

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Forestry, Wildlife, and Fishery Systems

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
102	Soil, Plant, Water, Nutrient Relationships	0%	0%	3%	
123	Management and Sustainability of Forest Resources	75%	75%	21%	
124	Urban Forestry	0%	0%	1%	
125	Agroforestry	10%	10%	0%	
133	Pollution Prevention and Mitigation	0%	0%	11%	
135	Aquatic and Terrestrial Wildlife	10%	10%	21%	
136	Conservation of Biological Diversity	0%	0%	3%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%	0%	3%	
206	Basic Plant Biology	0%	0%	2%	
213	Weeds Affecting Plants	0%	0%	1%	
215	Biological Control of Pests Affecting Plants	0%	0%	7%	
301	Reproductive Performance of Animals	0%	0%	3%	
311	Animal Diseases	0%	0%	2%	
312	External Parasites and Pests of Animals	0%	0%	3%	
605	Natural Resource and Environmental Economics	5%	5%	7%	
721	Insects and Other Pests Affecting Humans	0%	0%	2%	
722	Zoonotic Diseases and Parasites Affecting Humans	0%	0%	3%	
903	Communication, Education, and Information Delivery	0%	0%	7%	
	Total	100%	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	14.0	2.0	38.0	0.0
Actual Paid	9.0	2.0	37.9	0.0
Actual Volunteer	3.0	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
178437	58081	385559	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
761449	78081	4262691	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
50000	0	1898310	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

UT and TSU Extension partnered with the Tennessee Forestry Association to plan and conduct group meetings that informed forest landowners of issues pertaining to forestry and wildlife. Topics included management and marketing. Volunteers were recruited and trained; they presented at group meetings, provided information, demonstrated equipment and provided materials for demonstrations. UT and TSU Extension provided education at local, regional and statewide events, such as the Tennessee Forest Festival to inform the general public about forest management issues. Demonstrations were provided for landowners and forestry workers. Extension Agents and Specialists educated attendees at County Forest Landowners Association meetings. UT and TSU Extension worked closely with private consultants, Tennessee Wildlife Resources Agency, Tennessee Division of Forestry, and others in forestry related industries to develop educational programs and activities for professionals and landowners.

UT and TSU Extension will continue one-on-one contacts with landowners throughout the year and use mass media and newsletters to inform the general public on issues and educational opportunities related to natural resources. Both UT and TSU Extension will provide leadership for conducting programs that target limited resource landowners with TSU providing specialist leadership for this effort. For Tennessee's forestry sector, UT AgResearch continues biological control of Hemlock Woolly Adelgid by known predators and new species and release technologies. We evaluate methods of increasing seedling success, and techniques for improving reforestation. We exploit genetic variation in nursery and field characteristics of native hardwood and coniferous forest tree species. We try novel strategies to address exotic forest tree pests and corresponding forest restoration. We establish collections of woody plants, including species and cultivars, and plants having potential commercial value as forest species or for landscape development, from which materials may be obtained for breeding/propagation.

For wood products manufacturing, UT AgResearch characterizes key parameters associated with the formation of durable, high-performance composite materials, and establish new statistical methods to advance intelligent manufacturing practices. We explore new methods to produce carbon fibers from low-quality raw materials and are developing a process for bonding plastic or polymer to lignocellulosic fibers (using ultrasonic vibration) as a replacement for toxic wood preservatives. We identify approaches and services to landowners that would enable them to realize a wide range of landownership benefits while fostering stewardship and sustainability of private forest lands in Tennessee. Both qualitative (e.g., personal interviews and focus groups) and quantitative (e.g., survey responses) data are collected and analyzed to better understand landowners understanding of management.

UT AgResearch wildlife and fisheries research evaluates and quantifies the effects of deer on agricultural production and identifies associated land-use patterns and biological and ecological factors that could be used for reducing that impact. We monitor target avian species and relate specific population parameters to factors affecting forest health and sustainability, and develop new forest management prescriptions that promote sustainability. We develop prediction methods and evaluate selected aquatic species in existing and new production systems adapted to Tennessee's climate and geography.

2. Brief description of the target audience

The target audiences for this program were forest landowners, the professionals and volunteers who serve them, as well as those who enjoy the state's wildlife resources.

