Individual Wastewater Systems-Implications for a New Rural Generation

V(A). Planned Program (Summary)
1. Name of the Planned Program

Individual Wastewater Systems-Implications for a New Rural Generation

V(B). Program Knowledge Area(s)
1. Program Knowledge Areas and Percentage

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
<th>% 1862 Extension</th>
<th>% 1890 Extension</th>
<th>% 1862 Research</th>
<th>% 1890 Research</th>
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</thead>
<tbody>
<tr>
<td>102</td>
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<td></td>
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<tr>
<td>111</td>
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<tr>
<td>112</td>
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<tr>
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V(C). Planned Program (Inputs)
1. Actual amount of professional FTE/SYs expended this Program

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2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

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V(D). Planned Program (Activity)
1. Brief description of the Activity

Field days will be offered to show how to properly install and maintain on-site sewage systems. A core curriculum is developed for training in on-site sewage system basics and site selection. Workshops will be offered to increase awareness and skills for selection of on-site systems and site location. Professional education credit classes will be offered to keep real estate professions, home inspectors and installers updated and trained on the latest technologies and alternative systems available. Media (printed, radio, television coverage) are used to increase awareness of programs and classes.
2. Brief description of the target audience
The primary audience for this program is on-site sewage system installers, inspectors, home-loan inspectors, lenders, real estate appraisers and real estate professionals. This course is being offered to agency personnel to assist them in understanding site selection limitations and alternative on-site systems that can be used in environmentally sensitive areas.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

<table>
<thead>
<tr>
<th>Year</th>
<th>Direct Contacts Adults</th>
<th>Indirect Contacts Adults</th>
<th>Direct Contacts Youth</th>
<th>Indirect Contacts Youth</th>
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2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

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<tbody>
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<td>2007:</td>
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3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

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<tr>
<td>2007</td>
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</table>

V(F). State Defined Outputs

Output Target

Output #1

Output Measure
- A core curriculum will be produced and used for the PEC courses.

<table>
<thead>
<tr>
<th>Year</th>
<th>Target</th>
<th>Actual</th>
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</thead>
<tbody>
<tr>
<td>2007</td>
<td>6</td>
<td>6</td>
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</tbody>
</table>

Output #2

Output Measure
- University of Missouri Extension will offer classes totaling between 4.5 and 6 hours of professional education credit each year for real estate professionals, home building inspectors, and others.

<table>
<thead>
<tr>
<th>Year</th>
<th>Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>6</td>
<td>6</td>
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</tbody>
</table>

Output #3

Output Measure
- Evaluations will be given at each training session to determine the effectiveness of the course.

<table>
<thead>
<tr>
<th>Year</th>
<th>Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
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<td>6</td>
<td>6</td>
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</table>
V(G). State Defined Outcomes

<table>
<thead>
<tr>
<th>O No.</th>
<th>Outcome Name</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Five hundred (500) on-site sewage installers, real estate professionals and home inspectors will increase their awareness and have access to on-site sewage information technologies.</td>
</tr>
<tr>
<td>2</td>
<td>Five hundred (500) on-site sewage installers, real estate professionals and home inspectors will increase their understanding of how an on-site sewage system works and the importance of soils in determining the type of on-site system being installed.</td>
</tr>
<tr>
<td>3</td>
<td>Agency personnel will understand the functions of on-site sewage systems.</td>
</tr>
<tr>
<td>4</td>
<td>Five hundred (500) class participants will increase their awareness of on-site system alternatives and when they should be used.</td>
</tr>
<tr>
<td>5</td>
<td>There will be an increase in the number of alternative on-site sewage systems being installed in environmentally sensitive areas.</td>
</tr>
<tr>
<td>6</td>
<td>There will be reduced risk to human health from waterborne bacteria due to fecal coliform.</td>
</tr>
<tr>
<td>7</td>
<td>Five hundred (500) class participants will incorporate information about human health risk and environmental quality when evaluating site selection and on-site system design during inspections and land transfers.</td>
</tr>
<tr>
<td>8</td>
<td>In areas of class participation, 1,500 on-site systems will be installed under latest guidelines that protect environmental quality through reduced wastewater nutrients in surface and groundwater supplies.</td>
</tr>
</tbody>
</table>
Individual Wastewater Systems-Implications for a New Rural Generation

Outcome #1

1. Outcome Measures
   Five hundred (500) on-site sewage installers, real estate professionals and home inspectors will increase their awareness and have access to on-site sewage information technologies.

