An evaluation of Missouri Master Naturalist Program:
Changes in volunteer knowledge and the relationship between motivations and changes
in volunteer knowledge

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By

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The undersigned, appointed by the dean of the Graduate School, have examined the thesis entitled

An evaluation of Missouri Master Naturalist Program: Changes in volunteer knowledge and the relationship between motivations and changes in volunteer knowledge

presented by Caroline N. Broun, a candidate for the degree of master of science, and hereby certify that, in their opinion, it is worthy of acceptance.

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ABSTRACT

The Missouri Master Naturalist[TM] (MN) program, jointly run by the Missouri

Department of Conservation, University of Missouri Extension, and University of

Missouri School of Natural Resources, empowers adults to become certified volunteers in

conducting education, outreach, and service dedicated to the management of their

community's natural resources. Although several states have developed Master

Naturalist Programs, the relationship between changes in knowledge after training and

motivations to participate in MN training programs is not well known. My research

evaluated several aspects of the Missouri MN training program. My first objective was

to determine whether there was an improvement in volunteers' knowledge of ecological

processes and conservation issues in Missouri after completing the training. The second

objective was to identify volunteer's motivations for participating in the MN program,

and finally to determine if a relationship existed between volunteer's motivations and any

improvement in knowledge.

Analysis of the Knowledge Survey results demonstrated a significant

improvement in volunteers' knowledge of ecological processes and conservation issues in

Missouri after completing the Missouri MN training program ($F(2,76) = 50.678$, $p <$

0.001). Post-hoc analysis revealed this significant increase was due to improvement in

scores from the pre-training survey to the post-training survey ($t(77) = -10.356$, $p<.000$).

Although no significant increase in scores occurred from post-training to the six-month

follow-up survey ($t(38) = -.057$, $p > .955$), the post-hoc analysis demonstrated volunteers

maintained their level of knowledge six months after training. Analysis of volunteers'

motivations for participating in the MN program indicated that for most volunteers,

values/altruism was an important motivation followed closely by a desire to learn.

Analysis of the relationship between volunteer motivations and improvement in

knowledge scores indicated no significant relationship between any particular motivation

and improvement in knowledge at the end of the MN training program.

INTRODUCTION

Background

One challenge facing states and communities, rural and urban, is sustaining the natural resource base and the quality of life those resources provide. Increasing population growth, trends toward urbanization, loss of species, and water quality and watershed issues are but a few of these concerns (Mac, et al. 1998, Hobbs and Stoops 2002, Markham and Steinzor 2006). Professional literature and the popular press highlight concern for the public's limited understanding of natural resource issues and processes in their communities and of the influence humans have on these natural processes (Chawla and Salvadori 2003, Nilon, et al. 2003, Coyle 2005, Louv 2005). One factor cited for the public's lack of understanding is the shift to an urban lifestyle. This results in people spending less time out of doors and removed from natural processes that provide services, such as sources of drinking water and where wastes drain (Coyle 2005).

Aldo Leopold (1949) expressed concern of the impact of human's disassociation from nature and the lack of appropriate education about conservation. Louv (2005) coined the now familiar phrase "Nature-Deficit Disorder" to characterize the effects on humans from spending less time with and within nature. While not a medical diagnosis, Louv uses the term to describe a "diminished use of the senses, attention difficulties, and higher rates of physical and emotional illnesses" resulting from humans increasing alienation from nature (Louv 2005:34). Coyle (2005) reports that the public understands simple environmental topics. In contrast, the NEETF/Roper (1998) report indicates that millions of Americans do not understand more complex relationships, e.g. the sources of drinking water, the source of pollutants such as CFCs, and what provides America's main

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source of energy. The National Environmental Education & Training Foundation (NEETF), in conjunction with Roper Reports, publishes a yearly national report card on environmental knowledge, attitudes, and behavior. Nilon et al. (2003) observed that urban residents were less knowledgeable about animals and environmental issues than non-urban individuals were, and that this knowledge varies with gender, race, income, and level of education. Coyle (2005) found similar disparities with environmental knowledge related to gender, level of education, and age.

One way to help address this lack of knowledge is to educate the public about natural processes, humans' impact on these processes, and the local issues involving the use and misuse of natural resources (Mason 1995, Stewart 1999). Involving the public in activities that promote natural resource management and environmental protection helps decrease their alienation from nature. Volunteers, acting as teachers, resource persons, and service providers, can help provide this education and an opportunity for active involvement in their communities. During 2005 and 2006, approximately 26.7% of the U.S. population participated in some type of volunteer work (U.S. Department of Labor 2007).

The Sierra Club, Izaak Walton League, Nature Conservancy, and Ducks Unlimited are but a few of the many non-governmental organizations that promote citizen involvement with natural resources, primarily through hands-on management and restoration efforts. Today, citizen-based conservation or "Cooperative Conservation" is national policy (Executive Order 2004). "Cooperative Conservation" is a collaborative effort involving the Departments of Interior, Commerce, Defense, Agriculture, and the EPA working with various governmental, private, non-governmental groups as well as

individuals to promote the use, enhancement, and enjoyment of natural resources and to improve environmental protection (Executive Order 2004). For example, the Department of Interior notes that volunteers are critical to its mission and support the Department's activities by, among other things, clearing trails, helping conduct bird surveys and collecting information for maps (U.S. Department of Interior 2007). Partnerships promoting Cooperative Conservation are varied. They include vacant land management and reclamation projects in Philadelphia; restoring the Detroit River; protecting and restoring ecological diversity and the productivity of federal and state land on the Arizona and New Mexico border; and seeking cooperative means to address various management and environmental issues along the Blackfoot River Valley in Montana (Cooperative Conservation 2007).

State conservation and natural resource agencies are also promoting citizen and community involvement in management and restoration efforts through volunteer programs. These programs take many forms including classroom-based education about the Chesapeake Bay (Maryland Dept. of Natural Resources 2007), and hands-on programs to help preserve, protect, and restore Michigan State Parks (Michigan Dept. of Natural Resources 2007).

One rapidly expanding adult education and state-sponsored program is the Master Naturalist™ (MN) program. There are two different MN program models: a standardized ecoregion module approach (e.g. Florida's program) and a modified version of the successful Master Gardener concept that has been in place since the 1970's (Master Gardner 1995). Missouri modeled its program after the Texas MN program that is based on a Master Gardener program model, which is the only program model evaluated by my

research. Notwithstanding differences in program structure, MN programs "promote nature-based community service by citizen volunteers and provide continuing education opportunities" to enable adults "to learn about their state's natural history, environment, and conservation issues" (Guiney et. al. 2007). Although each state MN program varies in its approach and specific curriculum, their purposes are consistent: To promote awareness and citizen stewardship of natural resources through science-based education and community service.

At least twenty-five states either have or are developing MN type programs, an increase from 2005 when only twelve states had functioning MN Programs (Texas Park & Wildlife Department Newsletter 2004, A. Toness, personal communication 2005, Missouri Master Naturalist Newsletter 2006). Texas, the first state to develop a state-level MN program, has over 35 local chapters that have trained more than 4,000 volunteers since 1998. Texas Master Naturalists have completed more than 492,000 hours of volunteer service valued at more than $8.5 million dollars, and have enhanced more than 75,000 acres of natural habitats, reaching over 1 million adults and youth (Guiney et al. 2007). Florida, also one of the first innovators, began its MN program in 2001 and now has nine chapters, with over 2,800 Master Naturalists donating over 71,000 volunteer hours valued at over $1.2 million (C. Mazzacano, personal communication 2007). Minnesota's MN program, only recently began in 2005, has trained 135 MN volunteers who have contributed over 5,965 hours of service, valued at $107,000 (Guiney et al. 2007).

A National MN initiative began in 2005 to coordinate guidance, support member programs, and promote development of new citizen stewardship programs. Several

workshops occurred in 2004 to generate interest among various states to assist with the development of goals and objectives for this national effort (ANROSP 2007). Since that time, this initiative has sponsored two national conferences involving over 170 participants representing 26 programs throughout the United States (ANROSP 2007). The Initiative has coalesced into the Alliance of Natural Resource Outreach and Service Programs (ANRSOP) that provides support to state natural resource outreach and service programs such as Master Naturalist, Watershed Stewards, and Conservation Steward (ANROSP 2007).

Missouri was one of the first states to develop and implement a volunteer-based MN program. The Missouri MN program is a partnership between the Missouri Department of Conservation, MU Extension, and the University of Missouri, School of Natural Resources. Significant accomplishments of the Missouri Master Naturalist program include:

- Expanding from two pilot chapters in 2004, to seven active chapters by 2007

- training over 325 volunteer as Master Naturalists

- certifying more than 100 of these volunteers Master Naturalists

- documenting over 11,500 volunteer service hours valued at over $209,011

- Missouri MN is conducted through local MN chapters supported by local

Over 25 public and private organizations, including watershed groups, state parks and other conservation and natural resource groups and agencies, work as partners with MDC and MU Extension through the local MN chapters to conduct training and help achieve the MN program goals (Missouri Master Naturalist Annual Report 2006).

To receive Missouri MN certification, the initial training program includes 40-hours of classroom/field trip instruction; 8-hours of advanced training and 40-hours volunteer service within the first year. Volunteers maintain certification by annually completing 8-hours of advanced training and 40-hours of service. Volunteer service is with approved natural resource projects that meet local conservation needs. Service opportunities include surveys of local flora and fauna, natural community restoration, participation in a speakers' bureau, school educational programs, and assisting with outdoor skills training in local or state parks (Missouri Master Naturalist Annual Report 2006).

Volunteer training programs in general, and the MN programs specifically, place significant demands on the sponsoring agencies. For example, the training requires commitments of staff time organizing the training, collecting materials to provide participants, conducting the sessions and financial support. This demand inevitably leads to questions of the cost effectiveness of the training, whether the methods are appropriate, and whether the target audience benefited (W.K. Kellogg Foundation 1998, Culp and Nall 2001).

Justification and necessity drive evaluation of volunteer training programs, which have been analyzed extensively in the literature (e.g. Clary and Snyder 1999, Bennett and Rockwell 2000, Culp and Nall 2001). There has only been limited evaluation, however, of MN programs (Bonneau 2003, Main 2004). Because of concerns with budget cuts, state agencies such as the Missouri Department of Conservation are questioning the need to provide additional services, and whether the results of new services, such as the MN program, justify its expense. In addition, the Government Performance and Results Act

of 1993 (GPRA), requires federal agencies to set goals, measure performance, and report on their accomplishments (U.S. General Accounting Office [GAO] 1996). Services such as MU Extension, which falls within the GPRA requirements, must demonstrate they responsibly manage and spend the dollars invested in their programs. My evaluation of the Missouri MN training confirms the success of the program and thus, may help validate that this program is meeting its stated goals and support the continued commitment of personnel, resources, and funds.

Evaluation also is necessary to ensure that the training program's structure and focus are tailored to accomplish the MN program goals. There is no standard method to evaluate volunteer training programs such as the MN program. Kirkpatrick's four-level model for evaluating training programs (Kirkpatrick 1978, 1996, 1998) provides a simple yet comprehensive approach to evaluating the MN program. According to Kirkpatrick, evaluation moves through successive levels. At each level, the evaluation is a more precise measure of the program's effectiveness, and each level of evaluation is more rigorous and time-consuming. The four-levels of evaluation are: 1) Evaluating Reactions; 2) Evaluating Learning; 3) Evaluating on-the-job behavior; 4) Evaluating Results (Kirkpatrick 1978, 1996, 1998).

Kirkpatrick's first level that evaluates participants' reactions to the training helps determine how satisfied participants are with the training (Kirkpatrick 1998). The Missouri MN program completed this level of evaluation in 2004 when two pilot chapters evaluated volunteers' perceptions of the effectiveness of the training program. The results demonstrated that most of the forty-six volunteers perceived an improvement in

their knowledge of and ability to explain natural resource processes and issues after completing the training (G. Wallace, personal communication 2005).

Kirkpatrick's second level evaluates learning to determine what knowledge, skills, or attitudes participants acquired because of the training. Learning is essential to any change in behavior (Kirkpatrick 1998). Kirkpatrick recommends that this evaluation be objective using pre-test and post-test design and, where possible, using a control group (Kirkpatrick 1978, 1998). Tools to evaluate learning may include paper-pencil tests, presentations, and attitude surveys (Kirkpatrick 1978, 1998). My research evaluates the Missouri MN training program at Kirkpatrick's second level. Kirkpatrick's final two levels, which evaluate on-the-job behavior and results, are beyond the scope of my research, but I address them in the Discussion and Implication section.

Purposes

My research uses a pre-test and post-test design to determine the effectiveness of the training by analyzing changes in the volunteers' knowledge of ecological processes and conservation issues in Missouri after they have completed the MN training program.

One of the criticisms of training program evaluations is the failure to evaluate the influence of intervening variables on learning that occurs during training (Holton 1996). My research also evaluates the relationship between the volunteers' motives for joining the training program and any changes in their knowledge after completing the training. Many training program evaluations use a pre-test / post-test design to test knowledge before and after training, but without considering the potential impact of intervening variables such as motivation (Noe and Schmitt 1986, Mathieu et al. 1992, Holton 1996, Kirkpatrick 1998). I used a modified version of the Volunteer Functions Inventory

developed by Clary and Snyder (1991, 1999) and Clary et al. (1998) to evaluate the relationship between volunteers' motivations to join the MN program and learning that occurs during MN training. I selected motivation because it is recognized as one intervening variable that may significantly affect learning from training programs (Noe and Schmitt 1986, Mathieu et al. 1992, Holton 1996, Kirkpatrick, 1996, 1998). The University of Missouri–Columbia's Institutional Review Board (IRB Number 1049238) approved my research protocol.

Hypotheses

My null hypothesis related to evaluation of the effectiveness of the MN training program was: There is no significant difference between a volunteer's baseline knowledge of ecological processes and conservation issues in Missouri before and after participating in the Missouri MN training program.

My null hypotheses related to the relationship between volunteer motivation and participation in the MN training program was:

H_o1- There is no significant relationship between a volunteer's motivation to participate in the Missouri MN program to learn about natural resources and change in the volunteer's baseline knowledge of ecological processes and conservation issues in Missouri.

To evaluate volunteer motivations, I evaluate specific volunteer motivations to participate in the Missouri MN program and improvement in the volunteer's knowledge about natural resource processes and issues specifically considering motivation: to learn about natural resources ($H_0 2$); for socialization ($H_0 3$); to further

career (H_04); to enhance their feelings of self-worth (H_05); to help alleviate negative

feelings, such as guilt (H_06); and for altruistic and humanitarian concerns (H_07).

METHODS

Study locations

I conducted my research at four Master Naturalist training sites in Missouri during the fall 2005 and spring 2006 training sessions (Table 1).

Table 1: Study locations and details of training sessions

Mo MN Chapter	Location	# Volunteers	Format	Date	Time	Local Partner(s)
St. Charles	MDC Bush Conservation Area	24	40-hours Combined lecture, discussion, field trip	8/23/2005 to 11/8/ 2005	3 - 6 p.m.	Big Muddy National Wildlife Refuge, Shaw Nature Reserve, St. Charles County Parks and Recreation Department
Springfield	MDC Regional Offices	29		3/6/2006 to 4/24/2006	6 – 9:30 p.m.	Watershed Community of the Ozarks, Ozark Regional Land Trust, Greater Ozark Audubon Society
West Plains	MDC Regional Offices	17		3/16/2006 to 5/11/2006	6 - 9 p.m.	Ozark National Scenic Riverways, Bryant Watershed Education Project.
Columbia	Boone County Extension Center	15		3/21/ 2006 to 5/15/2006	3 - 6 p.m.	Rock Bridge Memorial State Park, Friends of Rock Bridge, Hinkson Watershed Restoration Project, Big Muddy Fish & Wildlife Refuge, Friends of Big Muddy

Experts in ecology and resource management provided the training in both the classroom and the field. The local chapter selected the experts to provide the training who, therefore, differed from one chapter training program to another. However, to ensure a standardized approach to training throughout the state, all the experts were provided a list of training objectives and specific topic areas to cover in their discussions, presentations, or hands-on activities.

