V(A). Planned Program (Summary)

Program # 12

1. Name of the Planned Program

Forestry

☑ 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
123	Management and Sustainability of Forest Resources	50%		60%	
124	Urban Forestry	25%		10%	
125	Agroforestry	25%		20%	
133	Pollution Prevention and Mitigation	0%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	9.0	0.0	22.0	0.0
Actual Paid Professional	18.1	0.0	43.9	0.0
Actual Volunteer	10.2	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**
549627	0	415777	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1797670	0	2214618	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
582207	0	4425263	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

MAES. Minnesota has over 15 million acres of commercially productive forest land split up among private, state, federal, county and industrial ownership. This commercial forest land supports about 38,000 jobs in Minnesota with in an annual economic impact of $6-7 billion. There are about 128 million urban trees in Minnesota, representing a value of over $100 billion. That urban and state-wide research is under threat from new insects and diseases. Diseases are responsible for more than 65 percent of the wood volume lost in forests each year. MAES has supported basic and applied research into managing and maintaining our forests and developing new forest products. Some of this research is reported this year under the Climate Change and Sustainable Energy programs, when they are focused specifically on those areas. Other highlights of MAES forest and forest products research in 2013 include:

- Researchers have been using breeding techniques to improve northern temperate forest species for growth rates, disease resistance and wood quality. They measured a 23 year old progeny trial planted in a very high blister rust risk area near Lake Superior and have found six families with blister rust resistance. The parentage of these survivors was used to develop breeding plans.
- Tree breeding is not a short term process. This year marked 20 and 15 year milestones for forest researchers' oldest hybrid aspen progeny trials. The results have shown that hybrid aspen has higher growth potential than native aspen with better wood quality than hybrid poplar.
- Researchers have collected and stored ash seed as part of the Minnesota native ash seed germplasm collection in cooperation with two Native American tribes, Prairie Island Indian Community and Fon Du Lac. The project is preserving genetic variation of ash species in Minnesota in response to the threat of emerald ash borer.
- We have reported over the years on developing novel methods to determine wood fungi and screening methods to determine their potential for bioremediation of toxic pollutants, novel new compounds for pharmaceutical and other medicinal uses as well as new microbes for bioprocessing technologies to produce biofuels. Many of these are now being studied in scale up bioprocessing investigations.
- Research on the processes of decomposition of wood to understand the basic mechanism of lignocellulose degradation. The most important finding this year was learning that wood was depolymerized ahead of the regions where cellulose enzymes and lignin modifications occurred, calling long-standing through troublesome aspects of the brown rot mechanism into question. The work is valuable for those working with lumber or with forest processing involving wood. ·
- Since private landowners oversee much of the urban forest, it is important to consider the motivations of these landowners as they relate to invasive species detection and treatment. Researchers developed and maintain Minnesota Land Economics, a searchable database for users to obtain land price, conservation easement and property tax information. The website is updated quarterly.·
- Cost-effective strategies are needed to find and remove diseased trees in forests damaged by pathogens. Researchers developed a model of cost-minimizing surveillance and control of forest pathogens across multiple sites. In our application to oak wilt in Anoka country, they developed a cost curve associated with saving healthy trees from infection. Assuming an annual infection growth rate of eight percent a $1 million budget would save an expected 185 trees from infection for an average of $5400 per tree. The model provides practical guidance about allocating surveillance and control resources when only modest information about their geographic distribution is available.
- Damage from early summer storms provided U of M researchers with a crash course in treefall. With thousands of suddenly downed trees, the storms provided opportunity the correlations between recent excavation and pavement work and downed trees. The study could lead urban communities to remove and replace older trees as part of street and sidewalk products to reduce the number of storm-vulnerable trees lining city streets. Other changes, such as moving sidewalks, eliminating boulevards but creating more space in the public right of way so trees would be at less risk from snowplowing and other work.

Extension. With concentrated efforts in counties and regions of the state where healthy forests provide quality of life, the forestry team is building sustainable solutions to ecological problems by coupling the good intentions of Minnesotans with the knowledge they need to act to maintain the health and well-being of forest lands. Through community-based efforts in 2013 the Forestry team mobilized dedicated volunteers to identify problems and implement solutions to the problems of invasive species. Extension provided these volunteers with the education they need to identify species. With new funds, online reporting systems and tablet computers were utilized to enhance tracking systems. Finally, training helped volunteers and community members use herbicides safely.