3. How was eXtension used?

This Forestry, Wildlife, and Fisheries planned program was enhanced through the service of:

- one Tennessee Extension personnel on the "Climates, Forests and Woodlands" CoP,
- one Tennessee Extension personnel on the "Extension Wildfire Information Network" CoP,
- one Tennessee Extension personnel on the "Feral Hogs" CoP, and
- one Tennessee Extension personnel on the "Wildlife Damage Management" CoP.

Tennessee Extension personnel shared implementation strategies, outcome measurement, and research results with their CoP colleagues.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	24205	817534	11494	0

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	10	61	71

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Release of Hemlock Woolly Adelgid predators reared in Tennessee (Parkman).
Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Develop phytosanitary methods for disinfecting walnut logs that are currently under quarantine for walnut twig beetle. (Taylor)
Not reporting on this Output for this Annual Report

Output #3

Output Measure

- New insecticidal strategies, such as the use of RNA interference, can be employed to decrease the damage from insect pests that rely on cellulolytic enzymes for a significant portion of their digestion. (Oppert)
Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Work has been used to highlight the importance of non-timber uses of Tennessee's forests and open space. The results of work in west Tennessee watersheds will identify the value of these services and could be used to assess the benefits of additional stream restoration efforts. (Hodges)
Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Proposed research will considerably enhance our knowledge regarding the spread and distribution of Thousand Cankers Disease in the native range of black walnut with a focus on Great Smoky Mountains National Park. Our goal is to provide a platform for informed disease

management to prevent widespread epidemics and conservation of park resources.
(Hadziabdic)

Year	Actual
2014	1

Output #6

Output Measure

- Utilizing the draft Chinese chestnut reference genome and high-throughput DNA sequencing of American chestnut, identified SNPs fixed in American and Chinese trees useful for marker-assisted breeding (Stanton)

Year	Actual
2014	0

Output #7

Output Measure

- Released book that characterized oil spill impacts fish and wildlife in marine habitats (Alford).

Year	Actual
2014	0

Output #8

Output Measure

- Developed assay for the pathogen, *Geosmithia morbida*, that reduced both assay time and cost by more than 50%, and is more reliable for detection (Grant, Lambdin, Hadziabdic, Windham).

Year	Actual
2014	0

Output #9

Output Measure

- Presented research on the impact of commercial tomato production on rare fish in the Nolichucky River and other east Tennessee watersheds (Alford).

Year	Actual
2014	0

Output #10

Output Measure

- Based on collection of natural enemies of Walnut Twig Beetle, provided a rational basis for a sustainable integrated pest management program against this pest in the southern Appalachians (Lambdin).

Year	Actual
2014	0

Output #11

Output Measure

- Assembled six new transcriptome sequences for forest trees (northern red oak, black walnut, green ash, honeylocust, tulip poplar, blackgum) and annotated the transcripts with open read frames, microsatellites with primer design, sequence similarity to public tree reference genes, protein domain function and gene ontology terms (Staton).

Year	Actual
2014	0

Output #12

Output Measure

- Completed a field study demonstrating that Lone Star tick populations in a middle Tennessee retirement community are infested with three species of Ehrlichia, and that current tick mitigation measures in the community are not adequate to protect residents from the risk of tick-borne disease (Hickling, Gerhardt, Trout-Fryxell).

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Forest Landowner Education: Number of landowners who now understand the ecology of forest development and succession (using forest management plans or contacting a professional forester.)
2	Forest Landowner Education: Number of landowners who improved profitability (marketing) of forest ownership.
3	Pond Management: Number of landowners who properly fertilized their pond, followed stocking/harvesting recommendations, or controlled weeds/algae.
4	Tennessee's Master Logger Program
5	National Advanced Silviculture Program
6	4-H Wildlife Habitat Education Program
7	Improving Railway Crossties
8	Tennessee Healthy Hardwoods
9	Log-on Before You Log in Tennessee
10	Sustainable Sturgeon fishery (Alford)

Outcome #1

1. Outcome Measures

Forest Landowner Education: Number of landowners who now understand the ecology of forest development and succession (using forest management plans or contacting a professional forester.)

