V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Climate Change

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation		50%		33%
403	Waste Disposal, Recycling, and Reuse		50%		67%
	Total		100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.5	0.0	0.5
Actual Paid	0.0	1.4	0.0	1.9
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	164919	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	96317	0	99640
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Compile beginning and ending water quality measurements associated with swine waste treatmen lagoon.
Compile beginning and ending water quality measurements associated with constructed wetland cells and varied aquatic plants.
Compile water quality measurements associated with the UAPB Demonstration Farm pond.
Conduct at least one Swine Waste Treatment System Outreach/Demonstration Meeting each year.
Conduct at least one Farm Water Quality Improvement Outreach/Demonstration Meeting each year.
Complete one peer reviewed research article every two years. Complete one fact sheet every year.
Document the number of small, local and limited resource farmers that have been assisted with swine waste treatment, odor and/or water quality issues each year.

County agents will be encouraged to have pond owners submit water samples for analysis and offer workshops. One-on-one visits will be made to producers to visually inspect existing ponds and potential pond sites.
I will re-organize and manage an already established collegiate tournament circuit for Arkansas university bass fishing teams, the Arkansas Collegiate Series (ACS).
I will visit Arkansas high schools that already have bass fishing teams to meet with their members, encourage them to consider going to college and join collegiate fishing teams, teach valuable lessons in fish locating, presentations, public speaking tips, etc while focusing on drawing students to UAPB.
I will also make efforts to establish high school, and perhaps collegiate, fishing teams at schools and institutions that do not already have them.

Annual updating of the aquatic herbicide section of the cooperative extension publication MP44, Recommended Chemicals for Weed and Brush Control; annual weed and pond in-service for cooperative extension agents; presentations at Master Gardener, Wildlife, and other state meetings; article in Arkansas Aquafarming

Develop and provide research-based information to the public through county extension faculty and direct contacts, and through newsletter articles, extension materials, and presentations at meetings and workshops. Identification of problematic aquatic plants is provided, as it is essential for selecting appropriate control measures, and basic water quality analysis is also provided.

· Provided the studies are considered feasible by AGFC, we will conduct largemouth bass population assessments in selected waters, with special emphasis on the age-0 cohort.
· Attempt to fit standard stock-recruitment models as outlined above if feasible.
· Characterize system-specific abiotic and biotic conditions and incorporate these data into modeling to improve fit as feasible.
· Assess contribution of age-1 crappies to year class using hatchery crappie previously marked with OTC and stocked in AGFC lakes.
· Assess contribution of walleye to year class using hatchery walleye previously marked with OTC and stocked into Ouachita River and Beaver Reservoir.
· Model contribution of hatchery fish to largemouth bass fishery in Arkansas River under a variety of management scenarios using EnhanceFish software and existing data on Arkansas River largemouth bass.
· Other activities planned dependent on successful completion of above objectives.

Monitoring agricultural storm water discharges from agricultural fields, water quality and biological condition in adjacent streams in southeast Arkansas since April 2011.

A range of activities will be conducted in support of this program, particularly in the areas of: 1) evaluating effects on wild largemouth bass of hatchery-reared bass in small impoundments; 2) understanding factors associated with successful sportfish stockings in Arkansas waters; 3? on-farm herbicide trials; and 4) extension programming related to control of aquatic weeds.

On-farm herbicide trials will be conducted using both pre-emergence and post-emergence herbicides. Results will be disseminated through meetings, a newsletter, fact sheets and a presentation for agent use. Fact sheets on nutrient management for small impoundments and on interpreting water testing results will be revised.

Information on managing these resources will be disseminated directly to the general public, through county offices, and through natural resource agencies. Proper identification of problematic aquatic plants is essential, and this service is provided to the general public. Activities include direct contacts with the general public, indirect contacts through county extension faculty, fact sheets, freshwater aquaculture eXtension content, newsletter articles and presentations at meetings and workshops. Radio interviews reached a wider audience across rural America. A wide variety of educational activities are utilized in this program, however, reaching a major segment of the target audience still requires individual contact for effective implementation.

Data logging devices have been installed in commercial fish farms across the state. Continuous monitoring of water temperatures will provide a basis for developing a comprehensive database of changing water temperatures.

Youth fishing and aquaculture education is a continuation of a long standing program. UAPB has a youth fishing trailer which contains enough rods and reels and other type fishing gear for 80 or so youth to fish at the same time. UAPB makes the trailer available to 4-H or other interested youth groups by reserving the trailer. Assistance is provided through extension to maintain the fishing trailer and gear in a good state of repair and assist with youth fishing derbies on request.

