V(A). Planned Program (Summary)

Program # 4
1. Name of the Planned Program
Water and Natural Resource Management
☑ Reporting on this Program

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>
</tr>
</thead>
<tbody>
<tr>
<td>111</td>
<td>Conservation and Efficient Use of Water</td>
<td>50%</td>
<td>0%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>112</td>
<td>Watershed Protection and Management</td>
<td>50%</td>
<td>0%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

V(C). Planned Program (Inputs)
1. Actual amount of FTE/SYs expended this Program

<table>
<thead>
<tr>
<th>Year: 2016</th>
<th>Extension</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1862</td>
<td>1890</td>
</tr>
<tr>
<td>Plan</td>
<td>20.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Actual Paid</td>
<td>27.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Actual Volunteer</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Extension</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith-Lever 3b &amp; 3c</td>
<td>1890 Extension</td>
</tr>
<tr>
<td>536995</td>
<td>0</td>
</tr>
<tr>
<td>1862 Matching</td>
<td>1890 Matching</td>
</tr>
<tr>
<td>536995</td>
<td>0</td>
</tr>
<tr>
<td>1862 All Other</td>
<td>1890 All Other</td>
</tr>
<tr>
<td>3131212</td>
<td>0</td>
</tr>
</tbody>
</table>

V(D). Planned Program (Activity)
1. Brief description of the Activity
AgriLife Extension, AgriLife Research, and Cooperative Agricultural Research Center
Publish research findings generated through evaluation of best management practices to efficiently manage available water resources, to limit off-site contaminant transport from production, processing, and landscaping systems, to utilize alternative water sources and to remove contaminants from impaired/alternative water sources.

Develop and conduct research and educational programs utilizing direct and indirect educational methods to support efficient utilization and conservation of water resources, to develop alternative water supplies, to implement best management practices on agricultural production and landscapes to protect water resources from contaminates, to promote proper management of surface and ground water resources, to enhance rainwater harvesting and to remove contaminants from impaired water supplies.

The work of AgriLife Research and AgriLife Extension is conducted jointly where research-based information is generated and then transferred to clientele.

Continue development of educational resources such as articles, fact sheets, bulletins, curriculum materials, short course manuals and other teaching materials.

Cooperative Agricultural Research Center
Assess irrigation water requirements for major crops in northern High Plains of Texas and citrus water requirements across some of the major citrus producing areas in the world under current and future climate scenarios; Analysis of potential future climate and climate extremes in the Brazos Headwaters Basin, Texas; Develop a web-based tool to calculate agricultural crops and urban landscape irrigation water requirement; evaluate land use effects on net ecosystem CO\textsubscript{2} exchange using satellite measurements; study the effect of torrential rain and drought on groundwater storage in Texas; Evaluate performance of different satellite soil moisture products over the state of Texas; monitor soil moisture using the electromagnetic induction sensor, EM-38; and study microbial decomposition of organic matter in lowland and upland systems.

Peer-reviewed articles and applied research outreach materials are some of the venues through which research is being communicated to different stakeholders within Texas and across the nation and globally.

2. Brief description of the target audience

AgriLife Extension, AgriLife Research
Programs focusing on the issue of water address target audiences including but not limited to producers, homeowners, landscape managers, industry practitioners, water resource managers, and others who identify themselves with this issue.

Cooperative Agricultural Research Center
Assess irrigation water requirements for major crops in northern High Plains of Texas and citrus water requirements across some of the major citrus producing areas in the world under current and future climate scenarios; Analyze potential future climate and climate extremes in the Brazos Headwaters Basin, Texas; Develop a web-based tool to calculate agricultural crops and urban landscape irrigation water requirement; evaluate land use effects on net ecosystem CO\textsubscript{2} exchange using satellite measurements; study the effect of torrential rain and drought on groundwater storage in Texas; Evaluate performance of different satellite soil moisture products over the state of Texas; monitor soil moisture using the electromagnetic induction sensor, EM-38; and study microbial decomposition of organic matter in lowland and upland systems.

Peer-reviewed articles and applied research outreach materials are some of the venues through which research is being communicated to different stakeholders within Texas and across the nation and globally.
3. How was eXtension used?

Responses to inquiries on eXtension were provided or reassigned to other specialists as needed and appropriate.

V(E). Planned Program (Outputs)

1. Standard output measures

<table>
<thead>
<tr>
<th>2016</th>
<th>Direct Contacts Adults</th>
<th>Indirect Contacts Adults</th>
<th>Direct Contacts Youth</th>
<th>Indirect Contacts Youth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>87235</td>
<td>1014678</td>
<td>44636</td>
<td>0</td>
</tr>
</tbody>
</table>

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2016
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

<table>
<thead>
<tr>
<th>2016</th>
<th>Extension</th>
<th>Research</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>0</td>
<td>182</td>
<td>182</td>
</tr>
</tbody>
</table>

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

• # of group educational sessions conducted.

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>3711</td>
</tr>
</tbody>
</table>

Output #2

Output Measure

• # research-related projects.
<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>64</td>
</tr>
</tbody>
</table>
## V(G). State Defined Outcomes

<table>
<thead>
<tr>
<th>O. No.</th>
<th>OUTCOME NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>% of participants who report an increased knowledge of best management practices related to water management.</td>
</tr>
<tr>
<td>2</td>
<td>% of participants who report the plan to or have adopted best management practices related to water management.</td>
</tr>
</tbody>
</table>
Outcome #1

1. Outcome Measures

% of participants who report an increased knowledge of best management practices related to water management.

