *septic system* installation: $3000; range, $1200-$6000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): Approximately, $6000.

Present Onsite Status (Answers 2a-2f Summarized Below)

Much of West Virginia is mountainous, marked by thin soils, bedrock and steep slopes. Many older systems in rural areas are unpermitted, self-installed, straight pipes, perhaps the largest wastewater problem in the state. (Mining wastes are, however, the leading environmental concern.) Some specifics: Much of the northern border of the state is marked by impervious soils, and older dense developments with many failing systems. The Appalachian (Allegheny) spine runs in a northeasterly direction, dividing the state east and west; much of it is protected; onsite conditions are not good. The area immediately off I-64, running east-west, is under strong development pressure (in spite of low projected growth on the Scoping Project map). The southwest corner of the state is marked by old mining towns with many straight pipes and pit privies.

Permits have been denied because of shallow bedrock, high water table, poor soils, steep slopes, and floodplain siting. Reasons cited for system failure include undersizing, poor soils, saturated soils, damage, improper maintenance, and poor construction or installation. There is a statewide push to replace failing systems with Home Aerobic Units (HAUs), disinfection, and surface discharge to streams, which are numerous while good soils are not. At least one community is under an enforcement action. While state policy is to centralize whenever possible, much new development is in rural areas, and sewering is often not feasible nor popular.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Rules are made at state level and administered by city, county or district health departments.

Code was last revised in: 1997 (an emergency filing, further details, NA).

New revisions in progress? To be adopted when? There is no set time frame for updates, but more revisions were expected in 1998.

Role of legislature, regulatory agency, and politics: Rule changes require legislative approval, but the legislature seems attuned to the need to improve wastewater management.

Management Programs (Answers 3e-3g Summarized)

Presently, all new or repaired systems require a pre-cover inspection. There is clearly a need to take special planning and measurement measures for older, rural communities, new development, and in critical resource areas. In fact, the push of new legislation is to improve management of ISDSs. There are plans to start at least one public onsite utility, but further information NA.

New Technology (Answers 4a-4h Summarized)

Present code accommodates alternative and advanced systems, and in some circumstances requires them, as it may BAT. HAUs with disinfection are often required of upgrades. Development on otherwise undevelopable sites is permitted with the use of suitable alternatives.

I/A technologies are reviewed by both sanitarians and engineers who sit on an Alternative Onsite Review Board. If deemed satisfactory, new technologies are then added by legislative rule changes that include design criteria. Prior to that, they may be permitted by variance. Alternatives in use include sand filters, mound systems, package plants, aerobic systems, wetlands, low pressure dosing, and shallow trenches. Enhancements are allowed for aerobic systems that permit surface discharges. All mechanical individual sewer systems with surface discharge, or that involve additional treatment steps, require an approved, perpetual maintenance program. Alternative and advanced systems are already in widespread use in the state, and if options increase, and costs diminish, more widespread use could be expected.

Onsite Funding (Answers 5a-5c Summarized)

There is no loan program available for remediations; however, there are plans to make use of EPA funds in remediation programs.

Leadership and Information

State-level agencies, task forces:

- West Virginia Office of Environmental Health (OEH), Public Health Sanitation Division, 815 Quarrier St, Ste 418, Charleston, West Virginia 25301-2616; tel 304-558-2981, 304-725-0348.
- OEH's Alternative Onsite Review Board.

Local governmental agencies, task forces:

- There are plans to establish an onsite public utility; further details were NA.

Research within governmental agencies: Yes, see below.

Research within universities:

- U.S. EPA's National Small Flows Clearinghouse, West Virginia Univ, POB 6064, Evansdale Dr, NRCCE Bldg, Morgantown, WV 26506 (listed as a training contact: Mike Aiton, Program Coordinator, tel 304-293-4191, eml maiton@wwu.edu).

Onsite demonstration programs:

- An EPA "Demo 1" project is located in Monongalia County: the Chestnut Ridge Plant, near Morgantown; further information NA.

Training or certification programs:

- OEH administers a certification program for system installers.

Citizen action, private groups:

- Ashco-A-Corporation, Rt 9, Box 66-B, Morgantown, WV 26505 (contact: Paul R. Ashburn, President, tel 304-291-0808, fax 304-291-0843.) The company is involved in several research and development efforts throughout the state.
- Reportedly there are citizen action groups involved in wastewater issues, but further information NA.