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	172

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

Outcome #2

1. Outcome Measures

Forest Landowner Education: Number of landowners who improved profitability (marketing) of forest ownership.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	35

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

Outcome #3

1. Outcome Measures

Pond Management: Number of landowners who properly fertilized their pond, followed stocking/harvesting recommendations, or controlled weeds/algae.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
------	--------

2014 288

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
135	Aquatic and Terrestrial Wildlife

Outcome #4

1. Outcome Measures

Tennessee's Master Logger Program

2. Associated Institution Types

- 1862 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)

Training of loggers in Best Management Practices (BMPs) is necessary to protect water quality during forest harvesting operations. The program is a cooperative effort between UT Extension, Tennessee Department of Agriculture Forestry Division, and the Tennessee Forestry Association.

What has been done

UT Extension conducted:

*18 continuing education logger workshops (8 hours each, 3,500 contact hours) in 2014 for 438 loggers, foresters, and landowners.

*three logger workshops of five days each (36 hours of instruction, 1,800 contact hours) were held in 2014 for 51 loggers.

Results

*Each participant increased their knowledge on BMPs to protect water quality during harvesting operations during the one-day continuing education workshop. Approximately 50% of the trained logging work force in Tennessee attended the workshops (requirement to maintain Master Logger designation is to attend one continuing education workshop every two years).

*Based on Master Logger class surveys (highly variable to characterize each logging operation), each logger is estimated to harvest 500 acres per year, averaging 3,000 board feet per acre (partial harvests included), and with an estimated average timber value of \$1,000 per acre.

*The Tennessee Master Logger educational program has reached more than 1,200 loggers and 300 forestry professionals since 1983 or about 90% of the state logging workforce.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

Outcome #5

1. Outcome Measures

National Advanced Silviculture Program

2. Associated Institution Types

- 1862 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)

Nationwide training for federal employees in advanced silviculture and formulating stand prescriptions in preparation for the USDA Forest Service certified silviculture panels.

What has been done

UT Extension provided 17 days of training for 35 forest silviculturists from the Forest Service, Bureau of Land Management and Bureau of Indian Affairs in March and April 2014. Training

consisted of in-class lectures, field tours and exercises, and a stand prescription project conducted by six university silviculture professors (four are from out-of-state).

Results

*Participants increased their knowledge about possible silvicultural options to meet various forest sustainability management objectives

*An average of 85% (30 of the 35) of the participants annually receive the 4-year certification in silviculture resulting in more effective forest management operations on federal lands.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

Outcome #6

1. Outcome Measures

4-H Wildlife Habitat Education Program

2. Associated Institution Types

- 1862 Extension
- 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)

Youth receive limited education and training in natural resources management. Increased knowledge and understanding is needed for youth to appreciate the challenges we face today with regard to soil, water, and wildlife resources.

What has been done

The 4-H Wildlife Habitat Education (WHEP) Program teaches youth principles and practices of wildlife management through local training (usually at the county level through Extension agents and volunteer leaders) and a series of contests. In Tennessee, three regional contests and one state contest were conducted. The structure of the contests helps youth develop leadership,

team-building, and communication skills.

Results

*An annual average of 214 youth from 26 counties participated in 4-H Wildlife Judging contests, 2012 ? 2014.

*State-winning Tennessee teams finished 1st at the National 4-H WHEP Invitational in 2012, 2013, and 2014.

*In a survey of WHEP participants, 94% indicated WHEP had a positive effect on their understanding of natural resources.

*More than 30% indicated they implement wildlife management practices as a result of the program and nearly 50% indicated they taught others (22 individuals per participant) about wildlife management.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

Outcome #7

1. Outcome Measures

Improving Railway Crossties

2. Associated Institution Types

- 1862 Extension
- 1862 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)

Twenty two million wooden railway crossties are installed each year in the United States, mostly to replace old ties that have failed due to fungal decay or other deterioration. Most crossties are treated with creosote preservative after a lengthy drying period for the unprotected wood. During this drying process decay can become established that weakens the wood. Also, the creosote treatment usually does not penetrate the tie completely, leaving the interior portions of the wood

unprotected. Pre-treatment of railway crossties with a borate ?a preservative that can diffuses throughout the tie -prevents degradation and improves the durability of the finished product.

What has been done

Applied research by UT Extension has shown that sufficient borate can be applied in an ambient temperature dipping process. The presence, and deleterious effects, of pre-creosote treatment decay have also been documented. The results of this research have been presented at numerous trade association meetings.