Wild age-1 largemouth bass abundance will be determined using Petersen method. Boat-mounted electrofishing in littoral areas will be used exclusively to collect fish. Age-1 largemouth bass should be effectively sampled using standard boat-mounted electrofishing methods (Jackson and noble 1995). This it anticipated that other gears will not be needed to collect representative samples of age-1 largemouth bass. Wild age-1 largemouth bass collected during the first sample period will be given a different color VIE tag and released. A census will occur 2-7 d after the first sample period. Collected fish will be counted as tagged or tagless, length (TL; mm) and weight (g) recorded, and scales removed in length classes where age overlap is expected. The Chapman modification of the Petersen method will again be applied to provide estimates of wild age-1 largemouth bass abundance. Daily instantaneous mortality rates will be calculated in each impoundment by regressing the natural log (loge) of wild largemouth bass population abundance on the natural log of the sampling day. The slope of the regression will be the daily instantaneous mortality rate. One-way analysis of variance (ANOVA) will be used to compare mortality of wild age-1 largemouth bass among impoundments stocked with defferent densities of hatchery-reared largemouth bass. For all ANOVAs, &alpha=0.05 and H0= no difference. Tukey's HSD test will be used to determine significant differences between treatment levels if H0 is rejected by ANOVA. Habitat and biotic factors measured during sampling may be used as covariates if high variation is encountered. Principal Component Analysis may also be used to examine variability among systems due to uncontrollable habitat and biotic sources of variability. Axes scores for each impoundment would be used as covariates in ANOVA to examine effects of stocking density on condition and vital rates of largemouth bass.

Growth will be determined for wild largemouth bass in each impoundment. The change in mean length will be divided by the number of days to between the two periods to estimate growth rate (i.e., mm/d). Growth will be compared among treatment levels using one-way ANOVA. Relative weights of age-1 largemouth bass will be used as an index of condition. Relative weights will be calculated and compared among treatment levels using one-way ANOVA.

In the first phase of this planned research, largemouth bass will be emphasized because they are the most sought-after sportfish in Arkansas. AGFC's Largemouth Bass Management Plan (LMBMP: AGFC

2002) specifies that rates of recruitment, growth, and mortality are poorly known for many Arkansas waters. More recent work done with largemouth bass since 2002 has provided information from the Arkansas River, but information is scarce for many of the state's other lakes (e.g., those < 3,000 ha without largemouth bass will shed light on factors important in understanding and identifying waters with better prospects for largemouth bass stocking success.

For the first study, twenty (20) lakes will be selected for assessment in conjunction with AGFC biologists. These lakes will represent those covered under the current LMBMP, and will contain largemouth bass populations with known or suspected poor, moderate, and high recruitment. This judgement will be based on any historical data that may exist for the lake input from the respective district biologists. Thus, work in 2014 focused on data collection in the sample lakes.

2. Brief description of the target audience

The target audience includes but is not limited to small, limited resource landowners, underrepresented communities, and families.
The target audience is farm pond owners in Arkansas and those interested in developing new farm ponds

High school and college students interested in bass fishing

The target audience is Pond owners, pond managers, county agents

The main target audience is county Extension faculty. We also respond to direct contacts from small impoundment owners and natural resource managers. Many of the impoundments are less than ½-acre, are located in rural areas, and are owned by a broad cross-section of the general public in terms of income, education and other socio-economic factors.

Fisheries managers of Arkansas, Arkansas Game and Fish Commission (AGFC), AGFC fisheries biologists and managers, competitive and recreational anglers.

The target audience is small impoundment owners, commercial fish farmers, and natural resource managers. Many of the impoundments are less than 1/2 - acre, are located in rural areas, and are owned by a broad cross-section of the general public in terms of income, education and other socio-economic factors.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2275	3706	1424	3

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

Patent Applications Submitted

Year: 2014

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	1	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Complete one peer reviewed research article every two years.

Year	Actual
2014	0

Output #2

Output Measure

- Document the number of small, local and limited resource farmers that have been assisted with swine waste treatment, odor and/or water quality issues each year.

Year	Actual
2014	1

Output #3

Output Measure

- Complete one fact sheet regarding water quality, swine waste management or environmental

stewardship each year.

Year	Actual
2014	0

Output #4

Output Measure

- Number of project annual and final reports

Year	Actual
2014	3

Output #5

Output Measure

- Number of presentations and scientific meetings

Year	Actual
2014	2

Output #6

Output Measure

- Number of abstracts published

Year	Actual
2014	4

Output #7

Output Measure

- Number of refereed journal articles

Year	Actual
2014	0

Output #8

Output Measure

- Number of research reports submitted to stakeholders

Year	Actual
2014	2

Output #9

Output Measure

- Number of non-peer reviewed pubications

Year	Actual
2014	0

Output #10

Output Measure

- Number of extension articles

Year	Actual
2014	0

Output #11

Output Measure

- Number of research projects on populations of important fisheries in Arkansas

Year	Actual
2014	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	The number of conservation practices utilized by swine farmers as a result of this project is an outcome measure.
2	Increase awareness of environmental issues and policies that pertain to operating small swine farms.
3	Good fertilization program that will increase fish production in farm ponds
4	Number of high schools teams visited
5	Student Participation in ACS Tournaments
6	Number of farm pond-related contacts with county faculty and the public
7	Water bodies free of weed problems that benefit their owners by allowing the pond to be used as intended
8	Number of fisheries biologists and other aquatic scientists that are informed of study results
9	Mississippi River Basin Health
10	Number of farm pond owners who indicate new knowledge of pond management
11	Number of fisheries biologists indicating new knowledge of populations of important Arkansas fisheries

Outcome #1

1. Outcome Measures

The number of conservation practices utilized by swine farmers as a result of this project is an outcome measure.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Both individual farmers, adjacent land owners and society in general care about the management of small swine farmers in their community.