2. Associated Institution Types
   - 1862 Extension

3a. Outcome Type:
   Change in Knowledge Outcome Measure

3b. Quantitative Outcome

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantitative Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>0</td>
<td>500</td>
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</tbody>
</table>

3c. Qualitative Outcome or Impact Statement

   Issue (Who cares and Why)
   Missouri citizens are concerned with the amount of nutrients and bacteria entering water systems from improper on-site sewage systems. Many soil types and new home sites in environmentally sensitive areas are not suited to traditional on-site systems. System failure pollutes the environment, causes water degradation and creates habitat for bacteria and vectors that cause human sickness. Newer technologies for proper on-site sewage disposal can add between $8,000 and $20,000 to home cost.

   What has been done
   Educational programs are offered to real estate professionals, installers, home inspectors and lenders on the design and selection of on-site sewage systems and new technologies being implemented for environmental protection. On-site sewage system demonstrations are used to show installation and effectiveness of new technologies for wastewater removal for proper environmental and human health.

   Results
   More than 500 people have attended educational classes or demonstrations concerning new technologies for on-site sewage systems and wastewater disposal. The classes have increased awareness and knowledge of the new technology, cost of alternative systems, cost of installation and maintenance requirements.

   There has been an increase in the number of alternative systems put into place based on the new technology to improve wastewater effluent. The Missouri Department of Health has increased the number of on-site inspections for installation of alternative new technologies by 30 percent over the last two years. It is anticipated this will increase as people become more aware of the environmental and water quality protection offered by the alternative systems.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>723</td>
<td>Hazards to Human Health and Safety</td>
</tr>
<tr>
<td>112</td>
<td>Watershed Protection and Management</td>
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<tr>
<td>102</td>
<td>Soil, Plant, Water, Nutrient Relationships</td>
</tr>
<tr>
<td>133</td>
<td>Pollution Prevention and Mitigation</td>
</tr>
</tbody>
</table>

Outcome #2

1. Outcome Measures
   Five hundred (500) on-site sewage installers, real estate professionals and home inspectors will increase their understanding of how an on-site sewage system works and the importance of soils in determining the type of on-site system being installed.

2. Associated Institution Types
   - 1862 Extension
3. Outcome Type:
   Change in Knowledge Outcome Measure

3b. Quantitative Outcome

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantitative Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>0</td>
<td>500</td>
</tr>
</tbody>
</table>

3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**

Much of the area surrounding lakes and streams that support tourism is environmentally sensitive. Nutrient and bacterial loading in Missouri’s waters from on-site sewage systems has destroyed aquatic habitat and increased the potential for human health risk. Water degradation can reduce overall aquatic diversity and habitat and can destroy tourism and recreational activities associated with water sports. On-site sewage education is important to protect the environment and the economic baseline.

**What has been done**

Classes are offered to increase knowledge of soil systems and their role in wastewater disposal. Demonstrations for real estate professionals, home inspectors, installers and homeowners have been used to show maintenance of on-site sewage systems and how proper soil characteristics can be part of the treatment system for wastewater or act as a barrier to nutrient and bacteria treatment. Mini-grants have been used to do demonstrations and cost-share for septic tank cleaning and maintenance.