Instruments

Knowledge Survey. I developed a Knowledge Survey, to evaluate the learning that occurred during the Missouri Master Naturalist (MN) training program. The survey consisted of 25 questions in mixed format that included multiple-choice, fill-in, True/False, matching, and short answer questions. I selected the topic areas for the questions from the training outlines and objectives of the MN training program (Program Overview, Missouri Master Naturalist), and modeled the questions on conservation education materials developed by the Missouri Conservation Department (MDC) (Behrens, Stucky, & Gray, 2001).   The topic areas were Conservation Principles (CP); Ecological Principles (EP); Energy Cycle (EnC); Forest Ecosystems (FE); Prairie Ecosystems (PE); Invasive and Exotic Species (Inv); Watershed Management (WS); Wildlife Management (WM); Ecoregions of Missouri (ER). Questions within each topic area are labeled in the Knowledge Survey in Appendix 1.

Ms. Ginny Wallace and Dr. Robert Pierce reviewed the Knowledge Survey for content validity. Ms. Wallace and Dr. Pierce provide leadership for the Missouri MN Program, including the design, development, implementation, and evaluation of the training curriculum as well as the overall MN Program. The Knowledge Survey was

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pilot tested for clarity and understanding with five naturalists: three naturalists from the MDC Runge Nature Center, Jefferson City, Missouri, and two naturalists from Rock Bridge Memorial State Park. I made changes to questions on the survey to reflect comments from the naturalists who completed a pilot test of the Knowledge Survey.

To determine reliability of the Survey, I compared Cronbach's alpha coefficient on the pre-training survey with that on the post-training survey. Cronbach's alpha is an important measure of reliability. It measures internal consistency of an instrument by estimating the proportion of variance in the test scores that can be attributed to true score variance. The closer the Alpha coefficient is to 1.0, the greater the internal consistency of the items in the survey. Generally, an Alpha of .70 is acceptable; of .80 is "good", and of .90 or higher is "excellent" (Garson, in press; George and Mallery 2003). My goal was to see an improvement in reliability from the pre-training survey to the post-training survey.

I based the scores on the Knowledge Surveys on the number of correct responses. The pre-training and post-training surveys were identical. A comparison of scores between the pre-training and post-training surveys helped me determine whether the training was effective to improve knowledge of the volunteers in the areas covered by the MN training program. A follow-up survey, mailed to the volunteers six-months after completing the training, was identical to the pre-training and post-training surveys. I did not use the follow-up survey to determine the effectiveness of the training, but it helped me assess how well the volunteers retained the knowledge gained during the training program. A copy of the Knowledge Survey is in Appendix 1. A copy of the answer key to the Survey is in Appendix 7.

Motivation Inventory. I adapted the Volunteer Functions Inventory (VFI) developed by Clary, et al. (1998) to evaluate the relationship between the volunteers' motivations for participating and learning that occurred. The VFI consists of five questions for each of six motivation categories: Understanding (new learning experiences); Values (altruism); Social (relationships with others); Career (preparation for a new career); Ego Enhancement (increasing self-esteem) and Ego Protection (protecting the ego/assuaging feeling of guilt). The statements in the VFI were general statements concerning individual motivations to volunteer. I rephrased some of these statements to narrow the focus to motivations for participating in the Missouri MN program. For example, I modified the VFI statement "I can learn more about the cause for which I am working" to state "Through volunteering as a Master Naturalist, I can learn more about natural resources issues in Missouri." Other VFI statements, I did not modify, for example, the MN Motivation Inventory uses the VFI statement: "I feel it is important to help others" to help evaluate the Values motivation.

Studies support the reliability of the VFI motivation categories to measure the functions served by volunteering (Clary et al. 1998), and the validity of the VFI to help match motivations of the individual to the opportunities in the volunteer experience (Clary et al. 1998).

The Missouri Master Gardner program, a program similar in format and design to the Missouri MN program, developed an adaptation of the VFI to evaluate motivations for participation in the Master Gardener program (Schrock et al. 2000). Principal factor analysis of the modified Master Gardener VFI confirmed the presence of six principal

components. Reliability of the six components, as measured by Cronbach's alpha coefficient, was 0.93 for all factors (Schrock et al. 2000).

The MN Motivation Inventory, similar to the VFI and Master Gardner motivation inventory, included thirty statements, five from each six motivational categories: Learning, Values, Career, Social, Ego Enhancement, and Ego Protection. MN volunteers rated each of the thirty statements on a 5-point Likert scale with the following choices: 1= not important at all; 2= somewhat unimportant; 3= no opinion either way; 4= somewhat important; and 5= very important.

I determined the reliability of each of the six components evaluated on the MN Motivation Inventory using Cronbach's alpha coefficient. All of the categories are within the good to excellent range; the Understanding category is within the acceptable range for reliability. Van Den Berg (2006) used a similar variation of Clary et al.'s VFI to evaluate the Michigan Conservation Stewards Program.

Ms. Ginny Wallace and Dr. Robert Pierce reviewed the Motivation Inventory for content. The Motivation Inventory is in Appendix 4.

Demographic Questionnaire. To help the sponsoring agencies, MDC and MU Extension, understand the characteristics of volunteers participating in the training, I asked each volunteer to complete a Demographic Questionnaire on the first night of the training. Eleven demographic questions inquired about gender, age, race/ethnicity, education and degree earned, occupation, marital status, income, where they live, whether their spouse or significant other is involved in the program, and how they found out about the Missouri MN program.

Participants

      A Missouri MN training program is conducted when an MU Extension Regional Specialist and MDC natural resource professional organize training within their community. The 85 volunteers in this research were MN volunteers participating in Missouri MN training in winter of 2005 and spring of 2006. All volunteers from four training classes (Table 1) agreed to participate, thus I did not sample the training classes. I selected these MN training locations to include volunteers that lived in rural as well as smaller urban areas in Missouri. However, it was not my intent to compare volunteer responses from the various locales. To evaluate the effectiveness of the training program statewide, I combined and tabulated the responses from all four of the training sites. Participation to complete the Knowledge Survey, Motivation Inventory, and Demographic Questionnaire was voluntary and confidential. All MN volunteers were over 18 years of age.

Data Collection

      MN volunteers completed the Knowledge Survey on the first night of training, and on the last night of training. Volunteers completed the Surveys in the training room; they worked alone and did not have access to resources to assist with completing the Surveys. I mailed a follow-up Knowledge Survey to each volunteer six months after they completed their training with a stamped return envelope for them to return their completed survey to me. The volunteers were asked to complete the follow-up survey at home, and I requested that they not use any resources in answering the questions. Whether the volunteers had assistance in completing the follow-up survey could not be determined.

The volunteers also completed the Demographic Questionnaire and the Motivation Inventory. These instruments were completed only once by each volunteer on the first night of training.

Ms. Ginny Wallace and/or I attended to first night of training for each of the four chapter trainings. Prior to asking the volunteers to complete the Survey, Questionnaire, and Inventory, we discussed the following points with the class:

1) Volunteers were told not to put their names on any of the three instruments: the Demographic Questionnaire, the Motivation Inventory, and the Knowledge Survey.

2) Their participation in completing the instruments was voluntary. They could complete all, none, or any part of the instruments that they chose.

3) Their responses were confidential, and the researcher was the only one who had their names and results.

4) They were to address the manila envelope that was included with the instruments, which would be used to mail out the follow-up survey in six months.

5) We provided the following explanation to each chapter training:

a) the Demographic Questionnaire included basic information about who is participating;

b) the Motivation Inventory helps us understand why people are joining, which can help with recruitment and retention;

c) the Knowledge Survey helps us assess the effectiveness of the training and identifies areas that can be improved.

6) We explained that we would ask them to complete only the Knowledge Survey two other times: (i) last night of training and (ii) six months after training ended. The Motivation Inventory and Demographics Questionnaire would be only completed once.

7) We reiterated several times that the Knowledge Survey and Motivation Inventory were not tests. We were careful to clarify that their score on the Knowledge Survey was not a grade; their response (or decision not to respond to any or all questions) did not affect their participation in the training, their ability to obtain certification, or their participation in the chapters after graduation. We also clarified that their instructors were not evaluated or graded on the scores of the volunteers. We reinforced again that no one but the researcher, would know who received what score, although I would be glad to share any individual's scores with that individual, if requested.

To reinforce this point, we further explained that we would compare the Knowledge Survey scores from the first night of training with those from the Knowledge Survey completed the last night of training. The results would then be used internally to determine the effectiveness of the training. For example, if many individuals were not able to answer questions concerning Prairie Ecosystems, MDC and MU Extension would need to re-evaluate the objectives and training for this section.

8) We mentioned that they were not expected to know all the answers, but that we needed them to be honest and not guess or skip questions. If they do not know and answer, I provided a box for that response.

9) Finally, we thanked them, noted that the information we just discussed was also included on the cover letter they received with the Surveys, which included contact information for the individuals involved with the research. These letters also detailed the consent requirements discussed with the volunteers as required by the IRB. A copy of the pre-training cover letters is found in Appendix 6.

Volunteers were concerned about points (7) and (8). Given that MN volunteers are adults and had not been in testing situations in years, many expressed concern with being "tested" over the material and that their score(s) may reflect on themselves or their instructors. The reassurance given by Ms. Wallace and myself seemed to address these concerns and several volunteers did request information on their scores.

To enable a comparison between pre-training and post-training surveys and to assure confidentiality of volunteers, I assigned each MN volunteer a unique number, which I put on that individual's Knowledge Survey, Demographic Questionnaire, and Motivation Inventory. When the instruments were distributed, I also distributed an envelope marked with the same number to each MN volunteer. On the first night of training, after completing the Knowledge Survey, Demographic Questionnaire, and Motivation Inventory, Ms. Wallace or I asked the volunteers to return the three instruments and the self-addressed envelope. The individual numbering was for research purposes only. Because the self-addressed envelope had the same number as that assigned to each volunteer, I did not request that the volunteers remember this number. I used the self-addressed envelope to mail the follow-up Knowledge Surveys to the volunteers six months after they completed their training.

On the last night of training for each chapter, Ms. Wallace or I asked the volunteers to complete the post-training Knowledge Survey. This post-training survey was identical to the pre-training Knowledge Survey. Ms. Wallace or I repeated the information provided the first night of training. Each Knowledge Survey was marked with the volunteer's unique number and distributed to that individual.

Ms. Wallace and/or I instructed the volunteers to complete the Survey individually and to answer all questions to the best of their ability. A cover letter that described the purpose and methods of the study was included with the post-training Knowledge Survey. A copy of the post-training survey cover letters is found in Appendix 6.

Six months after each training class finished, I mailed a follow-up Knowledge Survey and cover letter to each volunteer. I mailed the Surveys to the MN volunteers in the self-addressed envelope marked with their unique number. I also marked stamped return envelope addressed to me with the volunteer's unique number and included this return envelope with the follow-up survey. I sent a follow-up post-card to those volunteers who did not complete and return the follow-up survey by the date requested in the cover letter, and requested they complete and return the Survey. A copy of the cover letter for the follow-up survey is in Appendix 6.

Data Analysis

For all statistical analyses, I used the SPSS statistical software package. (SPSS 2005). I calculated a one-way repeated measures ANOVA comparing the Knowledge Survey scores at three different times: pre-training, post-training, and six-month follow-up survey. I used a significance level of $p \leq .05$. Because my results were significant, I

conducted post-hoc analysis to determine which mean differences contributed to the

significant findings. Due to software limitations, SPSS could not perform post-hoc

analyses on the data. Thus, I performed three paired samples *t*-tests, to evaluate the data.

Because an analysis performing multiple comparisons of the survey scores can inflate the

Type I error rate, I adjusted the level of significance for the post-hoc analyses using the

Bonferroni correction, which adjusts the significance level (Gray 2004, Miller 1991).

This correction divides the standard *p*-value for statistical significant, 0.05, by the

number of tests, here three. This correction ensures the overall risks for the number of

tests remains at p $\leq$ .05 (Gray 2004, Miller 1991). Thus, for the post-hoc analyses using

paired samples *t*-test, I used a significance level of $p \leq .017$, i.e. .05/3.

I used Pearsons *r* Correlation Coefficient to analyze the relationship between

volunteer responses on the Motivation Inventory and changes in knowledge of natural

resource processes and issues after completing the MN training program. I analyzed the

demographic information using frequency statistics.

Knowledge Survey. I hand-tabulated the scores on the Knowledge Survey because

there were multiple question formats including short answer questions and fill-in blanks.

The scores allocated to each question are attached in Appendix 7. A total of 50 points

was possible. Scoring of the questions was definite except question #1, which asked the

volunteers to define the term "conservation". Although there is no one definition of this

term agreed upon by professionals, there are key elements that include a focus on humans

(e.g. use, enjoyment, health, and economic), biota (on an ecosystem scale), and

ecological processes (e.g. air, water, habitat and diversity) (Marsh 1847, Leopold 1949,

Beckley 1999). By this questions, I sought to determine if the volunteers associated the

term "conservation" with key concepts of sustainability; the need to preserve ecological resources for future generations, and human's interdependence with ecosystems. These concepts encompass economic, environmental, cultural, and social welfare objectives (Cernea 1993, Munasinghe 1993, Rees 1993). When scoring this question, I gave full credit if any of these key concepts were included.

After tabulating scores for the first training, it became apparent that the volunteers used "catch-words" to define "conservation", in particular "management," "preservation," "restoration," and "wise use." To help assess whether volunteers understood the key concepts incorporated in their catchwords, I developed, in collaboration with Ms. Wallace and Dr. Pierce, two versions of an open-ended non-scored question that was included in subsequent surveys completed by the volunteers. The non-scored questions are in Appendix 2.

Motivation Inventory. I employed a Likert-type scale to identify the importance volunteers gave to each of the six motivation categories. The literature recognizes that researchers commonly use Likert scale data with interval procedures, such as Pearson's *r*. Jaccard and Wan (1996: 4) have observed that, "for many statistical tests, rather severe departures (from intervalness) do not seem to affect Type I and Type II errors dramatically." Limitations to the use of the Likert-type scale ratings as interval data include the need to have at least five categories. There is agreement that five category or greater scales will meet the assumption of normal distribution, as required for many tests, including Pearson's *r* (Garson, in press). Another consideration when using Likert-type scale ratings as interval data is that the integer rating levels have verbal anchors

(Uebersax 2006). The Motivation Inventory in my research meets these considerations; it has five categories and verbal anchors for the integer rating levels.

Use of a Likert-type scale ratings as interval data is consistent with the analysis of this data by Clary et al. in the development of the VFI (Clary and Snyder 1991, 1999, Clary et al. 1998, Schrock et al. 2000). Additional studies that assessed motivation using the VFI or a modification of that scale also analyzed the results as interval data. These studies include diverse areas such as community volunteers in a Court Appointed Special Advocates organization (Thompson 2002), medical students (Fletcher and Major 2004), and Australian community service volunteers working in a large nonprofit organization (The Smith Family 2001).