2. Brief description of the target audience

The Forestry team at the University of Minnesota Extension continue to deliver education to any and all Minnesotans who can help to keep Minnesota's forests safe from invasive species, and can utilize the resources of the forest for economic good. In 2013, education reached farmers, landowners, natural resource professionals, policy makers, community volunteers, woodland owners, city workers who care for trees, Minnesota loggers and cabin owners.

Targeted audience for research includes forest and forest products researchers, information specialists in natural resource management, public forest land management decision-makers and policymakers, plant pathologists specializing in tree diseases, wood products industry, biotechnology and biofuels industry, arborists, conservators and biological science researchers.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3609	4058	20	0

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	20	66	86

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of workshops, tours, and demonstration projects that increase awareness of landowners, volunteers, loggers, natural resource professionals and businesses involved in forestry, agroforestry, urban forestry and forest products.

Year	Actual
2013	125

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Program participants (landowners) will learn new information that helps them manage forest land. (Target expressed as percentage of participants.)
2	Program participants will improve forest management on a significant number of acres. (Target expressed as number of acres on which management was improved.)
3	State departments will use education to make key policy changes. (Quantitative outcome is the number of policy resolutions.)
4	Forest First Detectors will be trained and mobilized to identify emerald ash borer and other pest infestations. (Target expressed as number of responses to pest infestations.)
5	Research will help provide new tree species more resistant to invasive insects.
6	Research will provide new knowledge to support urban forestry.

Outcome #1

1. Outcome Measures

Program participants (landowners) will learn new information that helps them manage forest land. (Target expressed as percentage of participants.)

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	77

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Focused educational events provide community members concerned with what they need to maintain forests responsibly, and develop a stronger community that works together on forest preservation. One example of a focused educational initiative took place in Cook County and the Sugarloaf project -- a North Shore Stewardship Association. This region is a Minnesota tourist destination of particular significance.

What has been done
In conjunction with the Cook County Invasive Species Team and the North Shore Stewardship Association, eight invasive species control workshops were offered in Northeast Minnesota. These were attended by a total of 100 persons. Five were offered to the public, one was focused on buckthorn identification and control, and two were offered to maintenance workers responsible for weed control on public lands. Most participants attending the workshops attended to find answers to specific problems and to use the information for their own lands or jobs.

Results
The outcome reflects percentage of significant learning gains by all Forestry program participants. Application of knowledge in Cook County was reported for the following items: 1) control of invasive species; 2) reading labels for herbicide use; 3) knowing which herbicide to use and where to get it; and, 4) calibrating spray equipment. (Learning gains of at least 1.1 point on a five point scale were reported.) Participants attending the workshop on buckthorn control worked cooperatively to begin control of buckthorn on 90 acres of land. This work began the same day the workshop was held.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation

Outcome #2

1. Outcome Measures

Program participants will improve forest management on a significant number of acres. (Target expressed as number of acres on which management was improved.)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	11590

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
One example of a community-based approach to forest management exists in Itasca County. With two million acres of rural forested land, the county hosts 45,000 residents and cabin owners. Historically, the county averages 60 wildfires each year, and experts predict an increase in the frequency and intensity of fires. Access is an issue for rural fire trucks and emergency service vehicles.

What has been done
Through education to property owners and facilitation of nine sectors of public service in the county -- including 18 rural fire departments -- Extension has helped to mobilize the county to reduce risks from wildfire and improve the safety of Itasca County residents. According to the FedGazette, estimates of the total cost of wildfires to landowners, investors and taxpayers range from 10 to 50 times the cost of fire suppression.

Results
In 2013, 276 property owners volunteered 19,891 hours to improve defensible space and remove hazardous materials around structures, improving access for emergency service vehicles. The value for this in-kind contribution equals $440,386.74. In addition, property owners contributed 1,089 tons of hazardous fuel. Deer River Hired Hands, a local non-profit, hauled materials to neighborhood consolidation sites where it was chipped and used for renewable energy at the Minnesota Power Rapids Energy Center in Grand Rapids, Minnesota.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

Outcome #3

1. Outcome Measures

State departments will use education to make key policy changes. (Quantitative outcome is the number of policy resolutions.)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Agroforestry, an ancient practice that's only been recognized as a science since 1977, is undergoing a mini-revival in Minnesota. With support from Extension, farmers look to trees to increase the productivity of their land and to and become better stewards of the land. Trees can increase farm productivity and reduce problems with air pollution, declining water quality and degraded agricultural landscapes. Beyond simply planting trees and shrubs, farmers can intentionally integrate trees into crop and livestock systems.

What has been done
As interest in sustainable agriculture grows, Extension educators are teaching Minnesotans about agroforestry and its benefits, including healthier soils, water conservation, and increased crop and forest yields. In 2013, three natural resource professionals were recruited and trained to grow agro-forestry initiatives throughout the state.