**Results**

More than 30 people attended the ‘Soil Percolation Requirements for On-site Sewage course’ and over 300 people have taken the beginning installers class in the last two years. With increased understanding of how on-site systems work and the role of soil, more landowners are installing systems that will reduce the potential for wastewater contamination. The classes emphasize the function of on-site sewage system components, the role of soil in protecting water quality and identification of soils that are not acceptable for wastewater treatment by conventional drainage systems. As more people have become familiar with the role of soils, county ordinances are being written to require a soil morphology report before an on-site sewage system can be installed. Septic tank pumpers in demonstration areas have seen an increase in business in more environmentally sensitive areas as they learn the importance of maintenance and the function of a septic tank.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>102</td>
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</tr>
<tr>
<td>723</td>
<td>Hazards to Human Health and Safety</td>
</tr>
</tbody>
</table>

**Outcome #3**

1. Outcome Measures

Agency personnel will understand the functions of on-site sewage systems.

2. Associated Institution Types

• 1862 Extension

3a. Outcome Type:
   Change in Knowledge Outcome Measure

3b. Quantitative Outcome

<table>
<thead>
<tr>
<th>Year</th>
<th>Quantitative Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
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<td>0</td>
</tr>
</tbody>
</table>

3c. Qualitative Outcome or Impact Statement
Issue (Who cares and Why)

Many agency personnel are responsible for ensuring water bodies are protected. Improper on-site sewage systems have the potential to pollute water bodies. Bacteria and nutrients enter the water bodies and destroy aquatic habitat and increase algae growth. Bacteria can cause disease and make water unfit for consumption and recreation. Increasing the knowledge of agency personnel is one way to help protect water quality.

What has been done

Agency personnel have attended classes and demonstrations on the function of on-site sewage systems. The classes give attendees an opportunity to see how various systems work and how to identify when a system may not be working properly. Demonstrations on maintenance and water flow through a system show participants the importance of maintenance and how to identify structurally sound components in the system.

Results

After classes, agency personnel have a better understanding of how on-site sewage systems function to protect human health and environmental integrity. Personnel from the Department of Health, Department of Natural Resources (DNR) and the Natural Resources Conservation Service have received the training to increase their understanding and be able to offer assistance to residents and landowners. A change in the state regulations for on-site sewage has occurred reflecting information presented at these classes. The state Department of Health has established minimum guidelines for all new systems being installed, and water quality degradation from on-site sewage wastewater in environmentally sensitive areas has decreased.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
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</thead>
<tbody>
<tr>
<td>102</td>
<td>Soil, Plant, Water, Nutrient Relationships</td>
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<td>Hazards to Human Health and Safety</td>
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<tr>
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<td>Watershed Protection and Management</td>
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</table>

Outcome #4

1. Outcome Measures

Five hundred (500) class participants will increase their awareness of on-site system alternatives and when they should be used.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

<table>
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<tr>
<th>Year</th>
<th>Quantitative Target</th>
<th>Actual</th>
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<tbody>
<tr>
<td>2007</td>
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</tr>
</tbody>
</table>

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Real estate professionals, on-site sewage installers and Department of Natural Resources personnel have an interest in what type of system needs to be installed to meet environmental standards. In land and home transfers, having to replace an on-site system can increase the cost of a home. For installers, knowing the proper system to install to stay in compliance saves money for consumers. DNR personnel want to see the environment protected and water quality improved.

What has been done

Class participants received educational materials and resource notebooks comparing the different systems and landscape and soils characteristics to determine which system works best based on these characteristics. A field tour of the Bradford Farm on-site sewage training site shows the different alternative systems.

Results
Department of Health personnel have used the information from the training to establish baseline criteria for on-site inspections. The Natural Resources Conservation Service has used the information gained to update the Missouri publication of on-site sewage systems and soils suitability. The Department of Natural Resources relies on the knowledge learned when reviewing watershed plans and soil characteristics. Real estate professionals and home inspectors use this knowledge when working directly with clientele concerning inspections for land transfers and property sales. One southwest Missouri county has developed a 'sunset' law to require residents with older non-working systems to be replaced or brought into compliance.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
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<tbody>
<tr>
<td>133</td>
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<td>Hazards to Human Health and Safety</td>
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<td>102</td>
<td>Soil, Plant, Water, Nutrient Relationships</td>
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</tbody>
</table>

Outcome #5

1. Outcome Measures
   There will be an increase in the number of alternative on-site sewage systems being installed in environmentally sensitive areas.