To determine the importance of motivation for each volunteer that participated in the program, I obtained a mean score for each of the six categories by averaging the score of the five statements within each category. Individual scores on each motivation category ranged from 1-5: the higher the score, the greater the importance of that category of motivation. For example, one volunteer's average score for the category Understanding/Learning was 4.4 out of 5, while this volunteer's average score for the category Ego Protection (assuaging guilt) was 1 out of 5. Thus, this volunteer identified Understanding/Learning as a more important motivation for participating in the MN program than was Ego Protection. A listing of statements in each of the motivation categories is provided in Appendix 7.

To determine if there was a relationship between motivation and knowledge gain after training, I analyzed the mean for each motivation category and the change in the knowledge score. I obtained the change in baseline knowledge score for each volunteer

by subtracting the score on the pre-training survey from that on the post-training surveys. I then performed a correlation between motivations for participating in the Master Naturalist program and the change in the baseline knowledge of Master Naturalists using Pearson's *r*.

Demographic Questionnaire. I analyzed the frequency of demographic responses concerning age, ethnicity, education, gender, marital status, income, occupation, and locale in which the volunteers resides using SPSS. The Demographic Questionnaire is in Appendix 5. The variables for the demographics are coded as provided in Appendix 7.

RESULTS

Demographics

The majority of volunteers (n=85) were female (52.9%) and Caucasian (96.5%). Most volunteers had some post-high school education (94.1%), with about 29% of the volunteers reporting degrees at the Master's or Doctorate level. The median age of the volunteers was 52 years (mean = 50.77 years; SD = 13.27). Most volunteers were married (60%) and most described where they lived as rural (37%) or a city with a population of 25,000 – 249,999 (26%). MN volunteers reported bimodal annual household incomes before taxes with 28% (n=24) within the $20,000- $49,999 range and 23.5% (n=20) within the $50,000-$79,999 range. (Table 2)

Table 2. Demographics

Characteristic		%	x	Sd
Age n=81			50.8	13.3
Income n=78	Below $50,000	47.4		
	$50,000 and Over	52.6		
Ethnicity n=82	Caucasian	96.5		
Education n=82	High School/ Voc-Tech	16.5		
	College Degree	50.6		
	Advanced Degree	29.4		
Locale n=81	Rural	36.5		
	Suburban	20.0		
	City < 25000	12.9		
	City 25,000 and Over	25.9		

Response Rate

Of the 85 volunteers in the MN training programs, 78 volunteers completed both the pre-training survey and the post-training survey. This represents 92% of the volunteers in the four MN training classes. Forty volunteers completed the six-month follow up survey. This represents 51% of the volunteers that completed both the pre-training and the post-training survey.

Knowledge Survey

To determine reliability of the Knowledge Survey, I compared Cronbach's Alpha coefficient on the pre-training survey with the Alpha coefficient on the post-training survey. Because I assumed volunteers initially knew little about the core topics of the training, the objective was to see if there was an increase in reliability of the survey after they completed the training. There was an increase in the Alpha coefficient from .653 on the pre-training survey to .712 on the post-training survey (Table 3). This means that the Knowledge Survey reliably measures the content of the core topics taught through the MN training program.

Table 3. Reliability of Knowledge Surveys

Survey	n	Cronbach's Alpha
Pre-training	9	.653
Post-training	9	.712

The difference between the mean scores on the pre-training survey and the post-training survey meet the assumptions of normality and homogeneity (Figure 1). The

difference between the mean scores on the post-training survey and the six-month follow-up survey meet the assumptions of normality and homogeneity (Figure 2) (SPSS 2005).

Histogram
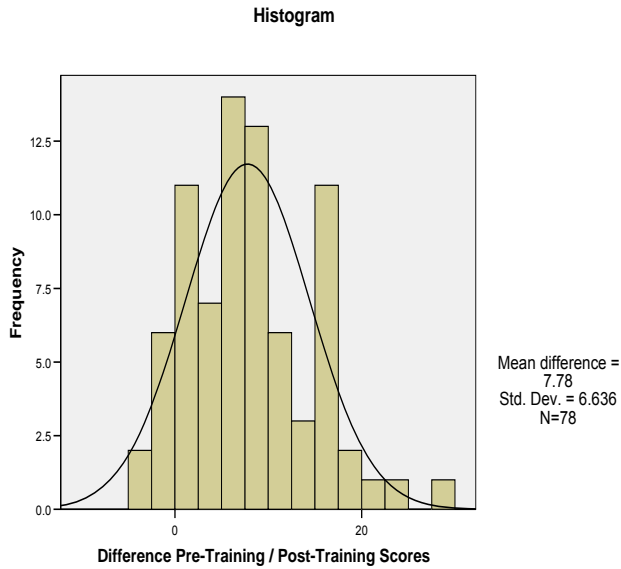
Figure 1. Normal Distribution Pre-training / Post-training Scores

Histogram
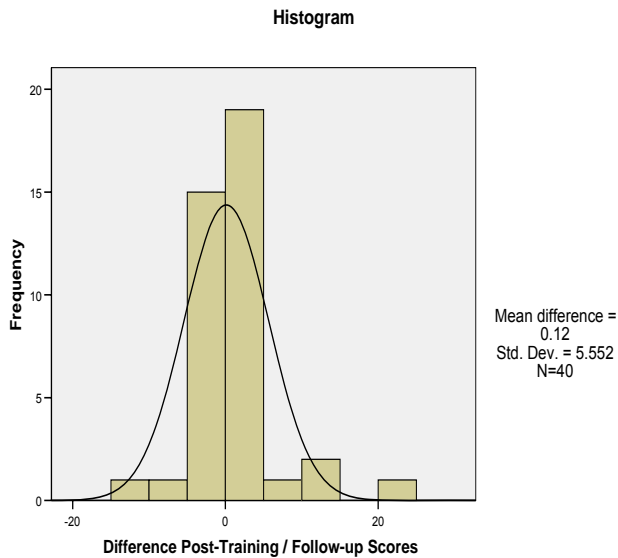
Figure 2. Normal Distribution Post-training / Follow-up Scores

I analyzed the Knowledge Survey data using one-way repeated measures

ANOVA comparing the Knowledge Survey scores of the volunteers at three different

times: pre-training, post-training, and the six-month follow-up survey (SPSS 2005). The

data met the assumptions for repeated measures ANOVA. I found a significant effect

($F(2,76) = 50.678$, $p < .000$). Thus, I rejected the null hypothesis and concluded that the

MN training significantly improved volunteers' knowledge of ecological processes and

conservation issues in Missouri after completing the program (Table 4).

Table 4. Repeated-measures ANOVA

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.
Time	Sphericity Assumed	2391.094	2	1195.547	50.678	.000
Error(time)	Sphericity Assumed	1792.906	76	23.591		

Due to limitations in the data and software, post-hoc tests were unavailable. To

examine the individual mean differences, I used paired samples *t*-tests. To avoid

inflating the Type I error rate when conducting post-hoc analysis, I adjusted the

significance level using Bonferroni correction using a significance level of .017 (.05/3).

The post-hoc analysis revealed a significant increase in scores from pre-training (*m* =

33.22, *sd* = 8.54) to post-training (*m* = 41.00, *sd* = 7.17). I found a significant increase

from the pre-training survey to the post-training survey (*t*(77) = -10.356, p<.000). Scores

did not increase significantly from post-training (*m* = 42.282, *sd* = 6.88) to the six-month

follow-up survey (*m* = 42.33, *sd* = 4.82). I found no significant different from the post-

training survey to the follow-up survey ($t(38) = -.057$, p > .955). Thus, volunteers'

knowledge improved after training, and they retained the knowledge over time (Table 5).

Table 5. Post Hoc Analysis

Paired Samples t- Tests	Mean (SD)	n	T (df)	P
Pair 1 Pre-training scores	33.22(8.5)	78		
			-10.36(77)	.000
Post-training scores	41.00(7.2)	78		
Pair 2 Pre-training scores	32.93(8.9)	40		
			-8.30(39)	.000
6-month follow-up scores	42.45(4.8)	40		
Pair 3 Post-training scores	42.28(6.9)	39		
			-.06(38)	.955
6-month follow-up scores	42.33(4.8)	39		

To ensure that my sample size of 78 volunteers did not influence the significance

finding for the pre-training to post-training surveys, I conducted two random paired

samples comparisons. In the first analyses (n=35), I found a significant increase from

pre-training to post-training ($t(34) = -6.97$, $p < .000$). In the second analysis (n= 48), I

found a significant increase from pre-training to post-training ($t(47) = -8.56$, $p < .000$)

(Table 6). Thus, the significant increase from the pre-training survey to the post-training

survey is not dependent on the sample size.

Table 6. Random Paired Samples *t*-tests

Paired Samples t- Tests		Mean (SD)	n	t (df)	P
Pair 1	Pre-training scores	33.91(7.6)	35		
				-6.70(34)	.000
	Post-training scores	41.83(6.6)	35		
Pair 2	Pre-training scores	33.27(8.5)	48		
				-8.60(47)	.000
	Post-training scores	41.25(6.7)	48		

I also analyzed the data based on the specific topics covered by the Knowledge Survey. With the exception of the Wildlife Management topic area, the topic areas scores from the pre-training survey to the post-training survey demonstrated a significant improvement, consistent with the results comparing the total Knowledge Survey scores (Table 7).

Table 7: Topic area analysis comparing pre-training survey and post-training survey

Topic Areas		Mean	Std. Deviation	t	df	Sig.(2-tailed)
Pair 1	CP PRE – CP POST	-.500	1.384	-3.191	77	.002
Pair 2	EP PRE – EP POST	-1.051	2.563	-3.623	77	.001
Pair 3	EnC PRE – EnC POST	-1.538	2.345	-5.794	77	.000
Pair 4	Inv PRE – Inv POST	-.256	.797	-2.842	77	.006
Pair 5	FE PRE – FE POST	-.705	1.250	-4.984	77	.000
Pair 6	PE PRE – PE POST	-.308	.631	-4.310	77	.000
Pair 7	WS PRE – WS POST	-.833	1.167	-6.308	77	.000
Pair 8	WM PRE – WM POST	-.064	.437	-1.297	77	.199
Pair 9	ER PRE – ER POST	-2.526	2.864	-7.789	77	.000

Also consistent with the results comparing the total Knowledge Survey scores, the topic area scores from the post-training survey to the follow-up survey did not show any significant improvement (Table 8).

Table 8: Topic area analysis comparing post-training survey scores and follow-up survey scores

Topic Areas		Mean	Std. Deviation	t	df	Sig. (2-tailed)
Pair 1	CP POST – CP Follow-Up	.050	1.535	.206	39	.838
Pair 2	EP POST – EP Follow-Up	.225	1.819	.783	39	.439
Pair 3	EnC POST – Enc Follow-Up	.150	1.688	.562	39	.577
Pair 4	Inv POST – Inv Follow-Up	-.025	.620	-.255	39	.800
Pair 5	FE POST – FE Follow-Up	.125	.757	1.044	39	.303
Pair 6	PE POST – PE Follow-Up	.025	.577	.274	39	.785
Pair 7	WS POST – WS Follow-Up	-.075	.764	-.621	39	.538
Pair 8	WM POST - WM Follow-Up	.000	.506	.000	39	1.000
Pair 9	ER POST – ER Follow-Up	-.450	2.050	-1.388	39	.173

I evaluated the improvement in volunteers' response to questions within each topic area covered in the MN training. I compared the frequency of the score for each question on the pre-training survey with the frequency of the score for the post-training survey. For example, for the topic area Ecological Principles (EP), I compared the frequency of the volunteers' scores on the pre-training survey for questions 4, 5, 6, 7 (i.e., those questions that addressed Ecological Principles) with the frequency of volunteers' scores for those questions on the post-training survey. The number of correct responses for each question within each category increased after the volunteers completed the MN training program. A detailed comparison of the topic area scores for the pre-training survey, post-training survey and follow-up survey is found in Appendix 3. The following

tables summarize by topic the correct and incorrect responses comparing pre-training survey scores and post-training survey scores (Tables 9 through 17).

Table 9. Conservation Principles Questions – Pre-training (n=82); Post-training (n=81)

Responses	Pre CP1	Post CP1	Pre CP2	Post CP2	Pre CP3	Post CP3 (n=79)
Incorrect	78%	56%	6%	1%	30%	18%
Correct	22%	44%	94%	99%	70%	82%

Table 10. Ecological Principles Questions – Pre-training (n=82); Post-training (n=81)

Responses	Pre EP4	Post EP4	Pre EP5	Post EP5	Pre EP6	Post EP6	Pre EP7	Post EP7
Incorrect	6%	1%	17%	0%	6%	0%	6%	1%
Correct	94%	99%	83%	100%	94%	100%	94%	99%

Table 11. Energy Cycle Questions – Pre-training (n=82); Post-training (n=81)

Responses	Pre EnC8	Post EnC8	Pre EnC9	Post EnC9
Incorrect	39%	17%	9%	2%
Correct	61%	83%	91%	98%

Table 12. Invasive Species Questions – Pre-training (n=82); Post-training (n=81)

Responses	Pre Inv10	Post Inv10	Pre Inv11	Post Inv11	Pre Inv12	Post Inv12
Incorrect	13%	1%	43%	36%	6%	1%
Correct	87%	99%	7%	64%	94%	99%

Table 13. Forest Ecology Questions – Pre-training (n=82); Post-training (n=81)

Responses	Pre FE13	Post FE13	Pre FE14	Post FE14	Pre FE15	Post FE15	Pre FE16	Post FE16	Pre FE17	Post FE17
Incorrect	30%	30%	40%	11%	5%	1%	6%	1%	59%	31%
Correct	70%	70%	60%	89%	95%	99%	94%	99%	41%	69%

Table 14. Prairie Ecology Questions – Pre-training (n=82); Post-training (n=81)

Responses	Pre PE18	Post PE18	Pre PE19	Post PE19
Incorrect	87%	73%	21%	2%
Correct	13%	27%	79%	98%

Table 15. Watershed Questions – Pre-training (n=82); Post-training (n=81)

Responses	Pre WS20	Post WS20	Pre WS21	Post WS21	Pre WS22	Post WS22	Pre WS23	Post WS23
Incorrect	22%	6%	60%	36%	16%	10%	43%	5%
Correct	78%	94%	40%	64%	84%	90%	57%	95%

Table 16. Wildlife Management Question – Pre-training (n=82); Post-training (n=81)

Responses	Pre WM24	Post WM24
Incorrect	59%	52%
Correct	41%	48%

Table 17. Mo. Ecological Regions Questions – Pre-training (n=82); Post-training (n=81)

Responses	Pre ER25	Post ER25
Incorrect	33%	10%
Correct	67%	90%

Sixty-two (62) volunteers completed the Knowledge Surveys that included open-ended non-scored questions concerning the definition of "wise use". Twenty-three (23) volunteers on the pre-training surveys (37%) and 26 volunteers on the post-training surveys (42%) explained the term "wise use" to include the concepts of sustainability, preservation of ecological resources for future generations, and human's interdependence with ecosystems. These were the concepts that volunteers were to include in the definition of "Conservation" on the Knowledge Survey.