Results

A low-cost (\$2 per tie), environmentally-benign protective treatment has been adopted by three Class 1 railroads. Ties receiving this treatment are expected to last 50% longer in service.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

Outcome #8

1. Outcome Measures

Tennessee Healthy Hardwoods

2. Associated Institution Types

- 1862 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)

The University of Tennessee Extension has been instrumental in formation and support of County Forestry Associations (CFAs) involving 48 counties since 1999. Members of these associations have expressed desire and need in joining with other associations to hold regional forestry field days to view and learn first-hand about sustainable forest management practices.

What has been done

The Tennessee Healthy Hardwoods (THH) program was initiated in 2006 as a partnership with

the Tennessee Department of Agriculture Forestry Division and the Tennessee Forestry Association. Since inception, the program has been funded through \$375,696 in grants, has reached 1,840 landowners, and has impacted over 330,000 acres of forestland (for an average investment of approximately \$1 per acre). During 2014, three THH field days were held throughout the state, located at three Tennessee State Forests. The theme was "On the Ground Steps to Administering a Timber Sale."

Results

During 2014, 45 percent of the 178 participants completed a survey, with the following results: 100 percent indicated that they had gained knowledge about the process of administering a timber sale. All landowners indicated that the field day was worth attending. Most encouraging is that 99 percent felt they would adopt practices addressed and would seek professional advice prior to selling timber. Finally, new Extension audiences were reached in that nearly 20 percent had never attended an Extension educational event before.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

Outcome #9

1. Outcome Measures

Log-on Before You Log in Tennessee

2. Associated Institution Types

- 1862 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)

Considerable forestry educational materials exist for the purpose of educating private landowners about forest best management practices. Some of these include the Forest*A*Syst and the Guide to Forestry Best Management Practices in Tennessee. Making landowners aware of these types of publications, and giving them access to them, is an ongoing challenge. Most of the

sedimentation originating from forest lands occurs intermittently, usually during or immediately following a commercial logging operation. Solving BMP problems after silvicultural operations are complete is much more challenging than addressing the issues in advance.

What has been done

To resolve this problem, other states have developed a program titled "Call Before You Cut." Modeled after this, UT's "Log-on Before You Log" program reaches landowners via the internet. The site serves as a clearing-house for current timber marketing educational material, including BMPs.

Results

During 2014, there were 677 unique visits to this web site (an average of two per day, and a seven percent increase over 2013). The site survey indicated that 100 percent of the visitors owned forestland, with total ownership of 240,335 acres. Additional impacts include: 76 percent indicated they would seek professional help when marketing timber, 89 percent gained better understanding about forestry BMPs, and 97 percent would implement forestry BMPs as a result of viewing the website.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

Outcome #10

1. Outcome Measures

Sustainable Sturgeon fishery (Alford)

2. Associated Institution Types

- 1862 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)

Sturgeon are not currently a sustainable fishery population.

What has been done

We partnered with the TN Aquarium Conservation Institute, who is funding the server space, to develop a real-time data reporting system for commercial and recreational anglers to report incidental bycatch of Lake Sturgeon in the Tennessee River system.

Results

These data will be critical to recovering the species to a sustainable recreational fishery.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
301	Reproductive Performance of Animals

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Nationwide training for federal employees in advanced silviculture and formulating stand prescriptions in preparation for the USDA Forest Service certified silviculture panels. UT Extension provided 17 days of training for 35 forest silviculturists from the Forest Service, Bureau of Land Management and Bureau of Indian Affairs in March and April 2014. Training consisted of in-class lectures, field tours and exercises, and a stand prescription project conducted by six university silviculture professors (four are from out-of-state). Key impacts included:

*Participants increased their knowledge about possible silvicultural options to meet various forest sustainability management objectives

*An average of 85% (30 of the 35) of the participants annually receive the 4-year

certification in silviculture resulting in more effective forest management operations on federal lands.

Key Items of Evaluation

Nationwide training for federal employees in advanced silviculture and formulating stand prescriptions in preparation for the USDA Forest Service certified silviculture panels. UT Extension provided 17 days of training for 35 forest silviculturists from the Forest Service, Bureau of Land Management and Bureau of Indian Affairs in March and April 2014. Training consisted of in-class lectures, field tours and exercises, and a stand prescription project conducted by six university silviculture professors (four are from out-of-state). Key impacts included:

*Participants increased their knowledge about possible silvicultural options to meet various forest sustainability management objectives

*An average of 85% (30 of the 35) of the participants annually receive the 4-year certification in silviculture resulting in more effective forest management operations on federal lands.