Newsletters, forums, other sources of information: NA

Wisconsin

Summary

Wisconsin has about 680,000 systems in the ground, annually installs another 10,000, and replaces 9000. Under current code, approximately half (under proposed code less than a quarter) of Wisconsin is deemed "largely unsuitable" for onsite systems. Central and northeastern areas are marked by high water tables and wetlands. Southwestern, north-central, and northeastern areas are marked by shallow bedrock. There are communities scattered throughout the state under enforcement actions. Nevertheless, real problems are few and isolated, due in part to the fact that the population is densest in the southeast, where onsite conditions are good, and in part due to aggressive efforts to discover and implement effective onsite solutions. Up to 25% of systems are alternative in some sense. New code is expected to ease and expand the options for putting new technologies into general use, and will specify performance, rather than prescriptive, standards; site-specific design; and management plans with demonstrated compliance for every system. In addition, several small management entities exist in the state, including Westboro's Sanitary District No. 1, which has received national attention. The state has several well-funded grant and loan options available for upgrades. University of Wisconsin's nationally known Small Scale Waste Management Project has developed several new technologies, runs experimental and demonstration projects, and offers training. The state also runs training and experimental programs in collaboration with UW. Installers, inspectors, and soil testers are certified at state level.

Numerical Information

Total number of onsite systems: Approximately 680,000 (30% of households); 1990 U.S. census reports approximately 580,000 systems.

Number of new systems installed each year: Approximately 10,000.

Failure definition: Discharge of "sewage" into the building, surface- or groundwater, draintile or zones of bedrock, or onto the ground.

Number or proportion of systems presently failing: NA

Number or proportion *repaired* annually: NA

Number or proportion *replaced* annually: Approximately 9000.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Approximately 2500 per year: 1800 mounds, 400 Wisconsin-at-grades, 300 in-ground pressure systems.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Less than 100; about 75 aerobic units and 25 sand filters.

Cost of a conventional *septic system* installation: $3000-$4000; range $1500-$15,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): $12,000-$30,000.

Present Onsite Status (Answers 2a-2f Summarized)

Southwestern, and some of north-central and northeastern, Wisconsin is marked by a prevalence of shallow bedrock. Portions of central and northeastern Wisconsin have high watertables and an abundance of wetlands. Under current code approximately 45% of Wisconsin's land has been categorized as "largely" physically unsuitable for ISDSs, meaning that adequate siting and design could pose problems for a given development. (Under proposed code revisions, allowing for more technologies and flexibility, this percentage would diminish to approximately 20%.) The situation in Wisconsin has been one of the driving forces behind the extensive research and development program at the University of Wisconsin/Madison. It is also reported that there is out-migration from the cities to rural areas not reachable by sewer lines, which could pose problems in the future. Nevertheless, the most densely populated area of the state is the southeast quadrant where soil conditions are good. In consequence, problems with onsite systems are described as few, isolated, and not extensive, with no particular concentrations in any geographic area. Permits have been denied because of poor soils, high groundwater, shallow bedrock, steep slopes and seasonal saturation. Reasons cited for system failures include surfacing of effluent, and discharge to bedrock and/or groundwater. System failures are said to relate to inappropriate design or abuse, and to only indirectly relate to soils or technology through misapplication. (In 1994 the percolation test was eliminated, to be replaced by a site-specific soil, drainage, and morphological evaluation to be performed by a Certified Soil Tester.) There are communities under enforcement actions scattered throughout the state, but further details are NA. Sewers have been supported in the past, but this is changing as the costs associated with them rise above owners' ability to pay.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Wisconsin Department of Commerce, Division of Safety and Buildings creates minimum code at state level, with local city and county health departments acting as agents. Wisconsin Department of Natural Resources is indirectly involved insofar as ISDS rules have environmental impacts. For the most part, enforcement is deemed adequate. Counties are able to make civil citations, and follow up with state help if criminal citations are necessary.

Code was last revised in: 1980 (major), and 1983, 1993 (minor).

New revisions in progress? To be adopted when? Yes, date not determined. The proposed new code, currently in the review and hearing stage, involves an extensive overhaul. Standards for onsite systems will change from a prescriptive basis (design, siting, and setback requirements), to a performance (outcome) basis. Numeric standards of POTW effluent concentrations are to be established for fecal coliform, total suspended solids and biochemical oxygen demand. The new code will also establish new procedures for the design, installation, and maintenance of systems, better enforcement of groundwater standards violations, as well as outreach and training

programs. It will also promote research and development, the use of alternative systems, and the recycling of wastewater components.

Role of legislature, regulatory agency, and politics: The new code must be approved by the legislature. Support depends on whether the package is deemed environmentally friendly or not. With respect to groundwater protection, it clearly is environmentally friendly. However, the existing code has been used as a de facto land use (zoning) tool for many years. The proposed performance-based rules can not be so used, which has some of the public, DNR regulators, and politicians concerned—sufficiently such that progress on a new code has been delayed. Currently the Environmental Impact Statement associated with these changes is undergoing revision to address some of these concerns. (See more on this below.)