Motivation Inventory

Contemporary literature supports the use of the Likert-type scale data as interval data provided the scale items have at least five categories (Garson, in press). There is agreement that five category or greater scales will conform meet the assumption of normal distribution, as required for many tests, including Pearson's r (Jaccard and Wan, 1996: 4). An average of the responses for the volunteers (n=82) demonstrated a normal distribution for the responses (Figure 3).
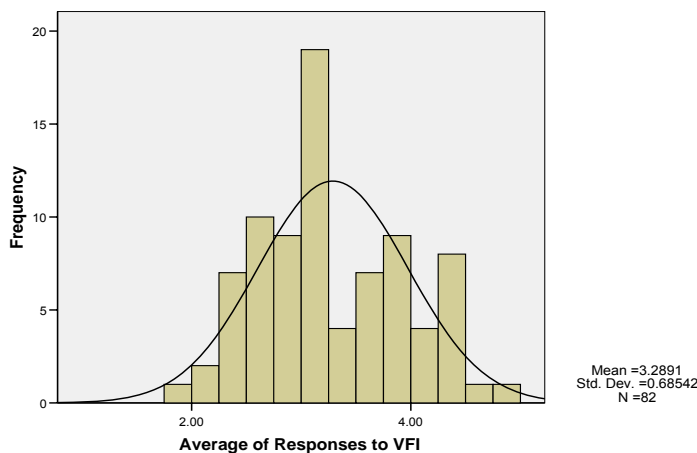
Figure 3. Average Responses to Volunteer Functions Inventory

There are six motivation categories on the adaptation of the Motivation Inventory developed by Clary et al. (1998): Social; Career; Values; Ego Enhancement; Ego Protection and Reliability. I analyzed each category for reliability using Cronbach's Alpha coefficient for internal consistency (Cronbach, 1951). The Alpha coefficient was 0.93 and 0.91, for Career and Ego Protection, respectively. For Social and Values, the Alpha coefficient was 0.82. For Ego Enhancement, the Alpha Coefficient was 0.80, and for Understanding, it was 0.70.

Most of the volunteers that completed the Motivation Inventory (n=82) ranked Values and Understanding or Learning as primary motivations for participating in the program. Volunteers did not rank Ego Enhancement as an important motivator and volunteers ranked the final three categories, Career, Social, and Ego Protection as somewhat unimportant motivators for participation (Figure 4).

MOTIVATION INVENTORY
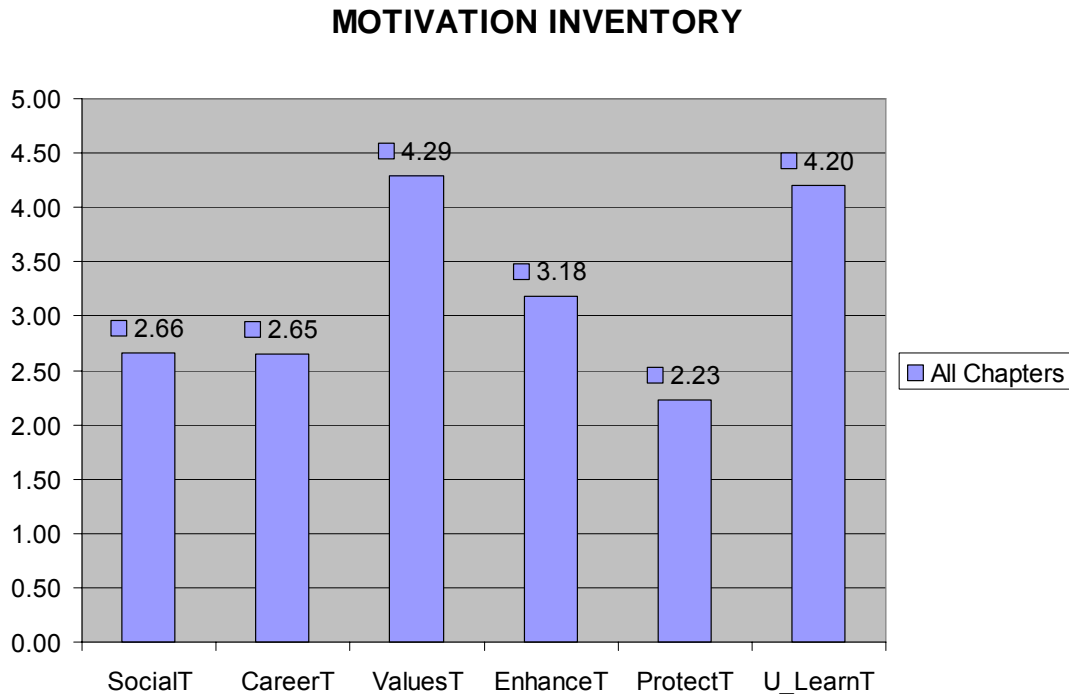
Figure 4. Motivation Inventory Responses

None of the motivation categories correlated significantly with an improvement in survey scores from the pre-training survey to the post-training survey (Table 18). Therefore, I failed to reject the null hypotheses that there was no significant relationship between any particular motivation and improvement in knowledge at the end of the MN training program.

Table 18. Pearson's Correlation (n=77)

Motivation Category	Correlation to Change in Knowledge Score	Sig. (2-tailed)
Social	$r = $ -.14	.23
Career	$r = $ .01	.90
Values	$r = $ .04	.74
Ego Enhancement	$r = $ -.01	.92
Ego Protection	$r = $ -.10	.39
Understanding(Learning)	$r = $ -.16	.16

DISCUSSION AND IMPLICATIONS

MN volunteer knowledge

Of the volunteers that completed the pre-training and post-training surveys (n=78), I found a significant improvement in volunteer knowledge of ecological processes and conservation issues in Missouri. The average score increased from 66% on the pre-training survey to 82% on the post-training survey, a 16 % gain. This improvement was notwithstanding that many volunteers reported prior experience or education in natural resource or science fields, e.g. wildlife nursery, naturalist, resource conservation, park ranger, park board, outdoor recreation/education specialist, landscaper, farmer, biologist, entomologist, horticulture/nursery, chemist, environmental education and public works, and natural resource supervisor. Furthermore, this knowledge gained remained stable over time. The average score of volunteers on the six-month follow-up survey increased slightly, but not significantly, to 85% for those participants that responded to the follow-up survey (n=40). Thus, the MN training program as implemented was effective at improving volunteers' knowledge of the ecological processes and conservation issues targeted by the program. Further, volunteers retained this level of knowledge six-months after completing training.

These results are similar to other studies that have evaluated learning from natural resource training programs specifically targeted to meet programmatic goals (Bonneau 2003, Jemison et al. 2004, Van Den Berg 2006). The Texas MN program evaluated its training program using similar methodology: a pre-training survey, post-training survey and an 8-month follow-up survey. Results demonstrated that the Texas MN Program increased participants' knowledge of ecological and natural resource concepts with a

15% gain, and participants retained this knowledge over time (Bonneau 2003). Michigan's Conservation Steward Program showed a similar statistically significant gain in knowledge of 15% after training (Van Den Berg 2006).

What is surprising about the 15% increase in knowledge scores before and after training for the Missouri, Texas, and Michigan programs is that Missouri's and Michigan's programs are based on the Texas MN program model. It is important to acknowledge the potential for pre-test sensitization in any pre-test / post-test design. The Texas MN general program model, however, appears successful at achieving the goals for these adult, natural resource outreach and service programs, at least for volunteers with characteristics similar to those who participated in these three programs.

While the Missouri MN survey reliably assessed knowledge differences of volunteers before and after training, the overall scores do not clarify volunteer learning in specific program areas. To illuminate the specific learning, I compared individual question responses on the pre-training survey with those on the post-training survey, and individual responses on the post-training survey with those on the follow-up survey (Appendix 3).

Most volunteers (94%) started the training with a general knowledge of conservation concepts, i.e., preservation, management, and restoration (Table 9, CP2). Most volunteers (83%-94%) also had a general knowledge of various ecological principles (Table 10, EP4-7), such as limiting factors, carrying capacity, and terms such as ecosystem, niche, community, biodiversity, and keystone species. Volunteers had a good general knowledge that invasive exotic species pose risks because there are fewer natural checks on these species (94%) (Table 12, Inv12), of the benefits provided by

39

Missouri forests (95%) (Table 13, FE 15), and the influence of harvesting trees on forest composition (94%) (Table 13, FE16). These results are consistent with the findings of others that indicate the public understands simple environmental topics (Coyle 2005).

Some specific content areas showed considerable gains in volunteer understanding. For example, although volunteer knowledge of categories of producers, consumers, herbivores, carnivores, etc. did not demonstrate considerable change (7%) after training (Table 11, EnC9), those receiving full credit for this aspect of the Energy Cycle increased from 30%-60% (Appendix 3, Question 9) and a 27% for volunteers correctly completing food chains (Appendix 3, Question 8). Similarly, volunteer understanding of the use of clear-cutting forests increased 28% (Table 13, FE17); their understanding of the value of a forested stream border increased 24% (Table 15, WS21) and their understanding of the negative effects of stream channelization increase 38% (Table 15, WS23). These improvements remained six-months later (Appendix 3).

In contrast, even after completing the training, over one-third (36%) of the volunteers did not understand the impact of invasive exotic species on native species (Table 12, Inv11). Almost three-fourths (73%) of the volunteers still lacked an understanding of tools used to manage Missouri prairies (Table 14, PE18). Less than one-half of the volunteers understood acceptable methods of wildlife management (Table 16, WM24), which changed little after training (41%-48%). There was no change (70% pre and post training) in volunteer understanding of ecological succession of forests (Table 13, FE13).

The fact that knowledge in several areas showed little improvement after training is difficult to reconcile with the considerable gains in understanding in other areas. One

factor that might have influenced the minimal or lack of change in some areas is that the

local chapter trainings have different instructors depending on what agencies or

organizations are its partners. These instructors may be more or less effective in

communicating the information or may emphasize different concepts. The training

outline provided the instructors might not have provided the specific detail or emphasis

that would result in significant changes for these specific areas. Another factor may be

that local chapters focus their training on local issues, e.g. in southern Missouri,

watersheds are a significant concern and the local chapter emphasizes these issues, while

in eastern and western Missouri, urban issues are emphasized. Additional research can

explore these issues in more depth to determine the need to standardize the curriculum, to

revise these specific content areas, or to provide additional training to instructors.

Despite the minimal changes in some specific content areas, overall volunteers

improved significantly within each topic area, with the exception of Wildlife

Management (Table 8). That this topic area had only one question on the Knowledge

Survey may explain why the results do not demonstrate a significant improvement.

One concept that initially appeared difficult to convey to volunteers in each of the

chapter trainings was a definition of the term "conservation" that included concepts of

sustainability, human interdependence with the environment, and preservation of

resources for future generations (Table 9, CP1). When responding to the question asking

volunteers to define "conservation" on the pre-training survey, most volunteers used

"catch-words" such as "management," "preservation," "restoration," and "wise use."

After including a non-scored question to provide an opportunity for volunteers to clarify

their use of these general terms, the results for all the chapters indicated that less than half

of the volunteers (41%) incorporated the concepts of interdependence, stewardship, and

sustainability in their responses to the definitional question on the post-training survey.

When responding to the non-scored question itself, which was included on three of the

four chapter's surveys, the results indicated that less than one-third (32%) of the

volunteers incorporated concepts of interdependence, stewardship, and sustainability after

completing the training.

Several factors may affect the volunteers' responses. The question asking

volunteers to define conservation as well as the non-scored question required short-

answers. Given the amount of paperwork volunteers completed the first night of training,

some may have chosen not to write a detailed explanation to these questions. Another

reason may be different instructors' teaching styles or emphasis on concepts. The most

significant factor, however, may be the attitude of the staff conducting the training

toward the survey and research objectives. When I analyzed the responses of volunteers

in individual chapters, there was a clear difference between the chapter responses.

I observed the first night of one chapter training where the instructor defined for

the class the term "conservation" using the concepts of interdependence, stewardship, and

sustainability. At the end of this training session, when the volunteers completed the pre-

training survey (n=15), six of the volunteers included those concepts in their responses.

While this is a very small sample, it does represent 40% of those completing that survey.

This number increased to 47% of volunteers in this chapter that completed the post-

training survey. Similarly, in another chapter training (n=28), 43% of volunteers on the

pre-training survey and 57% of volunteers on the post-training survey included those

concepts in their responses. In contrast, in a third chapter training (n=17), only 29% of

the volunteers on the pre-training and 18% of the volunteers completing the post-training survey included those concepts in their responses. The very low responses of the volunteers in the third chapter training may have resulted from the vocal resistance by the staff who conducted that training to having the volunteers' participate in the Knowledge Survey. The staff's attitude may have affected volunteer responses, which affected overall results of this question. Given the divergence in volunteer responses and the small sample size (n=60), further research may help clarify volunteers' understanding of the concept of conservation and modifications to the training curriculum that can reinforce this core concept.

There was no significant improvement in scores on the Knowledge Survey (Table 4) or within topic areas from the post-training survey to the follow-up survey (Table 9). Notably, however, there was no significant drop in scores. Thus, the volunteers retained the knowledge gained during the training up to six months after the training.

The Missouri MN training program was successful at improving volunteer knowledge in the areas targeted by the training. Importantly, volunteers retained this knowledge six months after training. Overall learning of topic areas was high. Specific content areas that may benefit from more structure or standardization of training format include management of prairies (PE18), the impact of exotic invasive species (INV11), reinforcement of the concept of conservation (CP1), tools to manage wildlife (WM24), and the concepts of forest succession (FE13).

MN volunteer motivations

Most of MN volunteers that completed the Motivation Inventory (n=82) ranked Values and Understanding or Learning as primary motivations for participating in the

program (Figure 4). These findings are similar to those in other research involving the motivation of volunteers in natural resource education or restoration (Schroeder 2000, Ryan et al. 2001, Bonneau 2003, Van Den Berg 2006). These results are also consistent with the anecdotal comments of Missouri MN volunteers who indicated in their applications to the program that they were interested in either learning more about the natural community, or were interested in furthering their knowledge. Interestingly, while volunteers participating in the Missouri MN training program had backgrounds, experience or were currently working in natural resource, state or county parks, or other similar careers, Career advancement did not rank as an important motive for participation in the program (Figure 4). The MN program is not advertised as a career development tool, however, so that it may not be an expectation of participants when the training began.

An unexpected result was that volunteers did not rank Social opportunities as a motivator for participation. In casual conversations with volunteers during the training programs, e.g. on field trips, volunteers often commented that they enjoyed the opportunity to be with and to do things with others who have similar interests. The difference in Motivation Inventory responses and the anecdotal comments may be that volunteers completed the Motivation Inventory on the first night of training. On that night, they may have been focused on the training program itself. Only after the training progressed did the social opportunities become more evident.

None of the motivation categories correlated significantly with an improvement in Knowledge Survey scores from the pre- to the post-training period. This result is not consistent with research that correlates motivation as an intervening variable that may

significantly affect learning that occurs during training programs (Noe and Schmitt 1986, Mathieu et al. 1992, Holton 1996, Kirkpatrick, 1996, 1998). The inconsistent result may reflect volunteer reluctance to read carefully the Motivation Inventory, given the large amount of written material the volunteers completed the first night of training. In addition to the four-page Motivation Inventory, there was the nine-page Knowledge Survey and the three-page Demographic Questionnaire. There was additional paperwork for the MN program itself. Faced with completing this amount of paperwork on the first night of training, volunteers might have chosen not to read carefully the motivation statements before circling a response. Several volunteers circled one response for multiple consecutive statements, suggesting that they did not consider each statement before responding. Finding an alternate time to complete the Motivation Inventory might affect how volunteers choose to read and respond to the motivation statements and affect the results.

One aspect of motivational research that my research did not address was how volunteer motivations may change during the program. Research indicates that social factors and project organization are significant predictors of volunteer commitment (Ryan et al. 2001). These findings reflect the anecdotal comments of the MN volunteers who enjoyed participating with those who have similar interests. The social factor may have implications for the type of volunteer programs made available to Master Naturalists who have completed training and are active in their local chapter. It may also suggest an opportunity to build cohesion within chapters and statewide by providing opportunities to socialize within and among the various chapters beyond simply providing volunteer

activities to earn or maintain individual MN certifications. The pending MN Satisfaction Survey may help clarify these factors for the current volunteers.