2. Associated Institution Types
   • 1862 Extension

3a. Outcome Type:
   Change in Action Outcome Measure

3b. Quantitative Outcome

<table>
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<th>Quantitative Target</th>
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<tbody>
<tr>
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</table>

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Real estate professionals and agency personnel involved in water quality protection are very concerned with on-site sewage systems in environmentally sensitive areas. Missouri has a variety of soil types and Karst materials that do not allow for proper wastewater treatment. These conditions create a high potential for contaminated wastewater to enter the environment and destroy water quality for humans and aquatic life unless alternative systems are used.

What has been done
Demonstrations have been done to show the different types of alternative systems that work effectively in environmentally sensitive areas. A new pamphlet lists alternative systems, explains when they work most effectively, and summarizes their cost and maintenance requirements.

Results
County ordinances have been developed that require a soil morphology report before installing an on-site system. The report shows those soils that would be classified as environmentally sensitive and provides criteria for determining what type of system will function properly. Approximately 56 percent of Missouri's counties only allow soil morphology reports for determining if an area needs an alternative system. Real estate professionals are better equipped to respond to the needs of clientele when discussing the hidden cost of home building on lands in environmentally sensitive areas.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>102</td>
<td>Soil, Plant, Water, Nutrient Relationships</td>
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</table>
Individual Wastewater Systems-Implications for a New Rural Generation

Outcome #6

1. Outcome Measures
   There will be reduced risk to human health from waterborne bacteria due to fecal coliform.

2. Associated Institution Types
   • 1862 Extension

3a. Outcome Type:
   Change in Action Outcome Measure

3b. Quantitative Outcome

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<tbody>
<tr>
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</table>

3c. Qualitative Outcome or Impact Statement

   Issue (Who cares and Why)
   Private citizens and agency personnel are concerned with how human health may be affected by improperly treated wastewater. The improperly treated water can rise to the surface and create human health issues or may enter groundwater, where it may get into private water supplies.

   What has been done
   A class that discusses the components and functions of an on-site system describes the role of both the septic tank and the soil in treating bacteria. Displays have been used to increase awareness of the importance of testing private water wells and doing wellhead protection.

   Results
   County health departments routinely provide water test bottles to check water quality of drinking water wells. In targeted areas, there has been an increase in request for bottles to check for bacteria in wells. Wellhead protection assessments have been done by extension specialists to prevent surface water contamination, and shock chlorination has been performed. County health department personnel have worked with assessments and demonstration of on-site sewage systems and provided information on the potential for disease from contaminated surface and groundwater from improper wastewater treatment.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
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</tr>
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<td>723</td>
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</tbody>
</table>

Outcome #7

1. Outcome Measures
   Five hundred (500) class participants will incorporate information about human health risk and environmental quality when evaluating site selection and on-site system design during inspections and land transfers.

2. Associated Institution Types
   • 1862 Extension

3a. Outcome Type:
   Change in Action Outcome Measure

3b. Quantitative Outcome

<table>
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<tr>
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<th>Quantitative Target</th>
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<tbody>
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<td>2007</td>
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</table>

3c. Qualitative Outcome or Impact Statement

   Issue (Who cares and Why)
Individual Wastewater Systems—Implications for a New Rural Generation

Home inspectors, realtors and agency personnel need to recognize the importance of reducing environmental and health risk from on-site sewage. As water quality and human health become everyone's responsibility, providing a consistent message to the general public will tend to increase proper selection and installation of on-site sewage systems.

What has been done

Demonstrations of proper pumping and maintenance of an on-site sewage system have been used to teach participants how to discuss the human and environmental health consequences when on-site systems are not properly maintained. Brochures are distributed describing the need to protect human and environmental health through proper maintenance and system selection. A grant providing cost-share for pumping septic tanks has been used to increase participation.

