V(A). Planned Program (Summary)

Program # 14

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	80%		60%	
124	Urban Forestry	10%		10%	
125	Agroforestry	10%		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: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	9.6	0.0	25.2	0.0
Actual Paid Professional	19.0	0.0	46.9	0.0
Actual Volunteer	0.1	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**
511926	0	209775	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1570415	0	2500919	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
754492	0	4719296	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

In 2012, **MAES** supported research focused on the long-term survival and sustainability of Minnesota's forest resources. Research efforts also responded to new and emerging threats to that important resource, especially in the form of invasive insects such as the emerald ash borer and mountain pine beetle. Other forest resources results are reported under Climate Change, Sustainable Energy, and Fish, Wildlife and Environment. Some examples of research progress in 2012:

- The first year of post-treatment data from a large-scale experiment examining impacts of the emerald ash borer on lowland black ash forests in northern Minnesota indicates that loss of black ash trees will increase wetland shrub species, creating significant challenges to reforestation efforts.
- The time frame for forest management decision-making requires a way of predicting future forest stand conditions. In the Lake States there is currently a shortage of such models for managed stands. Researchers working to develop modeling and information systems tools for forest management improved a "shared library" approach and a field trial was established as part of the project.
- Forest researchers developed a new method of establishing aspen called "dense pack" establishment that Blandin Paper Company has adopted. The method promises greater seedling survival, growth and lower deer browse on seedlings than traditional methods.
- A survey of Minnesota logging business owners was completed and analyzed. Results showed that logging businesses and their equipment continue to age. Survey results were discussed with policy makers, mill managers, and others to help discussions about how to keep a viable logging industry in Minnesota.
- A multi-state collaborative forest resource project is tracking wood decomposition and showing how that process stores important elements in decaying tissue for natural benefit over the long-term, including tree growth.
- Studying oak wilt in a Minnesota county for local planners, an applied economics researcher developed a cost curve associated with saving healthy trees from infection. Researchers developed a model of cost-minimizing surveillance and control of forest pathogens across multiple sites, where there is uncertainty about the extent of the infestation in each site.
- Research on invasive insects and the consequences on forest ecosystems brought new focus on the mountain pine beetle, which is a serious insect threat facing Minnesota. Work indicated that neither host chemistry nor climate suitability are barriers to the insects' colonization of pines in the Lake States.
- Another new tree disease recently introduced into the U.S. is Laurel Wilt, which has the potential to kill hundreds of millions of trees in the U.S. Collaborative research was begun in 2012 to study the disease, and the defense mechanisms produced by the tree to resist infection.
- Based on forest wildfire preparedness studies, reported in previous years' reports, researchers added a new collaboration with the U.S. Forest Service called Futures Research for Management under Uncertainty. The research has been used to improve communication to communities about how to develop and implement Community Wildfire Planning Projects.
- Research is underway to select elms resistant to Dutch elm disease, a disease that was introduced into the U.S. over 90 years ago. During these past decades, this disease has killed over a billion trees in North America. Although most trees have been killed, there are some surviving trees in Minnesota existing where all other elms have died. To determine if these trees are resistant, cuttings have been obtained and rooted clones inoculated in the greenhouse. Studies are underway to identify the mechanisms of resistance in these selected trees, with the goal to provide a genetically diverse group of resistant elms that will be hardy in Minnesota and other northern states.

Extension's Forestry program team addresses the issues of forest, agricultural and urban landscapes using educational programming, local consultation, and a widely accessed social media site called mymnwoods.com. Followers of this popular social media site grew from 40,555 in 2011 to 51,438 in 2012, as cited in "indirect contacts." Forestry programs cover a wide range of topics including forest ecology, siviculture, invasive species, timber harvesting, timber and non-timber forest products, wildlife

management, recreation, urban forestry, windbreak and taxes. Initiatiaves to address critical issues (for example, mitigation of emerald ash borer) are typically done in collaboration with citizen, environment and professional groups.

In 2012, the team responded to timely issues related to Minnesota's forests and landscape. For example: 1) After a landowner faced penalties and litigation for not following regulations related to his wetlands, the team developed a new workshop to promote the role of wetlands on local ecology and who regulates them, along with a "decision key" to guide landowners' actions. 2) In their ongoing efforts to address invasive species in Minnesota, the team collaborated with agriculture educators to deliver education about four invasive species to Minnnesota farmers. 3) A collaboration with Minnesota's Soil and Water Conservation District Association disseminated educational materials on key current issues, especially the expiration of Conservation Reserve Program options. This team continues to have standout efforts in using technology to reach forest owners. This year, the team observed that online education could reach land owners whose disabilities didn't allow for attendance at face-to-face sessions.