2. Associated Institution Types

- 1862 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>74</td>
</tr>
</tbody>
</table>

3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
AgriLife Extension and Research
The School of Irrigation provides opportunities for landscape irrigation professionals to meet their continuing education requirements. The program directly supports 1,214 jobs in the landscape irrigation industry, with an estimated annual age base of $29.2 million.

Cooperative Agricultural Research Center:
Research at the Cooperative Agricultural Research Center enables decision makers, farmers, ranchers, natural resource and environmental managers to make informed decisions and plan effective management practices that tackles surface and groundwater quantity and quality issues. Nine students actively participated in applied water-related research activities and gained practical water management skills. Several of these student are currently employed.

**What has been done**
AgriLife Extension and Research
Participants gain a better understanding of practices required to keep their home or commercial septic system workings and limit interferences with the enjoyment of their property. This course provides answers to the most frequently asked septic system questions, including when to pump out a tank and what can or cannot go down the drain.

Cooperative Agricultural Research Center
Field and lab experiments were conducted on effective water resources management practices through soil moisture monitoring and evaluation, groundwater monitoring and evaluation and
hydrological modeling from field scale to watershed scale. A well-equipped testbed was
developed to monitor Carbon Dioxide and hydrometeorology at the University Farm. Research
scientists and students presented findings of their research at local, national, and international
workshops and conferences. The NRES research team also disseminated research findings
through peer reviewed publications such as book, book chapters and journal articles. In addition,
NRES team has participated in REAP, AgDiscovery, elementary and middle school day,
academic demonstration programs at PVAMU to educate K-12 students from different schools
and other stakeholders in the state.

**Results**
AgriLife Extension and Research
Documentation of programming impact for several face to face meeting indicating gain of
knowledge by clients ranged from 74 to 96%. Additionally, 79% of the participants indicated a
willingness to adopt the practice of pumping out their septic tank as necessary and 71% of the
participants indicated a willingness to adopt the practice of performing operation and maintenance
activities on their septic system.

Cooperative Agricultural Research Center
The NRES research team of CARC increased knowledge of researchers, students and other
stakeholders on effective water resources management through hands on activities and
laboratory and modeling experience. Nine graduate and undergraduate students were trained in
conducting quality and problem solving research. The research team also increased knowledge
and awareness on soil health, soil quality and nutrients monitoring and evaluation, irrigation water
requirement estimation for different crops grown in Texas. In addition, NRES research team
enhanced knowledge of youth, K-12 students and University students about natural resources
and water management.

4. Associated Knowledge Areas

<table>
<thead>
<tr>
<th>KA Code</th>
<th>Knowledge Area</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>112</td>
<td>Watershed Protection and Management</td>
</tr>
</tbody>
</table>

**Outcome #2**

1. **Outcome Measures**

   % of participants who report the plan to or have adopted best management practices related to
   water management.

2. **Associated Institution Types**

   ● 1862 Extension
   ● 1862 Research
   ● 1890 Research

3a. **Outcome Type:**
Change in Action Outcome Measure

3b. Quantitative Outcome

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>75</td>
</tr>
</tbody>
</table>

3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**
The six-hour Homeowner Maintenance of Aerobic Treatment Units training is intended for homeowners wanting to understand more about the operation and maintenance of their aerobic treatment unit and spray field. Select counties allow homeowners to maintain their own system after completing this course.

**What has been done**
Two homeowner maintenance of aerobic treatment units programs were attended by 54 clients providing 324 contact hours. Participants gain a better understanding of practices required to keep their home or commercial septic system workings and limit interferences with the enjoyment of their property. This course provides answers to the most frequently asked septic system questions, including when to pumpout a tank and what can or cannot go down the drain.

**Results**
Documentation of programming impact for several face to face meeting indicating gain of knowledge by clients ranged from 77 to 90%. Additionally, 75% of the participants indicated a willingness to keep the disinfection component of the ATU operating properly and 81% of the participants indicated a willingness to adopt the practice of performing operation and maintenance activities on their aerobic treatment unit.

4. Associated Knowledge Areas

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<thead>
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<td>112</td>
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</table>
V(H). Planned Program (External Factors)

External factors which affected outcomes
- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Other (Other Program Areas)

Brief Explanation
- Success in securing funding through grants and contracts
- Weather patterns: both drought and flood impact interest in water management strategies. Commodity and energy prices
- Other emerging issues in communities (health, economics, etc.) can affect whether water management is a priority for individuals, businesses, families, communities. Regulatory and budgetary issues; ability to retain / recruit qualified staff

V(I). Planned Program (Evaluation Studies)

Evaluation Results
Program evaluation surveys for all programs indicate a high level of participant satisfaction in the quality and content of programs.

High Plains Irrigation Conference attendees indicated increases in participant knowledge/understanding of subject matter addressed in the program: how crops use water (agronomic considerations of water management) (62% indicated increase in knowledge); practical irrigation scheduling tools (62%); monitoring and interpreting soil moisture (63%); variable rate irrigation technology (71%); issues in water law and agriculture (91%); irrigation in the context of integrated pest management and integrated crop management (62%); and irrigation technologies, best management practices and practical tips to maximize benefits of these technologies (60%). All respondents (100%) indicated that the information provided in the program would be useful in their irrigation decisions, and 67% indicted that they would implement changes in their irrigation practices as a result of information presented at the conference.

Key Items of Evaluation
Program evaluation surveys for all programs indicate a high level of participant satisfaction in the quality and content of programs.

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