Results

Information by Department of Health personnel has increased awareness of private well water testing for bacteria. In one selected area, more than 20 individuals signed up for cost-share assistance to get septic tanks pumped and inspected to determine if their wells were at risk from wastewater. This program also provided residents with an opportunity to see if their tanks were functioning properly or if there was leakage occurring to surface or ground water. Realtors are using this information to assist clients when negotiating home contracts.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
</tr>
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<tbody>
<tr>
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<td>Hazards to Human Health and Safety</td>
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</table>

Outcome #8

1. Outcome Measures

In areas of class participation, 1,500 on-site systems will be installed under latest guidelines that protect environmental quality through reduced wastewater nutrients in surface and groundwater supplies.

2. Associated Institution Types

• 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

<table>
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<tbody>
<tr>
<td>2007</td>
<td>1500</td>
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</tbody>
</table>

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Agency personnel involved with human and environmental health are concerned with untreated wastewater and the effects that wastewater nutrients can have on surface and ground water quality. New criteria for on-site systems require more stringent testing of soils to guarantee water quality is protected and that human health risks are kept to a minimum.

What has been done

Classes have been offered to increase awareness and knowledge of the purpose of on-site septic systems and their ability to reduce wastewater contamination. Installers are working effectively with county health departments to ensure appropriate systems are selected and properly installed. Training sessions for installers and agency personnel have been offered to provide the latest information on types of systems available and the soils best suited for the different types.

Results

Under recently changed state and county ordinances, all new systems going in and all older systems requiring repair must be brought up to meet the latest environmental criteria. These criteria have been set to ensure new systems will provide proper treatment of sludge and wastewater. Educational activities have provided information about the new systems and how to maintain them.
4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>133</td>
<td>Pollution Prevention and Mitigation</td>
</tr>
<tr>
<td>723</td>
<td>Hazards to Human Health and Safety</td>
</tr>
<tr>
<td>112</td>
<td>Watershed Protection and Management</td>
</tr>
</tbody>
</table>

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

All goals have been met at this time. Due to a change in position responsibility, specific classes for real estate professionals may not be held next year. Other external factors may be a change in regulatory requirements that remove funding or support for certain aspects of the program.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned
   - After Only (post program)

Evaluation Results

Class evaluations were used to determine the effectiveness of training and the usefulness of the information in meeting present job responsibilities. Survey results showed 92 percent of those attending the on-site class for real estate professionals would use the information on a continuing basis and felt they were better prepared to discuss information with clients. In targeted areas, assistance from county health personnel in identifying the number of new and improved systems being installed provided information on how they communicated with clients and their effectiveness in improving human and environmental health. Water quality testing of private wells in areas of concern was performed to determine the percentage of people with high levels of bacteria in drinking water supplies. In one targeted area, about half of wells tested showed unsafe levels of bacteria. The change in county ordinances to require a more extensive soil morphology report for determining suitability of soil for on-site sewage system selection indicates knowledge of soil function in protecting human and environmental health has increased and caused a change in behavior and regulations for on-site sewage installation. In one targeted area, 20 private citizens signed up for cost-share assistance to get septic pumps pumped and inspected. This shows that citizens are engaged in water quality protection.

Key Items of Evaluation

This project is a true partnership with the Missouri Department of Natural Resources and the Missouri Department of Health and Senior Services. Through planning and discussion, we have been able to identify different aspects of on-site sewage systems that were misunderstood or needed clarification with a varied audience. This included installers, agency personnel, real estate professionals, and homeowners. Through the training and demonstration efforts we have been able to see positive changes occurring that should reduce, control or eliminate the potential threats to human and environmental health from improper on-site disposal of sewage. Impact highlights include:

1. Increase in the number of counties (56%) requiring a soil morphology report to determine soil properties for proper selection of on-site sewage system.
2. Evaluations from the on-site sewage class for real estate professionals show that 92 percent felt they would use the knowledge gained on a continuing basis.
3. Increased number of wells tested in one county resulting in about half with bacteria.
4. Twenty people in a target area signed up for cost-share assistance to pump out their septic tanks.
5. Installation of alternative sewage systems is up approximately 30 percent in targeted areas.
6. County ordinances require soil morphology report before permitting on-site sewage system installation.