The observation by Ryan et al. (2001) that the efficiency and effectiveness of project organization is a motivator is an area that the MN program may want to explore in more depth. Ryan et al. found that well organized programs providing volunteers decision-making authority and providing frequent work opportunities encourages long-term participation. As designed, the Missouri MN program provides volunteers decision-making authority in organizing and directing the work of the local chapters. The Missouri MN program organization also recently shifted from central coordination through the Missouri Department of Conservation (MDC) and MU Extension personnel to add a Statewide Advisory Committee (SAC). The SAC is composed of two MDC and MU Extension staff, two MN State Coordinators and, importantly, ten MN volunteers representing regions and selected by other volunteers. These ten volunteers are actively involved in the decision-making of the SAC for the state MN program. This shift in overall state management of the Missouri MN program may help encourage volunteers to maintain active long-term participation in the local chapters.

The MN program also may want to evaluate the retention of volunteers in different chapters to determine which chapters are successful, identify reasons for that success, and transfer this knowledge to chapters that may be less successful in retaining volunteers long-term.

MN volunteer characteristics

The majority of Missouri MN volunteers are Caucasian, females in their late 40's and early 50's. They are well-educated holding advanced degrees in areas such as law,

medicine, engineering, and higher education. The volunteers also have diverse

occupations including free-lance writer, odd jobs, natural resource professions, military,

farmer, public works and safety, social workers, students, and realtors. Their income is

in the upper brackets and many live in rural or suburban areas. This is reflective of the

local chapter trainings that participated in this research, which include rural areas (e.g.

West Plains), smaller metropolitan areas (e.g. Columbia and Springfield), and a suburban

area outside of a large metropolitan area (St. Charles) (Table 2).

The characteristics of Missouri MN volunteers are similar to volunteer

characteristics of other MN or MN-type programs. Bonneau (2003) reported that Texas

MN (n=226) were predominantly female (54%, n=129), between the ages of 40-59 years

(60%, n=136), and predominantly white, non-Hispanic (88%, n=192). Texas MN were

highly educated with over three-fourths of the volunteers holding a Bachelor's degree

(77%, n=174), and over a third held advanced degrees (39%, n=88). Forty-eight percent

(48%) grew up in rural communities but spent their adult years in large metropolitan

areas (pop. <250,000). Over two-thirds of the Texas MN volunteers (68%) earn greater

than $50,000/year.

Van Den Berg (2006) reported the Michigan Conservation Stewards Program had

85% (n=55) response rate, that 61.8% Michigan Conservation Stewards Program

volunteers were female, with nearly all respondents identifying themselves as white;

78.3% holding at least a Bachelor's degree and a mean age of 51 years (SD = 13 years).

More than half (51.8%) grew up in rural communities but less than half (42.7%)

continued to live in rural areas. Over half of the Conservation Steward Program

volunteers (53.8%) earned greater than $75,000/year.

The most conspicuous aspect of the volunteers in these three MN-based programs is the lack of racial or ethnic diversity. Bonneau (2003) and Van Den Berg (2006) logically recommend encouraging participation in their respective state programs of more ethnically and racially diverse populations through marketing strategies or locating training in areas where culturally and ethnically diverse audiences can meet. It is unclear, however, if the current MN model, can successfully transfer to minority, urban and inner city populations or to other areas that have demographics different from those of the Missouri, Texas and Michigan programs. Stated differently, will the Missouri MN training program be as successful if the demographics of the volunteers change significantly? This question has implications for expanding the Missouri MN program into rural as well as urban areas. My discussion focuses on urban areas because the City of St. Louis is considering developing a MN program. Also, the City of St. Louis represents one of the most challenging areas for adapting the MN program to a different demographic and location. Any expansion to rural areas with different demographics would need to consider similar issues and adaptations.

The City of St. Louis is a truly urban center with demographics that reflect a core central city without associated suburbs (Beiter and Brinkerhoff 1999). The majority of the St. Louis city population (51%) is African American. Three-fourths of the city's population (75%) has no college degree and almost two-thirds of the city's households (60%) earn less than $35,000/year with almost one-third of these households earning less than $10,000/year (Census 2000). These demographics are very different from the current MN volunteers. Persons living in urban areas place different demands on the urban ecosystem. The concerns of those living in urban centers often focus on addressing

risks such as making communities safe, healthy, viable, and productive rather than concerns with invasive species, biodiversity, or watersheds (Bryant and Callewaert 2003, Shu 2003). To provide another perspective, as Shu (2003:42) queried, "how important is wilderness protection to African Americans when such a disproportionately small number of them visit wilderness areas?" To address natural resource issues in urban areas requires an understanding of the values and beliefs of persons living in urban areas (Bryant and Callewaert 2003, Nilon et al. 2003).

Research demonstrates that the issues of urban ecosystems differ from traditional, less developed ecosystems and that addressing these issues requires a different approach (Lord et al. 2001, Bryant and Callewaert 2003, Burch and Carrera 2003, Shu 2003, Coyle 2005). Urban ecosystems are local environments characterized by intensive development and a concentration of energy and resources in a limited urban area, which influences adjacent areas (Bryant and Callewaert 2003, Nilon et al. 2003). Urban ecosystems are also distinguished by their loss of natural areas with the concomitant loss of the benefits those areas provide to an ecosystem (Nilon et al. 2003). As Lord et al. recognized, applying ecological sciences to urban ecosystems may provide an opportunity to halt the decline of urban centers while drawing on diverse perspectives, resources, and learning to solve problems in urban centers. An interdisciplinary approach can best address urban ecosystems, which present a multitude of interrelated issues: social, economic, cultural, biological, and physical (Lord et al. 2001, Bryant and Callewaert 2003, Simmons 2003, Shu 2003). When approaching urban issues to restore or rebuild ecosystems, programs must address the issues the urban community believes are important (Shu 2003).

The Missouri MN program has the flexibility to address these factors and can bring a unique approach to addressing ecosystem issues in urban environments. The MN chapters are local and function autonomously, to a large degree. Historically, the members bring a wide diversity of experiences and interests. The chapters and local partners identify and focus on issues specific to and of importance to the local community. What is lacking, at this time, is diversity in ethnic and racial backgrounds. The Missouri MN program is expanding into the St. Louis and Kansas City areas. Kansas City's Osage Trails Chapter recently completed a training program, and in the city of St. Louis, a Forest Park chapter is pending.

Expanding the Missouri MN program into urban centers, however, may require more than simply transposing the current training formats and goals in areas with strikingly different demographics. Research indicates that this strategy alone may not achieve a more diverse volunteer base for these types of citizen volunteer programs (Lord et al. 2001, Bryant and Callewaert 2003, Burch and Carrera 2003, Shu 2003, Coyle 2005). While urban renewal often focuses on economic development, renewal of urban ecosystems can benefit from the organization and success found in MN programs – if approached cautiously and with proper focus of the people in that community, their culture and concerns.

Components of the MN training program can be adapted to urban natural resource issues. For example, forest ecosystem concepts can shift from calculating board-feet or studying mixed native forests to resource use and techniques that are relevant to urban life such as planting and caring for street trees or restoring vacant lots. Watershed units can address the role and impact of storm sewers and sewage disposal on water supplies

and water quality. Cause-effect scenarios, as incorporated into urban programs such as Baltimore, can help urban populations better understand how their actions positively or negatively affect their ability to achieve their goals for their neighborhoods and communities (Burch and Carrera 2003, National Science Foundation 2007).

Expansion of the Missouri MN program into urban areas is within the mission of the MN program partners, MU Extension and the MDC. Extension services have expanded beyond their traditional agricultural, rural focus to play important roles in urban and suburban life (U.S. Department of Agriculture 2007). MU Extension is a leader in exploring successful, innovative urban programming and outreach (MU Extension 2007). The Missouri Department of Conservation is active in both St. Louis City and in Kansas City addressing various issues including sprawl, urban forests, fishing opportunities, wildlife management issues, and providing opportunities for urban youth and young adults through the Discovery Center in Kansas City (MDC 2007). MU Extension and MDC also have close ties with the University of Missouri's College of Natural Resources with its program emphasis on the human dimensions of urban ecosystems. This cooperative relationship provides an exceptional opportunity to design, develop, and implement the Missouri MN program in urban centers applying the learning and experience of leading researchers and educators to empower urban residents so they can apply the fundamentals of ecological and environmental science to better understand their environment and improve their community.

MDC and MU Extension should consider some specific programmatic factors as they expand the MN program into urban areas. A conscious effort to identify and select local urban partners will be critical to success. For example, the current West Plains

Chapter has a local watershed as a partner that was very proactive in the initial development of the chapter. The local partner continues to participate actively in the functioning of the West Plains chapter. This type of self-sustaining chapter is a core feature of the MN program. To ensure success in St. Louis City, for example, potential local partners could include well-established groups such as Operation Brightside, Grace Hill, and Forest Park Forever that have a strong local presence, a reputation for consistent, high-quality programs, and a commitment to the urban community.

Pertinent volunteer opportunities that involve areas and issues important to the local urban community are another specific program area that may be critical to success of an urban MN chapter. Research demonstrates that volunteer commitment is closely associated with providing individuals' decision-making authority and volunteer opportunities important to the participants (Ryan et al. 2001). In urban areas, these volunteer opportunities may be different from more traditional conservation activities, but still consistent with the MN goals and objectives. With existing chapters, local partners have helped incorporate historical features into MN volunteer projects, e.g. the development of the Lewis & Clark Interpretive Trail at the Big Muddy Fish & Wildlife Refuge near Arrow Rock, Missouri, and the historical studies at Rock Bridge Memorial State Park near Columbia, Missouri. MN volunteer projects in urban areas could include activities such as historical restoration of areas that also have natural resource significance. A recent example from St. Louis, although not associated with MN projects, was development of the Riverfront Trail that also included identification and dedication of the Mary Meachum Freedom Crossing site to honor Mary Meachum and other abolitionists who risked their lives to help slaves cross the Mississippi River into

Missouri. The community support for developing this site was very high. The effectiveness of incorporating these types of volunteer projects into an urban MN chapter will depend on the local partner and the ability of the chapter volunteers to network within the community to identify these opportunities.

Another program specific consideration will be teaching methods for the program. Given the educational level of the MN volunteers surveyed for this research, a lecture and discussion format with field trips to reinforce the discussions was effective. Instructional activities and approaches tailored to cultural and social experiences of urban learners may require different teaching methods and approaches to convey information effectively (Zemke and Zemke 1984, Lieb 1991, ERIC 1994). More than simply teaching a program, however, effectively implementing the MN program in urban areas may require an understanding of how urban residents' perceive their environment and the ecosystem as learned in their homes, schools, neighborhoods. The Institute of Ecosystem Studies and, in particular, the Baltimore Ecosystem Study are potential resources for assisting with methods and approaches to urban ecosystem issues and effective teaching methods (IES 2007, BES 2007). Delaware's Certified Citizen Naturalist program, a MN-type program, has a significant minority population participation that may also be an excellent resource for information and ideas.

In addition to specific programmatic considerations, organizational considerations include how to advertise the program to attract volunteers that are more diverse. Effective media to attract current MN volunteers include radio, newspapers, word-of-mouth, and the Missouri Conservationist magazine. When targeting urban populations, MDC and MU Extension will need to understand how these media target audiences. For

example, the local urban partner can be critical to effectively targeting individuals already committed to improving their communities. Local newspapers such as the St. Louis American that specifically target African Americans in not only the City of St. Louis, but also St. Louis County, St. Charles County, and portions of Illinois may be more effective than newspapers or magazines that do not reach that target audience as effectively.

Another organizational consideration is validating success of any expansion of the MN program into urban areas. As currently developed and for certain demographics, the Missouri MN program is effective at improving volunteers' knowledge of ecological processes and conservation issues in Missouri. Validating effectiveness of the program in urban areas will be important as the demographic base from which volunteers are recruited changes. One factor that may be significant is the retention of volunteers that start the program with little or no background in natural resource issues and processes in Missouri. Many of the participants involved in the four chapters surveyed for this research already had background, experience, or education in science or natural resource fields. Others who participated came from diverse fields such as business, information technology, and other non-science related fields. Urban residents will have diverse educational, career, and experiential backgrounds. Retention of volunteers from diverse backgrounds and experiences is essential to the continued success of the MN program and evaluating effectiveness of the program not only to attract but also to retain these individuals will be important.

Finally, any expansion will need to consider the very real constraints of staff and funding as well as potential issues within MDC and MU Extension as to the agency's

role. For example, in urban areas, MDC's traditional focus on ecosystems and wildlife may also require attention to water and air issues, areas traditionally within the purview of the Missouri Department of Natural Resources. Of course, these environmental and natural resource issues do not honor departmental compartmentalization and efforts to bridge these perspectives may be necessary to implement the MN program in urban areas. Another consideration is that individuals with limited income often hold several jobs and have severe time constraints. This may necessitate adjusting volunteer opportunities and commitments to allow flexibility in participation. Local partners who are sensitive to the day-to-day issues of urban residents are a valuable resource for helping ensure involvement of volunteers, a key component of the Missouri MN program.

Next Steps

To improve and expand the MN program and opportunities for volunteers, further evaluation of the program can employ Kirkpatrick's third and fourth levels: evaluating on-the-job behavior and program results (Kirkpatrick 1978, 1996, 1998). With the continued expansion of the Missouri MN program, these more detailed levels of evaluation will be useful. To determine the effectiveness of training programs requires evaluation beyond what the individuals learn through the training (Kirkpatrick 1998). Further evaluation of the MN program can include an evaluation of the impact of the programs on the communities within which trainings are conducted, and the impact on the public from developing a corps of 'master volunteers.' These levels of evaluation will help determine whether the MN training program has met its goals to raise awareness of and educate the public about natural resource issues in their Missouri communities. Evaluation of the program's impacts will also provide an opportunity to identify and, if

necessary, modify those areas in which the program or volunteers are not meeting the programs goals.

Although I have discussed evaluation of the MN program in somewhat lock-step fashion from evaluating volunteer reaction in the pilot chapters through this evaluation of the training to further evaluation of on-the-job behavior and program results, in reality all of these levels of evaluation may overlap. Evaluation of reactions to new and existing training programs can continue while, at the same time, evaluating within chapters whether the service activities meet volunteer expectations and encourage retention. These evaluations can be statewide, such as the pending Satisfaction Survey, and chapter-by-chapter. Comparisons between and among chapters may help clarify successes that can transfer and areas that need to be modified to meet goals objectives of expectations. These multiple levels of assessment also help support grant applications that require applicants to have some method to assess what participants have learned.

Evaluation, however, should also go beyond simply a focus on volunteers and their learning or implementation of the MN program. Assessment of the structure, organization, and efficiency of the program at various organizational levels will also help fine-tune areas that can be improved. The change from central coordination of the state program through MDC and MU Extension to the SAC is one example of expanding the citizen focus of this program to ensure that those involved in the program have significant input and responsibility for the decisions and their implementation.

Another consideration for the program is development of a formal training manual for the instructors. Currently, individuals interested in starting a MN chapter complete a training program. These individuals identify instructors and provide them

with goals and objectives for units they will teach. Developing a detailed manual for instructions of specific content areas may help ensure consistency statewide of the specific content areas, e.g. management of prairies or aspects of forest ecology, which, in this research, volunteers did not demonstrate considerable improvement after training.

