V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Forestry, Wildlife, and Fishery Systems

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
123	Management and Sustainability of Forest Resources	75%	75%	33%	
125	Agroforestry	10%	10%	0%	
133	Pollution Prevention and Mitigation	0%	0%	17%	
135	Aquatic and Terrestrial Wildlife	10%	10%	32%	
301	Reproductive Performance of Animals	0%	0%	7%	
605	Natural Resource and Environmental Economics	5%	5%	11%	
	Total	100%	100%	100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	1.0	22.0	0.0
Actual Paid Professional	4.0	0.5	47.1	0.0
Actual Volunteer	3.0	1.0	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**
85366	28018	239543	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
371021	28018	4004285	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
75225	13200	2433801	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

UT and TSU Extension will partner with the Tennessee Forestry Association to plan and conduct group meetings to inform forest landowners of issues pertaining to forestry and wildlife. Topics will include management and marketing. Volunteers will be recruited and trained to present at group meetings, provide information, demonstrate equipment and provide materials for demonstrations. UT and TSU Extension will provide education at local, regional and statewide events, such as the Tennessee Forest Festival to inform the general public about forest management issues. Demonstartions will be provide for landowners and forestry workers. Extension Agents and Specialists will educate attendees at County Forestry Landowners Association. UT and TSU Extension will work closely with private consultants, Tennessee Wildlife Resources Agency employees, 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, we characterize 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.

Although manipulative studies of tree seedlings and saplings are cost effective and quick, recent research has shown that they may not allow for valid predictions on mature trees. Therefore, direct experiments on large trees or forested catchments have been developed. Experiments are being conducted on local forest research sites developed by the Department of Energy (DOE). Each are large-scale, multi-year, multi-investigator experiments.

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 are 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?

Tennessee is represented by 108 eXtension members in 42 of the 59 approved Communities of Practice (CoP). Tennessee Extension personnel have addressed over 800 Frequently Asked Questions through eXtension. 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 evaluation protocols with their CoP colleagues.

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	24464	1331125	8563	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	10	32	42

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Release of Hemlock Woolly Adelgid predators reared in Tennessee (Parkman).

Year	Actual
2011	249000

Output #2

Output Measure

- Golden-winged warbler conservation strategy in place for the Cumberland Mountains of Tennessee (Buehler).

Year	Actual
2011	0

Output #3

Output Measure

- A novel wood treatment process was developed that provides better quality railway ties. A collaborative effort between UT and a local company has resulted in a commercial product and treatment system that has already secured orders with large railways valued at over $2 million. (Taylor)

Year	Actual
2011	1

Output #4

Output Measure

- Human disturbance can have a great impact on the health of forested land through altered soil properties and climate, and attempts to repair damage can be costly. We showed that the selection of ground cover species is important for the success of reforestation, that high elevation forests show signs of recovery after insect attack, and that mercury contamination had no long-term impacts on the capability of land to support forest growth in Tennessee. (Franklin)

Year	Actual
2011	1

Output #5

Output Measure

- Northern Bobwhite and other grassland bird populations are declining rapidly throughout the region primarily because of loss of native grassland habitat. Documenting the extent of the decline and population responses to restoration efforts is needed. We developed a monitoring protocol that meets the needs of the National Bobwhite Conservation Initiative and has been implemented across the 7-state Central Hardwoods Bird Conservation Region. Four years of data have been collected under this monitoring protocol. Analyses of these data will determine

how much conservation action is needed to reverse the declines of bobwhites and other priority species. (Buehler)

Year	Actual
2011	1

Output #6

Output Measure

- We have completed a 2-year field study demonstrating that Lonestar 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 insufficient to protect residents from the risk of tick-borne disease. (Hickling)

Year	Actual
2011	1

Output #7

Output Measure

- We are working to improve trap designs and success in monitoring the walnut twig beetle, which vectors Thousand Cankers Disease in walnut trees. (Klingeman)

Year	Actual
2011	1

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	Acres of production of freshwater prawn in Tennessee as an alternative income source (Wilson).
4	Extension Master Logger Program
5	Extension Educates Natural Resource Professionals on Restoring Bottomland Ecosystems
6	Post-Harvest Fields Limit Migratory Waterfowl Food (Gray)
7	Protecting amphibians from ranavirus (Gray)
8	Thousand Cankers disease on black Walnut (Grant, Lambdin)
9	Propagating Marine Species for Reintroduction (Wilson)

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
2011	466

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
2011	220

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

Acres of production of freshwater prawn in Tennessee as an alternative income source (Wilson).

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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
135	Aquatic and Terrestrial Wildlife
301	Reproductive Performance of Animals

Outcome #4

1. Outcome Measures

Extension Master Logger Program

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
During forest harvesting operations, Tennessee water quality is often compromised.

What has been done
UT Extension conducted 4 logger workshops of 5 days each (basic training) and 21 continuing education logger workshops (8 hours each).

Results
57 loggers increased their knowledge on best management practices (BMPs) to protect water quality during harvesting operations. These loggers impact approximately 17,000 acres of forest land consisting of 42 million board feet of timber harvested with a value of $6.5 million to landowners on an annual basis. The Tennessee Master Logger educational program has reached more than 2,500 loggers since 1983 or about 90 percent of the state logging workforce. 458 loggers attended and increased their knowledge about BMPs in a 1-day continuing education course (various subjects). A statewide BMP survey was initiated in 2011 collecting data from 205 logging sites statewide to determine BMP implementation rates/compliance. Our survey showed an 89% compliance rate, indicating that loggers were implementing BMPs. 18 of the 24 sites (75%) that were not in compliance were harvested by loggers who had not received the Master Logger training.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
605	Natural Resource and Environmental Economics

Outcome #5

1. Outcome Measures

Extension Educates Natural Resource Professionals on Restoring Bottomland Ecosystems

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Over the past several decades, federal incentive programs have encouraged the restoration of bottomland hardwood forests. Restoration efforts have been marginally successful, mostly because of a lack of knowledge regarding soil conditions on these sites.

