V(A). Planned Program (Summary)

Program # 12

1. Name of the Planned Program

Fish, Wildlife and Conservation

☑ 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
135	Aquatic and Terrestrial Wildlife	20%		50%	
136	Conservation of Biological Diversity	50%		50%	
903	Communication, Education, and Information Delivery	30%		0%	
	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	5.4	0.0	0.0	0.0
Actual Paid Professional	16.5	0.0	17.0	0.0
Actual Volunteer	21.6	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**
389101	0	335015	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1614345	0	1058171	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
692442	0	1690437	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

MAES supported research into the areas of environmental sustainability, including fish, wildlife and conservation, spans several different academic departments. In 2012, research was focused on best land use decision making, on maintaining diversity in the ecology of Minnesota, and in maintaining and improving the quality of fish and wildlife habitats. Some of this research is reported under other program areas, such as Forestry and Water Resources. Some have climate change impacts and are reported under that program area. Two projects are reported under Outcomes in this program. Other examples of research progress in fisheries, wildlife and conservation in 2012 include:

- Increasing interest in landscape-scale restoration of native ecosystems, converting lands currently in annual crop production to grasslands, wetlands and forest is seen as crucial for the migration of thousands of species. In 2012, research focused on developing control approaches for the invasive common reed (Phragmites australis.) This species alters river channels and is causing a significant loss of critical habitat for threatened species such as the whooping crane. Researchers have found plant species, including a native poplar resistant to flooding, that allow them to simulate conditions more typical of those that existed in the landscape historically.
- Other research into ways to diversify Minnesota's landscapes is studying native plants with potential economic benefits, such as for use in cosmetics, to be part of a mix of perennial species. Researchers are evaluating the phytochemical composition of these plants.
- An analysis of spotted owl nest and roost site locations over long periods of time sowed that establishing protected areas around the nests of teritorial owls has long term management benefit. This was the first test of the efficacy of this reserve strategy that was originally designed and implemented in 1992.
- Researchers developed a forest wildlife habitat model that provides unique insight on forest management implications for wildlife habitat across the state and large forest planning units.
- Researchers obtained data for approximately 70 waterbird nesting sites in the Great Lakes area. Results demonstrated that it is possible to calculate population trends from the sub-sample that are similar to trends obtained from a total census. The sampling effort is likely to be adopted by U.S. Fish and Wildlife Service. The method is less expensive and time consuming than the complete census approach that has been conducted each decade since the mid 1970s.

During the past five years, **Extension** implemented a National Science Foundation-funded project to design and grow a national-model Minnesota Master Naturalist program. This grant ended in 2012. A summative report is described in outcomes and evaluation results.

Through this emergent program, staff mobilized over 1,200 Minnesotans to educate others about their environment and conservation. Staff also developed a strong training infrastructure and resources upon which Extension can and will sustain the program. In 2012, these volunteers committed almost 45,000 hours of conservation service in Minnesota, continuing a pattern of annual growth in volunteerism. The program is further developing in two ways. 1) Advanced training like the 'Invasive Blitz' are being delivered to attract and support volunteers to address specific environmental concerns such as terrestrial invasive species. These issue initiatives provide opportunities for Master Naturalists to work with program areas across Extension (e.g., Forestry, Water Resources) to help them extend Extension's educational reach. 2) Training/mentoring systems and quality curriculum resources are being developed to connect and support Master Naturalist volunteers with after school programs, delivering science education to youth.

Program team members are helping other states develop Master Naturalist models, based on Minnesota resources and experience.

2. Brief description of the target audience

Fish, Wildlife and Conservation Education programs (formerly Environmental Science Education) reach: 1) Concerned citizens and volunteers who are willing to be trained and serve in a variety of roles as citizen teachers and scientists; 2) Minnesota professionals from within Extension, the Minnesota Department of Natural Resources, Soil and Water Conservation Districts, U.S. Fish and Wildlife Services, Health and Human Services Departments and Environmental Sciences; 3) the public schools and others involved in environmental science education programs; and, 4) Youth on the White Earth Reservation in Northwest Minnesota, when funding allows.

Targeted audiences for research programs include all of the above, and also other researchers, students and scholars in natural resource issues. Specialists in urban ecosystems, sustainability managers, mutifunctional agriculture, environmental agencies, rural planners, public land use managers, and social and natural scientists.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	277293	12200	18946	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	10	12	22

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Through training and other communications, volunteers, educators and natural resource professionals will be prepared to deliver research-based environmental science education programs, scientifically monitor their environments and take part in conservation stewardship.(Measure expressed as number of ESE participants trained and supported.)