Retention of volunteers is vital to the MN program. Evaluating aspects of the program that help promote retention is critical. Some chapters have higher rates of volunteer participation over time. Analyzing aspects of the chapter programs, motivational and structural, may help identify components that promote retention. For example, many participants in my research commented on the opportunities for socialization with others who have similar interests as a key benefit of the program. Thi motivation may be a factor in the different retention rates between chapters, and can be easily assessed between and among chapters.

CONCLUSION

The Missouri MN training program as implemented is effective at improving volunteers' knowledge of the ecological processes and conservation issues targeted by the program, which volunteers retain over time. Training in some content areas may be improved. MDC and MU Extension may want to experiment with modifying the content covered or the training provided instructors to determine which is more effective at improving volunteer knowledge of these areas.

Given the success of the MN program at improving volunteer knowledge after training, however, there may be other areas that the MN can focus its efforts to expand the program. One clear example is the diversity of the volunteers that participate in the MN program. Given the importance of urban areas as people increasingly move into cities, and given the poor state of many urban areas, expanding the MN program into urban centers may be beneficial. The MN program is uniquely situation, given its local focus, chapter autonomy and ability to interface with local partners to encourage volunteer participation in addressing ecosystem issues in urban areas. The abundance of research on this topic, current programs operating in urban areas, and the relationship of the MN program with the University of Missouri, Columbia, provide the MN program valuable resources.

My recommendation to expand the MN program to address urban issues is not meant to dismiss or detract from the obvious success of the current structure of the program. The Texas model as adapted and implemented in Missouri and in other areas throughout the country is impressive. However, given the recognition of increasing urbanization and its impacts on not only urban areas but surrounding watersheds and

lands, there appears to be a unique opportunity to build on the success of the MN programs to expand and provide relevance to more people and areas that will increasing become important for rebuilding, restoring, and sustaining ecosystems though Missouri.

Another final area that the MN program can focus attention is on the motivations of volunteers, not simply for joining the MN program, but also for staying as a volunteer. This will be critical to the continued success of the MN program in Missouri as the local chapters are only effective if they continue to attract and to retain volunteers. Related tothis area is research involving the local community, its recognition of and use of MN program and volunteers, which may help identify volunteer opportunities and provide information on community interests and needs that the MN volunteers can help address.

SURVEY OF PRESENT KNOWLEDGE

– Mo MN training program –

Conservation Principles

1. There are many different definitions of *conservation.* Give one definition (in as much detail as you are able):

_____

_____

_____

☐ -- Don't Know

2. Match a letter from the second column with each of the numbered items:

(use each letter only once)

(1) ___ The Department of Conservation's
programs and activities help ensure a supply
of timber from public or private lands, and focus
on ensuring healthy, sustainable forests.   a. preservation

b. restoration

(2) ___ In the late 1930's Missouri had fewer than
 4,000 deer. Because of the Department of Conservation's c. management
efforts to regulate, trap and reintroduce deer, they
are now abundant in Missouri.

(3) ___ A "hands-off" approach to conservation
that is difficult today because humans have altered
most ecosystems.

☐ -- Don't Know

3. You have just met Aldo Leopold's ghost who, amazingly, is questioning the need for conservation of natural resources. Choose at least three (3) of the following topics and briefly explain why conservation is important.

Economic:_____

Aesthetic: _____

Political: _____

Emotional: _____

Scientific: _____

Moral: _____

☐ ▬ Don't Know

Ecological Principles/Terms

4. Match a letter from the second column with each of the numbered items:
(use each letter only once)

(1) _____ The study of the interrelationship
of organisms to one another and their environment   a. niche

(2) ___ How frogs, fish, birds, plants rely on a pond
and how they interact with one another   b. habitat

(3) ___The role or job of an animal or plant; how it
fits with other animals or other plants in an area   c. ecosystem

(4) ___Where an animal or plant lives; what it needs
In an area to survive   d. community

(5) ___ A forest: the animals, plants, topography,
soils and how these interact with each other   e. ecology

☐ ▬ Don't Know

5. Temperature, light, nutrients, water, and fire influence the type and numbers of animals and plants that can live on a prairie. If any of these were in short supply, it would be called: (circle one)
        a. a limiting factor
        b. the carrying capacity
        c. an ecosystem
        d. succession
        e. don't know

6. A 10-acre pasture can feed a grazing herd of 15 horses, 20 cattle, or 100 sheep. The number of each kind of animal depends on its size, which determines how much it needs to eat. How much grass can grow on the pasture determines the total number of animals that can feed there.
This describes an ecosystem's: (circle one)
        a. carrying capacity
        b. succession
        c. predator/prey relationship
        d. limiting factors
        e. don't know

7. Match a letter from the second column with each of the numbered items:
                                   (use each letter only once)

(1) ___One quail   a. a population

(2) ___All the quail in an area   b. pioneer species

(3) __ The use of a limited resource by
      two or more organisms   c. keystone species

(4) ___The first species to occupy an   d. biodiversity
      area during succession

(5) ___A species that interacts with
      many others and whose loss may   e. competition
      result in changes in the community

(6) ___ The variety of life in a given ecosystem   f. an organism

☐ -- Don't Know

Energy Cycle

8. Draw two types of food chains, beginning with the Sun, and using at least four levels for each chain.

a. _____ → _____ → _____ → _____ → _____

☐ -- Don't Know

b. _____ → _____ → _____ →_____ → _____

☐ -- Don't Know

9. Give an example of a plant or animal within each category:

Producer: _____ ☐ -- Don't Know

Consumer: _____ ☐ -- Don't Know

Herbivore: _____ ☐ -- Don't Know

Carnivore: _____ ☐ -- Don't Know

Omnivore: _____ ☐ -- Don't Know

Scavenger: _____ ☐ -- Don't Know

Decomposer: _____ ☐ -- Don't Know

Exotic Plants / Animals

Circle "T" for True or "F" for False:

10. T or F - Examples of invasive exotics in Missouri include sericea lespedeza, multiflora rose, purple loosestrife, Japanese honeysuckle, and kudzu.

☐ -- Don't Know

11. T or F -All exotic plants cause problems by replacing or reducing indigenous species, disrupting native ecosystems and reducing habitat usability for human activity.

☐ -- Don't Know

12. T or F -Invasive exotic species become a problem because there are fewer natural   checks on them such as pests, diseases and competition from other species.

☐ -- Don't Know

Forest Ecosystems

13. Put these stages in order of ecological succession beginning immediately after a disturbance: (number the stages 1-5; 1 being the first stage after disturbance)

_____ oak – hickory tree species

_____ perennial grasses

_____ annual weeds and grasses

_____ woody shrubs

_____ bare soil

☐ -- Don't Know

14. The type of plant species an area can support is dependent on factors such as soil, moisture, drainage and topography. Circle all of the following that are true.

  a. "Slope" (the rise in elevation of land over a certain distance) and "aspect" (the   direction the slope faces) are important because they affect the amount of   sunlight hitting the land, which affects photosynthesis and soil moisture.

  b. Steep north-facing slopes dry out faster than steep south-facing slopes.

  c. Plants that grow on north-facing slopes have cooler temperatures and   deeper shade.

  d. Key soil-related factors affecting the type of plants that will grow   include: 1) the soil type; 2) the pH, which ranges from acid to   alkaline; and 3) the amount of organic content.

  e. Don't know

Circle "T" for True or "F" for False:

15. T or F -The following are all benefits provided by Missouri forests:
- helping maintain water quality for streams
- providing habitat for wildlife
- providing opportunities for recreation
- providing timber for harvesting and sale

☐ -- Don't Know

16. T or F -The way trees are harvested influences the character of the new forest that replaces them.

☐ -- Don't Know

17. T or F - Clearcutting is never an acceptable way to regenerate a forest.

☐ -- Don't Know

Prairie Ecosystems

18. The following tools are used to manage prairies in Missouri: (circle all that apply)
        a. grazing
        b. leaving them alone with no human intervention
        c. hay cutting
        d. prescribed burns / fires
        e. replanting

☐ -- Don't Know

19. Historically, grazing by bison and other animals helped maintain the prairies. What other process historically was essential to maintaining the prairie ecosystems. _____

☐ -- Don't Know

Watersheds / Streams

20. The four parts of a watershed include: (circle one)
      a. uplands; floodplains; riparian corridors; and stream channels
      b. flow; water quality; energy source; and habitat quality
      c. channelization; urbanization; deforestation; and levees
      d. oceans; lakes; rivers; and streams
      e. don't know

21. Benefits of a forested border to a stream corridor include: (circle all that apply)
      a. controlling erosion and sedimentation of bottomland fields
      b. protecting soil from falling rain
      c. acting as sponge to slow runoff
      d. improving fish and wildlife habitats
      e. don't know

Circle "T" for True or "F" for False:

22.   T or F -In a natural flowing Missouri stream, meanders or bends constantly change because the force of water removes soil and gravel from banks and deposits it on an inside bend downstream.

☐ -- Don't Know

23.   T or F - Channelization that straightens bends and shortens the length of the   river is an effective method to control bank erosion of Missouri streams.

☐ -- Don't Know

Wildlife Management

24. Which of the following are acceptable methods to manage wildlife in Missouri? (circle all that apply)

      a. legal protections for endangered species

      b. habitat improvement for bluebirds

      c. enforcement of regulations to prevent poaching

      d. hunting squirrels

      e. poisoning a coyote to control predation of livestock

      f. trapping otters

      g. research on the interrelationship between plants and animals to enhance wildlife conditions

☐ -- Don't Know

(One last question   Thank you for your help!)

Ecological Regions and Characteristics

Present Day (2005)

25. Label each Missouri region and identify a characteristic of that region.
(Regions and characteristics may be similar or the same in different parts of the state)
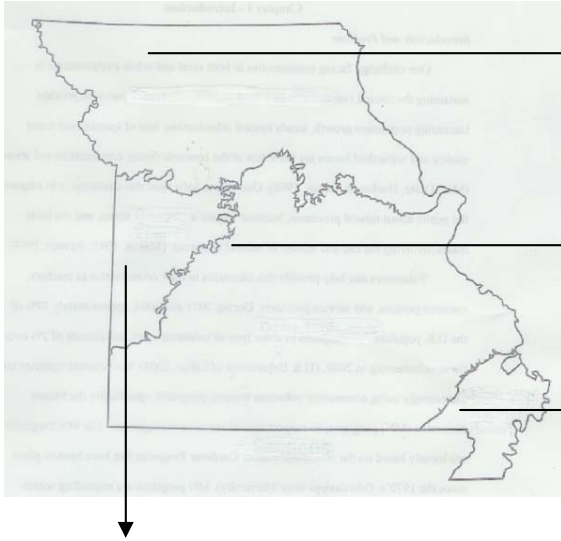
Region: _____ ☐ -- Don't Know

Characteristic: _____ ☐ -- Don't Know

Region: _____ ☐ -- Don't Know

Characteristic: _____ ☐ -- Don't Know

Region: _____ ☐ -- Don't Know

Characteristic: _____ ☐ -- Don't Know

Region: _____ ☐ -- Don't Know

Characteristic: _____ ☐ -- Don't Know

Missouri Regions:

Osage Plains

Missouri River Alluvial Basin

Ozark Highlands

Mississippi River Alluvial Basin

Central Dissected Till Plains

Igneous Knobs

Low Prairie Plains

Characteristics:
(Several characteristics may be identified for each region, but you only need to list one above).

Wetlands	Tundra
Prairie	Loess soils
Pasture	Marsh
Glades	Streams
Caves	Major river
Cropland	Woodland
Springs	Floodplains

Non-scored survey questions:

A. BRIEFLY explain why your choice describes the 'wise use' of natural resources for conservation.

1) Wise use is the scientific, planned management of the Earth's natural resources that allows time for regeneration, and for the prudent use of nonrenewable resources so they may last as long as possible and yield the greatest continuous benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations.

2) Wise use values private property over publicly owned property to permit the best use of the land because environmental problems can be eased by a market economy. Unlimited economic growth involving the use of natural resources is reasonable because humans can solve most serious problems through technology. Wise use recognizes that the earth and its life are tough and resilient, not fragile and delicate and that humanity's reworking of the earth is revolutionary and ultimately benevolent.

_____

_____

_____

□ -- Don't Know

The second of the non-scored questions queried:

A. CONGRATULATIONS! You are a certified Master Naturalist. You are speaking to a 6th grade class about conservation. They are eager but this concept is new to them. You put two definitions of 'wise use' up on the board. One bright student asks you to choose either (1) or (2) and explain to the class why your choice describes the 'wise use' of natural resources for conservation. Remember, they know nothing about conservation, so be specific but brief.

1) Wise use is the scientific, planned management of the Earth's natural resources that allows time for regeneration, and for the prudent use of nonrenewable resources so they may last as long as possible and yield the greatest continuous benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations.

2) Wise use values private property over publicly owned property to permit the best use of the land because environmental problems can be eased by a market economy; unlimited economic growth involving the use of natural resources is reasonable because humans can solve most serious problems through technology. Wise use recognizes that the earth and its life are tough and resilient, not fragile and delicate and that humanity's reworking of the earth is revolutionary and ultimately benevolent.

_____

_____

_____

□ -- Don't Know

Volunteer Scores on each question for pre-training survey (n=82); post-training survey (n=81) and follow-up survey (n=41)

Scores		0	1	2	3	4	5	6	7	8
Questions										
1	Pre	64 **78%**	18 **22%**	-	-	-	-	-	-	-
	Post	45 **56%**	36 **44%**	-	-	-	-	-	-	-
	Follow Up	16 **39%**	25 **61%**	-	-	-	-	-	-	-
2	Pre	5 **6%**	11 **13%**	3 **4%**	63 **77%**	-	-	-	-	-
	Post	1 **1%**	12 **15%**	0 **0%**	68 **84%**	-	-	-	-	-
	Follow Up	2 **5%**	4 **10%**	0 **0%**	35 **85%**	-	-	-	-	-
3	Pre	25 **30%**	57 **70%**	-	-	-	-	-	-	-
	Post (n=79)	14 **18%**	65 **82%**	-	-	-	-	-	-	-
	Follow Up	10 **24%**	31 **76%**	-	-	-	-	-	-	-
4	Pre	5 **6%**	4 **5%**	12 **15%**	21 **26%**	3 **4%**	37 **45%**	-	-	-
	Post	1 **1%**	0 **0%**	8 **10%**	24 **30%**	1 **1%**	47 **58%**	-	-	-
	Follow Up	0 **0%**	0 **0%**	3 **7%**	18 **44%**	0 **0%**	20 **49%**	-	-	-
5	Pre	14 **17%**	68 **83%**	-	-	-	-	-	-	-
	Post	0 **0%**	81 **100%**	-	-	-	-	-	-	-
	Follow Up	1 **2%**	40 **98%**	-	-	-	-	-	-	-
6	Pre	5 **6%**	77 **94%**	-	-	-	-	-	-	-
	Post	0 **0%**	81 **100%**	-	-	-	-	-	-	-
	Follow Up	1 **2%**	40 **98%**	-	-	-	-	-	-	-