What has been done
In 2004 a major bottomland hardwood restoration project was installed at the West Tennessee Research and Education Center involving over 51,000 seedlings on 120 acres. A field day was

delivered in 2011 to present the results of survival and growth of 10 different bottomland oak species on this site.

Results
The field day reached across five agencies, targeting natural resource professionals who advise landowners on bottomland restoration. Collectively the 60 participants advise on 43,000 acres annually. Of the participants, 100% indicated they had received valuable information from the program, 93% will adopt new practices and 83% felt financial resources spent on bottomland restoration will be more efficiently used as a result of the program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
605	Natural Resource and Environmental Economics

Outcome #6

1. Outcome Measures

Post-Harvest Fields Limit Migratory Waterfowl Food (Gray)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Biologists and hunters that manage land for waterfowl are concerned that post-harvest, agricultural fields provide little food for migratory waterfowl.

What has been done
There were six major findings: (1) seed mass of grain sorghum, corn, and soybean left behind combines immediately following harvest has decreased approximately 33% since the 1980s, (2) continuous monthly rates of decline from harvest to January were 64% for corn, 84% for soybean, and 74% for grain sorghum, (3) 70 ? 90% of harvested fields had little to no seed available for waterfowl by January, (4) corn seed was lost primarily to depredation whereas soybean and grain sorghum seed were lost mostly to decomposition and germination, (5) very little seed was lost in

unharvested fields, and (6) loss of submersed seed in flooded fields was 40−300% greater than on dry land.

Results
These findings indicate that waterfowl biologists should provide unharvested food plots for waterfowl because seed resources are low in winter in harvested agricultural fields. Given rapid seed loss in harvested and flooded fields, managers should delay harvesting and flooding until immediately prior to the arrival of waterfowl.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
605	Natural Resource and Environmental Economics

Outcome #7

1. Outcome Measures

Protecting amphibians from ranavirus (Gray)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Ranaviruses may be a significant risk to ranid frogs.

What has been done
We found that (1) high susceptibility to ranavirus in amphibian hosts is associated with small geographic range, fast development in the larval stage, and breeding in semi-permanent wetlands, (2) amphibians in the family Ranidae tend to have high susceptibility to ranavirus, and (3) susceptibility to ranavirus differs among pre-metamorphic developmental stages, with the egg stage least susceptible.

Results
These findings indicate that ranaviruses may be a significant risk to ranid frogs and contribute to population declines. Translocation of egg masses to ranavirus-free breeding sites can be an effective strategy to reestablish amphibian populations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
301	Reproductive Performance of Animals

Outcome #8

1. Outcome Measures

Thousand Cankers disease on black Walnut (Grant, Lambdin)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
We need to preserve the 1.64 million black walnut trees with a value of $430 million annually in urban and forest environments.

What has been done
Since we initiated studies on the invasive pest, walnut twig beetle, that is responsible for transmitting the thousand cankers disease, we have documented the life history of this pest with data providing information that could be used to manage pest populations on black walnut. Our preliminary data infers that the various chemicals available have limited, to no effect on the beetle once it bores into the cambial tissue of its host tree.

Results
We have observed predaceous beetles that feed on the pest in lab studies which may lead to the development of biological control agents that can be used to suppress and stabilize the

population of this pest and prevent serious damage to the trees. Techniques are being developed that can be used to mass rear populations of these predators for release in pest infested areas for control.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
125	Agroforestry
605	Natural Resource and Environmental Economics

Outcome #9

1. Outcome Measures

Propagating Marine Species for Reintroduction (Wilson)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	20

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Stream health and water quality caused the loss of aquatic species in Tennessee and North Carolina rivers.

What has been done
Five species have re-established reproducing populations, and successful recruitment has been observed in four additional species. For the first time since 2000, mussels have been translocated into the Pigeon River in both TN and NC. In June 2011, fifty-eight (58) tagged wavy-rayed lampmussel were released. In October 2011, TWRA reintroduced 6 species of mussels (755 individuals) into the Pigeon River.

Results
Since its inception in 2001, the PRRP has re-introduced 20 species of fish, including more than 29,000 individuals, into TN & NC portions of the Pigeon River. It appears stream health and water quality has improved sufficiently to support many of the aquatic species that were previously extirpated from the river.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
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

In 2011, evaluation efforts for forestry, wildife and fisheries focused on the Tennessee Healthy Hardwoods (THH) Program. UT 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.

During 2011, four regional forestry field days were held at Tennessee State Forests. The 2011 theme was "Restoration of Hardwood Forests," and included both state agency and private partners.

The 222 participants at the four Tennessee Healthy Hardwoods field days owned 66,782 acres of forestland. Highlights include:98% indicated they would adopt new practices addressed at the events, 99% thought that their hardwood plantings will be more successful as a result of attending, 96% agreed that financial and physical resources will be more efficiently used in tree planting projects, 30% had never attended an Extension program before, and collectively the attendees agreed to restore 1,076 acres (or approximately 586,000 seedlings) to hardwood forest.

Key Items of Evaluation