Management Programs (Answers 3e-3g Summarized)

An individual "management plan" for all new systems is a requirement of the proposed new code. Under both the old code and the new, maintenance and monitoring responsibilities are left to the homeowner, but compliance must be demonstrated. Even under the present code, all new or repaired systems are subject to a pre-cover inspection; and most counties specify fixed pumping and reporting schedules, notifying owners accordingly. Other than that, the state is not directly involved in planning issues, leaving that to the counties. No areas have been targeted for special management measures by the state. However, there are several small management entities that do exist. Westboro, for example, is a participant in the University of Wisconsin's Small Scale Waste Management Project. In 1974, eighty percent of the 69 occupied buildings in the town were thought have failing systems, many of them draining directly into a creek. Rather than sewering, as the town had initially been ordered to do, it formed a sanitary district that, with the help of University of Wisconsin, repaired or upgraded many of the systems which would then be owned and operated by the district. Other homes were connected to STEP pumps that transported effluent to one of two communal leaching fields. The state has received inquiries from utilities concerning the operation of O/M programs, and anticipates formal requests on revision of code.

New Technology (Answers 4a-4h Summarized)

Present code accommodates and sometimes requires the use of alternative technology, effectively allowing the development of parcels not otherwise developable. Permitted systems include sand filters, aerobic systems, sand in-fill, in-ground pressure dosing, mounds, and Wisconsin-at-grade systems. Expanded use of aerobic plants or sand filters discharging to modified mounds or shallow subsurface absorption areas appears promising for portions of the state that have slowly permeable soils or shallow depths to bedrock or water. Still, all applications are to be site-specific, the expanded number of technologies available lending itself to the specifics of a given site. Operation and maintenance requirements vary by county. Under the new code all new systems will require a management plan, with data tracking. Counties will be expected to follow up if problems develop. New code eases, and expands, the options for testing and bringing new technology into more general use, provided it meets the discharge standards. The position of the state is that there should be a wide variety of wastewater treatment options for an owner to develop a piece of property if the county otherwise permits its development. If new code passes, more widespread use of alternative and advanced systems can

be expected. Currently there is a great deal of interest in cluster systems; this is expected to increase as more options become available under the new code. (Ownership of such systems, and their size, remain at issue.)

Onsite Funding (Answers 5a-5c Summarized)

Wisconsin runs a statewide grant program, the Wisconsin Fund, for failed system upgrades. Depending on a homeowner's income eligibility and other qualifications, it will pay for up to 60% of the price of upgrading or replacement. The state has regularly rebudgeted the program at $3.5 million per annum, funds coming out of general purpose revenues. State revolving loan funds are available to counties if public management is provided.

Leadership and Information

State-level agencies, task forces:

- Wisconsin Department of Commerce (WDC), Division of Safety and Buildings, 2715 Post Road, Stevens Point, WI 54481-6456 (contact: Roman A. Kaminski, Program Manager; tel 715-345-5334, fax 715-345-5269; eml rkaminski@commerce.state.wi.us).
- Wisconsin Department of Natural Resources.
- Wisconsin County Code Administrators' Association advises the state on wastewater issues: c/o Marathon County Zoning Dept, 210 River Dr, Wausau, WI 54403.

Local governmental agencies, task forces:

- Westboro "Sanitary District No. 1."
- Some counties have Groundwater Management Advisory Boards.

Research within governmental agencies:

- The state approves experimental systems for projects submitted with the concurrence and collaboration with University of Wisconsin/Madison's Small-Scale Waste Management Project. See below. WDC has research funds available to it through legislative appropriation.

Research within universities:

- University of Wisconsin's Small Scale Waste Management Project is a nationally recognized research effort which has been active for decades, and has developed both management programs and technologies including Wisconsin Mound, and Wisconsin-at-Grade systems. SSWMP, Univ Wisconsin/Madison, Madison, WI 54403 (contacts: E. Jerry Tyler, Director, tel 608-262-0853; James Converse, tel 608-262-1106).
- There is also some research at University of Wisconsin/Stevens Point; further details, NA.

Onsite demonstration programs:

- The SSWMP runs many experimental systems on university agricultural property.

Training or certification programs:

- Two classes of installers, inspectors and soil testers are certified at state level. The state also sponsors training seminars, as does the university program. The state has continuing education requirements for installers, inspectors and soil testers.

Citizen action, private groups:

- Wisconsin Onsite Waste Disposal Association (WOWDA), 783 Tipperay Lane Hartford, WI 53027; (contact: Gretchen McQuestion, tel 800-377-6672).
- Ayres Associates 2445 Darwin Rd Madison, WI 53704 (contact: Richard J. Otis, Vice President Applied Technology; tel 608-249-0471, fax 608-249-2806; eml otis.r@ayres-msn.com).
- Many groups have taken an interest in the proposed code, pro or con.
- There are watershed groups throughout the state.