Scores / Questions		0	1	2	3	4	5	6	7	8
7	Pre	5 **6%**	2 **2%**	0 **0%**	1 **1%**	6 **7%**	1 **1%**	67 **82%**	-	-
	Post	1 **1%**	2 **2%**	1 **1%**	1 **1%**	5 **6%**	1 **1%**	70 **86%**	-	-
	Follow Up	0 **0%**	1 **2%**	0 **0%**	0 **0%**	0 **0%**	0 **0%**	40 **98%**	-	-
8	Pre	32 **39%**	16 **20%**	34 **41%**	-	-	-	-	-	-
	Post	14 **17%**	12 **15%**	55 **68%**	-	-	-	-	-	-
	Follow Up	6 **15%**	8 **20%**	27 **65%**	-	-	-	-	-	-
9	Pre	7 **9%**	2 **2%**	5 **6%**	5 **6%**	9 **11%**	8 **10%**	22 **27%**	24 **30%**	-
	Post	2 **2%**	1 **1%**	1 **1%**	6 **7%**	2 **2%**	5 **6%**	15 **19%**	49 **60%**	-
	Follow Up	0 **0%**	0 **0%**	0 **0%**	2 **5%**	0 **0%**	5 **12%**	10 **24%**	24 **59%**	-
10	Pre	11 **13%**	71 **87%**	-	-	-	-	-	-	-
	Post	1 **1%**	80 **99%**	-	-	-	-	-	-	-
	Follow Up	0 **0%**	41 **100%**	-	-	-	-	-	-	-
11	Pre	35 **43%**	47 **57%**	-	-	-	-	-	-	-
	Post	29 **36%**	52 **64%**	-	-	-	-	-	-	-
	Follow Up	13 **32%**	28 **68%**	-	-	-	-	-	-	-
12	Pre	5 **6%**	77 **94%**	-	-	-	-	-	-	-
	Post	1 **1%**	80 **99%**	-	-	-	-	-	-	-
	Follow Up	0 **0%**	41 **100%**	-	-	-	-	-	-	-

Scores / Questions		0	1	2	3	4	5	6	7	8
13	Pre	25 **30%**	57 **70%**	-	-	-	-	-	-	-
	Post	25 **30%**	56 **70%**	-	-	-	-	-	-	-
	Follow Up	3 **7%**	38 **93%**	-	-	-	-	-	-	-
14	Pre	33 **40%**	49 **60%**	-	-	-	-	-	-	-
	Post	9 **11%**	72 **89%**	-	-	-	-	-	-	-
	Follow Up	8 **20%**	33 **80%**	-	-	-	-	-	-	-
15	Pre	4 **5%**	78 **95%**	-	-	-	-	-	-	-
	Post	1 **1%**	80 **99%**	-	-	-	-	-	-	-
	Follow Up	0 **0%**	41 **100%**	-	-	-	-	-	-	-
16	Pre	5 **6%**	77 **94%**	-	-	-	-	-	-	-
	Post	1 **1%**	80 **99%**	-	-	-	-	-	-	-
	Follow Up	0 **0%**	41 **100%**	-	-	-	-	-	-	-
17	Pre	48 **59%**	34 **41%**	-	-	-	-	-	-	-
	Post	25 **31%**	56 **69%**	-	-	-	-	-	-	-
	Follow Up	14 **34%**	27 **66%**	-	-	-	-	-	-	-
18	Pre	71 **87%**	11 **13%**	-	-	-	-	-	-	-
	Post	59 **73%**	22 **27%**	-	-	-	-	-	-	-
	Follow Up	28 **68%**	13 **32%**	-	-	-	-	-	-	-

Scores Questions		0	1	2	3	4	5	6	7	8
19	Pre	17 **21%**	65 **79%**	-	-	-	-	-	-	-
	Post	2 **2%**	79 **98%**	-	-	-	-	-	-	-
	Follow Up	0 **0%**	41 **100%**	-	-	-	-	-	-	-
20	Pre	18 **22%**	64 **78%**	-	-	-	-	-	-	-
	Post	5 **6%**	76 **94%**	-	-	-	-	-	-	-
	Follow Up	0 **0%**	41 **100%**	-	-	-	-	-	-	-
21	Pre	49 **60%**	33 **40%**	-	-	-	-	-	-	-
	Post	29 **36%**	52 **64%**	-	-	-	-	-	-	-
	Follow Up	7 **17%**	34 **83%**	-	-	-	-	-	-	-
22	Pre	13 **16%**	69 **84%**	-	-	-	-	-	-	-
	Post	8 **10%**	73 **90%**	-	-	-	-	-	-	-
	Follow Up	5 **12%**	36 **88%**	-	-	-	-	-	-	-
23	Pre	35 **43%**	47 **57%**	-	-	-	-	-	-	-
	Post	4 **5%**	77 **95%**	-	-	-	-	-	-	-
	Follow Up	2 **5%**	39 **95%**	-	-	-	-	-	-	-
24	Pre	48 **59%**	33 **41%**	-	-	-	-	-	-	-
	Post	42 **52%**	39 **48%**	-	-	-	-	-	-	-
	Follow Up	21 **51%**	20 **49%**	-	-	-	-	-	-	-

Scores / Questions		0	1	2	3	4	5	6	7	8
25	Pre	27	4	7	3	8	4	8	8	11
		33%	**5%**	**9%**	**4%**	**10%**	**5%**	**10%**	**10%**	**13%**
	Post	8	2	4	3	7	6	6	12	33
		10%	**2%**	**5%**	**4%**	**9%**	**7%**	**7%**	**15%**	**41%**
	Follow Up	3	0	1	1	4	3	3	3	23
		7%	**0%**	**2%**	**2%**	**10%**	**7%**	**7%**	**7%**	**56%**

APPENDIX 4.

Why I became a Master Naturalist:

The items below relate to reasons why people choose to volunteer to become a Missouri Master Naturalist. Please circle the response that best describes how important each reason is for you. There is no right or wrong answer, so please pick the response closest to your feeling about each statement, Thank You!

1 Not important at all
2 Somewhat unimportant
3 No opinion either way
4 Somewhat Important
5 Very Important

	Not Important at all	Somewhat Unimportant	No opinion either way	Somewhat Important	Very Important
1. Through volunteering as a Master Naturalist, I can learn more about natural resources issues in Missouri.	1	2	3	4	5
2. I want to learn about natural resources through practical instruction and hands-on experience.	1	2	3	4	5
3. I feel it is important to help others.	1	2	3	4	5
4. I am genuinely concerned about Missouri natural resources.	1	2	3	4	5
5. I want to do something for a conservation cause.	1	2	3	4	5
6. I feel compassion for people in need.	1	2	3	4	5
7. I am concerned about those less fortunate than myself.	1	2	3	4	5

	Not Important at all	Somewhat Unimportant	No opinion either way	Somewhat Important	Very Important
8. Volunteering allows me to gain new perspectives on things.	1	2	3	4	5
9. Volunteering is a way to make new friends.	1	2	3	4	5
10. Through volunteering, I can explore my own strengths.	1	2	3	4	5
11. People I know share interest in community service.	1	2	3	4	5
12. Through volunteering, I can learn how to deal with a variety of people.	1	2	3	4	5
13. Those close to me value community service.	1	2	3	4	5
14. Volunteering increases my self esteem.	1	2	3	4	5
15. Volunteering helps me forget about how bad I have been feeling.	1	2	3	4	5
16. Volunteering helps me feel better about myself.	1	2	3	4	5
17. Volunteering is important to those I know best.	1	2	3	4	5

	Not Important at all	Somewhat Unimportant	No opinion either way	Somewhat Important	Very Important
18. By volunteering I feel less lonely.	1	2	3	4	5
19. Through volunteering, I can make new contacts that may help my career.	1	2	3	4	5
20. Volunteering is a good escape from my own troubles.	1	2	3	4	5
21. Volunteering will look good on my resume.	1	2	3	4	5
22. Volunteering helps me work through my own problems.	1	2	3	4	5
23. People I am close to want me to volunteer.	1	2	3	4	5
24. Volunteering will help me succeed in my profession.	1	2	3	4	5
25. Friends of mine volunteer as Master Naturalists.	1	2	3	4	5
26. Volunteering makes me feel important	1	2	3	4	5

	Not Important at all	Somewhat Unimportant	No opinion either way	Somewhat Important	Very Important
27.Volunteering allows me to explore different career options.	1	2	3	4	5
28. Volunteering can help me get my foot in the door where I want to work.	1	2	3	4	5
29. Volunteering relieves my guilt over being more fortunate than others.	1	2	3	4	5
30. Volunteering as a Master Naturalist will help me feel needed in the community.	1	2	3	4	5

Demographics of Missouri Master Naturalists

The following questions help us gather information about those who are interested in being Missouri Master Naturalists. We will keep all responses confidential and neither your name nor your address will be linked to your responses.

Except where otherwise noted, please mark only one answer per question.

1. What is your gender?

___ Female   ___ Male

2. What is your age? ____

3. What is your race/ethnicity? *(Please mark all that apply.)*

___ White (non-Hispanic)
___ Spanish/Hispanic/Latino
___ Black or African American
___ American Indian or Alaska native
___ Asian
___ Other *(Please specify.)* _____

4. Please identify your highest level of education?

___ High School / GED
___ Associate Degree
___ Bachelor's Degree
___ Master's Degree
___ Doctorate (M.D., J.D., Ph.D., etc.)
___ Other (college, technical, Vocational, etc.)

5. Are you retired?

___ No (if not, go to question 6.)
___ Yes

If you are retired, what was your occupation?

_____

If you had more than one occupation, please list any others.

_____

_____

_____

6. If you are not retired, what is your current occupation?

_____

7. Are you married?

___ No
___ Yes

8. Do you have a spouse or a significant other involved with the Missouri Master Naturalist program?

___ No

___ Yes

9. What is your total annual household income before taxes?

___ Under $20,000

___ $20,000 - $49,999

___ $ 50,000 - $79,999

___ $80,000 - $109,999

____$110,000 or over

10. Where do you currently live?

___ Rural area

___ Suburban area

___ City < 25,000

___ City: 25,000 – 249,999

___ City: 250,000 or larger

11. How did you find out about the Missouri Master Naturalist program? (check all that apply)

___ Missouri Conservationist magazine

___ Newspaper

___ Word of Mouth

___ Master Naturalist website

___ MU Extension

___ Other (please identify _____).

Thank you very much for taking the time to complete this survey. We appreciate your help!

APPENDIX 6.

Pretraining Cover Letter

Missouri Master Naturalist
Missouri Department of Conservation
MU Extension
University of Missouri School of Natural Resources
DATE

Dear Missouri Master Naturalist,

The Missouri Master Naturalist program began in 2004. It has active chapters in Columbia, West Plains, Joplin and St. Charles. We invite you to participate in a statewide evaluation to determine the effectiveness of our training program.

As part of my Master's thesis, I am working with Charlie Nilon and Bob Pierce from the MU Department of Fisheries and Wildlife Sciences, and Ginny Wallace at the Missouri Department of Conservation (MDC). The evaluation is a three-part study where you will be asked to complete three questionnaires: one tonight, one the last night of the training and the final one will be sent to you by mail six months after your training. We will compare responses on each questionnaire to determine how well the training is meeting the program objectives. You will also be asked to identify reasons for wanting to be a Missouri Master Naturalist. Your responses are crucial to improving the program.

THIS IS NOT A TEST. Your responses will help us determine your current level of knowledge. So please, be totally honest in your responses and do not feel you should know the answers to all the questions. We have taken significant steps to insure that all replies will be confidential. Only summaries of all the responses will be available to anyone outside of our study. Your name will not be connected to your individual responses. It will take 40-45 minutes to complete the questionnaires. If you would like results of the research, you may contact any of the people listed below.

Thank you for taking the time to participate in the first phase of this study. Your participation in this research is voluntary. You may refuse to participate in the study or may withdraw at any time. You can refuse to answer any question on the survey. If you choose not to participate, to withdraw or do not choose to answer questions, you can still participate fully in the Missouri Master Naturalist Program. Should you have any questions regarding your rights as a participant in the research, please contact the University of Missouri Institutional Review Board, (573) 882-9585.

If you have any questions at any time throughout the study, please call me at (573) 636-9858 or at cbkt3@mizzou.edu. You may also contact Charlie Nilon (573) 882-3738 or NilonC@missouri.edu; Ginny Wallace (573) 522-4115 x3294 or Ginny.Wallace@ mdc.mo.gov; or Bob Pierce (573) 882-4337 or piercer@missouri.edu.

Sincerely,
Caroline Broun Buenger

Post-training Cover Letter

<div align="center">

Missouri Master Naturalist
Missouri Department of Conservation
MU Extension
University of Missouri School of Natural Resources
DATE

</div>

Dear Missouri Master Naturalist,

This is the second questionnaire in our three-part study evaluating the effectiveness of the Missouri Master Naturalist training program. As you may recall, the evaluation of the training program is part of my Master's thesis. I am working with Charlie Nilon and Bob Pierce from the MU Department of Fisheries and Wildlife Sciences, and Ginny Wallace at the Missouri Department of Conservation (MDC).

Your participation is essential to growth and development of the Master Naturalist training program. As with the prior questionnaire, please be totally honest in your responses. We will compare responses on each survey to determine how well the training is meeting the program objectives. Your responses are crucial to improving the program.

THIS IS NOT A TEST. Please do not look up the answer to any of the questions, even if you remember covering the material but aren't sure of the answer. It is important for us to understand what you have learned to decide how best to adjust the training curriculum to meet the program needs. It should take about 30 minutes to complete the questionnaire.

We have taken significant steps to insure that all replies will be confidential. Only summaries of all the responses will be available to anyone outside of our study. Your name will not be connected to your individual responses. You may obtain results of the research, by contacting any of the people listed below.

Your participation in this research is voluntary. You may refuse to participate in the study or may withdraw at any time. You can refuse to answer any question on the survey. If you choose not to participate, to withdraw or do not choose to answer questions, you can still participate fully in the Missouri Master Naturalist Program. Should you have any questions regarding your rights as a participant in the research, please contact the University of Missouri Institutional Review Board, (573) 882-9585.

If you have any questions at any time throughout the study, please call me at (573) 636-9858 or at cbkt3@mizzou.edu. You may also contact Charlie Nilon (573) 882-3738 or NilonC@missouri.edu; Ginny Wallace (573) 522-4115 x3294 or Ginny.Wallace@ mdc.mo.gov; or Bob Pierce (573) 882-4337 or piercer@missouri.edu.

 Sincerely,

Caroline Broun Buenger

Six-month Follow-up Survey Cover Letter

Missouri Master Naturalist
Missouri Department of Conservation
MU Extension
University of Missouri School of Natural Resources
DATE

Dear Missouri Master Naturalist,

This is the third and final questionnaire in our study evaluating the effectiveness of the Missouri Master Naturalist training program. As you may recall, the evaluation of the training program is part of my Master's thesis. I am working with Charlie Nilon and Bob Pierce from the MU Department of Fisheries and Wildlife Sciences, and Ginny Wallace at the Missouri Department of Conservation (MDC).

Your participation is essential to growth and development of the Master Naturalist program. As with the prior questionnaires, please be totally honest in your responses. We will compare responses on each survey to determine how well the training is meeting the program objectives. Your responses are crucial to improving your program.

THIS IS NOT A TEST. Please do not look up the answer to any of the questions, even if you remember covering the material but aren't sure of the answer. It is important for us to understand what you remember to help us decide how to adjust the training curriculum to meet the program needs. We have taken significant steps to insure your replies are confidential. Your name will not be connected to your individual responses. Only summaries of all the responses will be available to anyone outside of our study. You may obtain results of the study by contacting any person listed below. The Missouri Master Naturalist program is YOUR program, and the primary purpose of this survey is program improvement. It is critical that we receive every survey for our results to be statistically valid and useful. Please take 20-30 minutes to fill out the questionnaire, and return it in the enclosed postage-paid envelope and return by <DATE>

Your participation in this research is voluntary. You may refuse to participate in the study or may withdraw at any time. You can refuse to answer any question on the survey. If you choose not to participate, to withdraw or do not choose to answer questions, you can still participate fully in the Missouri Master Naturalist Program. Should you have any questions regarding your rights as a participant in the research, please contact the University of Missouri Institutional Review Board, (573) 882-9585.