2. Brief description of the target audience

Primary audiences: Farmers and woodland owners, loggers, wood processors and marketers, natural resource and green industry professionals, volunteer educators, and local and state government personnel engaged in forestry, parks and recreation, soil and water conservation. A secondary audience is youth.

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

3. How was eXtension used?

Two Forestry team specialists have been working with the Wisconsin Bioenergy curriculum team for the past few years to create fact sheets on willows and poplar as a bioenergy feedstock. These are now availabe in eXtension. The team also contributes to communities of practice in Farm Energy, Wood Energy, Climate, Forests and Woodlands and Forest Farming.

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2793	51438	77	0

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

Patent Applications Submitted

Year:	2012
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	24	26	50

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Workshops, tours, and demonstration projects will increase awareness of landowners, volunteers, loggers, natural resource professionals and businesses involved in forestry, agroforestry, urban forestry and forest products. (Target expressed as the number of events.)

Year	Actual
2012	137

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	Education about invasive species will motivate citizen landowners to act to assess and control such species on their property. (Outcome is the percentage of all participants who reported behavior change.)
4	Natural resource programs will be adapted to the needs of the indigenous culture, resulting in adoption of the program by a tribal college.
5	Research will provide information to assist local communities make decisions about their forest resources.
6	Research will provide information to understand the biology, control and uses of forest microbes.

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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	94

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
An example of important knowledge gains relates to wetlands management. As societal understanding of the importance of wetlands increases, a myriad of regulations have arisen to protect them. More than 90 percent of timber harvest sites have at least one wetland on site, so foresters and loggers need to be aware of wetland regulations. The need for knowledge about regulations was brought to light in 2010 when a Minnesota landowner and logger failed to comply with regulations and faced litigation with county, state and federal government agencies.

What has been done
A workshop was designed to increase understanding of the role of wetlands in an ecology, and to identify agencies and laws regulating operations in wetlands. The workshop included both indoor and outdoor components and created connections with regulators from various agencies. Because there are numerous regulatory authorities, each with its own set of regulations, a "decision key" was drafted. The key is designed to lead users through the process of seeking needed approvals for operating near a wetland site.

Results
Participant awareness of the regulators and regulations was heightened as a result of the workshop, and knowledge gains were evaluated. Participants liked the decision tree, and were engaged with its developers to enhance its utility. The decision key is currently being reviewed by regulators from various jurisdictions as well. One participant offered to create a cell phone-based application for the decision key so that users can access it remotely from the field and begin work on submitting required paperwork. Landowners, regulators and the environment experienced a "win-win" as a result of this programming.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
124	Urban Forestry
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
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	27746

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In 2012, one significant effort to maintain forest acres was the Sugarloaf Lost Forest Project. As reported last year, the Lost Forest along Minnesota's North Shore was historically dominated by white pine, cedar, spruce and fir. Logging and homesteading cleared those trees, and fires burned soil and destroyed the seed bank. A healthy, restored North Shore Forest is good for the health of wildlife, streams, forests and tourism. The sustainability of this effort relies on the investment of residents in maintaining the effort for future generations.

What has been done
The project mobilized community members and land owners, creating an awareness of the declining forest, the need to inform action and the skills, training and support to take action.

Results
Fifteen participants planted trees on 245 acres in 2012. A qualitative evaluation of the effort showed that participants believe a significant project outcome is a new coalition of neighbors that care about the forest. Participants found like-minded neighbors and a common voice among those enthusiastic about planting trees. Participants also felt better able to "develop a core of advocates for the forest...I feel like I am armed to talk about the forest more thoughtfully than I was before...That may be the most valuable thing the program is doing. It may be more valuable than what anybody does with my (their) piece of property."

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Education about invasive species will motivate citizen landowners to act to assess and control such species on their property. (Outcome is the percentage of all participants who reported behavior change.)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	98

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As stated in earlier reports, Extension's Forestry team has played an important leadership role in addressing the spread of invasive species such as emerald ash borer in Minnesota. In 2012, the team recognized that farmers had not been targeted for invasive species education.

What has been done
In response, the Forestry team collaborated with agriculture Extension educators to develop a curriculum on invasive species for delivery through the Private Pesticide Applicator training workshops held in 2012. The education focused on four invasive species: buckthorn, emerald ash borer, oriental bittersweet and brown marmorated stink bug. The team also continued its efforts to educate forest landowners about invasive species.