Year	Actual
2012	1316

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Citizens will explore their natural environment, resulting in increased knowledge and meaningful discovery about Minnesota's environment and environmental issues. (Target expressed as percentage of ESE program participants reporting new knowledge.)
2	Citizen stewards will commit time to exploring and conserving the environment, and teach others about the environment and stewardship. (Target expressed as number of hours reported by volunteers and others involved in ESE programs.)
3	Citizens will, through exploration, conservation and education, influence environmental conditions on significant land acreage in Minnesota. (Target expressed as number of acres ESE program participants report that they influence each year.)
4	Citizens and professionals will be more connected with others in regional communities of interest through exploration, teaching and conserving natural resources. (Target expressed as percentage of ESE participants who report new network connections.)
5	Research will provide information on the nature and impact of biodiversity.
6	Research will provide new information to slow the spread or eradicate aquatic invasive species.

Outcome #1

1. Outcome Measures

Citizens will explore their natural environment, resulting in increased knowledge and meaningful discovery about Minnesota's environment and environmental issues. (Target expressed as percentage of ESE program participants reporting new knowledge.)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Citizens working in their homes, communities and organizations have great opportunity to enjoy and protect the natural world. Community volunteers can expand the role of professionals by reaching Minnesotans through everyday life and in volunteer settings.

What has been done
The Master Naturalist program recruited over 1,000 community volunteers to work with local organizations and grow the amount of environmental education available in Minnesota. A carefully designed curriculum provides forty hours of education to these volunteers. Each course covers one of three eco-regions: The Eastern Broadleaf Forest, the Northern Laurentian Mixed Forest and the Prairie Parkland. Classes emphasize experiential and skill-building methods that participants could transfer into informal learning and nature-based volunteering.

Results
The vast majority (96 percent) of volunters' expectations for learning about Minnesota's ecosystems were met. Additionally, all post-tests showed statistically significant increases in knowledge gain after completion of the course. Volunteers were also asked to reflect on how their experience with the program had deepended their learning. Participants mentioned a broad range of learning, including a stronger knowledge of ecosystems, increased awareness of the natural world and environmental issues, expanding conceptions of nature, and increased awareness of ways they could use their skills and knowledge as a volunteer.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

136	Conservation of Biological Diversity
903	Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

Citizen stewards will commit time to exploring and conserving the environment, and teach others about the environment and stewardship. (Target expressed as number of hours reported by volunteers and others involved in ESE programs.)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	44900

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
People who care about the environment may not necessarily have the confidence, nor the information they need, to act on their beliefs. Mobilizing volunteers and arming them with the information and the ability to teach others can significantly increase the amount of information Minnesotans have about the environment.

What has been done
Master Naturalists who have been provided comprehensive information about biomes (see outcome measure #1) are asked to provide 40 hours of volunteer time in community settings and with organizations that are in need of expanded time to meet their mission.

Results
Participants in volunteer-led interpretive programs were asked to assess their guide's interpretive skills. The vast majority of respondents agreed that the volunteers were knowledgeable (72 percent), presented information in a way that was understandable (64 percent) and could answer questions (64 percent). Observation data provided evidence that the programs were effective across a variety of settings for a range of audiences. In the years examined, the program met and exceeded its objective of 60 percent of volunteers providing at least 40 hours of annual service. In 2012, the number of hours of environmental education provided by Master Naturalists grew by 85 percent over 2011.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
903	Communication, Education, and Information Delivery

Outcome #3

1. Outcome Measures

Citizens will, through exploration, conservation and education, influence environmental conditions on significant land acreage in Minnesota. (Target expressed as number of acres ESE program participants report that they influence each year.)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	727387

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
With a significant percentage of its geography preserved in forests, waters and natural fields, organizations struggle to provide all needed environmental education and protection to Minnesota.

What has been done
Master Naturalists work with and through organizations that are developing and delivering projects that educate and engage citizens and act to make a difference.

Results
With an increased participant pool and more instructors, volunteers and organizations across the state made a stronger impact on Minnesota's land and water. According to the longitudinal study, organizations find Master Naturalist volunteers to be useful in the following ways: 1) Building a network or community invested in their organization; 2) Producing an improvement or outcome for their environmental center; 3) Increasing educational support and leadership; and, 4) Increasing general awareness of the environment in the community and for organizations. As one example of an impact, an organization reported, "We were lucky enough to have a Master Naturalist volunteer design our butterfly garden; a project that would have not come to fruition without that particular volunteer."

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
903	Communication, Education, and Information Delivery

Outcome #4

1. Outcome Measures

Citizens and professionals will be more connected with others in regional communities of interest through exploration, teaching and conserving natural resources. (Target expressed as percentage of ESE participants who report new network connections.)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	90

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
When networks of individuals and organizations have a common understanding and language about an issue or concern, action is more likely to be taken. Stronger social capital is a predictor of a community's readiness to act (Chazdon, et. al., 2010).