Newsletters, forums, other sources of information:

- The WDC publishes a monthly "Plumbing Code Report" that includes articles of interest to the general onsite community; it is available by subscription.
- WOWDA publishes a monthly newsletter.

Comments

"We have included a copy of the draft EIS pertaining to the proposed rule changes concerning regulation of private onsite wastewater treatment systems. This document contains much of the information you requested, and may be of interest to anyone [involved with onsite issues]."

The document referred to is *Draft Environmental Impact Statement for Proposed Changes to Chapter Comm 83, 85 and Other Related Rules Regulating Private Onsite Wastewater Treatment Systems*, June 23, 1997; prepared by the Wisconsin Dept of Commerce, 117 pages. It indeed covers many of the issues associated with onsite management, prescriptive versus performance standards, and the effects of differing sets of rules on land use. It includes almost thirty GIS generated maps, but with caveats applicable to the Scoping Project maps provided for this study: "...Digital soils data do not permit delineations of areas smaller than 1500 acres, and thus are not accurate enough to determine suitability for residential lots...soils [and other site characteristics] are [patchy] and highly variable even within small sites...an area determined to be "largely physically unsuitable"...means only that 50% or more of the land in that area has soil characteristics that [might] prohibit construction: up to 50% could in fact be suitable."

Wyoming

Summary

Wyoming has about 50,000 systems in the ground, annually installs about 1000, and repairs or replaces about 200. Problems are few and isolated. New developments must show the feasibility of onsite treatment. New technology is accommodated in the code first for piloting, and later for more general use, but is not widely deployed. There are no loan programs for upgrades, little or no government or academic research, and no demonstration projects. Two counties require licensure for installers and haulers.

Numerical Information

Total number of onsite systems: 1990 U.S. census reports about 50,000 systems.

Number of new systems installed each year: Over 1000.

Failure definition: Backup, surfacing effluent, or impacts on groundwater.

Number or proportion of systems presently failing: About 200 per year.

Number or proportion *repaired* annually: About 200 per year, repaired or replaced.

Number or proportion *replaced* annually: See above.

Number or proportion of repairs or replacements that require *alternative* technology (e.g., sand filters, pressure dosing): Very few.

Number or proportion of repairs or replacements that require *advanced* technology (e.g., disinfection, nutrient removal): Only in the most exceptional circumstance.

Cost of a conventional *septic system* installation: $2000-$2500; range, $1000-$10,000.

Cost of a centralized *sewer tie-in* (including fees and cost of the sewer lateral): NA

Present Onsite Status (Answers 2a-2f Summarized)

Problems are described as few and isolated in this sparsely populated state. System permits have been denied because of high groundwater and thin soils. Failures have been attributed to poor soils, age, high groundwater, and poor design or construction that may have predated regulations. A new law requires that new subdivision proposals include a feasibility study of the potential for using onsite systems.

Anticipated Changes in Regulations

Who administers, enforces onsite code? Code is made at state level, but administered by 16 of the 23 counties; the Wyoming DEQ takes responsibility for the remainder. Enforcement is reported to be adequate, "failure to meet code and obtain permit is almost always resolved through conference and negotiation."

Code was last revised in: 1984.

New revisions in progress? To be adopted when? Updates as needed; none currently planned.

Role of legislature, regulatory agency, and politics: NA

Management Programs (Answers 3e-3g Summarized)

Present code is believed to be sufficient to handle any onsite wastewater management needs at this time. No special programs or measures are being planned. There are no reports of O/M program management on the part of rural cooperatives, or other utilities.

New Technology (Answers 4a-4h Summarized)

New technologies are in use, but not widely so, although that could change because they do allow for development on otherwise undevelopable sites. I/A technologies are added after a review of their performance during pilot projects. Enhanced treatment may be permitted through exceptions. Permitted systems include sand filters, mounds, package plants, aerobic systems, evapotranspiration, lagoon, and leaching chambers. STEP systems are permitted with a maintenance contract. Package plants and cluster systems reportedly have only a small role.

Onsite Funding (Answers 5a-5c Summarized)

There are no loan programs for system upgrades, and none are contemplated.

Leadership and Information

State-level agencies, task forces:

- Wyoming Dept of Environmental Quality (DEQ). Water Quality Division, Herschler Bldg. 122 West 25th St. Cheyenne, WY 82002 (contact: Mr. Larry Robinson, tel 307-777-7075).

Local governmental agencies, task forces: NA

Research within governmental agencies: None.

Research within universities: None.

Onsite demonstration programs: None.

Training or certification programs:

- Two counties require licensure for installers and haulers.

Citizen action, private groups: NA

Newsletters, forums, other sources of information: NA

Target:

Municipal Water and Wastewater

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