Results
As a result of the class, over 85 percent of the participants recognized that they have an invasive species on their property and 100 percent said they will look for these invasive species. One profound example of forest owners acting as a result of invasive species education took place in Delano, MN. After concluding that buckthorn was "everywhere" on their 25-acre property, they spent 1100 hours controlling it. Now, their story has been distributed to 820 members of the Minnesota Forestry Association in order to create greater awareness of buckthorn as a forest pest, and of how to successfully control it.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
124	Urban Forestry

Outcome #4

1. Outcome Measures

Natural resource programs will be adapted to the needs of the indigenous culture, resulting in adoption of the program by a tribal college.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In March of 2008, UMN Extenshion hired a regional educator in natural resources to partner with the American Indian community, with an emphasis on the Fond du Lac Reservation. Listening sessions were undertaken with the FDL community to capture community priorities, values and needs. The result was the development of a program for natural resource education and outreach emphasizing culture, ecology and traditional resource management.

What has been done
Emerging from the identified need to physically and culturally reconnect FDL community members with traditional natural resources, the Thirteen Moons program pursues three interconnected objectives: 1) to increase awareness of and knowledge about traditional and other resources; 2) to create stronger social interaction in the context of natural resources; 3) to highlight and honor the importance of natural resources in traditional and contemporary Ojibwe lives and livelihoods. Monthly media outreach, a worship series and seasonal community events carry out the goals of the program.

Results
The program was successful in attracting over 2,000 Native American participants in 2011. The team also used the experience to develop evaluation processes adapted to concerns of Native American participants when traditional evaluation methods were not effective. Most importantly, in 2012 the program was successfully turned over to the FDL Tribal and Community College. This

trusted local resource is supported by Extension when needed. This will allow Extension to develop programming elsewhere in the state while leaving the Thirteen Moons program in the hands of a trusted institution.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Research will provide information to assist local communities make decisions about their forest resources.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Communities with public forest resources need to consider multiple objectives for the use of those resources.

What has been done
An applied forest resources project provided modeling methods to assist a Minnesota county with more than 41,000 hectares of county-managed forest land important for the local community.

Results
The final plan was approved by the county's natural resources stakeholders committee. As a result, the county's timber revenues and timber volumes are scheduled to nearly double in each of the next 10 years. Net present value estimates of direct net returns to the county were increased by $3.4 million over the initial plan proposed by the county land department.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

Outcome #6

1. Outcome Measures

Research will provide information to understand the biology, control and uses of forest microbes.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Wood destroying fungi cause damage to trees and wood products. However, they also have the potential to be used for many bioprocessing technologies where lignin needs to be altered or removed to free cellulose

What has been done
A large comparative study of the genomes from 31 wood decay fungi has been completed and degradation patterns of fungi from different lineages identified.

Results
These studies have provided new insights into the evolutionary development of lignin degradation. This information is being used to select and evaluate the potential of wood decomposing fungi to be used as a pretreatment of wood and other perennial plants for biofuels production. Short treatment periods by selected fungi successfully modified lignocellulosics and have provided new organisms for use in future biotechnological research.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
125	Agroforestry

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Appropriations changes

Brief Explanation

The number of acres affected by the Forestry team was dramatically reduced in 2012. As grants have ended, the team is using existing funds to invest in the most important forest initiatives that are likely to change a condition.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Qualitative evaluation of forestry projects provide participants the opportunity to identify the value of the program from their perspective. As indicated, one such evaluation process revealed that those engaged in the Sugarloaf project now identify themselves as part of a stronger community ready and able to advocate and care for local forests.

Surveys were distributed at the end of workshops to assess outcomes and to learn about participants. Pre-post questions were used to determine the magnitude of learning gains, and participants were also asked to indicate the likelihood they would change their behavior. Questions also monitored participants' preferences for training location, time of day and other logistics in order to design for increased access to target audiences. Lastly, demographic information is gathered as a means to better understand who attended the workshops and events.

The Thirteen Moons program, as a complement to its cultural adaptations for the Fond du Lac tribe, implemented creative evaluation techniques. The community is generally not open to completing surveys, and so the team employed a strategy of anonymous "votes" and event maps to measure the extent to which the program achieved desired outcomes.

Key Items of Evaluation

The long-term impact of forestry projects go beyond the refurnishing of forests in northern Minnesota, because newly engaged citizens are now working together to preserve and protect their forests for the next generation.