If you have any questions, please call me at (573) 636-9858 or at cbkt3@mizzou.edu. You can also contact Charlie Nilon (573) 882-3738 or NilonC@missouri.edu; Ginny Wallace (573) 522-4115 x3294 or Ginny.Wallace@mdc.mo.gov; or Bob Pierce (573) 882-4337 or piercer@missouri.edu.

Sincerely,

Caroline Broun Buenger

Knowledge Survey Answer Key

ANSWER KEY (correct answers marked in red)
SCORING (scoring for each question is in blue) (Total possible score = 50)
Questionnaire – Mo MN training program

MN Training Topic: Conservation Principles (Score = 5)

1. There are many different definitions of *conservation*. Give one definition (in as much detail as you are able):
Recognition of humans' interdependence with the environment and the need for stewardship and maintaining a sustainable balance between human needs, nature's needs and nature's capacity. (Total score = 1 - if identify key concepts of <u>interdependence</u> between humans and nature; need for <u>sustainable balance</u> between humans behavior and nature's needs/capacity)

☐ -- Don't Know

2. Match a letter from the second column with each of the numbered items:
(use each letter only once)
(Total possible score = 3, i.e. each correct answer scores 1, so if they list 2 correctly, the score is 2.)

(1) _c._ The Department of Conservation's
programs and activities help ensure a supply
of timber from public or private lands, and focus
on ensuring healthy, sustainable forests.   a. preservation

                                                             b. restoration

(2) _b._ In the late 1930's Missouri had fewer than
4,000 deer. Because of the Department of Conservation's   c. management
efforts to regulate, trap and reintroduce deer, they
are now abundant in Missouri.

(3) _a._ A "hands-off" approach to conservation
that is difficult today because humans have altered
most ecosystems.

☐ -- Don't Know

3. You have just met Aldo Leopold's ghost who, amazingly, is questioning the need for conservation of natural resources. Choose at least three (3) of the following topics and briefly explain why conservation is important. (Total possible score = 1)

Economic:_____

Aesthetic: _____

Political: _____

Emotional: _____

Scientific: _____

Moral: _____

☐ ▬▬ Don't Know

MN Training Topic: Ecological Principles/Terms (Score = 13)

4. Match a letter from the second column with each of the numbered items:
                                        (use each letter only once)
(Total possible score = 5, i.e. each correct answer scores 1, so if they list 2 correctly, the score is 2)

(1) __e.__ The study of the interrelationship
of organisms to one another and their environment   a. niche

(2) _d.__ How frogs, fish, birds, plants rely on a pond
and how they interact with one another   b. habitat

(3) _a.__The role or job of an animal or plant; how it
fits with other animals or other plants in an area   c. ecosystem

(4) _b.__Where an animal or plant lives; what it needs
In an area to survive   d. community

(5) _c.__ A forest: the animals, plants, topography,
soils and how these interact with each other   e. ecology

☐ ▬▬ Don't Know

5. Temperature, light, nutrients, water, and fire influence the type and numbers of animals and plants that can live on a prairie. If any of these were in short supply, it would be called: (circle one) (Score = 1)

     a. a limiting factor
     b. the carrying capacity
     c. an ecosystem
     d. succession
     e. don't know

6. A 10-acre pasture can feed a grazing herd of 15 horses, 20 cattle, or 100 sheep. The number of each kind of animal depends on its size, which determines how much it needs to eat. How much grass can grow on the pasture determines the total number of animals that can feed there.

These two descriptions refer to an ecosystem's: (circle one) (Score = 1)
     a. carrying capacity
     b. succession
     c. predator/prey relationship
     d. limiting factors
     e. don't know

7. Match a letter from the second column with each of the numbered items:
                               (use each letter only once)
(Total possible score = 6, i.e. each correct answer scores 1, so if they list 2 correctly, the score is 2)

(1) _f.__One quail   a. a population

(2) _a.__All the quail in an area   b. pioneer species

(3) _e._ The use of a limited resource by
     two or more organisms   c. keystone species

(4) _b.__The first species to occupy an   d. biodiversity
     area during succession

(5) __c._A species that interacts with
     many others and whose loss may   e. competition
     result in changes in the community

(6) _d.__ The variety of life in a given ecosystem   f. an organism

☐ ‒‒ Don't Know

MN Training Topic: Energy Cycle (Score = 9)

8. Draw two types of food chains, beginning with the Sun, and using at least four levels for each chain. (Total possible score = 2, i.e. each complete chain (of at least 4 levels) scores 1)

a. _Sun___→   __grass___ → ___bison_ → _human____ → __decomposer

☐ -- Don't Know

b. _Sun__→ _aquatic plant_ → _aquatic insect_ → _bat__ → _____

☐ -- Don't Know

9. Give an example of a plant or animal within each category:
 (Total possible score = 7, i.e. each correct answer scores 1, so if they list 2 correctly, the score is 2.)

Producer: ___ aquatic plants_____ ☐ -- Don't Know

Consumer: _____aquatic insects _____ ☐ -- Don't Know

Herbivore: _____cattle _____ ☐ -- Don't Know

Carnivore: _____human_____ ☐ -- Don't Know

Omnivore: _____bear _____ ☐ -- Don't Know

Scavenger: _____turkey vulture _____ ☐ -- Don't Know

Decomposer: _____fungi _____ ☐ -- Don't Know

MN Training Topic: Exotic Plants / Animals (Score = 3)

Circle "T" for True or "F" for False:

10. T or F - Examples of invasive exotics in Missouri include sericea lespedeza, multiflora rose, purple loosestrife, Japanese honeysuckle, and kudzu. (Score = 1)

☐ -- Don't Know

11. T or F -All exotic plants cause problems by replacing or reducing indigenous species, disrupting native ecosystems and reducing habitat usability for human activity. (Score = 1)

☐ ‒‒ Don't Know

12. T or F -Invasive exotic species become a problem because there are fewer natural checks on them such as pests, diseases and competition from other species. (Score = 1)

☐ ‒‒ Don't Know

MN Training Topic: Forest Ecosystems (Score = 5)

13. Put these stages in order of ecological succession beginning immediately after a disturbance: (number the stages 1-5; 1 being the first stage after disturbance)
(Total possible score = 1)

__5__ oak – hickory tree species

__3__ perennial grasses

__2__ annual weeds and grasses

__4__ woody shrubs

__1___ bare soil

☐ ‒‒ Don't Know

14. The type of plant species an area can support is dependent on factors such as soil, moisture, drainage and topography. Circle all of the following that are true.
 (Total possible score = 1)

        a. "Slope" (the rise in elevation of land over a certain distance) and "aspect" (the   direction the slope faces) are important because they affect the amount of   sunlight hitting the land, which affects photosynthesis and soil moisture.
        b. Steep north-facing slopes dry out faster than steep south-facing slopes.
        c. Plants that grow on north-facing slopes have cooler temperatures and   deeper shade.
        d. Key soil-related factors affecting the type of plants that will grow   include: 1) the soil type; 2) the pH, which ranges from acid to   alkaline; and 3) the amount of organic content.
        e. Don't know

Circle "T" for True or "F" for False:

15. T or F -The following are all benefits provided by Missouri forests: (Score = 1)
- helping maintain water quality for streams
- providing habitat for wildlife
- providing opportunities for recreation
- providing timber for harvesting and sale

☐ -- Don't Know

16. T or F -The way trees are harvested influences the character of the new forest that replaces them. (Score = 1)

☐ -- Don't Know

17. T or F - Clearcutting is never an acceptable way to regenerate a forest. (Score = 1)

☐ -- Don't Know

MN Training Topic: Prairie Ecosystems (Score = 2)

18. The following tools are used to manage prairies in Missouri: (circle all that apply)
(Total possible score = 1.)
        a. grazing
        b. leaving them alone with no human intervention
        c. hay cutting
        d. prescribed burns / fires
        e. replanting

☐ -- Don't Know

19. Historically, grazing by bison and other animals helped maintain the prairies. What other process historically was essential to maintaining the prairie ecosystems.. _____ (Score = 1)

☐ -- Don't Know

20. The four parts of a watershed include: (circle one) (Total possible score = 1.)

     a. uplands; floodplains; riparian corridors; and stream channels
     b. flow; water quality; energy source; and habitat quality
     c. channelization; urbanization; deforestation; and levees
     d. oceans; lakes; rivers; and streams
     e. don't know

21. Benefits of a forested border to a stream corridor include: (circle all that apply) (Total possible score = 1.)

     a. controlling erosion and sedimentation of bottomland fields
     b. protecting soil from falling rain
     c. acting as sponge to slow runoff
     d. improving fish and wildlife habitats
     e. don't know

Circle "T" for True or "F" for False:

22.   T or F -In a natural flowing Missouri stream, meanders or bends constantly change because the force of water removes soil and gravel from banks and deposits it on an inside bend downstream.

☐ -- Don't Know

(Score = 1)

23.   T or F - Channelization that straightens bends and shortens the length of the river is an effective method to control bank erosion of Missouri streams.

☐ -- Don't Know

(Score = 1)

<u>MN Training Topic: Wildlife Management</u> (Score = 1)

24. Which of the following are acceptable methods to manage wildlife in Missouri? (circle all that apply) (Total possible score = 1.)

       a. legal protections for endangered species
       b. habitat improvement for bluebirds
       c. enforcement of regulations to prevent poaching
       d. hunting squirrels
       e. poisoning a coyote to control predation of livestock
       f. trapping otters
       g. research on the interrelationship between plant and animal to enhance wildlife conditions

☐ -- Don't Know

Present Day (2005)

25. Label each Missouri region and identify a characteristic of that region. (Regions and characteristics may be similar or the same in different parts of the state)

(Total possible score = 8; each correct answer scores 1, e.g. 1 score for correctly identifying an Region and 1 score for correctly identifying a characteristic.)
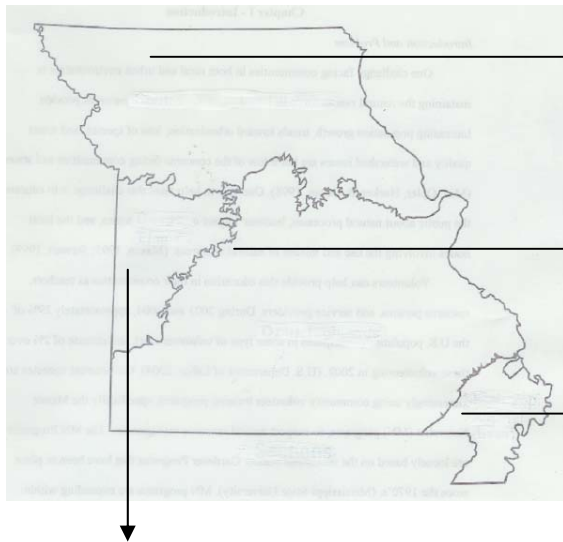
Region: Central Dissected Till Plains - □ -- Don't Know
Characteristic: ___Loess soils - □ -- Don't Know

Region: _____ Ozark Highlands - □ -- Don't Know

Characteristic: ___Glades   - □ -- Don't Know

Region: Mississippi River Alluvial Basin - □ -- Don't Know

Characteristic: ____Marsh -   □ -- Don't Know

Region: _ Osage Plains -   □ -- Don't Know

Characteristic: ___Prairie   - □ -- Don't Know

Missouri Regions:
Osage Plains (OP)

Missouri River Alluvial Basin

Ozark Highlands (OH)

Mississippi River Alluvial Basin (MRAB)

Central Dissected Till Plains (CDTP)

Igneous Knobs

Low Prairie Plains

Characteristics: (Abbreviations refer to ecoregions, e.g. OP = Osage Plains; OH = Ozark Highlands, etc.)

(Several characteristics may be identified for each region, but you only need to list one above).

Wetlands (MRAB)	Tundra
Prairie (OP, CDTP)	Loess soils (CDTP)
Pasture (OH, OP, CDTP)	Marsh (MRAB)
Glades (OH)	Streams (OH, MRAB)
Caves (OH)	Major river (OH, MRAB)
Cropland (OH, OP, CDTP)	Woodland (OH)
Springs (OH, MRAB)	Floodplains (OH, MRAB)

Coding for Demographic Questions:

Label	Values	Description
1. Gender	1 = Female 2 = Male	Gender category
2. Age	age as given	Age category
3. Race/Ethnicity	1 = White (non-Hispanic) 2 = Spanish/Hispanic/Latino 3 = Black or African American 4 = American Indian or Alaska native 5 = Asian 6 = Other	Race /ethnicity
4. Highest Degree Earned	1 = High School / GED 2 = Associate Degree 3 = Bachelor's Degree 4 = Master's Degree 5 = Doctorate (M.D., J.D., Ph.D., etc.) 6 = Other (some college, technical, Vocational)	Educational level
5. Retired	1 = No 2 = Yes	Employment status
	Statements of past occupations will be recorded and coded after volunteers complete the survey.	Past occupation
6. Occupation	Statements of current occupations will be recorded and coded after volunteers complete the survey.	Current occupation

7. Marital Status	1 = No 2 = Yes	Marital status category
8. Involvement in MN program	1 = No 2 = Yes	Whether spouse or significant other is involved in MN Program
9. Income	1 = Under $20,000 2 = $20,000 - $49,999 3 = $ 50,000 - $79,999 4 = $80,000 - $109,999 5 = $110,000 or over	Total annual household income before taxes
10. Locale	1 = Rural area 2 = Suburban area 3 = City < 25,000 4 = City - 25,000 – 249,999 5 = City - 250,000 or larger	Where volunteer currently lives
11. Learn about program	1= Missouri Conservationist magazine 2 = Newspaper 3 = Word of mouth 4 = Master Naturalist website 5 = MU Extension 6 = Other (specifics as how individuals learned of the program identified under "Other" will be hand tabulated and coded after volunteers complete the survey)	Where volunteer first learned about MN program

Motivation Inventory Categories / Statements:

Protective

15. Volunteering helps me forget about how bad I'm been feeling.

18. By volunteering, I feel less lonely.

20. Volunteering is a good escape from my own troubles.

22. Volunteering helps me work through my own problems.

29. Volunteering relieves my guilt over being more fortunate than others.

Values

3. I feel it is important to help others.

4. I am genuinely concerned about Missouri natural resources.

5. I want to do something for a conservation cause.

6. I feel compassion for people in need.

7. I am concerned about those less fortunate than myself.

Enhancement

9. Volunteering is a way to make new friends.

14. Volunteering increases my self esteem.

16. Volunteering helps me feel better about myself

26. Volunteering makes me feel important.

30. Volunteering as a Master Naturalist will help me feel needed in the community.

Social

11. People I know share interest in community service.

13. Those close to me value community service.

17. Volunteering is important to those I know best.

23. People I'm close to want me to volunteer.

25. Friends of mine volunteer as Master Naturalist.

Career

19. Through volunteering, I can make new contacts that may help my career.

21. Volunteering will look good on my resume.

24. Volunteering will help me succeed in my chosen profession.

27. Volunteering allows me to explore different career options.

28. Volunteering can help me get foot in door where I want to work.

Understanding

1. Through volunteering as a Master Naturalist, I can learn more about natural resources issues in Missouri.

2. I want to learn about natural resources through practical instruction and hands on experience.

8. Volunteering allows me to gain new perspective on things.

10. Through volunteering, I can explore my own strengths.

12. Through volunteering, I can learn how to deal with a variety of people.

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