What has been done
The Master Naturalist program has an explicit goal of developing an infrastructure that will support Master Naturalists and encourage long-term involvement with the program.

Results
In the longitudinal program evaluation, nearly 90 percent of volunteers reported moderate to high levels of feeling a sense of community with organizations where they volunteered. Specific connections included people they interacted with as they volunteered, other volunteers and instructors. Additionally, local chapters were developed and successfully retained active members. These chapters engaged 51 percent of volunteers who were surveyed. Because these volunteers also reported that being part of a chapter motivated them to continue volunteering, it is a safe assumption that the strengthened social capital will result in more volunteerism and more action to care for the environment in the future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
136	Conservation of Biological Diversity
903	Communication, Education, and Information Delivery

Outcome #5

1. Outcome Measures

Research will provide information on the nature and impact of biodiversity.

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)
The benefits of plant biodiversity is frequently assumed, but not really understood.

What has been done
A 14-year study of diversity prairie grasslands was completed, and results showed that all 16 species in the study?s most diverse plots contributed more and more each year to higher soil fertility and biomass production. The level of biodiversity affected growth at least as much as any other factor. For example, plots with 16 species had about 2.5 times the biomass of those with one species.

Results
In this first-ever long-term analysis of plant biodiversity, the U of M researcher determined that prairies, forests, and cropland are more productive over time when a large number of plant species are present. The study also demonstrated that different species have different ways to acquire water, nutrients, and carbon. The research uncovered the functional equivalent of social networks in ordinary grassland plants.

4. Associated Knowledge Areas

KA Code	Knowledge Area

136 Conservation of Biological Diversity

Outcome #6

1. Outcome Measures

Research will provide new information to slow the spread or eradicate aquatic invasive species.

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)
Non-native aquatic species are threatening Minnesota?s outdoor recreation and economy and we have few ways to address these threats.

What has been done
Previous U of M research on invasive species such as the zebra mussel and bighead carp has delivered important information on the scope of the problem, and the importance of focusing significant efforts on this problem.

Results
As a result, in 2012, the Minnesota Legislature diverted $2 million from the Environmental Trust Fund and $1.8 million from the Clean Water Legacy Fund to launch a new world-class, invasive-species research center at the U of M. Another $8.7 million is being requested from the 2013 Minnesota State Legislature, which would fund the center for six years.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Appropriations changes

Brief Explanation

No factors negatively affected program outcomes. As grants for the design and development of Master Naturalist programming ended, efforts focused on sustaining the program and transferring new knowledge to other states.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

This planned program report shares what was learned from a longitudinal evaluation of the Master Naturalist program since 2009. This evaluation used a mixed-method approach (Greene & Carcelli, 1997). Data included administrative records, select information from ongoing formative program surveys, ongoing recorded participant activities, surveys, observations and interviews. Data were analyzed using Excel and SPSS software. Basic summary statistics included frequencies and percentages. Where appropriate, Chi-Square tests were used to test for statistical significance for changes in nominal variables and Mann-Whitney U tests were used to test for statistical significance for changes in ordinal variables (Norusis, 2012). Content analyses were conducted across descriptive activities recorded by participants. Finally, content and thematic analyses were used for open-ended survey or interview questions.

While it is impossible to convey the definitive breadth and depth of impacts, triangulated data collection methods provide evidence that the Master Naturalist model achieved its predicted impacts. (See outcome measures.) Organizations and instructors saw increases in educational programs and other projects that improved the environment or contributed to citizen science. Public citizens described how programs taught them about the environment and motivated them to keep learning. Public feedback and observations demonstrated that volunteer program leaders skillfully communicated with the public, making the information they delivered interesting and engaging. Volunteers shared how involvement in the program increased their confidence and led them to engage in programs they would not have started had they not been Master Naturalists. Logged service time indicated that volunteers provided a breadth of services, spending thousands of hours educating the public, working on citizen science projects, engaging in environmental stewardship and supporting environmental programs. The program increased, focused and deepened their knowledge and skills so that prticipants more effectively helped others learn about and engage in environmental endeavors.

Key Items of Evaluation

The Master Naturalist program engaged over 1,200 volunteers to work in Minnesota, contributing citizen science education and engaging the public in environmental issues. A longitudinal evaluation used a mixed-method approach to examine multi-year incomes. The study found that the program increases educational programs and projects that improved the environment or contributed to citizen science. The program both taught the

public and motivated them to learn more. Volunteers experienced increased confidence and engagement in community environmental issues. In 2012, Master Naturalists committed 44,900 hours of time to environmental organizations and projects, valued at $970,738 by Independent Sector. This is an 85 percent increase in Master Naturalist volunteerism over 2011.