What has been done
Demonstrations have been developed and displayed at farm field days and farm tours.

Results
The conservation practice has been demonstrated to both the target and non-target public.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse

Outcome #2

1. Outcome Measures

Increase awareness of environmental issues and policies that pertain to operating small swine farms.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Small, limited resource landowners, underrepresented communities, and families. These clientele groups are typically the ones which own and operate small swine farms in the south.

What has been done
Demonstrations have been developed and displayed at farm field days and farm tours. Fact sheets have been developed to help disseminate the environmental issues.

Results
The conservation practice has been demonstrated to both the target and non-target public.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse

Outcome #3

1. Outcome Measures

Good fertilization program that will increase fish production in farm ponds

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #4

1. Outcome Measures

Number of high schools teams visited

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #5

1. Outcome Measures

Student Participation in ACS Tournaments

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #6

1. Outcome Measures

Number of farm pond-related contacts with county faculty and the public

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #7

1. Outcome Measures

Water bodies free of weed problems that benefit their owners by allowing the pond to be used as intended

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #8

1. Outcome Measures

Number of fisheries biologists and other aquatic scientists that are informed of study results

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #9

1. Outcome Measures

Mississippi River Basin Health

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Human activities especially agricultural development can largely affect water quality and aquatic ecosystem health. Agriculture is one of the biggest issues in the Mississippi River Basin. These agricultural activities are causing water use (e.g., irrigation) and potential environmental problems (e.g., eitrophication).

What has been done
Monitoring of agricultural storm water discharges from agricultural fields, water quality and biological condition in adjacent streams in southeast Arkansas has been since April 2011.

Results
The current results found that agricultural conservation activities have positive effects on reducing nutrients and sediments runoff to streams. One graduate student (Sagar Shrestha) has completed his M.
S. thesis comprehensive exam, and two other graduate students (Christopher Laskodi and Matthew Skoog) have completed their M.S. proposal defense and finished all their thesis related field data collection from this research. The current study provided practical guidance for farmers in the Mississippi Delta to better implement conservation practices in their fields, reduced economic loss from sound fertilizer management, and reduced environmental impacts on the Mississippi River and Northern Gulf of Mexico.

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #10

1. **Outcome Measures**

   Number of farm pond owners who indicate new knowledge of pond management

2. **Associated Institution Types**

   - 1890 Extension

3a. **Outcome Type:**

   Change in Action Outcome Measure

3b. **Quantitative Outcome**

Year	Actual
2014	80

3c. **Qualitative Outcome or Impact Statement**

Issue (Who cares and Why)

What has been done

Results

4. **Associated Knowledge Areas**

KA Code	Knowledge Area
{No Data}	null

Outcome #11

1. **Outcome Measures**

   Number of fisheries biologists indicating new knowledge of populations of important Arkansas fisheries

2. **Associated Institution Types**

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	40

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Public Policy changes
- Competing Public priorities

Brief Explanation

The project was not significantly affected by adverse weather conditions. Although colder than normal winter temperatures affected the survival of swine research animals. This in turn delayed the timing of animal scientist's feeding projects which in turn delayed the timing of nutrient inputs into the swine waste treatment system.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Results of the constructed wetland project suggest that the quality of the wastewater was improved after passing through the Swine Wastewater Treatment System and constructed wetland, with respect to the removal of total nitrogen, phosphorus, and ammonia. The annual nutrient removal percentages were 49% (phosphorus), 45% (total nitrogen) and 38%

(ammonia). After treatment, wastewater concentration levels for each nutrient were below 10 mg/L each month throughout the duration of this study; which is in compliance with Arkansas state law regulation No. 6. The parameter with the highest annual standard deviation (11 mg/L) was ammonia, indicating large concentration variations of this nutrient in the wastewater; likely due to its relatively short existence in the environment before its rapid conversion to ammonium, as suggested by Hargreaves and Tucker 2004. The parameter with the second highest annual standard deviation (4 mg/L) was total nitrogen, and lastly phosphorus (2 mg/L). The standard deviations for total nitrogen and phosphorus suggest they may have been more "stable" nutrients in the wastewater than ammonia. No additional research was conducted after the project ended.

Key Items of Evaluation

Constructed wetlands for swine waste nutrient removal can be very effective as demonstrated by the swine waste treatment system project.