Results
One of the trained professionals initiatied discussion with the Bureau of Soil and Water Resources (BWSR) to integrate agroforestry into their educational program. A resulting BWSR resolution included the adoption of agroforestry as an integral part of the agency's work. In addition, he established agroforestry demo trails through a local non-profit organization.

4. Associated Knowledge Areas

KA Code	Knowledge Area
125	Agroforestry

Outcome #4

1. Outcome Measures

Forest First Detectors will be trained and mobilized to identify emerald ash borer and other pest infestations. (Target expressed as number of responses to pest infestations.)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	99

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Early identification of pests can prevent infestation, but early identification happens most easily when citizens of the forest are educated and alert to finding pests easily.

What has been done
The Minnesota Forest Pest First Detectors training program is designed to help identify the occurrence of Emerald Ash Borer and other forest pests in Minnesota. First Detectors are the front line of defense against likely infestations. Meeting, working with and educating the public about exotic forest pests are key activities of Forest Pest First Detectors. First Detectors are a part of the Federal National Plant Diagnostic Network (NPDN) that promotes the early detection of invasive, exotic plant pathogens, arthropods, nematodes and weeds.

Results
A study of 103 Forest Pest First Detectors in 2013 found that the program had generated significant action and impact for Minnesota's Forests. Detectors responded to at least 99 reported pest infestations, made 179 site visits and addressed 1,450 general questions about pests. They volunteered 775.5 hours, valued at $16,991.21 by IndependentSector.org. One significant impact was that one of these trained volunteers was the first to detect emerald ash borer in Superior, Wisconsin, triggering mitigation efforts among local and state agencies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

124	Urban Forestry

Outcome #5

1. Outcome Measures

Research will help provide new tree species more resistant to invasive insects.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In the 1970's there were more than 300,000 elms lining the urban landscape of Minneapolis-St. Paul. Then Dutch Elm Disease swept through the region and over the course of the decade, most of the trees were lost.

What has been done
U of M researchers have been studying one large elm tree that appeared to be tolerant of the disease. The tree is 80 feet tall and 175 inches in diameter and is over 100 years old. After many studies and clippings, researchers are replicating it and going to try to bring it to market.

Results
If this tree could be brought to market and people started to plant it again it could change the urban landscape, and potentially bring back the beauty of city boulevards lined with American Elm.

4. Associated Knowledge Areas

KA Code	Knowledge Area
124	Urban Forestry

Outcome #6

1. Outcome Measures

Research will provide new knowledge to support urban forestry.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Cities nationwide are grappling with how to replace a dwindling supply of trees. The U.S. Forest Service found last year in a study of aerial photographs that urban areas are losing four million trees a year, while paved surfaces are expanding. The urban forest must constantly be renewed.

What has been done
In a pilot project in Minneapolis U of M urban forest researchers are testing new tree tube technology to help nurse seeds from seedlings. Currently, the 5,000 trees planted yearly by the Minneapolis park system are many feet tall and several years old by the time they're planted into the city's soil. That's because it is often difficult to grow seedlings in an urban setting. The tubes can foster the growth of more and longer-lasting trees by nurturing seedlings as they mature in place. The 4-foot tubes offer just right amount of light and support.

Results
Establishing trees when they are smaller and younger is not only less expensive, but gives them a better chance of becoming resilient to stresses in their environment and living longer. Minneapolis is grappling with the loss of thousands of trees from summer storms and the invasive emerald ash borer.

4. Associated Knowledge Areas

KA Code	Knowledge Area
124	Urban Forestry

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Appropriations changes
- Public Policy changes
- Government Regulations

Brief Explanation

Partnerships with local and state government have greatly enhanced the outcomes and impacts that forestry education can make. Local public services join with Extension to educate local volunteers and citizens, ultimately creating safer forests for the entire community. Education about agroforestry for state department officials has resulted in a change in public priorities for the Bureau of Water and Soil Resources in Minnesota, among others.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The Forestry team tracks whether education of citizens and professionals results in local action to protect forests or to use them for local economic or natural resource gains. In 2013, this work leveraged over nine full-time equivalents of volunteer time, and integrated best practices in forest management into several local initiatives. Ultimately, Extension education resulted in better management of 11,590 acres of forest in Minnesota.

Key Items of Evaluation

In 2013, Extension mobilized the equivalent of 9.8 full-time volunteers and ultimately impacted the quality of land management in 11,590 acres of Minnesota's forest land.